

The Jefferson Performing Arts Society

Presents



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Teacher's Notes

- Lyrics by Irving Berlin
- Based upon the Paramount Pictures Film written by NORMA KRASNA
- Book by DAVID IVES & PAUL BLAKE

Adapted from the film of the same, this heartwarming musical features seventeen Irving Berlin songs and a book by David Ives and Paul Blake.

Veterans Bob Wallace and Phil Davis have a successful song-and-dance act after World War II. With romance in mind, the two follow a duo of beautiful singing sisters en route to their Christmas show at a Vermont lodge, which just happens to be owned by Bob and Phil's former army commander. The dazzling score features well known standards including Blue Skies, I Love A Piano, How Deep Is the Ocean and the perennial favorite, White Christmas. An uplifting musical great for the Holiday Season!

The musical stage adaptation of **White Christmas** premiered in San Francisco in 2004 followed by productions in Boston, Buffalo, Los Angeles, Detroit, Louisville and the United Kingdom. The Broadway production opened on November 23, 2008 at the Marquis Theater and ran for 53 performances earning two Tony Award nominations. The musical was revived at the Marquis Theater for the 2009 Christmas season.

White Christmas is a story of philanthropy and hope, a story of friends who use their talents to assist a friend in need. In the story, the four main characters, Bob Wallace, Phil Davis, Betty Haynes and Judy Haynes take the train from Florida to Vermont. All four characters are professional performers. Bob Wallace and Phil Davis are also war veterans who fought together during World War Two. Betty and Judy Haynes are sisters who perform together every winter at The Columbia Inn in Vermont. Bob and Phil accompany Betty and Judy to Vermont. When they arrive at The Columbia Inn Bob and Phil discover the inn is owned by General Henry Waverly, the general they served under during World War II. They also learn that the inn is on the verge of bankruptcy, due to lack of customers and snow.

Bob Wallace, Phil Davis, Betty Haynes and Judy Haynes decide to use their singing and dancing talents to produce a show that will raise money for the financially struggling inn. Additionally, Bob and Phil reach out to all General Waverly's former troops to invite them to support the general and attend the show.

The **Background** section of this Companion includes information on Irving Berlin's inspiration for the song **White Christmas**, information on the film and the musical theater production of the same name, and information on a special exhibit on Bob Hope currently on display in The National World War II Museum located in New Orleans.

Bing Crosby and Bob Hope performed frequently together. Although Bob Hope was never considered for a role in **White Christmas**, he and Bing Crosby are both mentioned in the lyrics of one of the songs in the show. The song "Gee, I Wish I Was Back In The Army" contains the lyric, "Jolson, Hope And Benny all for free". This is a reference to the three wartime entertainers: Al Jolson, Bob Hope and Jack Benny. The original words were "Crosby, Hope and Jolson all for free", but the lyric was changed because with Bing Crosby in the cast of **White Christmas** the original lyric would break the fourth wall. Bob Hope is included in this Companion for his long-time collaboration with **White Christmas** cast member Bing Crosby, his involvement in WWII and for his philanthropic efforts directly related to WWII.

A Penny War is a friendly competition and a way everyone can get involved in philanthropy. In

White Christmas: The Season of Giving, students will explore the story of **White Christmas** and its themes of giving, philanthropy and hope. During this exploration they will discuss the story and its connection to philanthropy. They will use this exploration to undertake their own philanthropic project (a Penny War,) engage at least one other class in the project, and explore mathematical concepts of $>$, $=$, and $<$ and graphing (bar graphs, circle graphs, box-and-whisker plots and scatterplots.) They will use this exploration of mathematical concepts to compare and contrast the progress of the two classes throughout the course of the Penny War. AND they will use the proceeds they raise during their philanthropic project support a cause of their choosing.

In the story **White Christmas** snow is a contributing factor to the Columbia Inn's financial difficulties because it is ubiquitous. It impedes travel and prevents customers from visiting the Inn. As ubiquitous as the lace of snowflakes that cover the Vermont countryside for a good portion of the year, the lacy ironwork designs that decorate the doorways, balconies and staircases across New Orleans and many of the surrounding parishes are ubiquitous. In addition, the lace of snowflakes and the lacy ironwork designs have something in common:

geometry and geometric patterns. In **Symmetry: Lace and Snow**

students will learn how temperature is a factor in the development of the designs of snowflakes, investigate the germ of ice crystals (the hexagon,) discover the geometric patterns found in snowflakes, have the opportunity to further explore geometric patterns in three types of snowflakes: plane crystals, rimed snow crystals and irregular particles, compare and contrast these three types of snowflakes to five Adinkra symbols: twin crocodiles, spider's web, fern, the "king of Adinkra symbols" and the staff of life and create their own lace designs inspired by these explorations. To further connect their investigations and discoveries students will develop written descriptions of the lace designs they create. To develop their writing, students will use an order of adjectives/list of adjectives review sheet as an additional source of inspiration.

AN EXTENTION: Symmetry: Lace and Snow is a follow up to the designs students created using the **White Christmas Symmetry: Lace and Snow** graph paper. Students will investigate geometric patterns further by expressing designs as a sequence of numbers.

*I'm dreaming of a white Christmas,
just like the ones I used to know
Where the treetops glisten and children listen
to hear sleigh bells in the snow*

*I'm dreaming of a white Christmas,
with every Christmas card I write
May your days be merry and bright,
and may all your Christmases be white*

~White Christmas, Irving Berlin



Louisiana Educational Content Standards and Benchmarks

The arts facilitate interconnection. They provide tangible, concrete opportunities for students and teachers to explore academic concepts. Academic concepts are strengthened when learning integrates academic subjects like English language arts with arts. A system of Grade Level Expectations and Standards and Benchmarks is replacing the Common Core standards used since 2010 to measure student achievement. Here is some background information on Louisiana Common Core:

LOUISIANA STATE STANDARDS

In March, 2016 The Louisiana Board of Elementary and Secondary Education (BESE) approved the Louisiana State Student Standards in English language arts and mathematics. This action by BESE replaces the Common Core State Standards with unique state standards developed through a collaborative statewide process which included extensive public input and the work of Louisiana educator-led committees. Academic standards define the knowledge and skills that students are expected to learn in a subject in each grade. Please visit these sites for more information:

<http://bese.louisiana.gov/documents-resources/newsroom/2016/03/04/bese-approves-louisiana-student-standards-adopts-2016-17-education-funding-formula>

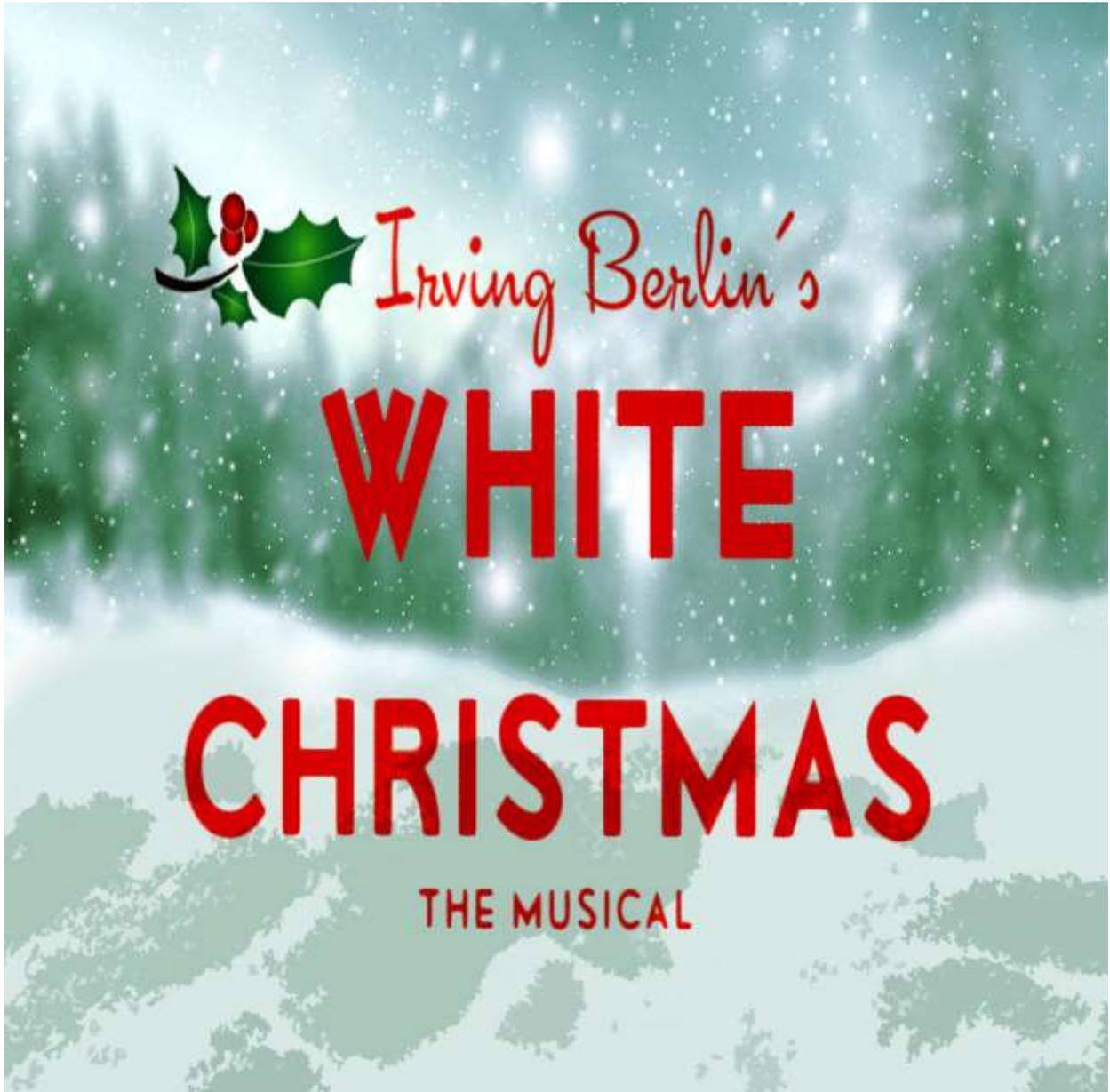
<http://www.louisianabelieves.com/academics/louisiana-student-standards-review>

All Louisiana State Standards were retrieved from:

<http://www.louisianabelieves.com/docs/default-source/teacher-toolbox-resources/k-12-ela-standards.pdf?sfvrsn=12>

http://www.louisianabelieves.com/docs/default-source/teacher-toolbox-resources/louisiana-student-standards-for-k-12-math.pdf?sfvrsn=86bb8a1f_60

Background



CountryLiving

The True Story Behind the Song 'White Christmas' Is Even Sadder Than Its Lyrics
America's favorite Christmas song actually has a pretty dark back story.

BY [TAYSHA MURTAUGH](#)

NOV 19, 2017



ALFRED EISENSTAEDT/JOHN SWOPE/THE LIFE IMAGES COLLECTION/GETTY IMAGES

With 50 million copies sold, not only is [Bing Crosby's "White Christmas"](#) the best-selling Christmas song of all time, it's also the best-selling single ever, according to [Guinness World Records](#).

It first aired during the Kraft Music Hall radio show (yes, sponsored by the food company) on December 25, 1941. Then-host, Bing Crosby, crooned the carol, which is soulful, longing, and *sad* anyway, but especially so at the time. Pearl Harbor had been attacked just a few weeks before.



Patty Andrews, Bing Crosby, and Irving Berlin
GAB ARCHIVE/REDFERNS

It turns out, the song has a sad back story too. It was written by Irving Berlin (the same composer behind "Cheek to Cheek," "God Bless America," and [many more classics](#)), a Russian-born immigrant who, interestingly enough, did not celebrate Christmas, as he was Jewish.



Irving Berlin

ALFRED EISENSTAEDT/THE LIFE PICTURE COLLECTION/GETTY IMAGES

Berlin's three-week-old son had died on Christmas day in 1928, so every year on December 25, he and his wife visited their baby's grave, Jody

Rosin, author of *White Christmas: The Story of an American Song*, told *NPR*.

"I'M DREAMING OF A WHITE CHRISTMAS/JUST LIKE THE ONES I
USED TO KNOW/WHERE THE TREETOPS GLISTEN AND CHILDREN
LISTEN/TO HEAR SLEIGH BELLS IN THE SNOW"

"The kind of deep secret of the song may be that it was Berlin responding in some way to his melancholy about the death of his son," Rosen said.

He wrote "White Christmas" for a musical that eventually morphed into the movie *Holiday Inn* and ended up winning an Academy Award for the song. In 1954, it was the title track of another Bing Crosby Christmas musical, *White Christmas*.



Bing Crosby, Rosemary Clooney, Vera-Ellen, and Danny Kaye in a scene from "White Christmas"

Crosby's rendition quickly became an American favorite, even though the original radio recording was lost and the 1942 version, which is said to have [only taken 18 minutes](#), was worn out, according to Seattle's [KUOW](#). It was constantly requested by troops during Bing's USO appearances overseas, which gave the singer some mixed feelings.

"I hesitated about doing it because invariably it caused such a nostalgic yearning among the men, that it made them sad," Crosby said in an interview. "Heaven knows, I didn't come that far to make them sad. For this reason, several times I tried to cut it out of the show, but these guys just hollered for it."

"I'M DREAMING OF A WHITE CHRISTMAS/WITH EVERY CHRISTMAS
CARD I WRITE/MAY YOUR DAYS BE MERRY AND BRIGHT AND MAY
ALL YOUR CHRISTMASSES BE WHITE"

Clearly, they identified with the wistful lyrics about holidays at home. Since then, "White Christmas" has been covered by everyone from Elvis to Karen Carpenter to Lady Gaga—but its timeless message remains the same.

(h/t [NPR](#))

FROM: <https://www.countryliving.com/life/news/a45720/white-christmas-song-history/>



DALLAS NEWS

Powered by *The Dallas Morning News*

Why was Irving Berlin dreaming of a white Christmas? Hear the story before seeing the show

FILED UNDER THEATER AT NOV 23

Written by Nancy Churnin, *Theater Critic*



On Jan. 8, 1940, Irving Berlin announced to his longtime musical arranger that he'd written his greatest song. That was quite a statement from the man who'd already given the world "God Bless America."



Irving Berlin at his piano in 1938.

(Rodgers & Hammerstein: A Concord Music Company)

Still, there it was: "White Christmas." Bing Crosby's recording of this song would go on to win the Academy Award in 1943 and sell more than 50 million copies, making it the best-selling Christmas song of all time.

After all these years, one might be tempted to dismiss the power of the song as a nostalgic ode. It was originally one of the tunes in the 1942 *Holiday Inn* film. Now it's the centerpiece of Berlin's *White Christmas*, which is adapted from the 1954 cinematic musical, *White Christmas*, with its well-worn plot about two Army buddies who put on a show to save their former general's failing Vermont inn.

But if you know Berlin, you know the song and plot mean more than they seem.

His success came from his ability to pour his heart into his lyrics and melodies. You think the idea of putting on a show to save a general is silly? During World War I, that's how Berlin helped his country — by putting on a show, *Yip Yip Yahank*. He gave all the money the show earned, \$150,000, for an Army camp service center.

He did the same during World War II, creating a show, *This is the Army*, which was performed on Broadway and was made into a 1943 movie, with future President Ronald Reagan as one of the stars. Berlin traveled with the show for 3 1/2 years, refused any salary or compensation for his expenses, and gave all profits, which added up to more than \$10 million, to the Army. President Harry S. Truman thanked him by awarding him the Army's Medal of Merit in 1945.



Rosemary Clooney, at piano, with Bing Crosby (left) and Vera-Ellen and Danny Kaye in a scene from the 1954 movie version of "White Christmas."

(Paramount Pictures)

But how could the son of a cantor, an immigrant refugee from Russia who'd grown up in an observant Jewish family, write with such feeling about Christmas?

There are layers of reasons that give this seemingly simple song such enduring depth. On the outer layer, he recalled the homesickness he felt for his wife and daughters in 1937 when they were in their home in New York celebrating Christmas and he was working in Los Angeles on the movie *Alexander's Ragtime Band*.

Certainly, Christmas in Los Angeles was what inspired the original opening stanza that hardly anyone sings anymore: "The orange and palm trees sway/There's never been such a day/In Beverly Hills, L.A./But it's December the twenty-fourth,/And I'm longing to be up north."

But there was someone else Irving missed, too. Someone whose loss he grieved in that song: his infant son, Irving Berlin Jr., who died in 1928 on Christmas Day. Every Christmas, Berlin and

his wife would visit their son's grave before returning home to open presents with their daughters, who wouldn't learn until they were older that they'd had a brother.

Suddenly the line, "just like the ones I used to know" takes on fresh, heartbreaking weight.

Timing is one of the elements that propelled this song to stardom. Crosby first sang it on the radio on Christmas Day in 1941, just weeks after the attack on Pearl Harbor on Dec. 7. By the following Christmas, the song resonated even more powerfully among young Americans who found themselves overseas, missing their families, and among their families, who were missing them.

It continues to evoke longing that echoes for anyone who dreams of a time before the loss of someone dear. It makes you feel sad and then does what a great song does — it harmonizes frayed feelings, reminding you that even when you feel alone, you're not.

Nancy Churnin's children's book Irving Berlin, the Immigrant Boy Who Made America Sing, will be published June 1 by Creston Books.

RETRIEVED FROM: <https://www.dallasnews.com/arts/theater/2017/11/23/irving-berlin-dreaming-white-christmas-hear-story-seeing-show>



Trending: A White Christmas

November 26, 2014 by [Erin Allen](#)

(The following is an article in the November/December 2014 issue of LCM, the Library of Congress Magazine. The issue can be read in its entirety [here](#).)

As the holidays approach, the dream of a white Christmas is on many minds.

The cast of “White Christmas” poses on this 1954 movie poster. Paramount Pictures Corporation, Prints and Photographs Division.

A white Christmas is the stuff that dreams are made of, at least according to composer and lyricist Irving Berlin (1888-1989).

Berlin’s “White Christmas” was written for the movie musical “Holiday Inn,” starring Bing Crosby and Fred Astaire. The first public performance of the song was by Crosby, on his NBC radio show “The Kraft Music Hall” on Christmas Day 1941. The song rapidly became a wartime tune for those fighting abroad and for those on the home front. By the time the film debuted in the summer of 1942, the song was on its way to becoming the best-selling single of all time. It garnered the Academy Award for Best Original Song of 1942.

The [Irving Berlin Collection](#) in the Library of Congress—750,000 items—documents all aspects of his life and career. The collection contains music scores, Berlin’s handwritten and typewritten lyric sheets, publicity and promotional materials, personal and professional correspondence, photographs, business papers, legal and financial records, scrapbooks filled with press clippings, awards and honors and artwork. Among these items is the lead sheet sketch of “White Christmas,” dated Jan. 8, 1940—though not in Berlin’s own hand since he didn’t write musical notation.

The popular song also became the inspiration for the 1954 movie musical, “White Christmas.” With a similar plot involving a country inn, “White Christmas” paired Crosby with Danny Kaye. Still images from the film came to the Library as part of the [Danny Kaye and Sylvia Fine Collection](#).

The collection of more than 1,000 boxes of materials (sheet music, scripts, business papers, correspondence, photographs, recordings and videos) came to the Library in 1992. The Library’s 2013 exhibition “[Danny Kaye and Sylvia Fine: Two Kids from Brooklyn](#)” featured items from the collection.

Score and cover for "White Christmas," Irving Berlin Music Corporation, 1940. Music Division.

The original 1942 Bing Crosby recording of "White Christmas" was added to the National Recording Registry of the Library of Congress in its inaugural year, 2002.

The opening verse, dropped from the original version, may prove that the song was written in California.

"The sun is shining, the grass is green,

The orange and palm trees sway.

There's never been such a day

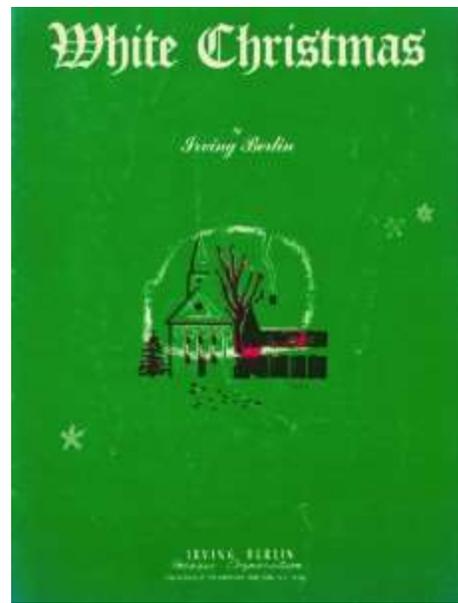
in Beverly Hills, L.A.

But it's December the twenty-fourth,—

And I am longing to be up North—"

Posted in: [Collections](#), [Film](#), [Music](#)

RETRIEVED FROM: <https://blogs.loc.gov/loc/2014/11/trending-a-white-christmas/>





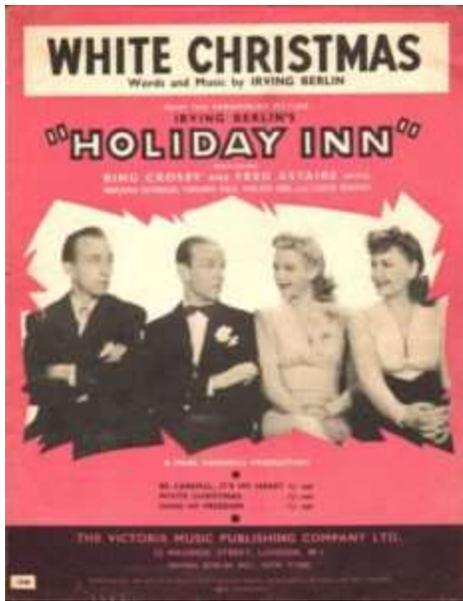
Welcome to America Comes Alive!, a site I created to share little-known stories of America's past. These stories are about Americans - people just like you - who have made a difference and changed the course of history. Look around the site and find what inspires you. *Kate Kelly*

White Christmas The Story Behind the Song



Irving Berlin's *White Christmas* has notched many top positions on “best-selling” and “most-recorded” lists. Exact numbers are difficult to pin down even by the careful staff of *Guinness Book of World Records*.

The song—written in 1940-41 was introduced at a time when sheet music sales were more important than record sales. The following year (1942), many of the “plays” of the recording were on [Armed Forces Radio](#), at a time when the world was at war. Tabulating record sales was low on America's “to do” list.



Speaking generally, however, the Bing Crosby recording of the song has sold more than 100 million copies worldwide. When the recordings by other artists are added to Crosby's, the sales of the song reach a very impressive 150 million. The only other song to come near this—and perhaps surpass it—is Elton John's 1997 recording of *Candle in the Wind*, a song he wrote in 1973 in memory of Marilyn Monroe but re-recorded in 1997 after Princess Diana died.

Here's how White Christmas became one of the most successful songs ever.

Irving Berlin

Irving Berlin (1880-1989) was born Israel Baline in Tyumen (part of western Siberia). He was the youngest of eight children, six of whom emigrated with their parents to the U.S. in 1893.

His father, a cantor, had trouble finding steady work in America, so the children accepted after-school jobs. Izzy, as Irving was then called, sold newspapers and delivered telegrams during grammar school. After his father died in 1901, Izzy left school and supported himself as a “song plugger.” (Sheet music companies hired “buskers” or “song pluggers” to travel the city and perform new songs in saloons, vaudeville theaters, and on street corners. By introducing a song to the public in this way, the companies hoped to stimulate sheet music sales.)

Singing Waiter



Izzy had a fine singing voice and a superior ear for music. At 16, he became a singing waiter at the Pelham Café in Chinatown in New York City. He taught himself the basics of piano playing, but he was never skilled at it, nor did he ever learn to write music. But his time at the Pelham Café gave him invaluable experience. He began composing with a partner, and because he performed what he wrote, he learned about audience reaction and what makes a song a crowd-pleaser.

His first published song—written and published while he was still at the Pelham Café—led to his name change. The song was called *Marie from Sunny Italy*. When the sheet music came back from the publisher, there was a typo: I. Baline became I. Berlin.

Berlin went on to be one of the most successful songwriters of all time. His songs, [listed here](#), have been and are still recorded by top performers.

White Christmas was to become the most popular Christmas song ever written. It continues to be a December perennial, recorded by many solo artists and orchestras.

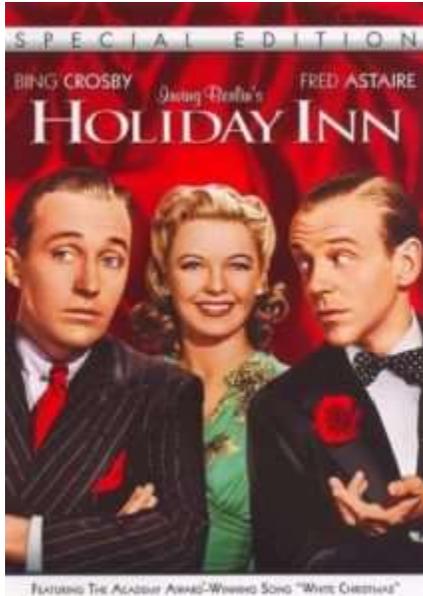
Writing White Christmas

When people today talk about *White Christmas*, the conversation usually begins with, “Did you know it was written in Beverly Hills?” or “...Palm Springs?” The thought of this ballad to a wintry white holiday being written by a pool in 80-degree weather seems to fascinate.

So was *White Christmas* written in California? According to Jody Rosen, author of *White Christmas: The Story of an American Song*, the song may have been drafted in or near Los

Angeles, but it was undoubtedly finished in New York or at the Berlin family's weekend house in the Catskills. Like writers of all types, Berlin had a habit of writing something and putting it away if he wasn't satisfied. He called these his "trunk songs."

Song First Shared with Staff



The first time the song was introduced to his staff was on January 8, 1940. On that day, Berlin appeared in his business office to meet with Helmy Kresa, the fellow who scored his music. Berlin would sing the song and work carefully with Kresa, until the melody Kresa wrote sounded just as Berlin heard it in his head.

When Berlin came in, he announced that he wrote the song "over the weekend." The Berlin family was in New York through the holidays that year, so he must have written or at least polished it there.

White Christmas was also originally written as a satire. As Berlin envisioned it, the song would be part of a musical revue. It would be performed tongue-in-cheek by sophisticates, drinks in hand, standing around a Hollywood pool surrounded by palm trees.

White Christmas To Be Part of Movie

That spring (1940), Berlin signed to do a musical for Paramount. The plot Berlin had in mind featured a vaudeville performer retiring to run a country inn. The gimmick was that it was a “holiday inn,” open for overnight guests only on holidays. Berlin would provide a holiday-themed score that would take viewers through the year of holidays.



Casting for the film and early rehearsals for *Holiday Inn* began in the autumn of 1941. Irving Berlin knew his recently finished song, *White Christmas*, was a good one. The deal he made with Paramount was that *White Christmas* would be part of the film only if Paramount managed to sign Bing Crosby (1903-1977). Crosby was already a big star.

World Shocked by Attack

In the midst of planning for *Holiday Inn*, Berlin, Crosby, and all Americans were rocked by national tragedy.

On December 7, 1941, a surprise attack by the Japanese did unfathomable damage and caused great loss of life at the American port at Pearl Harbor. President Franklin Roosevelt summoned his military leaders to the White House and ordered a bombing raid on Japan. The country was at war.

Just a few days after this—December 24, 1941—Bing Crosby introduced *White Christmas*, perhaps as a note of hope, on his highly successful radio broadcast, Kraft Music Hall.

By late December of 1941, Americans were enlisting in the military in record numbers as America mobilized for war. They heard *White Christmas* not as a spoof but as a longing for days “just like the ones I used to know.” The lyrics took on a whole new meaning for soldiers on their way overseas.

Movie Release



When *Holiday Inn* was released in 1942, the hit song was as expected: *Be Careful It's My Heart*, which tied into the Valentine's Day celebration at the fictitious Holiday Inn.

Berlin—ever the savvy song plugger—was happy about this as he planned a push for *White Christmas* closer to the December holiday.

What caught Berlin by surprise, however, were the requests for *White Christmas* on radio starting in the early fall. By October, *White Christmas* was topping the charts.

Berlin was worried the song's popularity would die down, but his worries were unfounded. On November 21, *White Christmas* began a 10-week run on top of the Hit Parade.

In 1942, one million copies of sheet music and 2 million copies of Bing Crosby's recording sold...it was huge, and it's a big part of holiday music every year since.

Song Writing Style of the Era

Songs like *White Christmas*, written during the Tin Pan Alley era, had a prescribed format. A 16-bar verse led into a 32-bar chorus, and with almost all songs it was the chorus that people remembered.

The verse of *White Christmas* became problematic for Berlin when he saw what people looked for in listening to the song. His verse, which set up the satirical scene he envisioned, was:

The sun is shining, the grass is green

The orange and palm trees sway

There's never been such a day

In Beverly Hills, L. A.

But it's December the 24th

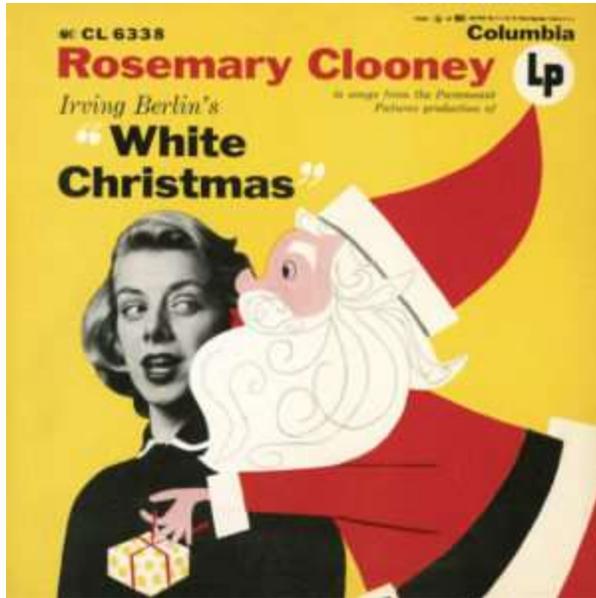
And I am longing to be up north....

I'm dreaming of a white Christmas...

(Chorus continues)

Berlin rapidly saw that the soldiers took a very different sentiment from *White Christmas*, and he wanted to honor the spirit of his listeners. He notified his publishing company that going forward all recordings and sheet music should be published without the first verse.

Many Years Later Verse Reappears



For many years, no one thought about the original first verse of the song. Then in 1989, Rosemary Clooney (1928-2002), star of the 1954 movie, *White Christmas*, recorded the song. She included the first verse.

This became the start of speculation as to where Berlin was when he wrote the song.

Song Hits Right Note

While most other holiday songs promise a time of unmitigated joy and merriment, the melancholy undertone of *White Christmas* continues to appeal. “Fairy tale” holidays are rare, and *White Christmas* reminds us that others, too, identify with the song’s ambivalence. Will this year’s holiday ever equal the ones of the past?

Maybe not, but we can always dream and share our dream with others.

Berlin and Crosby, a Great Team

Irving Berlin and Bing Crosby were forever united by what turned out to be one of the best decisions either of them ever made. Berlin imagined the lyrics and the tune; Crosby could evoke just the right feeling.

“It’s a little late—after almost twenty-seven years—to send you a fan letter about *White Christmas*,” wrote Irving Berlin to Bing Crosby in 1967. “But I heard you sing it last night on the *Hollywood Palace* show. Not only were you the first, but you remain the best.”

Later Berlin was to write that after Berlin first played *White Christmas* for Bing Crosby at Paramount, Crosby said, “You don’t have to worry about this one, Irving.”

To read the story of how the song, *White Christmas*, was part of the coded signal about [the fall of Saigon, click here](#).

And for more about the music technology of the era, read “[How a 1920s Technology Changed Music](#).”

RETRIEVED FROM: <https://americacomesalive.com/2017/12/13/white-christmas-the-story-behind-the-song/>



Welcome to America Comes Alive!, a site I created to share little-known stories of America's past. These stories are about Americans - people just like you - who have made a difference and changed the course of history. Look around the site and find what inspires you. *Kate Kelly*

Dorie Miller (1919-1943), Hero of World War II

- Serving in a noncombat role in the Navy, Dorie Miller responded heroically when the battleship *West Virginia* was attacked at Pearl Harbor



- Because the Navy was segregated, African Americans were not given combat roles or weaponry training, so Miller's adept ability to shoot down enemy planes was all the more remarkable
- First African American awarded the U.S. Navy Cross

Doris Miller, known as "Dorie," was born in Waco, Texas, in 1919. He was one of four sons. After high school, he worked on his father's farm until 1938 when he enlisted in the Navy as mess attendant (kitchen worker) to earn money for his family. At that time the Navy was segregated so combat positions were not open to African-Americans.

On December 7, 1941, Dorie arose at 6 a.m. to begin work. When the Japanese attack occurred, he immediately reported to his assigned battle station. Miller was a former football player and a Navy boxing champ so his job was to carry any of the injured to safer quarters; this included the mortally wounded ship's captain.

Miller then returned to deck and saw that the Japanese planes were still dive-bombing the U.S. Naval Fleet. He picked up a 50-caliber Browning anti-aircraft machine gun on which he had never been trained and managed to shoot down three to four enemy aircraft. (In the chaos of the attack, reports varied, and not even Miller was sure how many he hit.) He fired until he ran out of ammunition; by then the men were being

ordered to abandon ship. The *West Virginia* had been severely damaged and was slowly sinking to the harbor bottom. Of the 1541 men on board during the attack, 130 were killed and 52 wounded.

Early Reports: Heroic “Negro Messman”



The original newspaper reports noted that a “Negro messman” had behaved heroically. The editors at the Pittsburgh Courier, one of the country’s most widely circulated black newspapers, pounced on that and sent a reporter out to identify the hero. Had this newspaper not been on the case, Dorie Miller probably would never have been identified.

On April 1, 1942 Miller was commended by the Secretary of the Navy, Frank Knox, and on May 27, 1942 he received the Navy Cross for his extraordinary courage in battle. His rank was raised to Mess Attendant First Class on June 1, 1942.

As happened with other war heroes, Dorie Miller was then sent on a tour in the States to raise money for war bonds, but Miller he was soon called back (spring ’43) to serve on the new escort carrier the *USS Liscome Bay*. The ship was operating in the Pacific near the Gilbert Islands. At 5:10 a.m. on November 24, the ship was hit by a single torpedo fired from a Japanese submarine. The torpedo detonated the bomb magazine on the carrier; the bombs exploded, and the ship sank within minutes. Miller was initially listed as missing; by November 1944 he status was changed to “presumed dead.” Only 272 men survived the attack.

Today there is a Dorie Miller park in Hawaii and a good number of schools and buildings throughout the U.S. are named in his honor. He was also one of four Naval heroes featured on U.S. postal stamps in 2010.

However, many officers and men in the Navy felt that for his actions on the *West Virginia* at Pearl Harbor, Miller deserved more—that he should have been awarded the Medal of Honor.

For another story of an African-American hero during World War II, read about [Charles David, Jr.](#), who served in the Coast Guard.

Following the anniversary of the bombing of Pearl Harbor, I heard from many people who would like to show their support for Dorie Miller being given the Congressional Medal of Honor posthumously.

These are steps you can take in that effort:

And to read a story about World War I soldier whose family overcame all the resistance to honoring him properly, read about World War I veteran, Henry Lincoln Johnson, a proud member of the Harlem Hellfighters:

<https://americacomesalive.com/2015/06/03/harlem-hellfighter-receives-congressional-medal-of-honor-posthumously/>

RETRIEVED FROM: <https://americacomesalive.com/2012/02/20/dorie-miller-1919-1943-hero-of-world-war-ii/>



Irving Berlin: The Immigrant Boy Who Made America Sing

By Nancy Churnin

Illustrated by James Rey Sanchez

Irving Berlin came to America as a refugee and began singing about his new home. From Broadway to "God Bless America," his music still defines the American spirit!

"Together, Churnin and Sanchez have created a timely biography that says a lot about the world in which we live and, as a bonus, just happens to be gorgeous to the eye and ear alike. More like this please!"

—Betsy Bird, Fuse#8, School Library Journal

"Jewish songwriting icon Irving Berlin immigrated to the United States as a child, but was American down to his core. Songs like "There's No Business Like Show Business," "Alexander's Ragtime Band," and the ubiquitous "White Christmas," were all Berlin compositions. But the song which meant the most to him and for which he refused to take any personal profit was "God Bless America." This richly-colored picture biography details Irving Berlin's younger years as he struggled to develop his musical talent. The illustrations make evocative use of shadow and light, creating a sense of movement across the pages. The reader is drawn into Berlin's world of New York streets and music-filled rooms. The text is dense enough to be informative, yet spare enough to keep the attention of young readers. This lovely book is highly recommended for ages 7 to 12."

—Michael Malen, Jewish Book Council

"Irving Berlin and his family arrived in America as countless immigrant families did: in New York

Harbor, with the Statue of Liberty serving as a welcoming beacon (“ ‘God bless America,’ Irving whispered”). Through vivid storytelling, Churnin describes young Irving’s impressions of the unfamiliar city: “Walking home, the melodies in his head mixed with the crack of stickball games, the wail of the ragmen, and the creak of cartwheels on the cobblestones.” After his father’s death, Berlin earns money by writing and singing songs on the street, then at a restaurant; a fortuitous job at a song-writing company leads to his success. Yet Churnin recounts how fame doesn’t diminish Berlin’s gratitude for his life in America: he gave all of the proceeds for his hugely popular song “God Bless America” to the Girl Scouts and Boy Scouts. Sanchez’s handsomely stylized graphics offer visual depth that hints at the many stories unfolding within Berlin’s New York City community; readers will recognize Berlin in the crowds by his long red scarf, which curls emotively throughout the pages. Ages 7–12.” —Publishers Weekly

ISBN: 978-1-939547-44-6

Format: Hardcover

Pages: 32pp, color

Size: 11in x 8in

Category:

Juvenile Fiction: Biography/Music

Age Range: 7 to 12

Publication: May 2018

Price: \$17.99

[Download Curriculum Guide](#)



"The story of songwriter and composer Irving Berlin’s humble beginnings and rise to Broadway and Grammy fame takes shape in an engaging biography that highlights the compassion, generosity, and patriotism that characterized his life. Berlin is depicted wrapped in an expressive, bright red scarf that swirls and dances along the streets of New York along with lines of musical notes. Children will enjoy learning about the inspiration behind such well-known hits as 'White Christmas' and 'God Bless America.'"

—Foreward Review

"Irving Berlin’s life sings in this beautifully illustrated, crisply told biography. Churnin tell us how and why he came to this country at age 5, escaping a pogrom in Tsarist Russia. She writes about the financial struggles when his father dies, his beginnings as a songwriter and how his songs captured the love of his adopted country and won the hearts of the American people. An author’s note and time line fill in biographical data. The exuberant art work captures the flavor and the rhythms of early 20th-century New York City."

—Joanna Kraus, San Jose Mercury News

"An immigrant, a talent—and America itself was changed. The true story of Irving Berlin, his songs, and American music. Beautifully, artfully done."

—Jane Yolen, award-winning author of *How Do Dinosaurs Say Goodnight*

"Nancy Churnin does a remarkable job of condensing Irving Berlin’s long and productive life into a narrative that will appeal to children and introduce them to one of America’s greatest songwriters."

—Philip Furia, author of *Irving Berlin: A Life in Song*

“A delightful historical narrative with pop, pizzazz, and color, just like Irving Berlin himself. Children and adults alike will enjoy reading this fantastic journey to the birth of the song God Bless America.”

—Mary Jo Guidice, Director of Libraries, Dallas



RETRIEVED FROM: <https://www.crestonbooks.co/irvingberlin> <https://www.crestonbooks.co/irvingberlin>

SPECIAL EXHIBITS



So Ready for Laughter: The Legacy of Bob Hope

When World War II began, entertainer Bob Hope's career as a major movie star in film and radio was just beginning to take off, having worked his way from jobs as a newsboy, a butcher's assistant, a shoe salesman, and an amateur boxer to scrape by in the early 1920s.



May 25, 2018 – February 10, 2019

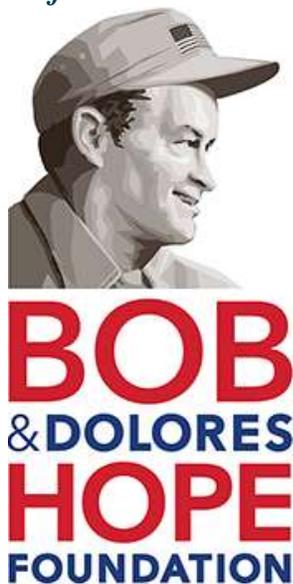
The Joe W. and Dorothy D. Brown Foundation Special Exhibit Gallery

American entertainer Bob Hope began his career as an immigrant who came to the United States with his family as a young boy. In the early 1920s, he worked as a newsboy, a butcher's assistant, a shoe salesman, and an amateur boxer to scrape by. In the decades that followed, Hope shaped his art on the vaudeville stage, and by the start of World War II, he was just emerging as one of America's most popular radio and film stars.

When America went to war in 1941, Hollywood recognized the need for contributions and responded by entertaining troops, raising funds, and boosting morale. Hope's work quickly took on new meaning when he was asked to perform his show outside of the studio, in front of a military audience at March Field, California. That day, he discovered what would become his most cherished audience: the armed forces. Hope later flipped the format of the show entirely and took his wartime programs on the road to military camps and bases across the country, inspiring other entertainers to join him. During the war, only nine of Hope's 144 broadcasts were recorded in the studio—the rest were performed in front of troops.

So Ready for Laughter: The Legacy of Bob Hope, the Museum's newest special exhibit, tells the story of Hope's unique place in the history of World War II and beyond, and the contributions he made that still reverberate more than 70 years later. Using multimedia elements and captivating storytelling—including artifacts, films, photographs, and interactive displays—the exhibit highlights how Hope helped lift the human spirit during one of the darkest times in American history.

Supported by the Bob & Dolores Hope Foundation. With special thanks to the World Golf Hall of Fame & Museum.



RETRIEVED FROM: <https://www.nationalww2museum.org/programs/so-ready-laughter-legacy-bob-hope>

FROM THE COLLECTION



Mail Call: A Moving Letter Within a Letter

A look into the prolific and meaningful correspondence
between Bob Hope and his fans.
June 20, 2018



... I can never thank you enough for having brought him those two hours of fun.

Mrs. A.A. Stumpf

Almost no other figure embodies the importance of a message from home like the entertainer [Bob Hope](#). His performances were letters from home come to life.

He was often recognized as the Home Front ambassador to troops fighting overseas during World War II. He led the way in the effort to entertain troops during World War II, dedicating

himself to live performances that brought his show to troops in the field. There, he saw how comedy could lift the human spirit even in the most desperate of times.

Hope's dedication to troops lasted for the many decades of his long life after World War II. He toured extensively during both the Korean and Vietnam conflicts. Hope's last performance overseas for troops was during Operation Desert Storm, when he was in his 80s. In total, it is estimated that he entertained over 11 million troops.



Bob Hope watching his troupe perform on Pavuvu, August 1944

All Images Courtesy of the Bob & Dolores Hope Foundation Collection, World Golf Hall of Fame & Museum

1st Marine Division Audience on Pavuvu, August 1944

All Images Courtesy of the Bob & Dolores Hope Foundation Collection, World Golf Hall of Fame & Museum

Hope's connections to his fans did not end when he left the stage. "Dear Bob Hope" was the opening line of millions of letters sent to Hope by fans during his career. In 1944, he received an estimated 38,000 letters a week. With the help of assistants, he aimed to give each a personal response. He felt a duty to reply, often several months later, maintaining the bonds with his audience through the mail.

The many thousands of letters Hope received put names to the faces of his audience. They felt compelled to write him to thank him for being there, for recognizing them, for not forgetting them.

One letter, by Mrs. A.A. Stumpf, dated November 27, 1944, began: "Dear Bob Hope: I know you get plenty of fan mail, but this may be a little different." Mrs. Stumpf's letter (read it in the above photo gallery) is a letter within a letter. She excerpts her son Andy's review of Hope's show, which he saw on the island of Pavuvu in August 1944. It was one of the last letters her son wrote. Andy, who served with the First Marine Division, was killed in action on Peleliu soon after seeing Hope's troupe perform.

RETRIEVED FROM: <https://www.nationalww2museum.org/war/articles/mail-call-moving-letter-within-letter>

November 27, 1944.

Dear Bob Hope: I know you get plenty of fan mail, but this may be a little different.

In August I received a letter from my son-
Andy, a Marine then at the little island
of Pavuvu in the Russell Islands in the
Solomons group. It said-

"This morning we saw Bob Hope, Jerry Collona, Frances Langford and Patty Thomas. They flew right over us in these little cub airplanes and landed. They really put on a show and I still can't figure out why they would come to a weather beaten hole like this. We had a very crude stage and we sat on the ground. Frances sang a lot and the other girl danced. I was all eyes on her, as I have never seen anybody that was stacked up as nice as she was; she was really beautiful. And between Hope and Collona, they were a scream, and how we enjoyed it! Both the girls were beautiful, and you can imagine a bunch of guys that haven't seen a girl for a year or so. It was the most enjoyment we've had - in fact it is the only one. They are touring the South Pacific and they stopped in for about two hours. I wish they'd stayed all day, as you never get tired of listening to Hope and Collona, to say nothing of the girls".

Soon after this letter was written, this boy was killed in his first battle, at Peleliu. He was only nineteen, had never been away from home before and was lonely and homesick as most of the boys are, and I can never thank you enough for having brought him those two hours of fun.

Rt. 1 - Box 137
Hilpfield, Wn
Gratefully yours,
Mrs. A. A. Stumpf

P.O. Box 137
Hilpfield, Wn
7th Nov 1944

Letter to Bob Hope from Mrs. A. A. Stumpf

All Images Courtesy of the Bob & Dolores Hope Foundation Collection, World Golf Hall of Fame & Museum
RETRIEVED FROM: <https://www.nationalww2museum.org/war/articles/mail-call-moving-letter-within-letter>



[Bob Hope](#)

Biography

Showing all 154 items

Jump to: [Overview](#) (5) | [Mini Bio](#) (1) | [Spouse](#) (2) | [Trade Mark](#) (6) | [Trivia](#) (74) | [Personal Quotes](#) (60) | [Salary](#) (6)

Overview (5)

Born [May 29, 1903](#) in [Eltham, Woolwich \[now in Greenwich\], London, England, UK](#)

Died [July 27, 2003](#) in [Toluca Lake, Los Angeles, California, USA](#) (pneumonia)

Birth Name Leslie Townes Hope

Nicknames Old Ski Nose
Packy East

Height 5' 10" (1.78 m)

Mini Bio (1)

Comedian Bob Hope was born Leslie Townes Hope in Eltham, London, England, the fifth of seven sons of Avis (Townes), light opera singer, and William Henry Hope, a stonemason from Weston-super-Mare, Somerset. His maternal grandmother was Welsh. Hope moved to Bristol before emigrating with his parents to the US in 1908. After some years on the stage as a dancer and comedian, he made his first film appearance in [The Big Broadcast of 1938](#) (1938) singing "Thanks for the Memory," which became his signature tune. In partnership with [Bing Crosby](#) and [Dorothy Lamour](#), he appeared in the highly successful "Road to ..." comedies (1940-1952), and in many others until the early 1970s. During World War II and the Korean and Vietnam wars he spent much time entertaining the troops in the field. For these activities and for his continued contributions to the industry he was given a special Academy Award on five occasions.

- IMDb Mini Biography By: [Lester A Dinerstein <lester1@earthlink.net>](#)

Spouse (2)

[Dolores Hope](#) (19 February 1934 - 27 July 2003) (his death) (4 children)

Grace Louise Troxell (25 January 1933 - 1934) (divorced)

Trade Mark (6)

His ski shaped nose

Usually played a coward

Performing stand up for the U.S. military

Often worked with Bing Crosby

Quick one-liners.

Frequently worked with the Rat Pack - [Frank Sinatra](#), [Sammy Davis Jr.](#) and [Dean Martin](#).

Trivia (74)

ABC-TV Network News Poll, A&E Biography Viewers Poll, as well as magazine and newspaper 'century roundups' have proclaimed Hope as the "Entertainer of the 20th Century."

In 1959 he was awarded the Emmy Trustees' Award "for bringing the great gift of laughter to all peoples of all nations; for selflessly entertaining American troops throughout the world over many years; and for making TV finer by these deeds and by the consistently high quality of his TV programs through the years".

Winner of the Kennedy Center Honors in 1985.

In 1995 he was presented the National Medal of Arts: presented by President [Bill Clinton](#).

Has four adopted children: Eleanora Avis "Nora", Anthony, [Linda Hope](#) and [Kelly Hope](#).

Has entertained the troops overseas in every war from WWII to the Gulf War

In 1998 he was awarded an honorary knighthood by [Queen Elizabeth II](#).

In the 1950s he was a part-owner of the Cleveland Indians baseball team. His guest appearance in [I Love Lucy](#) (1951) centered around his attending a Yankees-Indians game at Yankee Stadium.

Holds two entries in "The Guinness Book of World Records". One is for having the distinction of being the entertainer with "the longest running contract with a single network--spanning 61 years". The second is for being the "most honored entertainer", with over 1500 awards.

Served as United Service Organizations, Inc. (USO) Entertainment Coordinator from 1941-2001. Retired his post at age 98 in favor of [Wayne Newton](#).

Received 58 honorary degrees.

Entertained U.S. troops starting 6th May 1941, and became the first to be named an "honorary veteran" by Congress.

He entertained 11 different Presidents, beginning with [Franklin D. Roosevelt](#) and ending with [Bill Clinton](#).

His golf buddy was [Prescott Bush](#), the father and grandfather of presidents [George Bush](#) and [George W. Bush](#).

He was the only entertainer to have complete carte blanche to walk on whenever he felt like it on [The Tonight Show Starring Johnny Carson](#) (1962).

He changed his name from Leslie to Bob, because in school they would call the roll as 'Hope, Leslie' and classmates shortened it to hopeless.

In a mostly ad-libbed skit for a TV show, Hope joked with [Jimmy Durante](#) about the size of his own nose. Durante quipped "When it comes to noses, you're a retailer. I'm a wholesaler!"

Appointed an honorary CBE in 1976.

Wife [Dolores Hope](#) was born 27th May 1909. She and Bob celebrated their birthdays on 28th May every year--splitting the difference between their respective real birthdays.

Spent his 99th birthday--29 May 2002--at home in Toluca Lake, CA. Wife [Dolores Hope](#)'s 93rd birthday was just two days before. Los Angeles National Cemetery dedicated veterans' chapel in his name to salute his lifetime of service entertaining U.S. troops.

His grandfather lived to 99 years, 11 months, and 25 days.

Was the first honoree of the "'Dean Martin' Celebrity Roasts" series on October 30, 1974. The Celebrity Roasts had begun in the last season (1973-74) of [The Dean Martin Show](#) (1965) and were so popular that after that show went off the air, the "Celebrity Roasts" continued as specials.

Has three theaters named after him--London, CA, and on the campus of Southern Methodist University in Dallas, TX.

He was inducted into the Radio Hall of Fame in 1990.

Was incorrectly declared dead several times since retiring from the public eye. On the most infamous occasion in 1998, a wire service accidentally posted a pre-written obituary to a

Web page. A member of the US House of Representatives saw this bogus news flash and announced Hope's death during a session at the Capitol. Hope learned he was dead when a reporter called his home asking for a statement. According to family members, Hope took this mistake in good humor.

First show-business job was as a dancer in the [Roscoe 'Fatty' Arbuckle](#) vaudeville revue at the Bandbox Theater in Cleveland, OH, in 1924. Arbuckle recommended Hope and his partner Lloyd Durbin to producer [Fred Hurley](#), who hired them for his popular revue, "Hurley's Jolly Follies." While on tour with Hurley, Durbin ate a piece of tainted coconut custard pie and died a few days later. Dancer George Byrne replaced him.

Graduated from Fairmount High School in Cleveland, OH.

Wrote several books about his experiences over the years, including "I Owe Russia \$1200", about his Soviet tour in early 1962; "Confessions of a Hooker", about his lifelong passion for golf; and "Don't Shoot, It's Only Me!", about his many overseas trips to entertain U.S. troops over the years.

In 1999 he became the first to start the tradition of the official lighting of the Christmas Tree in Disneyland. Afterwards, he and wife [Dolores Hope](#) drove their own golf cart down Main Street, through Frontier Land to Club 33 for dinner.

His last TV appearance with [Lucille Ball](#) was March 28, 1989 on [The 61st Annual Academy Awards](#) (1989). They received a standing ovation upon walking out on stage. Hope and Ball introduced a musical number featuring "The Stars of Tomorrow", which included [Johnny Depp](#), [Christian Slater](#), and [Ricki Lake](#). [Lucille Ball](#) passed away 28 days later on April 26, 1989.

Brother [Jack Hope](#) sometimes served as producer of Bob's shows; his memoir "I Owe Russia \$1200" is dedicated to Jack's memory.

Has a ship named after him: USNS Bob Hope.

In 1997 Congress named Hope an honorary U.S. veteran, citing his decades of entertaining troops around the world. He is the only person to receive that distinction.

In 1997 the U.S. Air Force honored Hope by naming a cargo plane "The Spirit of Bob Hope" after him.

The Bob Hope USO Center is named after him.

Biography in: "Who's Who in Comedy" by Ronald L. Smith, pg. 219-222. New York: Facts on File, 1992. ISBN 0816023387

Was a supporter of Valley Forge Military Academy & Junior College in Wayne, PA. He has the "Bob Hope Five-Star Award for Distinguished Service to the United States of America" named in his honor.

At 69 years, his marriage to [Dolores Hope](#) held the record for the longest Hollywood marriage when he passed away in 2003. It has since been passed by the marriage of [Art Linkletter](#) to Lois Foerster. They were married November 25, 1935.

He is among the select few non-band members who have had the honor of dotting the "i" during The Ohio State University Marching Band's 'Script Ohio' routine. This is considered the greatest honor the band can bestow to any non-band person and is an extremely special (and rare) event.

Awarded a Congressional Gold Medal by President [John F. Kennedy](#) at the White House on September 11, 1963. Only two other entertainers--[George M. Cohan](#) and [Irving Berlin](#)--were similarly honored.

Awarded a Presidential Medal of Freedom by President [Lyndon Johnson](#) on his last day in office, January 20, 1969.

He was one of the richest movie stars, ranking in the top ten highest salaried stars continuously from 1941-53 [except for 1948].

Hosted the Academy Awards in 1939, 1940, 1943, 1945 (alongside [John Cromwell](#)), 1946 (alongside [James Stewart](#)), 1953 (alongside [Conrad Nagel](#)), 1955 (alongside [Thelma Ritter](#)), 1958 (alongside [James Stewart](#), [David Niven](#), [Jack Lemmon](#), [Rosalind Russell](#) and "Donald Duck"), 1959 (alongside [Jerry Lewis](#), [David Niven](#), [Laurence Olivier](#), [Mort Sahl](#) and [Tony Randall](#)), 1960, 1961, 1962, 1965, 1966, 1967, 1968, 1975 (alongside [Sammy Davis Jr.](#), [Shirley MacLaine](#) and [Frank Sinatra](#)) and finally in 1978.

According to Hope's biographer [Arthur Marx](#), son of comedian [Groucho Marx](#), Hope married his vaudeville partner of five years, Grace Louise Troxell, on 25 January 1933, although they divorced soon afterwards. Hope denied that they had actually married.

As a young comedian, he won a [Charles Chaplin](#) look-alike contest in Cleveland.

Was briefly a professional boxer. He fought under the name Packy East.

He and best friend [Bing Crosby](#) were planning to make one last "road" picture in early 1977, but Bing died before filming. Bob was so broken up about Bing's death that he couldn't sleep for days on end. He stated that it was one of the worst times of his life and that his wife was his rock who got him through the tough time.

On his wartime USO tours he had one ironclad rule that he insisted his fellow performers follow: under no circumstances were they allowed to cry when visiting wounded soldiers in military hospitals. This was often difficult given the amount of suffering they saw, but he told his performers that it was their duty to always smile and provide laughs and good cheer for the troops. According to Hope, he broke his own rule only once. While visiting an army hospital in Italy in 1943, he stopped at the bedside of a wounded soldier who had been in a coma for two months. The soldier suddenly opened his eyes and said, "Hey, Bob Hope! When did you get here?" He had to leave the hospital room to keep the troops from seeing his tears, but he returned a few hours later to present the soldier with his Purple Heart medal.

Inducted into the World Golf Hall of Fame in 1983.

Attended the funeral of his friend of more than 40 years, former President [Richard Nixon](#), on April 27, 1994.

He was a staunch supporter of the Republican Party.

In November of 1948, when President [Harry S. Truman](#) scored his upset presidential election victory, Hope sent him a one-word telegram: "Unpack". Truman was so amused by it he kept it in his desk in the Oval Office.

There is a major street in Rancho Mirage, CA, named after him. Bob Hope Drive crosses [Frank Sinatra](#), [Gerald Ford](#), [Ginger Rogers](#) and [Dinah Shore](#) Drives.

He bought several acres of prime real estate in Rancho Mirage, CA, to build a racetrack. He later decided a medical center was needed in the area instead, so he donated the land to build Eisenhower Medical Center, which is now rated as among the top 100 hospitals in America. A medical building on the campus is named for him and contains statues of he and wife [Dolores Hope](#) in the lobby. Another medical building next door is called "Hope Square".

Hospitalized with pneumonia and respiratory problems in August 2001. A week after he left hospital on 4 September, Hope and his wife released a joint statement expressing their horror at the 9/11 attack on the World Trade Center.

At the beginning of the Iraq war in March 2003, Hope released a statement saying he wished he could go there to entertain the troops, but that his doctors would not allow him.

Despite a well documented reputation for frugality, Hope is believed to have donated an estimated \$1 billion to charity.

Retired from show business at the age of 93 after filming [Bob Hope's Bag Full of Christmas Memories](#) (1993).

Once remarked the only place where he could walk unrecognized was in the People's Republic of China. However, even then a Chinese man still recognized him from one of his movies from before the Chinese Revolution.

In 1969 he was worth in excess of \$150 million, largely as a result of shrewd business and real estate investments.

Biography in: "The Scribner Encyclopedia of American Lives". Volume 7, 2003-2005, pages 256-258. Farmington Hills, MI: Thomson Gale, 2007.

His mother's name was Agnes Townes (she was a concert singer). He had many brothers, including [Jack Hope](#) (1898 - 1962) who was his personal manager. [James Hope](#) was Director of Hope Enterprises. Ivor Hope (? - 1969) was President of Hope Metal Products. George Hope (? - 1969) was a production company coordinator. Two more brothers were Sidney Hope (? - 1946) and Frederick Hope.

Pictured on a 44¢ USA commemorative postage stamp issued 29 May 2009, Hope's 106th birthday. The two official first-day-of-issue postmarks for the stamp feature caricatures by cartoonist [Al Hirschfeld](#).

Introduced two Oscar-winning songs: "Thanks for the Memory" from [The Big Broadcast of 1938](#) (1938) (music by [Ralph Rainger](#), lyrics by [Leo Robin](#)) and "Buttons and Bows" from [The Paleface](#) (1948) (music by [Jay Livingston](#), lyrics by [Ray Evans](#)).

After his death in 2003, an airport in Burbank, CA, was named "Bob Hope Airport" in his memory.

In addition to the three theaters cited as bearing Hope's name, Alumni Hall at the U.S. Naval Academy, Annapolis, MD, houses the Bob Hope Performing Arts Center.

Hope first met [Bing Crosby](#) when they were both playing New York's Capitol Theater in 1932. He first met [Dorothy Lamour](#) when she was a cocktail singer at New York's Hotel One Fifth Avenue in the same year.

Was friends with comedienne [Vicki Lawrence](#). She was a veteran from his USO shows and Hope worked with her in [The Carol Burnett Show](#) (1967). He guest-starred twice on Vicki's own talk show, [Vicki!](#) (1992).

He got his big break in feature films when [Jack Benny](#) turned down a role in [The Big Broadcast of 1938](#) (1938) and it was given to him instead.

In 1998 he was interviewed in "The Great Comedians Talk About Comedy" by [Larry Wilde](#).

Along with [George Burns](#) and [Señor Wences](#), he is one of three [The Muppet Show](#) (1976) guest stars to live to be 100 years old.

Established the Bob Hope Home for Disabled Children in Port Arthur, TX. He also contributed towards its expansion.

Younger brother of [Jim Hope](#).

At one point he and Bing Crosby were due to make The Road to Paris.

Personal Quotes (60)

[on being told he was being awarded an honorary knighthood] What an honor and what a surprise for a boy born in England, raised in Cleveland and schooled in vaudeville.

Golf is my real profession--show business pays my greens fees.

You know you're getting old when the candles cost more than the cake.

[on his 100th birthday] I'm so old, they've canceled my blood type.

[at the height of the Cold War] We had a very successful trip to Russia. We made it back.

[When asked by his wife where he wanted to be buried] Surprise me.

I have seen what a laugh can do. It can transform almost unbearable tears into something bearable, even hopeful.

[Bing Crosby](#) and I weren't the types to go around kissing each other. We always had a light jab for each other. One of our stock lines used to be, "There's nothing I wouldn't do for Bing, and there's nothing he wouldn't do for me. And that's the way we go through life--doing nothing for each other!"

Welcome to the Academy Awards--or as it's known at my house, Passover.

[referring to the Academy Awards ceremonies] Tonight we set aside petty differences, forget old feuds and start new ones.

I've never wanted an Oscar, although they are reassuring to an actor who doesn't know how really great he is.

[At the Academy Awards] We're all here to celebrate Oscar--or as he's known at my house, The Fugitive!

[referring to the Academy Awards ceremonies] Welcome to "You Bet Your Career."

[at the 50th Anniversary Academy Awards, referring to Oscar Winners Tribute Sequence] They've all got their Oscars. But are they happy?

[1991] Remember me? The [Macaulay Culkin](#) of 1927.

[At the Academy Awards] To all you losers, remember there's a bright side to all of this: you can still run for Governor.

[In reference to [Macaulay Culkin](#)] I remember when they handed out the Oscars in 1927; I was Home Alone, too!

Personally, I never drink on Oscar nights, as it interferes with my suffering.

I love Oscar, that little bald head. I didn't know [Sinéad O'Connor](#) had children!

[In reference to the Academy Awards] It's wonderful to be here in person. I couldn't be here in spirit, so I'm here in person.

[1991] Remember, you kids, always pay to get into the movies; the Japanese need the money.

[referring to [Macaulay Culkin](#)] That kid's getting \$5 million for his next picture. For this we need child labor laws?

They said I was worth \$500 million. If I was worth that much, I wouldn't have visited Vietnam, I'd have sent for it.

People who throw kisses are hopelessly lazy.

[on [Vincent Price](#)] He always loved a good joke. Moreover, he was kind enough to laugh at jokes that weren't so good.

[referring to both the film release of "Mommie Dearest" ([Mommie Dearest](#) (1981)), the biography of [Joan Crawford](#) written by her daughter [Christina Crawford](#), and the equally scathing book about [Bette Davis](#), written by her daughter] Now I know why tigers eat their young.

I was lucky, you know, I always had a beautiful girl and the money was good. Although I would have done the whole thing over for, oh, perhaps half.

I do benefits for ALL religions. I'd hate to blow the hereafter on a technicality.

[on [Jane Russell](#)] Don't let her fool you. Tangle with her and she'll shingle your attic.

[on [Katharine Hepburn](#)] This dame is terrific--and expert in her craft and so electrifying on set that if you don't watch out, you're likely to wind up as part of the scenery.

[on [Bing Crosby](#)] A lot of people think that Bing was a loner, but Bing was a very loyal friend.

[on [Dorothy Lamour](#)] Dottie was fearless. She stands there before the camera and ad libs with [Bing Crosby](#) and me, fully knowing the way the script's written, she'll come up second or third best.

[when asked why he didn't run for President of the United States] I thought about it. But my wife said she wouldn't want to move into a smaller house.

[on [Jack Benny](#)] He didn't just stand on the stage. He owned it.

[on MGM chief [Louis B. Mayer](#)] Louis B. Mayer came out west with \$28.00, a box camera and an old lion. He built a monument to himself--the Bank of America.

[on [Samuel Goldwyn](#), while Hope and co-star [Bing Crosby](#) were shooting [Road to Morocco](#)(1942)] Dave [director [David Butler](#)] ordered the assistant director to station the phone for "The Road to Morocco" a block and a half away from the set where we were working [to discourage Hope and Crosby from spending so much time on the phone and holding up production]. Not only that, the telephone was installed under a pile of lumber so that anyone answering it would have to slide horizontally to pick up the receiver. That worked well until the day that Sam Goldwyn called. David Butler trudged across the soundstage and into the next one and slid under the lumber pile. "Hello, Sam, what is it?" Dave said. Goldwyn was working on the script that Dave was to direct next . . . For fifteen minutes Goldwyn expounded on the intricacies of the story while "The Road to Morocco" company waited. Finally Goldwyn said, "Thanks very much for calling me" and hung up.

[on Grauman's Chinese Theater] The is the first time I knew this was a theater. I always thought it was the place where [[Darryl F. Zanuck](#)] sent his laundry.

I can't drink like [[Lee Marvin](#)], grunt like [[Rod Steiger](#)], enunciate like [[Laurence Olivier](#)]. And when it comes to [[Richard Burton](#)], I'm really in trouble.

Today's ballroom dances like the swim, the frug, the chicken and the monkey are really nervous disorders set to music.

Leaving [[Richard Burton](#)] alone in Paris is like leaving [Jackie Gleason](#) locked in a delicatessen.

[Hosting the Oscars, 1967] I will not seek nor will I accept an Oscar. Actually, I have a deal with the Academy. They'll negotiate if I stop bombing.

Pictures have been really wild this year, haven't they? Oscar has been more naked than usual. They're doing things on the screen today I wouldn't do in bed--even if I had the chance.

[Jokingly, referring to his wife's singing 'Silent Night' to troops in Vietnam] The last thing these guys needed was sentiment. Dolores became their mother. What they needed was [Raquel Welch](#).

[on hosting the Oscars, when [[The Godfather: Part II](#)] (1974) was in nomination] Neither Mr. Price nor Mr. Waterhouse has been heard from for days. I'm wearing a tuxedo with a bullet-proof cummerbund. Who knows what will happen if [Al Pacino](#) doesn't win?

[at a USO show, 1943] Were the soldiers at the last camp happy to see me! They actually got down on their knees. What a spectacle! What a tribute! What a crap game!

I led such a sheltered life I didn't go out with girls until I was almost four.

When we recall Christmas past, we usually find that the simplest things--not the great occasions--give off the greatest glow of happiness.

[on having six brothers] That's how I learned to dance. Waiting for the bathroom.

[on growing up in poverty] Four of us slept in one bed. When it got cold mother threw on another brother.

[on turning 100] I don't feel old. In fact, I don't feel anything until noon. Then it's time for my nap.

[on turning 80] It's the time of your life when even your birthday suit needs pressing.

[on turning 70] I still chase women, but only downhill.

I have it on good authority that [[Joseph McCarthy](#)] McCarthy is going to disclose the names of two million Communists. He has just got his hands on the Moscow telephone directory.

[[Dwight D. Eisenhower](#)] admitted that the budget can't be balanced, and [[Joseph McCarthy](#)] said the Communists are taking over. You don't know what to worry about these days--whether the country will be overthrown or overdrawn.

A few months ago [[John F. Kennedy](#)]'s mother said, "You have a choice. Do you want to go to camp this year or run for President?"..

[[Richard Nixon](#)] lives here in Whittier, California. They're so sure he's going to be President they're building the log cabin he was born in.

If you watch a game, it's fun. If you play at it, it's recreation. If you work at it, it's golf.

[about his arrival in Hollywood in 1937] At last Paramount could no longer ignore the inevitable, and I was brought to Hollywood with great fanfare. A man in a red cap met me at the station and showed me to the nearest streetcar.

When vaudeville died, television was the box they put it in.

RETRIEVED FROM: <https://www.imdb.com/name/nm0001362/bio>

Born: May 29, 1903

Eltham, England

American comedian and actor

In addition to his successes on radio, in movies, on television, and in live shows, Bob Hope entertained members of the American military all over the world and made many appearances to benefit different charities.

"Hopeless" childhood

Born in Eltham, England, on May 29, 1903, Leslie Townes Hope was one of Harry and Agnes Townes Hope's seven surviving boys. His father was a [stonemason](#) (a construction worker), and his mother had been a concert singer in Wales. By the age of four Hope was a skilled mimic and loved to sing and dance. In 1908 the family left England and settled in Cleveland, Ohio. For Hope, who looked and sounded British, the adjustment was difficult. Neighborhood kids turned his name around to create the nickname "Hopelessly." When he shortened his name to Les, they began to refer to him as "Hopeless." As a result of all this teasing, Hope often got in fights. He developed into a [boxer](#) of some skill.

As a youth Hope sold two-cent newspapers on the streets of Cleveland to help his family out. On one occasion a man in a long, black limousine waited while Hope rushed into a nearby store to get change for a dime. When he returned he received a lecture about the importance of keeping change in order to take advantage of all business opportunities. The man in the limousine was [John D. Rockefeller](#) (1839–1937), founder of Standard Oil Company and one of the richest men in the world.

Enters show business

As a teenager Hope once said that he would rather be an actor than hold an honest job. He performed whenever possible, mainly dancing and telling the one-line jokes for which he later became famous. He gained experience in an act he formed with a comedian from Columbus, Ohio, named George Byrne. Using the name Lester, Hope went with Byrne to New York City in 1926. They performed in cities and towns throughout the state. They finally appeared in a New York City [vaudeville](#) (traveling stage entertainment featuring several different performers) production called "Sidewalks." They were fired within a month, however.

Hope got his first chance to work as a solo act at the Stratford Theatre in Chicago, Illinois, in 1928. He changed his name to Bob because he felt that would be "chummier" and would look better on a theater sign. Hope always made his audience feel at ease and comfortable by making himself the subject of his humor. He worked hard and succeeded but soon left the Stratford to tour Midwestern cities. From 1920 to 1937 Hope performed in all kinds of shows both on and off Broadway, earning a reputation as a master of the one-liner (a short joke). By 1932 Hope was earning a thousand dollars a week during a time when millions of people were out of work. Still, he was not satisfied. He always wanted to improve and to become an outstanding comic in the business.

Hope and Crosby

Hope met actor and singer Bing Crosby (1904–1977) in 1932, and they started performing together in song and dance routines. Hope met actress Delores Reade in 1933 and later married her. In 1935 Hope joined the "[Ziegfield Follies](#)" and performed in cities outside New York. In January 1936 he opened in the "Follies" at New York City's Winter Garden Theatre. The "Ziegfield Follies" was the musical highlight of Broadway, consisting of beautiful girls and costumes, witty dialogue between the actors and actresses, and music by such great composers as Vernon Duke (1903–1969) and [Ira Gershwin](#) (1896–1983).

Although Hope had acted in some short motion picture comedies as early as 1934, he began his feature-length movie career in Hollywood in 1938 with *The Big Broadcast of 1938*, which also starred comedian [W. C. Fields](#) (1880–1947). This was the beginning of an active film career for Hope. He went on to



Bob Hope.

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AP/Wide World Photos

appear in fifty-two movies, including six films in the *Road* series (including *The Road to Zanzibar* and *The Road to Rio*), which also featured Crosby and [Dorothy Lamour](#) (1914–1996).

Performed for the troops

Hope has always been strongly patriotic. On December 7, 1941, when Japanese attack planes bombed Hawaii's Pearl Harbor, causing the United States to enter World War II (1939–45; a war in which Germany, Japan, and Italy fought against Great Britain, France, the [Soviet](#) Union, and the United States), Hope spoke out against the attack. During a radio broadcast on December 16, Hope declared his love for his country: "There is no need to tell a nation to keep smiling when it's never stopped. It is that ability to laugh that makes us the great people that we are ... Americans!"

In 1942 Hope was asked to make an entertainment tour of Alaskan army bases. Hope brought other performers along and put together a variety show for the troops stationed there. That was the beginning of a commitment on Hope's part that has never ended. Every year, especially during the Christmas season, he has led a drive to present shows to American men and women in the armed forces. At the Academy Awards in February 1941, Hope was given a special award for his many benefit performances. He also won honorary (awarded without meeting the usual requirements) [Oscars](#) in 1940, 1944, 1952, and 1965.

Later years

Some of Hope's charitable activities involve golf. Hope has played the game all of his life, including with several U.S. presidents. In 1964 he agreed to have the Palm Springs Classic golf tournament renamed The Bob Hope Desert Classic, which he has hosted ever since. Since the administration of Franklin Roosevelt (1882–1945), Hope has appeared many times at the White House. Hope's seventy-fifth birthday party, held in the Washington Kennedy Center, was attended by members of Congress and by many of Hope's acting friends. Another celebration was held at the Kennedy Center in 1983, when Hope turned eighty years old. This time President Ronald Reagan (1911–) and his wife, Nancy (1921–), hosted the celebration. At the celebration Hope showed no signs of slowing down.

In May 1993 NBC celebrated Hope's ninetieth birthday with the three-hour special "Bob Hope: The First Ninety Years." The show featured tributes from every living U.S. president at that time. By then, according to *TV Guide*, Hope had made more than five hundred TV shows and seventy movies. Hope concluded his sixty-year contract with NBC in November 1996, when his final special, "Laughing with the Presidents," aired.

The Guinness Book of World Records called Hope the most honored entertainer in the world. By mid-1995 he had received more than two thousand awards, including fifty-four honorary doctorate degrees, *The Saturday Evening Post* reported. In 1998 Hope and his wife Delores announced that they would donate his personal papers and collection of almost 90,000 jokes to the Library of Congress. In June 2000 Hope spent six days in the hospital because of internal bleeding.

For More Information

Curtis, Jenny. *Bob Hope*. New York: Metro Books, 1999.

Faith, William Robert. *Bob Hope: A Life in Comedy*. New York: Putnam, 1982.

Grudens, Richard. *The Spirit of Bob Hope*. Stony Brook, NY: Celebrity Profiles Publishing, 2002.

Quirk, Lawrence J. *Bob Hope: The Road Well-Traveled*. New York: Applause, 1998.

RETRIEVED FROM: <http://www.notablebiographies.com/He-Ho/Hope-Bob.html>

White Christmas

Musical

WRITERS:

- [David Ives](#)
- [Paul Blake](#)
- [Irving Berlin](#)

SYNOPSIS

Soldiers Bob Wallace and Phil Davis served under General Henry Waverley in World War Two and, ten years later, they are still working together in a popular song and dance duo, Wallace and Davis. When they meet the singing sisters, Betty and Judy Haynes, Phil becomes enamored with the beautiful Judy, while Bob is more reserved about his feelings for Betty. The two men follow the sisters up to their seasonal engagement at The Columbia Inn in Vermont. They discover the inn is owned by General Waverley but, unbeknownst to him, the inn is struggling to survive. With the help of Martha, the concierge, and the General's granddaughter, Susan, Bob, Phil, Betty and Judy decide to put on a big show to draw in business.

Bob arranges for his old friend Ralph Sheldrake to bring the General's former troops up to Vermont to support the show. Betty overhears Bob's plans and misinterprets his intentions, believing that he wants to buy the inn instead. Confusion ensues as Betty leaves to go back to New York alone. Bob follows her to attempt to reconcile but, believing he has lost her, he goes on the Ed Sullivan Show to reach out to his former comrades. Back in Vermont, the rehearsals are coming to an end and the General is convinced to wear his uniform to watch the show. He is moved to see his former men return to support him and decides to put his efforts into making the inn a success. Betty returns to apologize to Bob and the couple finally declare their love for each other. With the show a huge success, Bob leads the whole theater in a rendition of "White Christmas".

RETRIEVED FROM: <https://stageagent.com/shows/musical/8554/white-christmas>



List of Characters

Bob Wallace

Phil Davis

Betty Haynes

Judy Haynes

General Henry Waverly

Martha Watson

Susan Waverly

Ralph Sheldrake

Rita

Rhoda

Ensemble

RETRIEVED FROM: <https://stageagent.com/shows/musical/8554/white-christmas/characters>

**Act One**

*Happy Holidays / White Christmas (Pre-Reprise) - Bob, Phil, Ralph Sheldrake and Ensemble

*Happy Holidays / Let Yourself Go - Bob, Phil and Ensemble

Love and the Weather - Bob and Betty Haynes

*Sisters - Betty and Judy Haynes

*The Best Things Happen While You're Dancing - Phil, Judy and Ensemble

*Snow - Bob, Phil, Betty, Judy, and Ensemble

What Can You Do With a General? ... - Martha Watson, Bob and Phil

Let Me Sing and I'm Happy - Martha and Ensemble

Count Your Blessings - Bob and Betty

*Blue Skies - Bob and Ensemble

Act Two

*I Love a Piano - Phil, Judy and Ensemble

Falling Out of Love Can Be Fun - Martha, Betty and Judy

*Sisters (Reprise) - Bob and Phil

Love, You Didn't Do Right By Me - Betty

How Deep Is the Ocean - Bob

We'll Follow the Old Man (Pre-Reprise) - Bob and Male Ensemble

Let Me Sing and I'm Happy (Reprise) - Susan Waverly

How Deep Is the Ocean (Reprise) - Bob and Betty

*We'll Follow the Old Man - Bob, Phil, Ralph and Male Ensemble

White Christmas - Bob and Company

I've Got My Love to Keep Me Warm - Full Company

A song with an asterisk (*) before the title indicates a dance number; a character listed in a song with an asterisk (*) by the character's name indicates that the character exclusively serves as a dancer in this song, which is sung by other characters.

RETRIEVED FROM: <https://stageagent.com/shows/musical/8554/white-christmas/songs>

Lessons





White Christmas: The Season of Giving

By Karel Sloane-Boekbinder

White Christmas is a story of philanthropy and hope, a story of friends who use their talents to assist a friend in need. In the story, the four main characters, Bob Wallace, Phil Davis, Betty Haynes and Judy Haynes take the train from Florida to Vermont. All four characters are professional performers. Bob Wallace and Phil Davis are also war veterans who fought together during World War Two. Betty and Judy Haynes are sisters who perform together every winter at The Columbia Inn in Vermont. Bob and Phil have romance on their minds and so they accompany Betty and Judy to Vermont. When they arrive at The Columbia Inn Bob and Phil discover the inn is owned by General Henry Waverly, the general they served under during World War II. They also learn that the inn is on the verge of bankruptcy, due to lack of customers and snow.

Bob Wallace, Phil Davis, Betty Haynes and Judy Haynes decide to use their singing and dancing talents to produce a show that will raise money for the financially struggling inn. Additionally, Bob and Phil reach out to all General Waverly's former troops to invite them to support the general and attend the show.

In this lesson, students will explore the story of **White Christmas** and its themes of giving, philanthropy and hope. During this exploration they will discuss the story and its connection to philanthropy. They will use this exploration to undertake their own philanthropic project (a Penny War,) engage at least one other class in the project, and explore mathematical concepts of $>$, $=$, and $<$ and graphing (bar graphs, circle graphs, box-and-whisker plots and scatterplots.) They will use this exploration of mathematical concepts to compare and contrast the progress of the two classes throughout the course of the Penny War. AND they will use the proceeds they raise during their philanthropic project support a cause of their choosing.

Begin the lesson by asking students if they are familiar with the story **White Christmas**. Ask students to share what they remember about the story. Record student responses on a dry erase board, ELMO, SMART board or Promethean Board where they can be visible to the whole class. (NOTE: the class may be familiar with the song **White Christmas** and not the stage musical. If they are familiar with the song only, discuss the lyrics they remember and record student responses.)

Follow this with a review of the synopsis for the stage musical **White Christmas**. Place the **White Christmas** synopsis on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the synopsis. During the discussion, consider the following questions: Who are the main characters? Who are the supporting

characters? Who owns The Columbia Inn? What challenge is The Columbia Inn facing and why? How do the main characters assist with the challenge?

Next, as a class, explore the concept of philanthropy. Place the definitions of philanthropy on an ELMO, SMART board or Promethean Board where they can be visible to the whole class. As a class, read and discuss the definitions. During the discussion ask students to consider how in **White Christmas** assisting The Columbia Inn is an act of philanthropy. Also ask students to think of and share specific examples of philanthropy, specific ways they could help other people.

Review the definitions of a philanthropist on an ELMO, SMART board or Promethean Board where they can be visible to the whole class. As a class, read and discuss the definitions. During the discussion ask students to consider how the characters in **White Christmas** act as philanthropists. Also ask students to think of and share specific examples of when they may have personally acted as philanthropists (IE: some students may volunteer, may have participated in fun walks that raise money for charitable causes or have done other types of fundraising. As a class, discuss these personal examples.)

Explain that everyone in the class is going to become a philanthropist. As a class, review **New Orleans Voluntourism Organizations** listed on <http://www.neworleansonline.com/neworleans/voluntourism/>. Using an ELMO, SMART board or Promethean Board, pull up the web-site. Read the **Description** for each organization (NOTE: each organization includes a link for additional information.) Select an organization from the list or as a class choose your own cause.

Explain a Penny War is a friendly competition and a way everyone can get involved in philanthropy. Review the rules for a Penny War Fundraiser: <https://www.ptotoday.com/pto-today-articles/article/8400-how-to-run-a-school-penny-war-fundraiser> Explain the class will be using the Penny War to support the cause they have chosen. Invite at least one other class to participate in the Penny War Fundraiser. Undertake the Penny War for two weeks.

At the beginning of the first week, ask both classes to create a class bar graph to track the total amount raised. Each day, ask both classes to count and record the total collected on their class bar graph. Each box equals 300 cents (\$3.) If there are 25 students in the class and each student brings in 15c the class total for that day would be \$3.75 and the class would shade in 1 box and a little less than a quarter of another. (NOTE: There are 20 boxes on the Y axis, a total of \$60. If the class raises more than \$60 in one day, use additional graph paper, attaching at the top, to extend the graph as needed.)

After the first week of the Penny War, use the class bar graphs created by Class A and Class B to make comparisons between the two classes. Display both bar graphs where they can be seen by the whole class. Distribute a copy of the **White Christmas Penny War Circle Graph Week 1**, a pencil and colored pencils to each student in Class A. Explain students will be calculating and comparing percentages: 100% is the total raised by both classes over the past week. Ask students to consider greater than, lesser than and equal to as they complete their circle graphs. Using the class bar graphs for Class A and Class B, ask students to write and

compare class totals using $>$, $=$, and $<$ symbols and then complete their **White Christmas Penny War Circle Graphs**. Collect the circle graphs once the students complete them.

Explain the class will continue to use the class bar graphs to make additional comparisons between the two classes. Distribute a copy of the **White Christmas Box-and-Whisker Plot (1)** and **Box-and-Whisker Plot (2)** to each student. As a class, review the steps to create a box-and-whisker plot.

Place the **Box-and-Whisker Plot (1)** on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, review and discuss the steps for calculating the *median* (Q2 or Med on the calculator,) the *lower quartile* (Q1 on the calculator,) the *upper quartile* (Q3 on the calculator) and the *interquartile range* (IQR). Ask students to complete the first part of their worksheets to compare the totals raised by both classes. Once students have recorded and graphed the amounts raised for Class A and Class B for days 1-5 on their **Christmas Box-and-Whisker Plot (1)** and **Box-and-Whisker Plot (2)**, collect the worksheets. Return the Penny War class bar graph to the other class.

After the second week of the Penny War, use the class bar graphs created by Class A and Class B for that week to make additional comparisons. Display both bar graphs where they can be seen by the whole class. Distribute a copy of the **White Christmas Penny War Circle Graph Week 2**, a pencil and colored pencils to each student in Class A. Ask students to calculate and compare percentages: 100% is the total raised by both classes over the past week. Ask students to again consider greater than, lesser than and equal to as they complete their circle graphs by first writing and comparing class totals using $>$, $=$, and $<$ symbols. Using the class bar graphs for Class A and Class B, ask students to complete their **Week 2 White Christmas Penny War Circle Graphs**.

Return the copies of the **White Christmas Penny War Circle Graph Week 1** back to each student in Class A. Distribute a copy of the **White Christmas Penny War Circle Graph, Total Raised** to each student. Ask students to review the circle graphs for **Week 1** and **Week 2**, combine the totals for the first week and the second week and create a new graph. Also ask students to consider greater than, lesser than and equal to as they complete their circle graphs and first record and compare class totals using $>$, $=$, and $<$ symbols. The new graph will illustrate the **Total Raised** by both classes over the past two weeks.

Return the copies of the **White Christmas Box-and-Whisker Plot (1)** and **Box-and-Whisker Plot (2)** back to each student in Class A. Ask students to complete the second part of their worksheets to compare the totals raised by both classes. Once students have recorded and graphed the amounts raised for Class A and Class B for days 6-10, as a class, review the worksheets.

Break the comparison of the class totals down further. Distribute copies of the **White Christmas Penny War Scatterplot, Week 1** and the **White Christmas Penny War Scatterplot, Week 2** to each student. Explain the scatterplots are another way to analyze and compare the two variables in the data set for each week of the Penny War. Ask students to use the amounts raised per day listed on their **White Christmas Penny War Box-and-Whisker**

Plot (1) and **White Christmas Penny War Box-and-Whisker Plot (2)** to help them complete their **Scatterplot, Week 1** and **Scatterplot, Week 2**. Once students have completed their **Scatterplot, Week 1** and **Scatterplot, Week 2**, as a class, review and discuss the scatterplots.

Once the Penny War is complete, donate the total proceeds raised by both classes to the cause the class has chosen.

White Christmas

Musical

WRITERS:

- [David Ives](#)
- [Paul Blake](#)
- [Irving Berlin](#)

SYNOPSIS

Soldiers Bob Wallace and Phil Davis served under General Henry Waverley in World War Two and, ten years later, they are still working together in a popular song and dance duo, Wallace and Davis. When they meet the singing sisters, Betty and Judy Haynes, Phil becomes enamored with the beautiful Judy, while Bob is more reserved about his feelings for Betty. The two men follow the sisters up to their seasonal engagement at The Columbia Inn in Vermont. They discover the inn is owned by General Waverley but, unbeknownst to him, the inn is struggling to survive. With the help of Martha, the concierge, and the General's granddaughter, Susan, Bob, Phil, Betty and Judy decide to put on a big show to draw in business.

Bob arranges for his old friend Ralph Sheldrake to bring the General's former troops up to Vermont to support the show. Betty overhears Bob's plans and misinterprets his intentions, believing that he wants to buy the inn instead. Confusion ensues as Betty leaves to go back to New York alone. Bob follows her to attempt to reconcile but, believing he has lost her, he goes on the Ed Sullivan Show to reach out to his former comrades. Back in Vermont, the rehearsals are coming to an end and the General is convinced to wear his uniform to watch the show. He is moved to see his former men return to support him and decides to put his efforts into making the inn a success. Betty returns to apologize to Bob and the couple finally declare their love for each other. With the show a huge success, Bob leads the whole theater in a rendition of "White Christmas".

RETRIEVED FROM: <https://stageagent.com/shows/musical/8554/white-christmas>



philanthropy

noun

phi-lan-thro-py | \ fə-'lan(t)-thrə-pē \

plural **philanthropies**

Definition of *philanthropy*

1: goodwill to fellow members of the human race *especially* : active effort to promote human welfare

2a: an act or gift done or made for humanitarian purposes

b: an organization distributing or supported by funds set aside for humanitarian purposes

philanthropy

noun

phi-lan-thro-py | \ fə-'lan-thrə-pē \

plural **philanthropies**

Kids Definition of *philanthropy*

1: desire and active effort to help other people

2: something done or given to help needy people

3: an organization giving or supported by charitable gifts

How Should You Use *philanthropy*?

With its *anthro-* root, *philanthropy* means literally "love of mankind". Thus, philanthropy is giving money for a purpose or cause benefiting people who you don't personally know. (Animals are usually included as well.)

Individuals have often set up their own

permanent *philanthropic* organizations in the form of foundations. The

greatest American *philanthropists* have included Warren Buffett, Bill Gates, Andrew Carnegie, and John D. Rockefeller, but tens of millions of us could be considered philanthropists on a much smaller scale.

RETRIEVED FROM: <https://www.merriam-webster.com/dictionary/philanthropy>

Philanthropist

noun

phi-lan-thro-pist | \ fə- 'lan(t)-thrə-pist \

Definition of *philanthropist*

: one who makes an active effort to promote human welfare : a person who practices philanthropy

philanthropist

noun

phi-lan-thro-pist | \ fə- 'lan-thrə-pəst \

Kids Definition of *philanthropist*

: a person who gives generously to help other people

RETRIEVED FROM: <https://www.merriam-webster.com/dictionary/philanthropist>

Penny Wars:

Quick Steps



1. Decide the rules and publish (and distribute) them

2. Distribute containers to classrooms (or in a common area)

3. Publicize your event (flyers, Facebook)



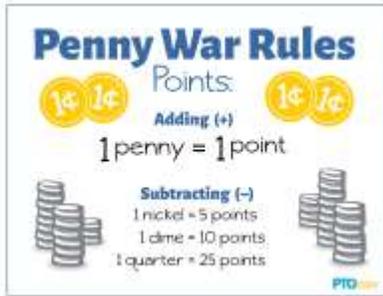
4. Encourage kids with announcements or charts

5. Count the donations, reward the winning class, and enjoy your profits!



PTOTODAY

RETRIEVED FROM: <https://www.ptotoday.com/pto-today-articles/article/8400-how-to-run-a-school-penny-war-fundraiser>



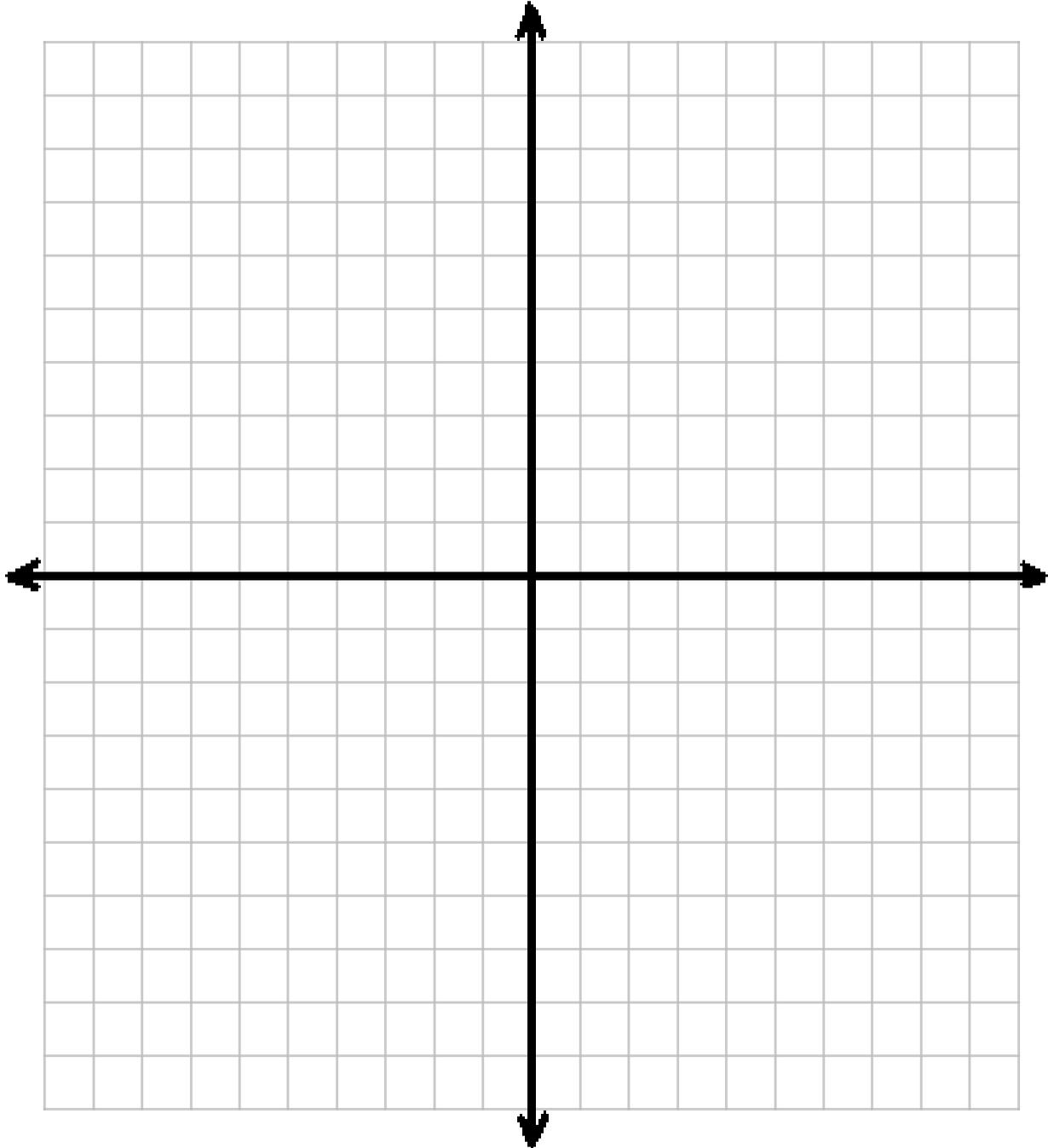
FOR MORE IDEAS VISIT: <https://www.ptotoday.com/filesharing/document/2099-penny-war-positive-pennies-rules>



FOR MORE IDEAS VISIT: <https://www.ptotoday.com/filesharing/document/2100-penny-war-negative-pennies-rules>



White Christmas Penny War Class Graph: Graph and compare the amount raised by each class over a two week interval. First, count and record the class total collected that day. Each box equals 300 cents (\$3.) (NOTE: There are 20 boxes on the Y axis, a total of \$60. Use additional graph paper, attaching at the top, to extend the graph as needed.)

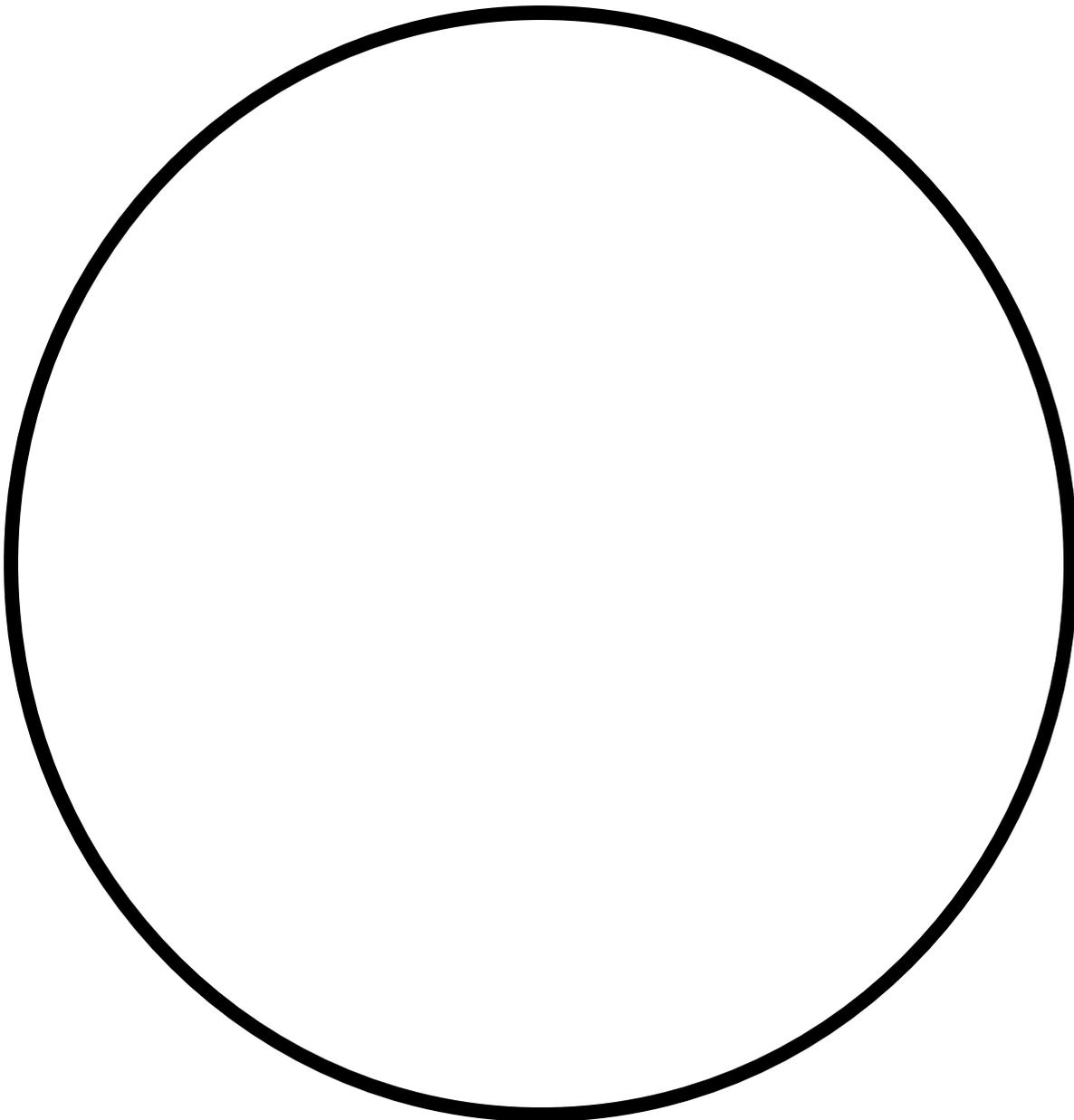




White Christmas Penny War Circle Graph, Week 1

Name _____

Compare the total amounts each class raised over a two week period. After the first week, create a circle graph to compare percentages for the first week: 100% is the total raised by both classes over a one week interval. A) What percentage of the total 100 did Class A raise? B) What percentage of the total 100 did Class B raise?

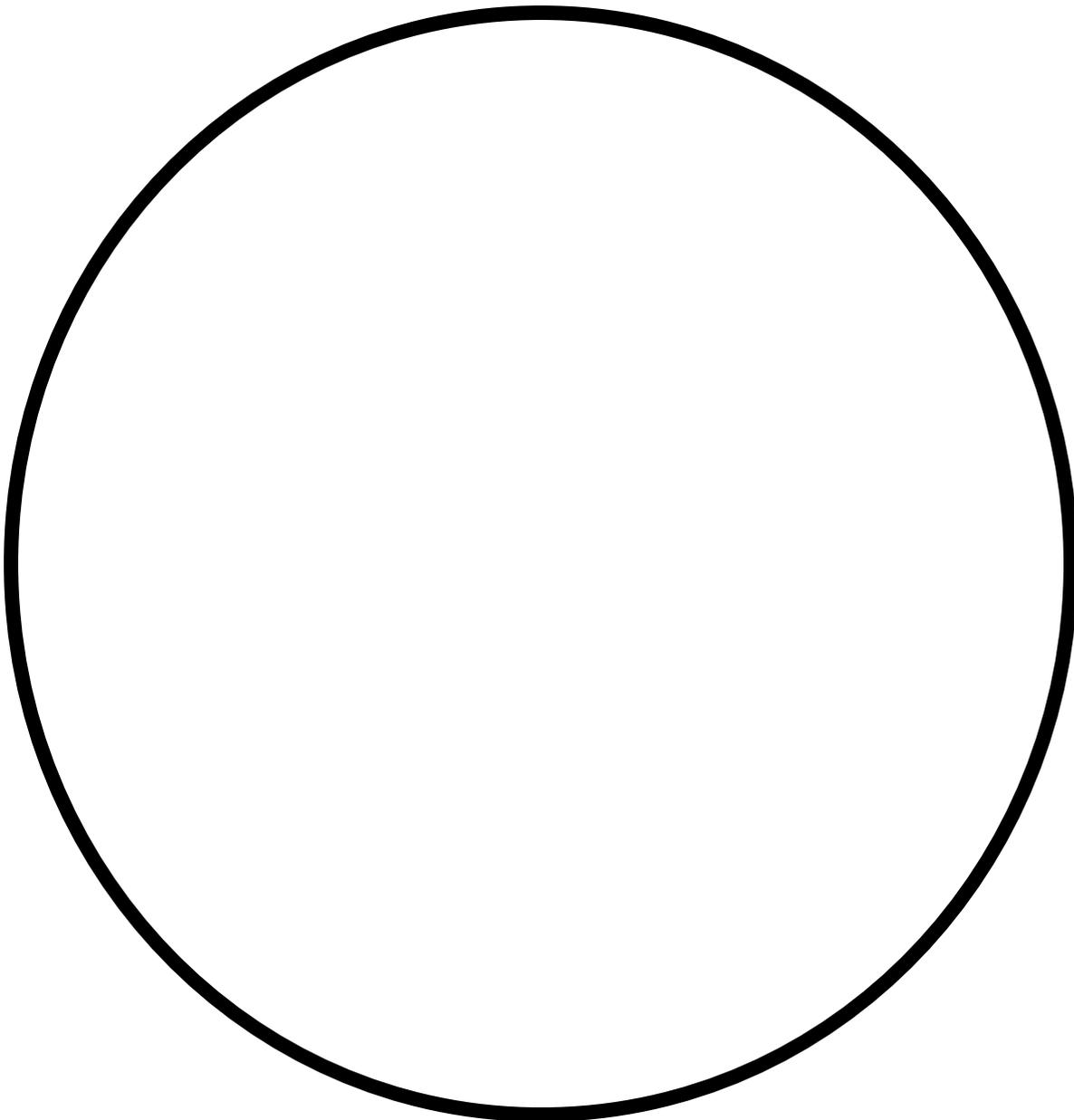




White Christmas Penny War Circle Graph, Week 2

Name _____

Compare the total amounts each class raised over a two week period. After the second week, create a circle graph to compare percentages for the second week: 100% is the total raised by both classes over a one week interval. A) What percentage of the total 100 did Class A raise? B) What percentage of the total 100 did Class B raise?

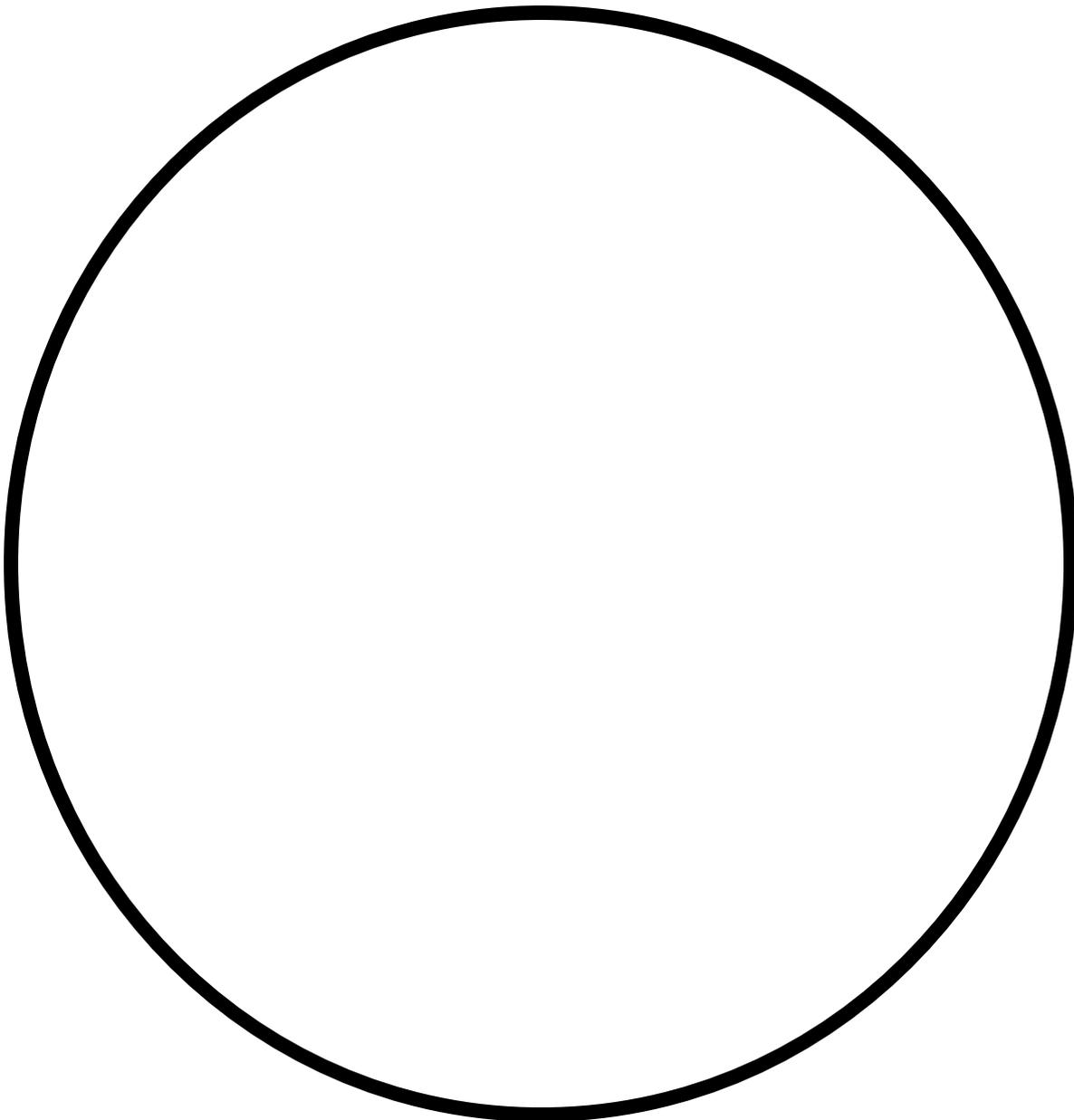




White Christmas Penny War Circle Graph, Total Raised

Name _____

Compare the total amounts each class raised over a two week period. Create a circle graph to compare percentages for both weeks of the Penny War: 100% is the combined total raised by both classes over a two week interval. A) What percentage of the total 100 did Class A raise? B) What percentage of the total 100 did Class B raise?





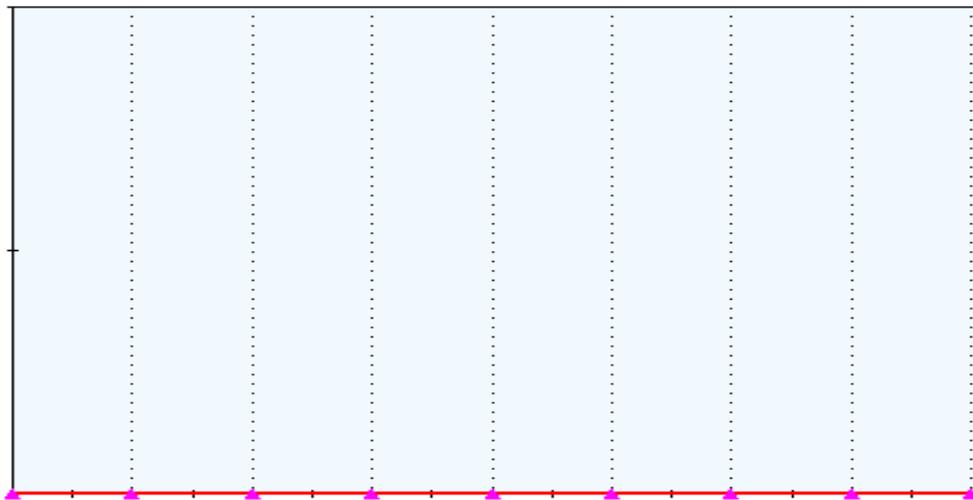
White Christmas Penny War Box-and-Whisker Plot (1)

Name _____

Create a box-and-whisker plot to compare the different amounts raised each day by Class A during the two-week Penny War. Using the class bar graph as a reference, begin by listing the amount raised each day.

Next, list all the amounts and arrange them from smallest to largest and find the *median* (Q_2 or Med on the calculator.) The median is the number exactly in the middle of this ordered set of numbers. Now look at the numbers on the left side of the *median*. Find the number exactly in the middle of this set of numbers. This number is called the *lower quartile* (Q_1 on the calculator.) Now look at the numbers on the right side of the *median*. Find the number exactly in the middle of this set of numbers. This number is called the *upper quartile* (Q_3 on the calculator.) Now subtract the *lower quartile* from the *upper quartile*. This number is the *interquartile range (IQR)*.

Box-and-Whisker Plot



Amount Raised

List of Amounts Raised by Day:

- | | | | |
|----|----|----|-----|
| 1) | 4) | 7) | 10) |
| 2) | 5) | 8) | |
| 3) | 6) | 9) | |



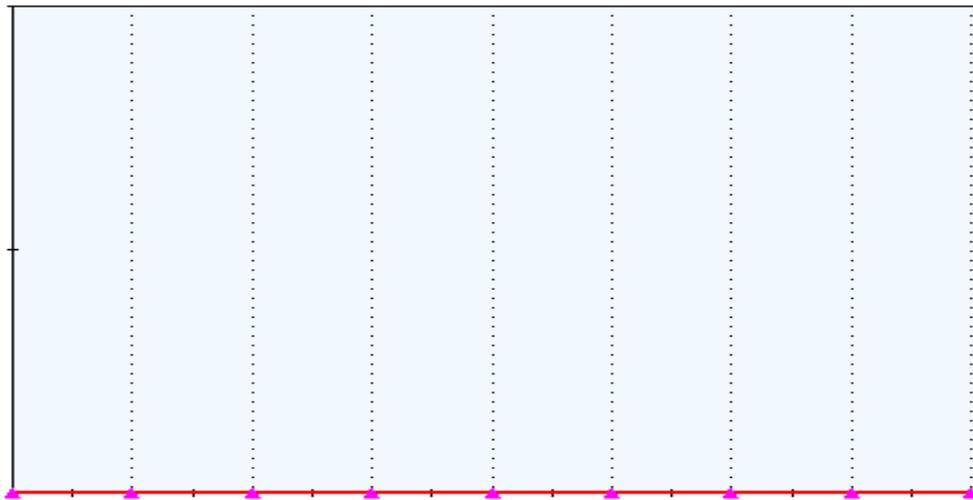
White Christmas Penny War Box-and-Whisker Plot (2)

Name _____

Create a box-and-whisker plot to compare the different amounts raised each day by Class B during the two-week Penny War. Using the class bar graph as a reference, begin by listing the amount raised each day.

Next, list all the amounts and arrange them from smallest to largest and find the *median* (Q_2 or Med on the calculator.) The median is the number exactly in the middle of this ordered set of numbers. Now look at the numbers on the left side of the *median*. Find the number exactly in the middle of this set of numbers. This number is called the *lower quartile* (Q_1 on the calculator.) Now look at the numbers on the right side of the *median*. Find the number exactly in the middle of this set of numbers. This number is called the *upper quartile* (Q_3 on the calculator.) Now subtract the *lower quartile* from the *upper quartile*. This number is the *interquartile range (IQR)*.

Box-and-Whisker Plot



Amount Raised

List of Amounts Raised by Day:

- | | | | |
|----|----|----|-----|
| 1) | 4) | 7) | 10) |
| 2) | 5) | 8) | |
| 3) | 6) | 9) | |



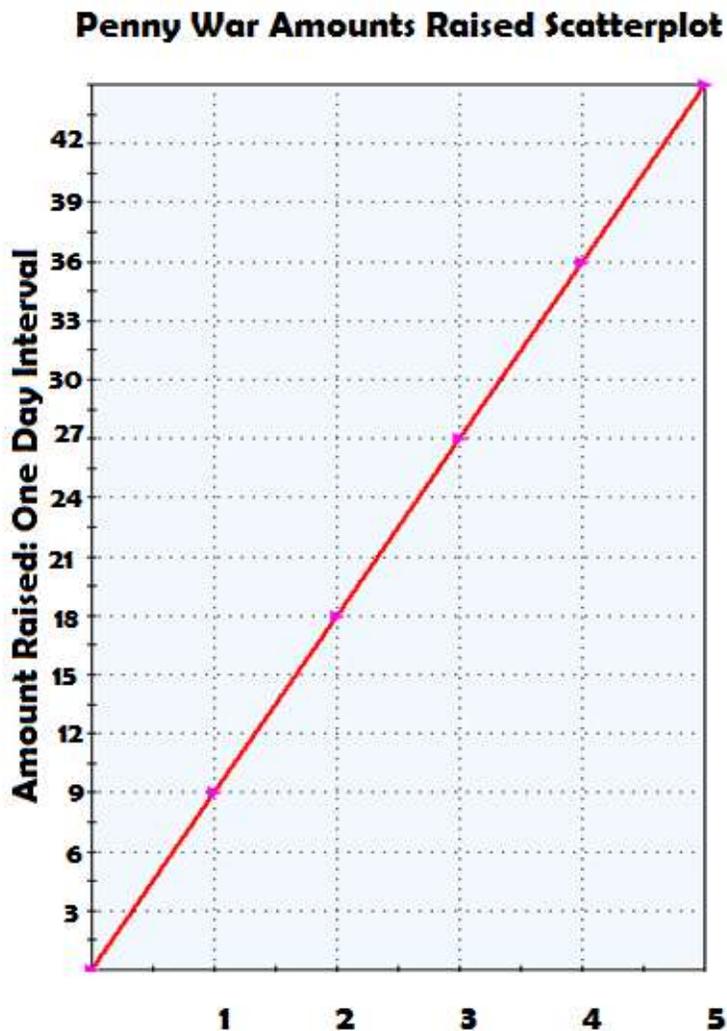
White Christmas Penny War Scatterplot, Week 1

Name _____

First, each class calculates the amount raised each day using the Class Bar Graph.

Plot a dot for "Amount raised" (first variable,) and each day (second variable) in a scatter plot, labeling the horizontal axis "1-5" (number of days) and labeling the vertical axis "Amount Raised." Plot a dot for each class for each day of the first week.

A class that raised \$3 total on day one would be represented by a single dot on the scatter plot at the point (1, 3) in the Cartesian coordinates (X,Y.) The scatter plot of the two classes will provide a visual comparison of the two variables in the data set.





White Christmas Penny War Scatterplot, Week 2

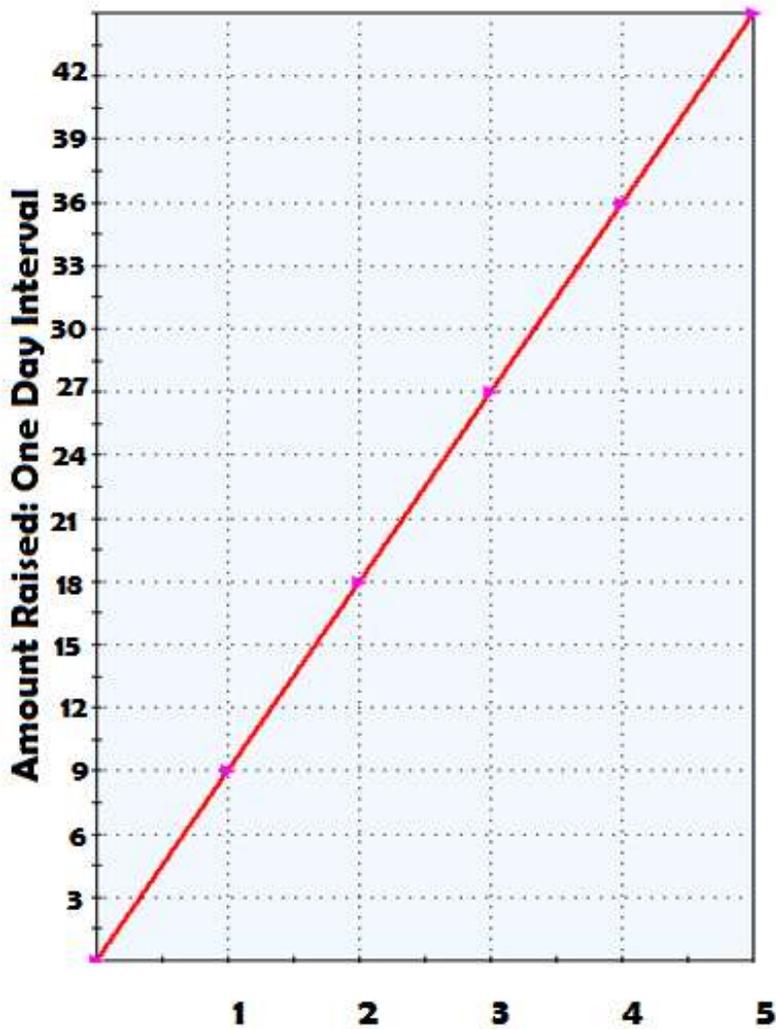
Name _____

First, each class calculates the amount raised each day using the Class Bar Graph.

Plot a dot for "Amount raised" (first variable,) and each day (second variable) in a scatter plot, labeling the horizontal axis "1-5" (number of days) and labeling the vertical axis "Amount Raised." Plot a dot for each class for each day of the second week.

A class that raised \$3 total on day one would be represented by a single dot on the scatter plot at the point (1, 3) in the Cartesian coordinates (X,Y.) The scatter plot of the two classes will provide a visual comparison of the two variables in the data set.

Penny War Amounts Raised Scatterplot



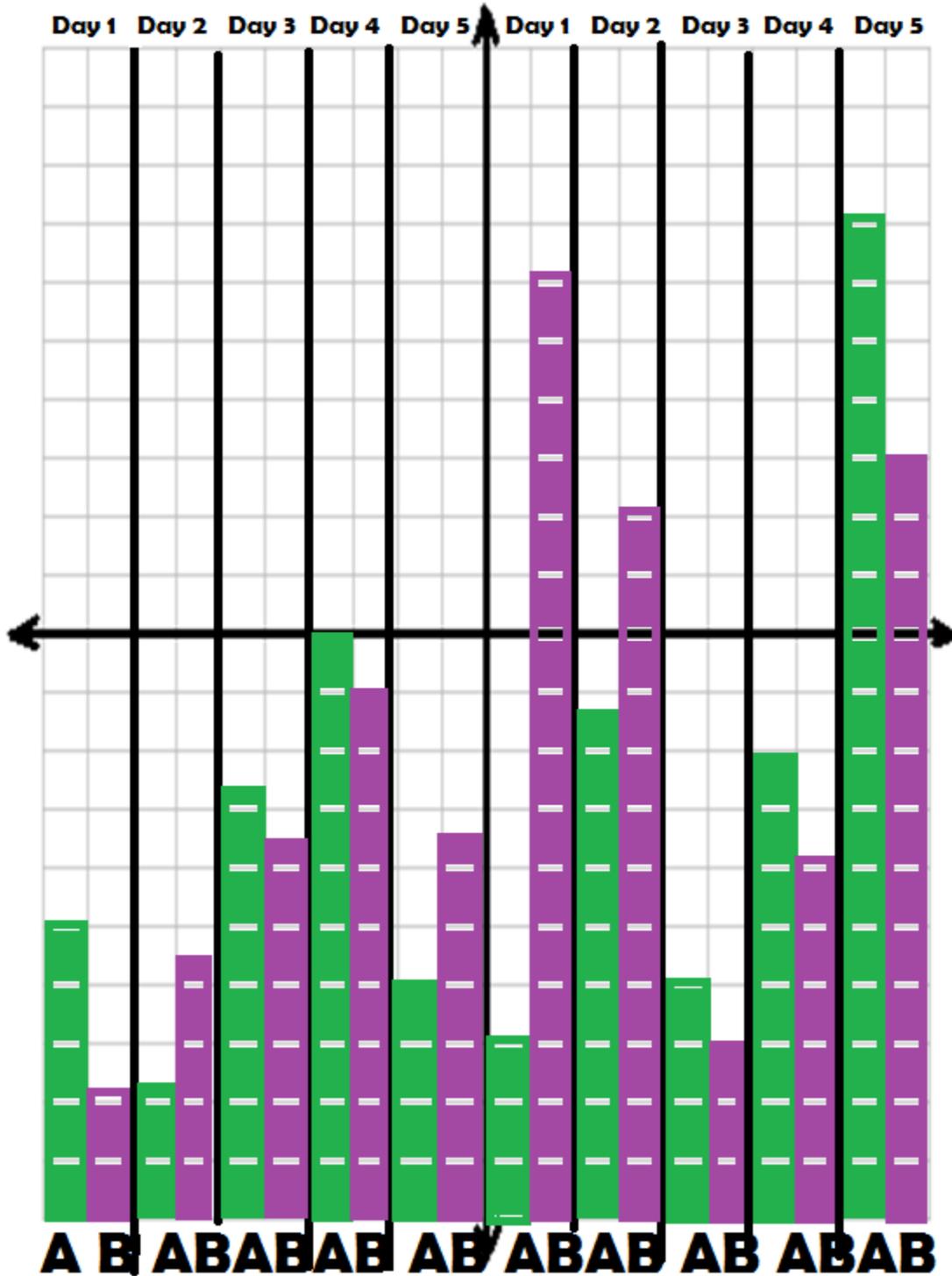


White Christmas: The Season of Giving

Sample Graphs

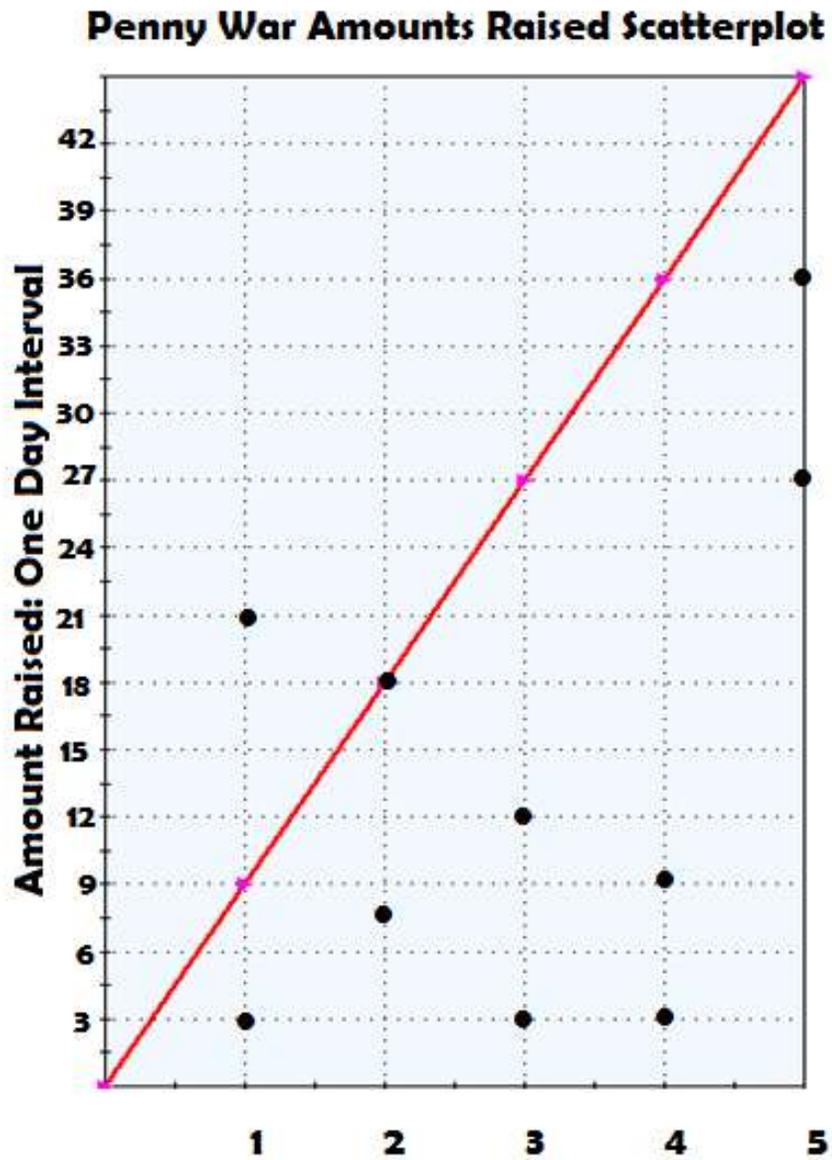


White Christmas Penny War Sample Bar Graph





White Christmas Penny War Sample Scatterplot



K-12 Student Standards for English Language Arts » Grade 1

Reading Standards for Literature

Key Ideas and Details

1. Ask and answer questions about key details in a text.
2. a. Retell stories, including key details.
b. Recognize and understand the central message or lesson.
3. Describe characters, **settings**, and major events in a story, using key details.

Integration of Knowledge and Ideas

7. Use illustrations and details in a story to describe its characters, **setting**, or events

Range of Reading and Level of Text Complexity

10. With prompting and support read informational texts appropriately complex for grade 1.

Writing Standards

Research to Build and Present Knowledge

8. With guidance and support from adults, recall information from experiences **or gather information from provided sources to answer a question.**

K-12 Student Standards for English Language Arts » Grade 4

Reading Standards for Literature

Key Ideas and Details

1. Refer to details and examples in a text when explaining what the text says explicitly and when **drawing inferences from the text.**
2. Determine a theme of a **story**, drama, or poem from details in the text; summarize the text.
3. Describe in depth a character, **setting**, or event in a story or drama, drawing on specific details in the text (e.g., a character's thoughts, words, or actions).

Integration of Knowledge and Ideas

7. Make connections between the text of a story or drama and a visual or oral presentation of the text.
9. Compare and contrast the treatment of similar themes and topics (e.g., opposition of good and evil) and patterns of events (e.g., the quest) in stories, myths, and traditional literature from different cultures.

Writing Standards

- d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

K-12 Student Standards for English Language Arts » Grade 7

Reading Standards for Literature

Key Ideas and Details

1. Cite several pieces of relevant textual evidence to support analysis of what the text says explicitly as well as **inferences** drawn from the text.
3. Analyze the interactions between individuals, events, and ideas in a text (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).
2. Determine a theme or central idea of a text and analyze its development over the course of the text; provide an objective summary of the text.
3. Analyze how particular elements of a story or drama interact (e.g., how **setting** shapes the characters or **plot**).

Craft and Structure

6. Analyze how an author develops and contrasts the points of view of different characters or narrators in a text.

Writing Standards

3. Write narratives to develop real or imagined experiences or events using effective technique, relevant **descriptive details**, and well-structured event sequences.
- d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.

K-12 Student Standards for Mathematics» Grade 1

Number and Operations in Base Ten 1.NBT

A. Extend the counting sequence.

1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

B. Understand place value.

2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: a. 10 can be thought of as a bundle of ten ones—called a “ten.” b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols $>$, $=$, and $<$.

Measurement and Data 1.MD

C. Represent and interpret data.

4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

D. Work with money.

5. Determine the value of a collection of coins up to 50 cents. (Pennies, nickels, dimes, and quarters in isolation; not to include a combination of different coins.)

K-12 Student Standards for Mathematics» Grade 4

Number and Operations in Base Ten 4.NBT

2. Read and write multi-digit whole numbers less than or equal to 1,000,000 using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.

Measurement and Data 4.MD

A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit

1. Know relative sizes of measurement units within one system of units including ft, in; km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, **express measurements in a larger unit in terms of a smaller unit.**
2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and **money**, including problems involving **whole numbers** and/or simple fractions (addition and subtraction of fractions with like denominators and multiplying a fraction times a fraction or a whole number), and problems that require expressing **measurements given in a larger unit in terms of a smaller unit.** Represent measurement quantities using diagrams such as number line diagrams that feature a **measurement scale.**

K-12 Student Standards for Mathematics» Grade 7

Ratios and Relationships 7.RP

A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

2. Recognize and represent proportional relationships between quantities.
 - a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or **graphing on a coordinate plane** and observing whether the graph is a straight line through the origin.
 - b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and **verbal descriptions** of proportional relationships.

Expressions and Equations

B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Statistics and Probability 7.SP

B. Draw informal comparative inferences about two populations.

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities using quantitative measures of center (**median and/or mean**) and variability (**interquartile range** and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

4. Use measures of center and measures of variability for **numerical data** from random samples to draw informal **comparative inferences** about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

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Symmetry: Lace and Snow

By Karel Sloane-Boekbinder

In both the film version of **White Christmas** and the musical, the main setting of the story is the Columbia Inn in Vermont. At the beginning of the story, the four main characters, Bob Wallace, Phil Davis, Betty Haynes and Judy Haynes take the train from Florida to Vermont.

All four characters are professional performers. Bob Wallace and Phil Davis are also war veterans who fought together during World War Two. Betty and Judy Haynes are sisters who perform together every winter at The Columbia Inn in Vermont. Bob and Phil have romance on their minds and so they accompany Betty and Judy to Vermont. When they arrive at the Columbia Inn Bob and Phil discover the inn is owned by General Henry Waverly, the general they served under during World War II. They also learn that the inn is on the verge of bankruptcy, due to lack of customers and snow. The Columbia Inn is in a location where it snows often; there is a lot of snow everywhere. It can be inferred from this plot point snow is a contributing factor to the Columbia Inn's lack of customers and its financial difficulties because it is ubiquitous.

Snow is a common phenomenon in Vermont. In November alone, between the southern and northern part of the state, snowfall can range from five inches to 33 inches (information on snow fall retrieved from: <https://www.currentresults.com/Weather/Vermont/snowfall-november.php>) In addition to being ubiquitous, snow is geometrical.

As ubiquitous as the lace of snowflakes that cover the Vermont countryside for a good portion of the year, the lacy ironwork designs that decorate the doorways, balconies and staircases across New Orleans and many of the surrounding parishes are ubiquitous. In addition, the lace of snowflakes and the lacy ironwork designs have something in common: geometry and geometric patterns.

In preschool, students learn about shapes. They learn how to identify them by appearance. As an example, a shape made of straight lines with four equal sides is a square,  a shape made of three straight lines is a triangle,  a shape made of straight lines where the sides opposite each other (parallel) are equal is a rectangle  and so forth. In this lesson, we will expand on students' understanding of shapes, geometric patterns and symmetry by exploring them through the lens of inference and setting.

In this lesson students will learn how temperature is a factor in the development of the designs of snowflakes, investigate the germ of ice crystals (the hexagon,) discover the geometric patterns found in snowflakes, have the opportunity to further explore geometric patterns in three types of snowflakes: plane crystals, rimed snow crystals and irregular particles, compare and

contrast these three types of snowflakes to five Adinkra symbols: twin crocodiles, spider's web, fern, the "king of Adinkra symbols" and the staff of life and create their own lace designs inspired by these explorations. To further connect their investigations and discoveries students will review an order adjectives/list of adjectives review sheet and then develop written descriptions of the lace designs they create.

Begin the lesson by asking students if they are familiar with the story **White Christmas**. Ask students to share what they remember about the story. Record student responses on a dry erase board, ELMO, SMART board or Promethean Board where they can be visible to the whole class. (NOTE: the class may be familiar with the song **White Christmas** and not the stage musical. If they are familiar with the song only, discuss the lyrics they remember and record student responses.)

Next, as a class, discuss the concept of setting. Place the definition of setting on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the definition. During the discussion ask students to consider and name different types of locations that could be the setting of a play or a stage musical.

Follow this with a review of the synopsis for the stage musical **White Christmas**. Place the **White Christmas** synopsis on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the synopsis. During the discussion, consider the following questions: Who are the main characters? What is the setting? What challenge is The Columbia Inn facing and why?

Next, as a class, explore the concept of inference. Place the definition of inference on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the definition. During the discussion ask students to consider what can be inferred about the setting of **White Christmas** from the synopsis. Consider the following question as part of the discussion: What element of the setting is a contributing factor to the challenge the Columbia Inn is facing and why? Write student responses where they can be visible to the whole class.

As a class, follow this discussion of inference with an exploration of the concept of ubiquitous. Place the definition of ubiquitous on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the definition. Explore how it can be inferred from the **White Christmas** synopsis that snow is ubiquitous to the setting of Vermont. In November alone, between the southern and northern part of the state, snowfall can range from five inches to 33 inches (information on snow fall retrieved from: <https://www.currentresults.com/Weather/Vermont/snowfall-november.php>) Also explain in addition to being ubiquitous, snow is geometrical.

As a class, review the information on snowflakes. Place information from **The Smart Happy Project** on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the article.

Follow this with an expanded discussion of the geometry of snowflakes. First, place information on hexagons from **Math is Fun** on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the information. Explain that in addition to starting with a hexagon shape, snowflake designs are often symmetrical. Place the definitions for symmetrical and asymmetrical on an ELMO, SMART board or Promethean Board where they can be visible to the whole class. As a class, read and discuss the definitions. Then place information on symmetry from **Math is Fun** on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the information. Next, place information from **Snowflakes All Fall In One of 35 Different Shapes** on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the article. During the discussion, consider and identify examples of symmetry (reflection, rotational and point) in the snowflake patterns.

Follow this with a discussion of regional comparisons and how they relate to geometry. Explain that as ubiquitous as the lace of snowflakes that cover the Vermont countryside for a good portion of the year, the lacy ironwork designs that decorate the doorways, balconies and staircases across New Orleans and many of the surrounding parishes are ubiquitous. In addition, the lace of snowflakes and the lacy ironwork designs have something in common: geometry and geometric patterns.

Explain that the ironwork in Louisiana includes designs from a mixture of cultures, including West Africa. Explain the West African designs in the lacy ironwork are Adinkra symbols. Adinkra symbols are inspired by designs and patterns found in nature. These symbols are also a form of writing. Each Adinkra symbol has a story that goes with it. Like snowflakes, Adinkra symbols often have reflection symmetry or rotation symmetry in the design. As a class, read and discuss the information on Adinkra symbols, beginning with **Adinkra Symbols/Math is a Verb**. Follow this with the articles **Geometry: Traditional Geometry, Reflection in Adinkra Symbols** and **Where Did Adinkra Geometric Forms Come From?** Place each article on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss each article. . During the discussion, consider and identify examples of symmetry (reflection, rotational and point) in the Adinkra symbol patterns.

Distribute a copy of the **White Christmas Symmetry: Lace and Snow** Venn diagram to each student. Display the **Comparing Lace of Snowflakes and the Lacy Ironwork of Louisiana** images where they can be seen by the whole class, such as on an ELMO or SMART board. Discuss how the designs in the snowflakes and Adinkra symbols incorporate symmetry and how these designs are similar/how they are different. Ask students to complete their Venn diagrams as the class reads and discusses the images. Also encourage students to consider and include information on symmetry (reflection, rotational, point) information from the images the class just finished viewing, Siamese Crocodiles (“the Twin Crocodiles”) and aya/fern as they complete their Venn diagrams.

Tell students that in a few moments the class will be creating their own symmetrical lace designs. Distribute a copy of the **White Christmas Symmetry: Lace and Snow** graph paper and a pencil to each student. Ask students to identify the shape in the graph paper (NOTE: the

shape is a hexagon = Germ of ice crystals.) Explain students will be using their Venn diagram investigations and the graph paper to develop their design. Ask students to consider size, shape and symmetry (reflection, rotational and point) as they create their designs.

After students complete their lace designs, ask them to use the graph paper to compare the lengths of things they have drawn. Ask students to count the hexagons for each part of their designs. Which lines are longer/bigger? Which are smaller? How does the size and shape of an object reflect the symmetry of the design? As a class, share and discuss the designs students made.

Tell students that in a few moments they will be writing about their designs. Display the

 **Order of adjectives** and **List of adjectives** information sheets where they can be seen by the whole class, such as on an ELMO or SMART board. As a class, review the information on the sheets. Distribute a copy of the **White Christmas Symmetry: Lace and Snow Describe your design** sheet to each student. Ask students to include adjectives (particularly common, appearance, shape and size) as they write about their designs. Once students have completed their **White Christmas Symmetry: Lace and Snow Describe your design** sheets ask them to share what they have written with the class.



setting

[**set**-ing] noun

5.
the locale or period in which the action of a novel, play, **film**, etc., takes place:
The setting of this story is Verona in the 15th century.

6.
Also called **stage setting**, **stage set**. the scenery and other properties used in a dramatic performance.

RETRIEVED FROM:

<http://www.dictionary.com/browse/setting>

White Christmas

Musical

WRITERS:

- [David Ives](#)
- [Paul Blake](#)
- [Irving Berlin](#)

SYNOPSIS

Soldiers Bob Wallace and Phil Davis served under General Henry Waverley in World War Two and, ten years later, they are still working together in a popular song and dance duo, Wallace and Davis. When they meet the singing sisters, Betty and Judy Haynes, Phil becomes enamored with the beautiful Judy, while Bob is more reserved about his feelings for Betty. The two men follow the sisters up to their seasonal engagement at The Columbia Inn in Vermont. They discover the inn is owned by General Waverley but, unbeknownst to him, the inn is struggling to survive. With the help of Martha, the concierge, and the General's granddaughter, Susan, Bob, Phil, Betty and Judy decide to put on a big show to draw in business.

Bob arranges for his old friend Ralph Sheldrake to bring the General's former troops up to Vermont to support the show. Betty overhears Bob's plans and misinterprets his intentions, believing that he wants to buy the inn instead. Confusion ensues as Betty leaves to go back to New York alone. Bob follows her to attempt to reconcile but, believing he has lost her, he goes on the Ed Sullivan Show to reach out to his former comrades. Back in Vermont, the rehearsals are coming to an end and the General is convinced to wear his uniform to watch the show. He is moved to see his former men return to support him and decides to put his efforts into making the inn a success. Betty returns to apologize to Bob and the couple finally declare their love for each other. With the show a huge success, Bob leads the whole theater in a rendition of "White Christmas".

RETRIEVED FROM: <https://stageagent.com/shows/musical/8554/white-christmas>



Definition of *inference*

- 1:** the act or process of inferring (see **INFER**): such as
 - a:** the act of passing from one proposition, statement, or judgment considered as true to another whose truth is believed to follow from that of the former

- 2:** something that is inferred *especially* : a conclusion or opinion that is formed because of known facts or evidence
- 3:** the premises and conclusion of a process of inferring

inference

noun

in·fer·ence | \ 'in-fə-rəns \

Kids Definition of *inference*

- 1:** the act or process of reaching a conclusion about something from known facts
- 2:** a conclusion or opinion reached based on known facts

RETRIEVED FROM: <https://www.merriam-webster.com/dictionary/inference>



ubiquitous

adjective

ubiq·ui·tous | \yü- 'bi-kwə-təs \

Definition of *ubiquitous*

: existing or being everywhere at the same time : constantly encountered : WIDESPREAD

ubiquitous

adjective

English Language Learners Definition of *ubiquitous*

: seeming to be seen everywhere

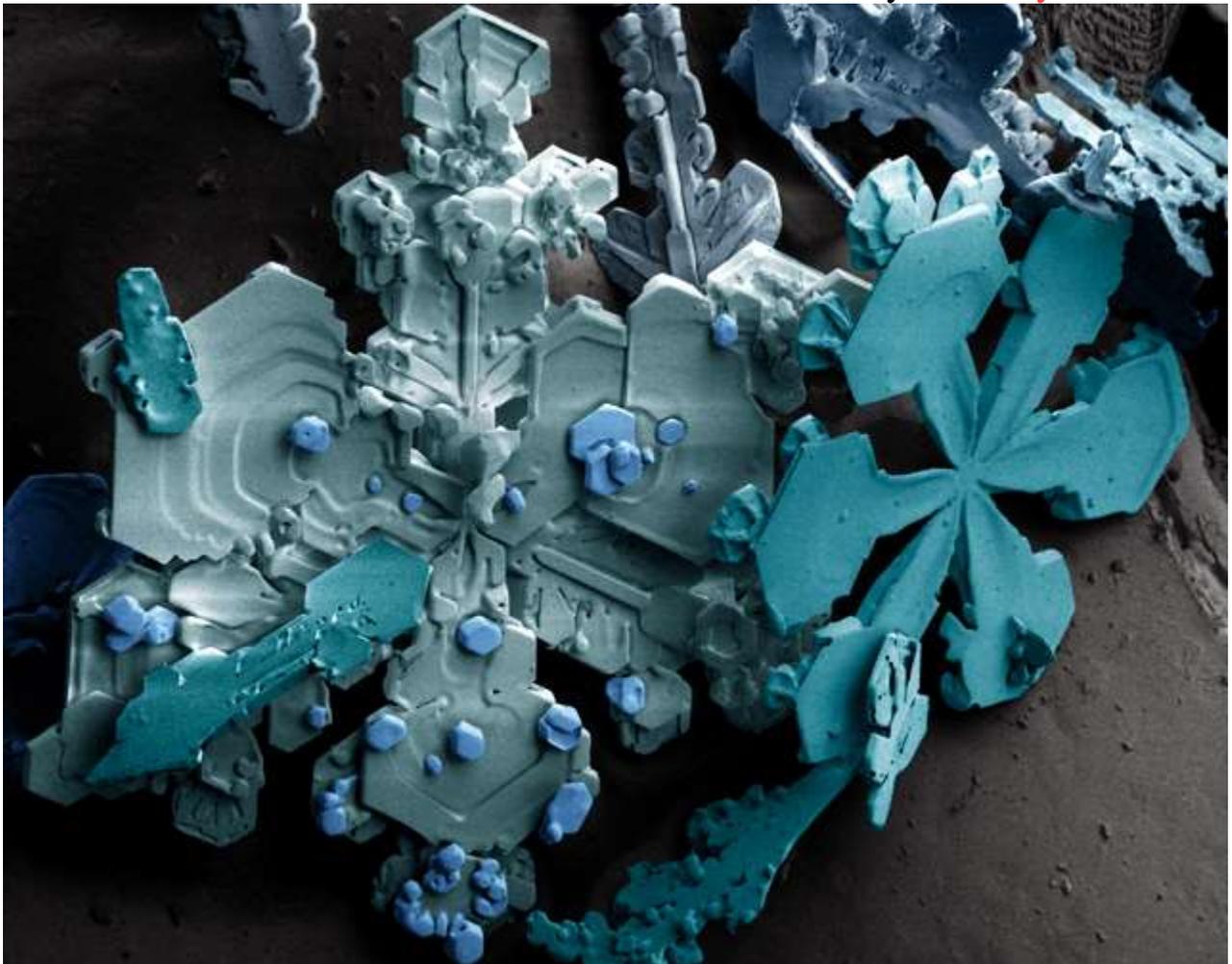
Did You Know?

Ubiquitous comes to us from the noun *ubiquity*, meaning "presence everywhere or in many places simultaneously."

RETRIEVED FROM: <https://www.merriam-webster.com/dictionary/ubiquitous>

the
smart
HAPPY
Project

December 16, 2013 By [LisaLillywhite](#)



What is it?

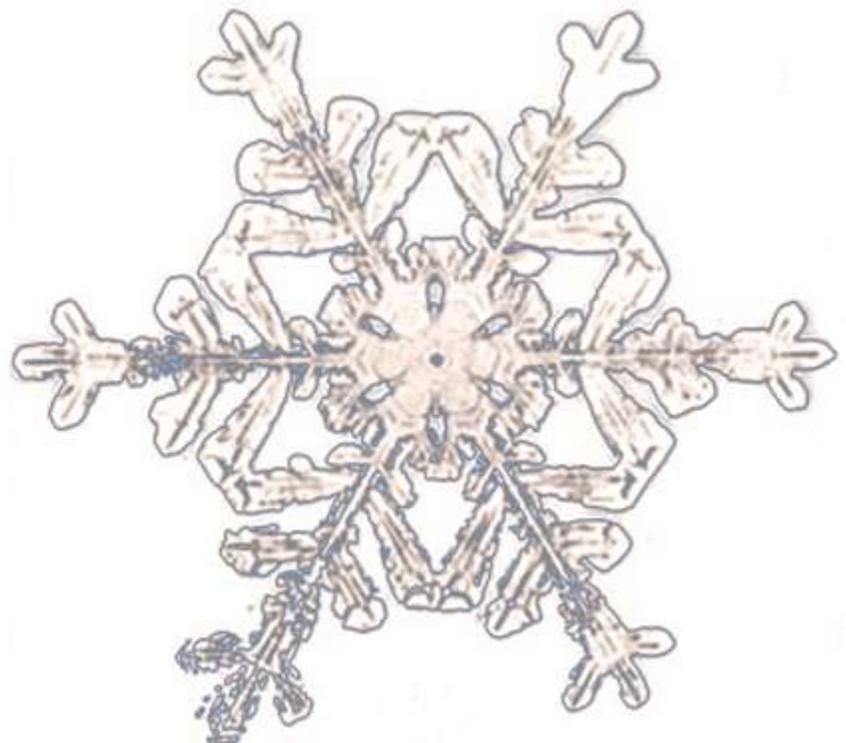
It's **Snow Crystals** at high magnification. Yes, bonkers, I know! The blue colours were added into the photograph for effect.

Maybe this is more what you'd expect for a snowflake. But the grey is a bit dull isn't it?



Or maybe something a bit more sparkly? How are snowflakes made? It's about shapes, this time the hexagon and the number six. **The natural, hexagon geometry of a snowflake.**

Water (or water vapour) molecules attach to a dust particle and form the beginnings of a snowflake. These molecules crystallize



to a **hexagonal** plate form; every snowflake is formed around this shape. Everyone will have repeated hexagon design but each snowflake will be slightly different.

But why a hexagon?

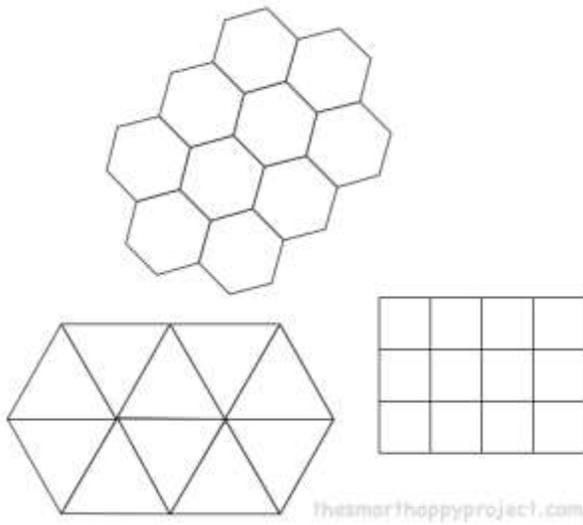
Funny isn't it? Why not another shape? A hexagon is a 2D shape with SIX sides.

Hexagonal geometry.

Johannes Kepler wondered the same thing. Kepler was a German mathematician and astronomer in the 17th Century. At that time astronomy was seen as strongly linked to maths and considered a liberal art, one of the quadrivium – that's four subjects often still taught as part of a classical education. Kepler's major astronomical work defined the universe as a set of geometric shapes. You can see why I bring him up now.

Kepler wondered why a hexagon is the underlying form for a snowflake and not another shape; he proposed that it may be something to do with a **hexagon** being one of only three shapes **that can fill a 2D surface without any gaps**. The

others being a triangle and a square:



back to the snow falling....

These water molecules arrange themselves in a hexagonal net structure (in science the term is a 'lattice') using the atoms of hydrogen and oxygen, which is what water is.

If you want to be really studious here: The molecule H_2O (water) contains one oxygen and two hydrogen. These two hydrogen atoms sit at an angle in relation to the oxygen which is perfectly the same angle as the corners of a hexagon, so building the lattice structure.

In doing so they fill up all available space. Look no gaps! And crystals grow.

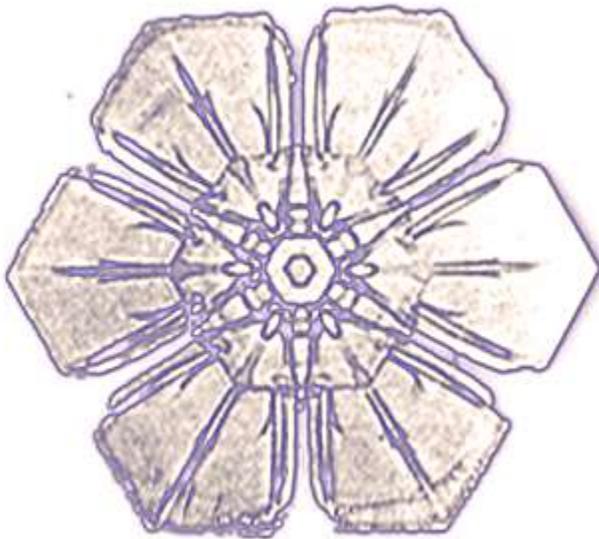
A hexagonal plate is the beginning of every snowflake, as it grows the water available becomes less able to fill all the space and so branches and tendrils appear always on a six fold pattern which are what we recognize as traditional looking snowflakes.

Why so many different variations on a six cornered pattern?

We all know the weather is unpredictable right? That's it.

The structure of a snowflake is determined by the **temperature and moisture levels** around it as it passes through weather systems on its journey to your garden and your child's protruding tongue.

Different temperatures create different patterns, but they are all based on hexagonal geometry. These many different forms have become named things like : fernlike, dendritic, stellar, plate, columnar.



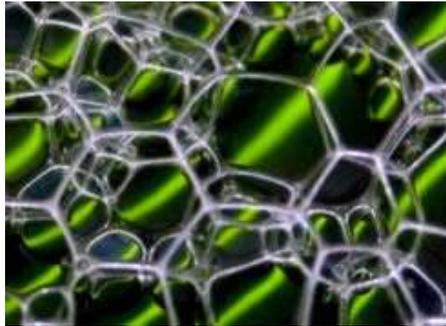
RETRIEVED FROM: <http://thesmarthappyproject.com/hexagon-geometry-snowflake/>



A

Hexagon

hexagon is a 6-sided [polygon](#) (a flat shape with straight sides).



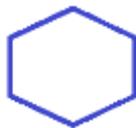
Soap bubbles tend to form hexagons when they join up.



Honeycomb has hexagons too!

Regular or Irregular

When all angles are equal and all sides are equal it is **regular**, otherwise it is **irregular**:



Regular Hexagon



Irregular Hexagon

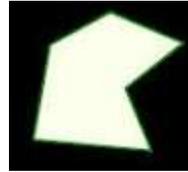
Concave or Convex

A **convex** hexagon has no angles pointing inwards. More precisely, no internal angles can be more than 180° .

When any internal angle is greater than 180° it is **concave**. (*Think: concave has a "cave" in it*)



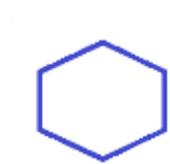
Convex Hexagon



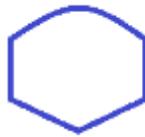
Concave Hexagon

Is it a Hexagon?

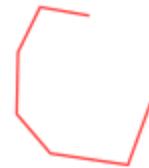
No curved sides. And the shape must also be **closed** (all the lines connect up):



Hexagon
(straight sides)



Not a Hexagon
(has a curve)



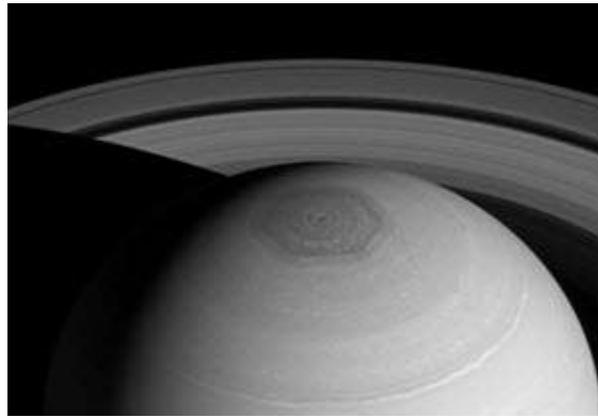
Not a Hexagon
(open, not closed)

Properties

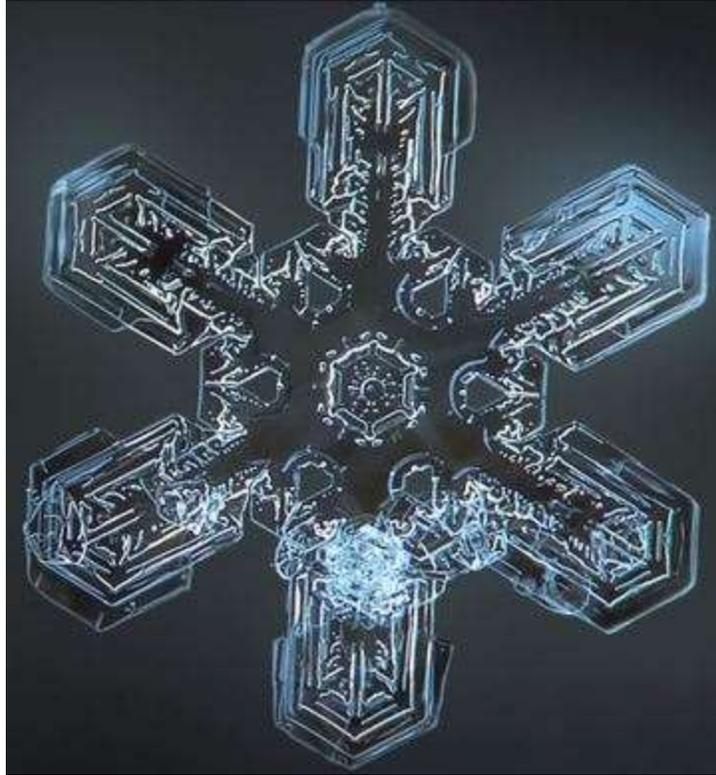


A **regular** hexagon has:

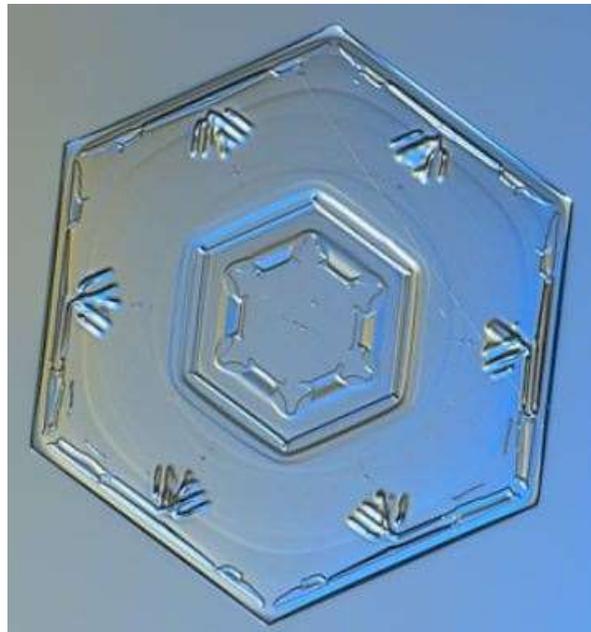
- Interior Angles of **120°**
- Exterior Angles of **60°**
- Area = **$(1.5\sqrt{3}) \times s^2$** , or approximately **$2.5980762 \times s^2$** (where s=side length)



There is a **huge** hexagon on Saturn,
it is wider than Earth.



Snowflakes have hexagonal patterns, like this beautiful image from NASA.
Photograph by NASA / Alexey Kljatov.



Also a snowflake!
Photograph by NASA / Alexey Kljatov.

RETRIEVED FROM: <https://www.mathsisfun.com/geometry/hexagon.html>



symmetrical

adjective

sym·met·ri·cal | \sə-'me-tri-kəl \

variants: *or* **symmetric** \sə-'me-trik \

Definition of *symmetrical*

1: having, involving, or exhibiting symmetry

symmetry

noun

sym·me·try | \ 'si-mə-trē \

plural **symmetries**

Definition of *symmetry*

1: balanced proportions *also* : beauty of form arising from balanced proportions

2: the property of being symmetrical *especially* : correspondence in size, shape, and relative position of parts on opposite sides of a dividing line or median plane or about a center or axis

symmetry

noun

sym·me·try | \ 'si-mə-trē \

plural symmetries

Kids Definition of *symmetry*

: close agreement in size, shape, and position of parts that are on opposite sides of a dividing line or center : an arrangement involving regular and balanced proportions

RETRIEVED FROM: <https://www.merriam-webster.com/dictionary/symmetrical>

<https://www.merriam-webster.com/dictionary/symmetry>



asymmetrical

adjective

asym·met·ri·cal | \, ā-sə-'me-tri-kəl \

variants: *or* **asymmetric** \-trik \

Definition of *asymmetrical*

1: having two sides or halves that are not the same : not symmetrical
an *asymmetrical* design *asymmetrical* shapes

RETRIEVED FROM: <https://www.merriam-webster.com/dictionary/asymmetrical>



Symmetry



Symmetry is when two or more parts are identical after a flip, slide or turn.

The simplest type of Symmetry is "Reflection" (or "Mirror") Symmetry, as shown in this picture of my dog Flame.

There is also Rotational Symmetry and Point Symmetry.

Symmetry

[syn- **together** + metron **measure**]

Reflection Symmetry

The simplest symmetry is [Reflection Symmetry](#) (sometimes called *Line Symmetry* or *Mirror Symmetry*). It is easy to see, because one half is the reflection of the other half.



Here my dog "Flame" has her face made perfectly symmetrical with a bit of photo magic.

The white line down the center is the **Line of Symmetry**



The reflection in this lake also has symmetry, but in this case:

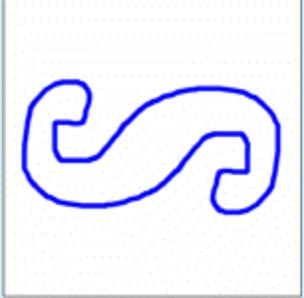
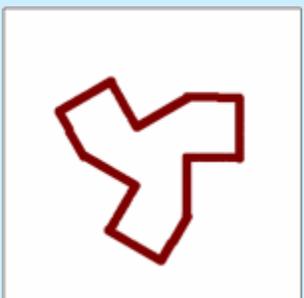
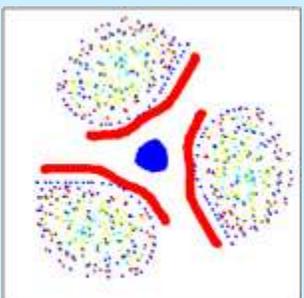
- the **Line of Symmetry** runs left-to-right
- it is not perfect symmetry, as the image is changed a little by the lake surface.

The Line of Symmetry can be in any direction (not just up-down or left-right). To learn more, go to [Reflection Symmetry](#).

Rotational Symmetry

With [Rotational Symmetry](#), the image is rotated (around a central point) so that it appears 2 or more times. How many times it appears is called the **Order**.

Here are some examples (they were made using [Symmetry Artist](#), and you can try it yourself!)

Order	Example Shape	Artwork
		
		
<p>... and there is Order 4, 5, etc ...</p>		

Point Symmetry

Point Symmetry is when every part has a matching part:

- the **same distance** from the central point
- but in the **opposite direction**.

It is also the same as "Rotational Symmetry of Order 2" above

RETRIEVED FROM: <https://www.mathsisfun.com/geometry/symmetry.html>

Smithsonian.com

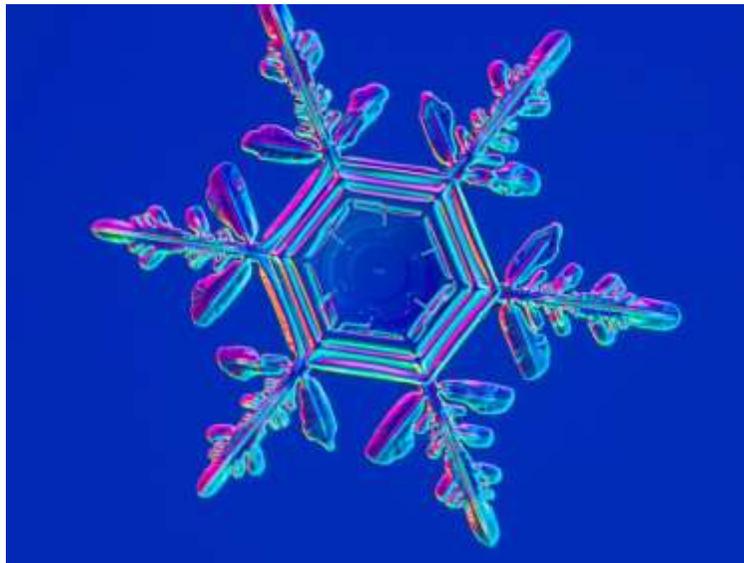
SMARTNEWS *Keeping you
current*

Snowflakes All Fall In One of 35 Different Shapes

The latest categorization of solid precipitation types inspired a cool graphic

By [Marissa Fessenden](#)

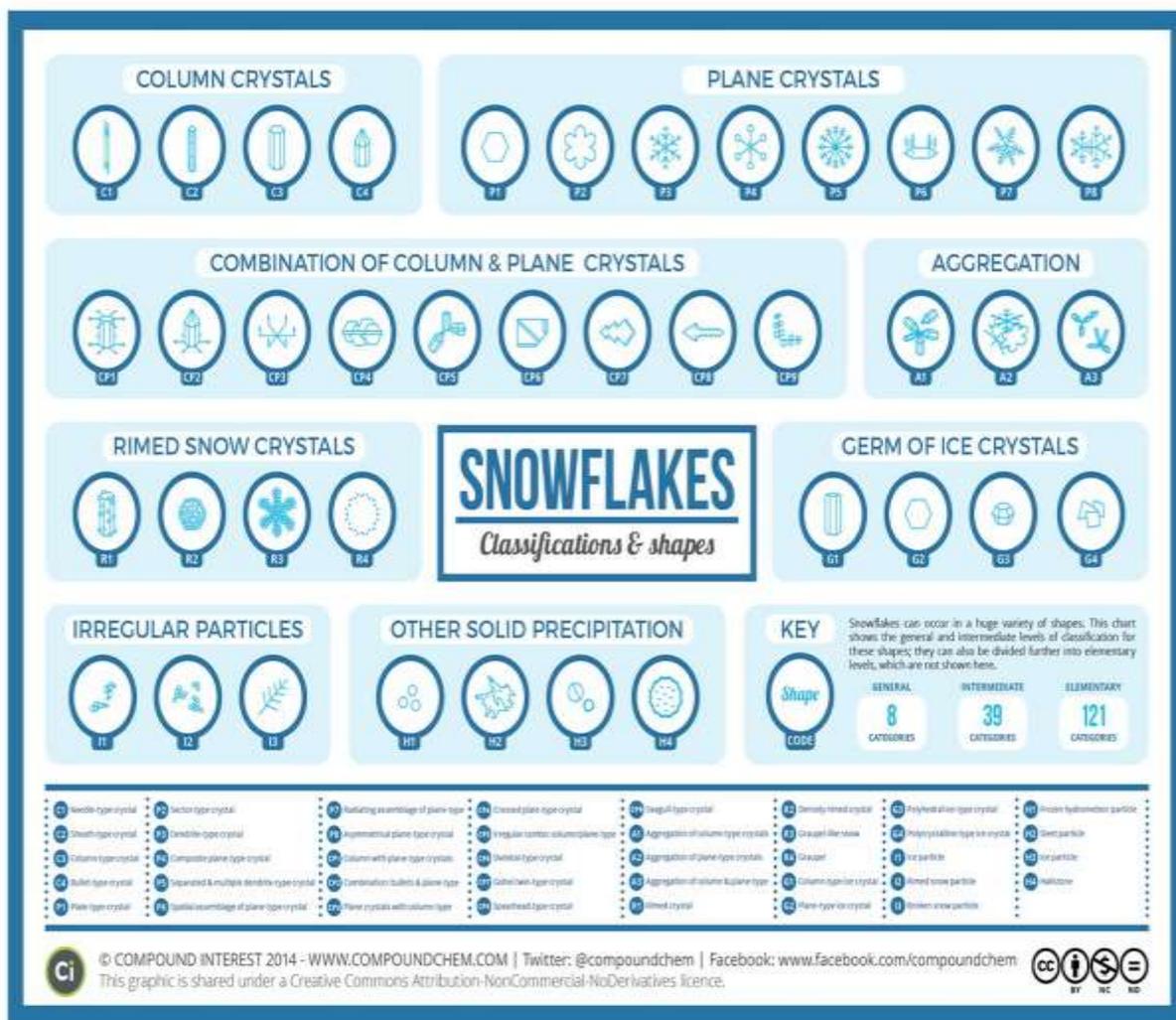
smithsonian.com
December 30, 2014



(Visuals Unlimited/Corbis)

The stunning diversity of snowflakes gives rise to the idea that every single one is unique. While “no two flakes alike” might be an attractive metaphor, it [isn't entirely true](#). Yet that doesn't stop us from peering at the intricate crystal structures caught on our mittens. It also doesn't stop researchers from painstakingly cataloguing each and every type of crystal that might form.

Thanks to their work, chemistry teacher Andy Brunning, who keeps the graphics and chemistry blog *Compound Interest*, has created [a fascinating graphic](#) that shows 39 kinds of solid precipitation, including 35 that are snow crystals or flakes. The other forms of precipitation pictured include sleet, ice, a hailstone and a frozen hydrometeor particle.



You might wonder what the shapes of snowflakes have to do with chemistry. Actually, the study of crystal structures of solids has its own discipline, crystallography, which allows us to determine the arrangement of atoms in these solids. Crystallography works by passing X-rays through the sample, which are then diffracted as they pass through by the atoms contained therein. Analysis of the diffraction pattern allows the structure of the solid to be discerned; this technique was used by Rosalind Franklin to photograph the double helix arrangement of DNA prior to Watson & Crick's confirmation of its structure.

[Previous efforts](#) have come up with a few different numbers for the total categories of solid precipitation. The new graphic is based [on work](#) from researchers based in Japan. The 39 categories can be further broken down into 121 subtypes, Susannah Locke [reports for Vox](#). And they all can be lumped into eight broader groups:

- Column crystals
- Plane crystals
- Combination of column & plane crystals
- Aggregation of snow crystals
- Rimed snow crystals
- Germs of ice crystals
- Irregular snow particles
- Other solid precipitation.

Kenneth Libbrecht [a physicist at Caltech](#) writes about snow crystal formation on [his website](#):

The story begins up in a cloud, when a minute cloud droplet first freezes into a tiny particle of ice. As water vapor starts condensing on its surface, the ice particle quickly develops [facets](#), thus becoming a small [hexagonal prism](#). For a while it keeps this simple faceted shape as it grows.

As the crystal becomes larger, however, [branches](#) begin to sprout from the six corners of the hexagon (this is the third stage in the diagram at right). Since the atmospheric conditions (e. g. temperature and humidity) are nearly constant across the small crystal, the six budding arms all grow out at roughly the same rate.

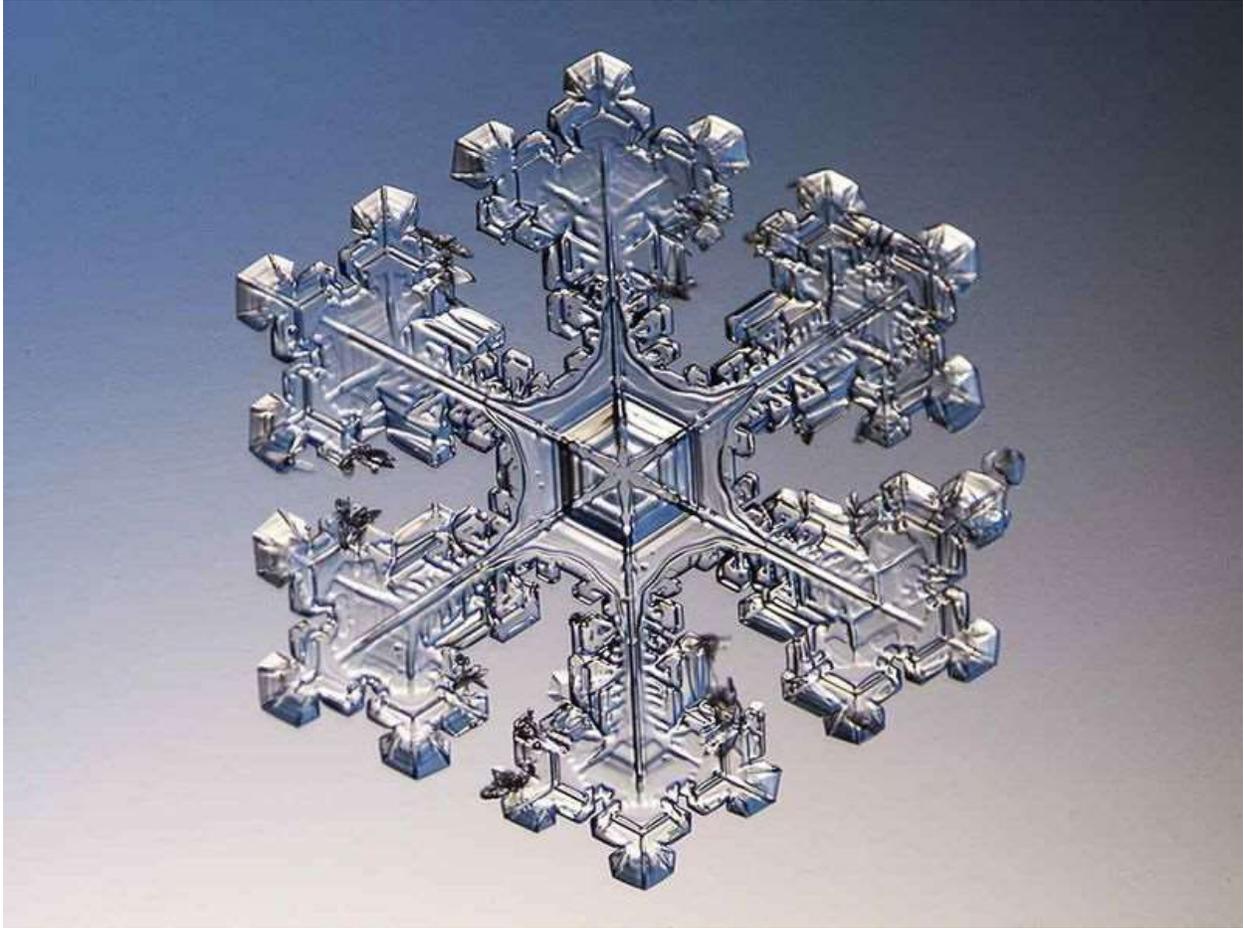
While it grows, the crystal is blown to and fro inside the clouds, so the temperature it sees changes randomly with time.

Those temperature changes morph the arms into different shapes and give us the diverse snowflakes and crystals we see. Since all the arms endure the same fluctuations, they *can* grow symmetrically. In reality, most snow crystals are irregular, he writes.

Why spend all this time classifying snowflakes? As Libbrecht explains, this is really the study of how crystals form. And that knowledge can be applied to making crystals for a host of other applications—silicon and other semiconductors in computers and electronics are built of crystals, for example.

Plus, they are stunning.

RETRIEVED FROM: <https://www.smithsonianmag.com/smart-news/snowflakes-all-fall-one-35-different-shapes-180953760/>



IMAGES OF MAGNIFIED SNOWFLAKES: <https://www.poppo.com/tips-pro-microscopic-photography#page-10>

Adinkra Symbols

In book: **Math is a Verb**, Edition: 1, Chapter: 5, Publisher: NCTM, Editors: Jim Barta, Ron Eglash, Cathy Barkley, pp.61-17

Authors and Editors



Lindsay Poirier



Ron Eglash

- University of Michigan, Department: School of Information

Adinkra symbols are prevalent throughout Ghana. They are the traditional symbols of the Asante (also known as Ashanti) culture, which developed in the country's central region. Each symbol represents an ideal or belief, along with a proverb held by the Asante people...

Today, the most common use of Adinkra is still in textiles. The Asante use a traditional stamping process to create cloth that is worn to ceremonies and festivals (as shown in fig. 5.2). The colors of the cloth and the symbols it features represent the sentiments of the event. At funerals, for instance, individuals will adorn themselves with black, brown, or brick-colored cloth that is stamped with symbols pertaining to mortality or religion.



Fig. 5.2. Stamped Adinkra cloth

In order to stamp the fabric, symbols are carved into a calabash and attached to bamboo sticks for a grip. Adinkra designers produce their own ink by shaving the bark of a Badie tree (*Bridelia ferruginea*), pounding it, soaking it, and then boiling it. This results in a

thick black ink called Adinkra aduru, or Adinkra medicine. Cloth is then laid out along a table, and the stamps are dipped in the ink and then pressed down on the cloth an equal distance apart. In Twi (or Akan), the language of the Asante, Adinkra translates to “good-bye”; accordingly, cloth stamped with Adinkra symbols was at first often worn to funerals. Over time, the traditions surrounding Adinkra have evolved. Today, symbols can be seen in architecture, sculptures, pottery, and even incorporated in company logos, providing a profound significance to the objects on which they are placed. While the original symbols are still used, new symbols and meanings are constantly being developed.

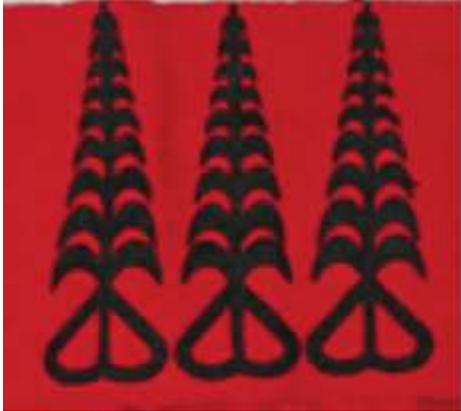
Ghana: Adinkra Symbols

One of the most interesting aspects of Adinkra design is how the symbols incorporate elements of geometry. Students may enjoy learning how to pronounce the Twi words that represent four possible geometric transformations: adane (a h -DAW N - e h) means “reversed image,” or reflection; ketowa (KET-wah) and keseye (ke-SEE-yah) mean “smaller” and “larger” and relate to dilation, which can be a size change in either direction; ntwaho (en-TWA-hoe) is the word for “spinning,” or rotation; and twe (TWEE) is the word for “pulling an object” that relates to translation.



The Adinkra symbol shown in figure 5.3 is called is called Funtunfunefu Denkyemfunefu (“the Twin Crocodiles”).

It represents democracy and unity in diversity and is based on the proverb “They share one stomach and yet they fight for food.” In this symbol, we can see reflection (where one side of the symbol mirrors the other side) along the vertical and horizontal axes.



In Aya (“the Fern,” shown in fig. 5.4), the leaves gradually become smaller as the fern grows upwards, representing the dilation that can be seen in an actual fern. This symbol represents endurance and resourcefulness.

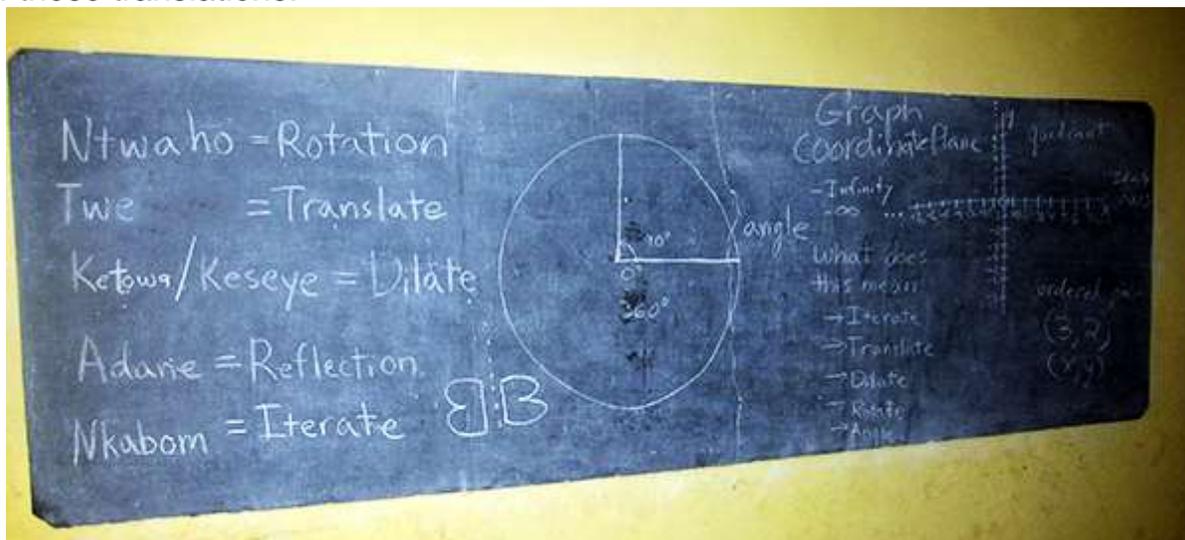
(PDF) *Adinkra Symbols*. Available from:

https://www.researchgate.net/publication/299437190_Adinkra_Symbols [accessed Aug 21 2018].

RETRIEVED FROM: https://www.researchgate.net/publication/299437190_Adinkra_Symbols

Geometry: Traditional Geometry

Many of the Adinkra symbols incorporate elements of transformational geometry in their design. The following pages show Adinkra symbols using translation, reflection, dilation, and rotation. Math teachers in Kumasi, Ghana have translated these terms from English into the local language, Twi. Below is a table of these translations.



English: Reflection

Twi: Adane

Pronounced Like: "Ah-DAWN-eh"

Literal meaning: Reversed image

English: Dilation

Twi: Ketowa/Keseye

Pronounced Like: "KET-wah"/"ke-SEE-yah"

Literal meaning: Smaller/larger (using both terms helps remind students that dilation can be a size change above or below 100%)

English: Rotation

Twi: Ntwaho

Pronounced Like: "En-TWA-hoe"

Literal meaning: Spinning (for example a spinning move defines the Ntwaho dance)

English: Translation

Twi: Twe

Pronounced Like: "TWEE"

Literal meaning: Pulling an object

Reflection in Adinkra Symbols

In mathematics, an image is said to have reflection when half of the image appears to mirror across a line. For instance, the symbol to the right reflects across the X-axis, the Y-axis, and both diagonal axes. On either side of the imaginary lines, the image appears identical but opposite. This symbol is called Funtunfunefu



Denkyemfunefu, or the Siamese Crocodiles (“the Twin Crocodiles”). It represents democracy and unity in diversity based on the proverb, "They share one stomach and yet they fight for getting food."

RETRIEVED FROM: <https://csdt.rpi.edu/culture/adinkra/geometry.html>

Where Did Adinkra Geometric Forms Come From?

Like all cultures, the Ashanti developed their math ideas from both natural and social influences. Below you can see 3 stages:

1. Observing an object from nature or culture.
2. Artistically representing this object.
3. Abstracting the art into geometric forms. This makes the stamps easier to reproduce, and the symbols easier to recognize. And it helps us see why African mathematical traditions were slightly different from those of Europe: more emphasis on iteration and logarithmic curves.

From Nature

Original Object



Water Drop

Adinkra Symbol



Adinkrahene Symbol

Description

Photos of water ripples are often used to study fluid physics. Ghanaian artisans were also keen observers of fluid shapes. We can identify a ripple pattern in the gold "Soul Washer's" badge - worn by the Ghana priests who conducted the king's water rituals. This suggests an origin for the adinkrahene ("king of adinkra") symbol: ripples of power spread in all directions.

From Animals

Original Object



Bird

Artistic Representation



Artistic Sankofa Symbol

Adinkra Symbol



Abstract Sankofa Symbol

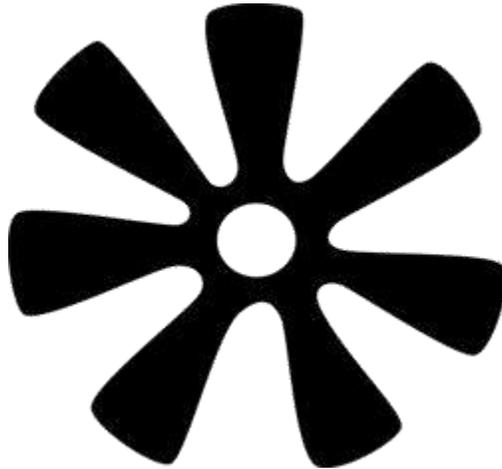
Description

Many shapes created by living organisms can be modeled by using the arc of a log spiral. Some shapes have several full rotations (like a snail shell), while others are just a short arc (like the neck of a bird). Adinkra symbols often use log spiral arcs due to an important feature of biological growth, as we will see in later sections.

RETRIEVED FROM: <https://csdt.rpi.edu/culture/adinkra/origins.html>

Comparing Lace of Snowflakes and the Lacy Ironwork of Louisiana

West African Wisdom: Adinkra Symbols & Meanings



ANANSE NTONTAN

"spider's web"

symbol of wisdom, creativity and the complexities of life

Ananse, the spider, is a well-known character in African folktales.

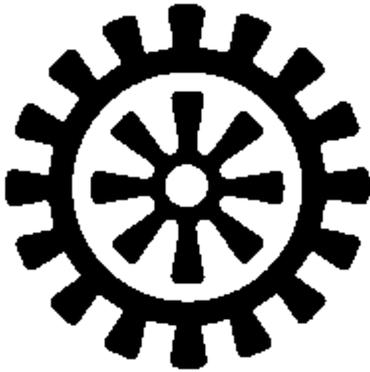
RETRIEVED FROM: <http://www.adinkra.org/htmls/adinkra/anank.htm>



R2: Densely rimmed crystal

R3: Graupel-like snow

RETRIEVED FROM: <https://www.smithsonianmag.com/smart-news/snowflakes-all-fall-one-35-different-shapes-180953760/>



ADINKRAHENE (v)

"king of Adinkra symbols"

Variation of the Symbol of Authority

This symbol is said to have played an inspiring role in the designing of other symbols. It signifies the importance of playing a leadership role.

RETRIEVED FROM: <http://adinkra.lassanay.net/>



P2: Sector-type crystal P3: Dendrite-type crystal P4: Composite plane-type crystal

P5: Separate and multiple dendrite-type crystal

RETRIEVED FROM: <https://www.smithsonianmag.com/smart-news/snowflakes-all-fall-one-35-different-shapes-180953760/>



West African Wisdom: Adinkra Symbols & Meanings

NYAME NTI

"by God's grace" "the staff of life"

symbol of faith and trust in God

similar to **Gye Nyame**

According to The Adinkra Dictionary by W. Bruce Willis: "This stalk is depicted as the staff of life in many cultures. It symbolizes to the Akan that food is a basis of life and that they could not survive if not for the food that God has placed here on Earth for their nourishment. "

RETRIEVED FROM: <http://www.adinkra.org/htmls/adinkra/nyame-nti.htm>



13: Broken snow particle

RETRIEVED FROM: <https://www.smithsonianmag.com/smart-news/snowflakes-all-fall-one-35-different-shapes-180953760/>

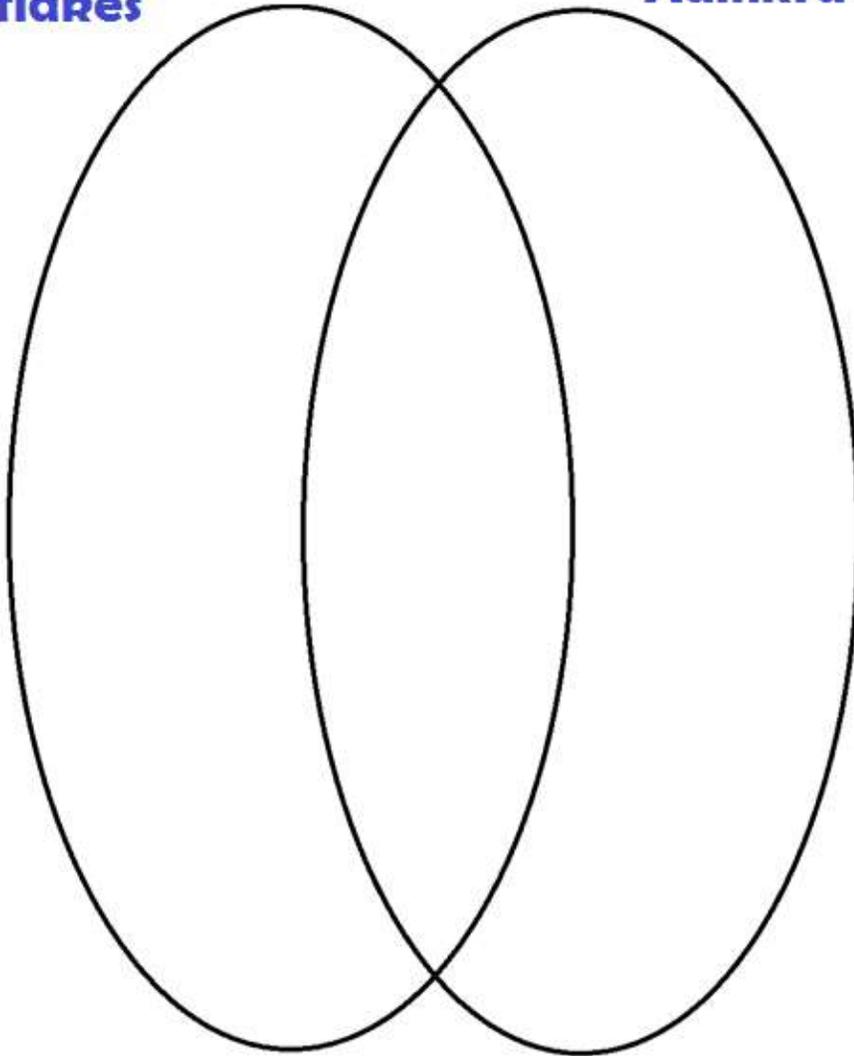


Symmetry: Lace and Snow

NAME _____

**The geometry of
snowflakes**

**The geometry of
Adinkra symbols**





Order of adjectives

How to order adjectives in English

In many languages, [adjectives](#) denoting attributes usually occur in a specific order. Generally, the adjective order in English is:

1. Quantity or number
2. Quality or opinion
3. Size
4. Age
5. Shape
6. Color
7. Proper adjective (often nationality, other place of origin, or material)
8. Purpose or qualifier

For example:

1. I love that **really big old green antique** car that always parked at the end of the street.
2. My sister adopted a **beautiful big white** bulldog.

When there are two or more adjectives that are from the same group, the word **and** is placed between the two adjectives:

1. The house is green **and** red.
2. The library has old **and** new books.

When there are three or more adjectives from the same adjective group, place a comma between each of the coordinate adjectives:

1. We live in the big **green, white and red** house at the end of the street.

2. My friend lost a **red, black** and **white** watch.

A comma is not placed between an adjective and the noun.

Order of adjectives – examples

Determiner	Quantity or number	Quality or opinion	Size	Age	Shape	Color	Proper adjective	Purpose or qualifier	Noun
A		beautiful		old			Italian	sports	car
The	three	beautiful	little			gold			plates
An		amazing			heart-shaped	red and white			sofa

RETRIEVED FROM: <https://www.gingersoftware.com/content/grammar-rules/adjectives/order-of-adjectives/>



Common adjectives

Good

New

First

Last

Long

great

little

own

other

old

right

big

high

different

small

large

next

early

Appearance adjectives

adorable

beautiful

clean

drab

elegant

fancy

glamorous

handsome

long

magnificent

old-fashioned

plain

quaint

sparkling

ugliest

unsightly

wide-eyed

Color adjectives

red

orange

yellow

green

blue

purple

gray

black

white

Condition adjectives

alive

better

careful

clever

dead

easy

famous

gifted

helpful

important

inexpensive

mushy

odd

powerful

rich

shy

tender

uninterested

young

vast

important

wrong

few

public

bad

same

able

Lists of adjectives

Shape adjectives

broad
chubby
crooked
curved
deep
flat
high
hollow
low
narrow
round
shallow
skinny
square
steep
straight
wide

Size adjectives

big
colossal
fat
gigantic
great
huge
immense
large
little
mammoth
massive
miniature
petite
puny
scrawny
short
small
tall

Touch adjectives

boiling
breeze
broken
bumpy
chilly
cold
cool
creepy
crooked
cuddly
curly
damaged
damp
dirty
dry
dusty
filthy
flaky

Quantity adjectives

abundant
empty
few
full
heavy
light
many
numerous
sparse
substantial

teeny

fluffy

teeny-tiny

freezing

tiny

hot

warm

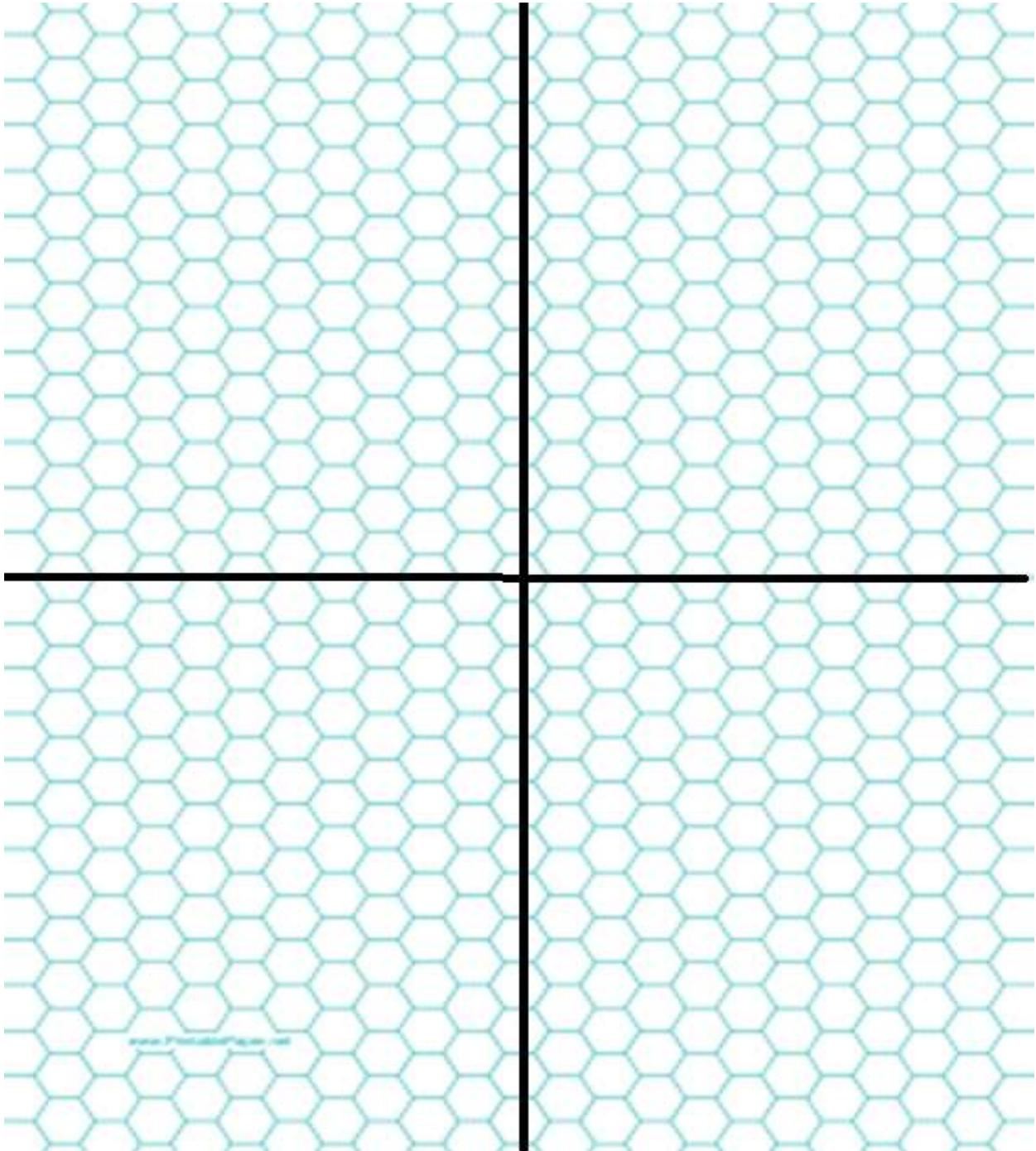
wet

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Symmetry: Lace and Snow

NAME _____





Symmetry: Lace and Snow

NAME _____

Describe your design. Use the  **List of adjectives** and the definitions of symmetry to help you write your description.

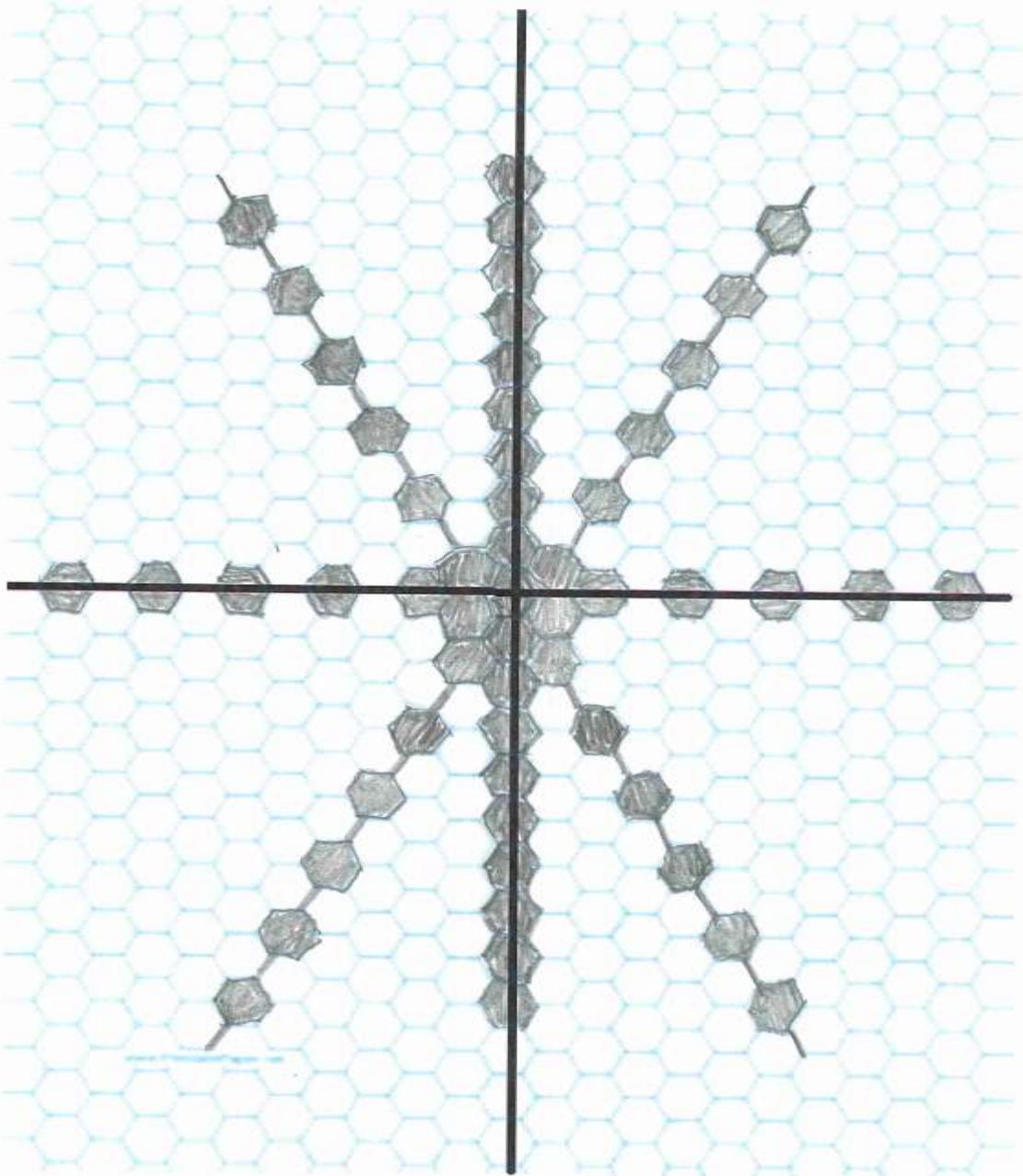


Symmetry: Lace and Snow

Sample Graph Designs

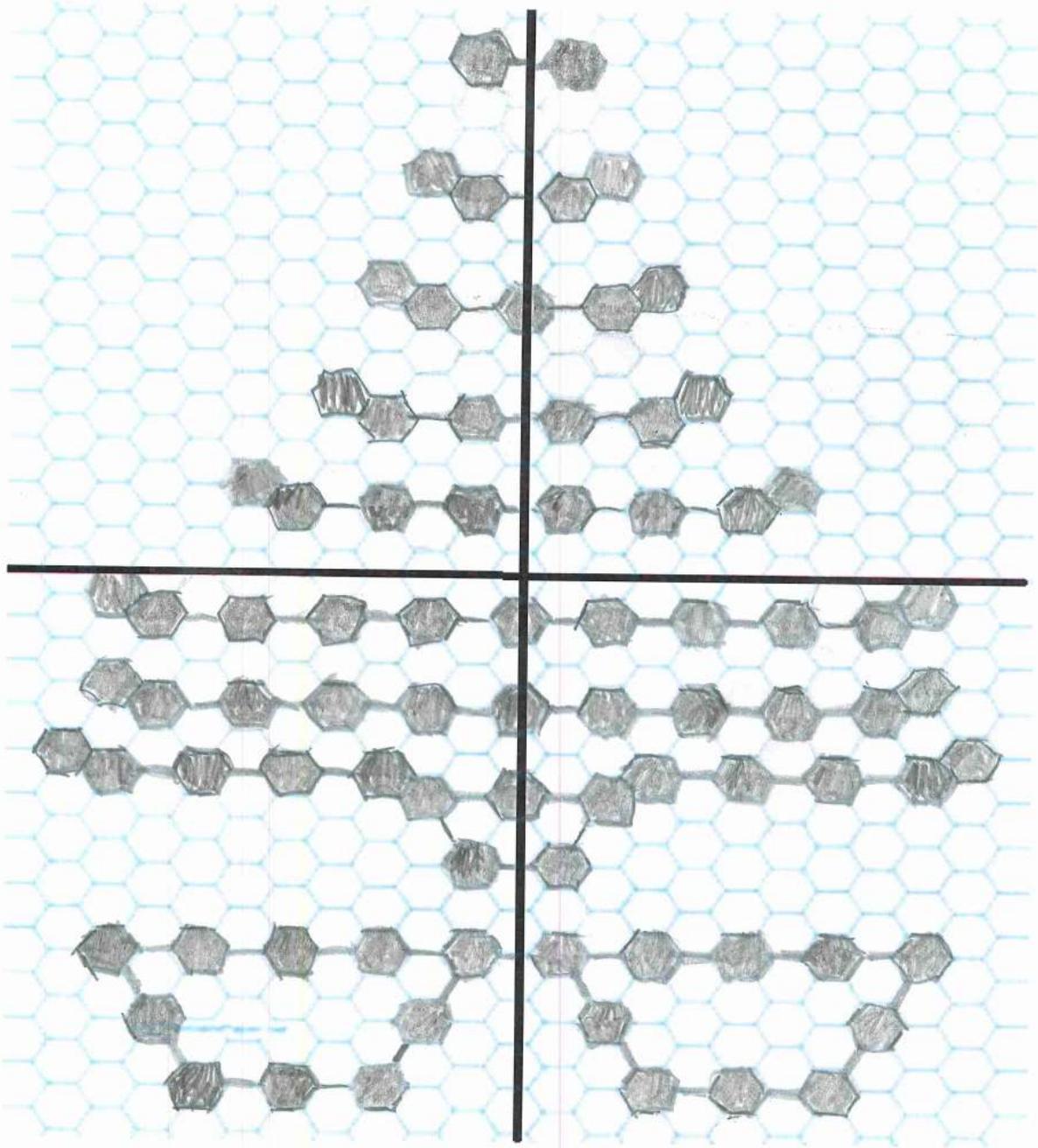


Symmetry: Lace and Snow





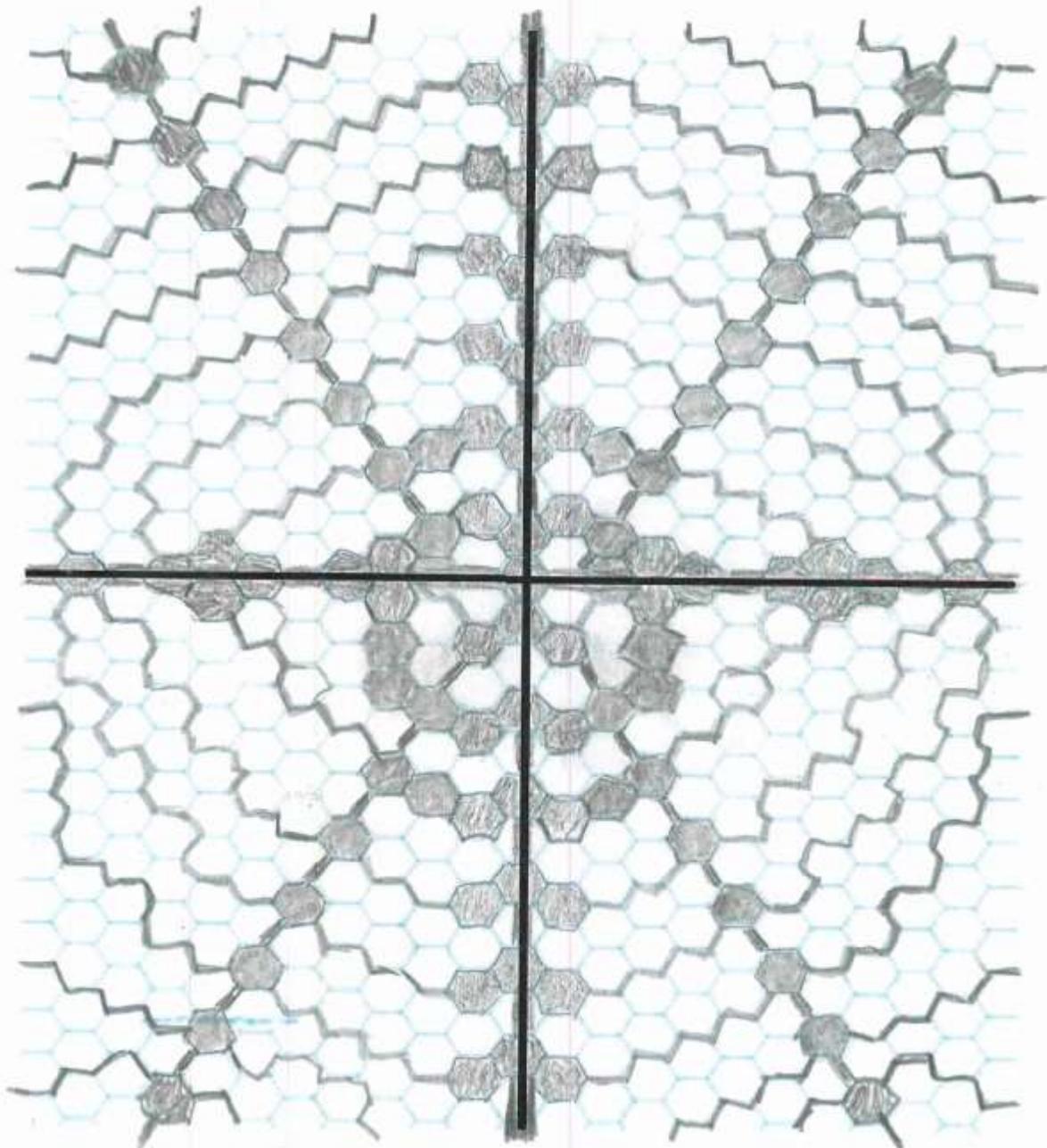
Symmetry: Lace and Snow





Symmetry:

Lace and Snow



K-12 Student Standards for English Language Arts » Grade 1

Reading Standards for Literature

Key Ideas and Details

1. Ask and answer questions about key details in a text.
2. a . Retell stories, including key details.
3. Describe characters, **settings**, and major events in a story, using key details.

Integration of Knowledge and Ideas

7. Use illustrations and **details** in a story to describe its characters, **setting**, or events

Range of Reading and Level of Text Complexity

10. With prompting and support read informational texts appropriately complex for grade 1.

Writing Standards

Research to Build and Present Knowledge

8. With guidance and support from adults, recall information from experiences **or gather information from provided sources to answer a question.**

K-12 Student Standards for English Language Arts » Grade 4

Reading Standards for Literature

Key Ideas and Details

1. Refer to details and examples in a text when explaining what the text says explicitly and when **drawing inferences from the text.**
2. Determine a theme of a **story**, drama, or poem from details in the text; **summarize the text.**
3. Describe in depth a character, **setting**, or event in a story or drama, drawing on specific details in the text (e.g., a character's thoughts, words, or actions).

Integration of Knowledge and Ideas

9. **Compare and contrast** the treatment of similar themes and topics (e.g., opposition of good and evil) and patterns of events (e.g., the quest) in stories, myths, and traditional literature from different cultures.

Writing Standards

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

K-12 Student Standards for English Language Arts » Grade 7

Reading Standards for Literature

Key Ideas and Details

1. Cite several pieces of relevant textual evidence to support analysis of what the text says explicitly as well as **inferences** drawn from the text.
2. Determine a theme or central idea of a text and analyze its development over the course of the text; provide an **objective summary of the text**.
3. Analyze how particular elements of a story or drama interact (e.g., how **setting** shapes the characters or **plot**).

Writing Standards

3. Write narratives to develop real or imagined experiences or events using effective technique, relevant **descriptive details**, and well-structured event sequences.
- d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.

K-12 Student Standards for Mathematics » Grade 1

Measurement and Data 1.MD

A. Measure lengths indirectly and by iterating length units.

2. **Express the length of an object as a whole number of length units**, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.

Geometry 1.G

A. Reason with shapes and their attributes.

1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, **orientation, overall size**); build and **draw shapes that possess defining attributes**.
2. Compose two-dimensional shapes (**rectangles, squares**, trapezoids, triangles, half-circles, and quarter-circles) and three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and **compose new shapes** from the composite shape.

K-12 Student Standards for Mathematics» Grade 4

Measurement and Data 4.MD

A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit

1. Know relative sizes of measurement units within one system of units including ft, in; km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, **express measurements in a larger unit in terms of a smaller unit**.
2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, **masses of objects**, and money, including problems involving **whole numbers** and/or simple fractions (addition and subtraction of fractions with like denominators and multiplying a fraction times a fraction or a whole number), and problems that require expressing **measurements given in a larger unit in terms of a smaller unit**. Represent measurement quantities using diagrams such as number line diagrams that feature a **measurement scale**.

Geometry 4.G

A. Draw and **identify** lines and **angles**, and classify shapes by properties of their lines and angles.

1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and **perpendicular and parallel lines**. Identify these in two-dimensional figures.

K-12 Student Standards for Mathematics» Grade 7

Ratios and Relationships 7.RP

A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

2. Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or **graphing on a coordinate plane** and observing whether the graph is a straight line through the origin.

b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and **verbal descriptions** of proportional relationships.

Expressions and Equations

B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Geometry 7.G

A. Draw, construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, such as computing **actual lengths** and areas from a scale drawing and reproducing a scale drawing at a different scale.

2. Draw (freehand, with ruler and protractor, or with technology) **geometric shapes** with given conditions. (Focus is on triangles from three measures of angles or sides, noticing when the conditions determine one and only one triangle, more than one triangle, or no triangle.)



AN EXTENTION: Symmetry: Lace and Snow

By Karel Sloane-Boekbinder

As a follow up to the designs students created using the **White Christmas Symmetry: Lace and Snow** graph paper, investigate geometric patterns further.

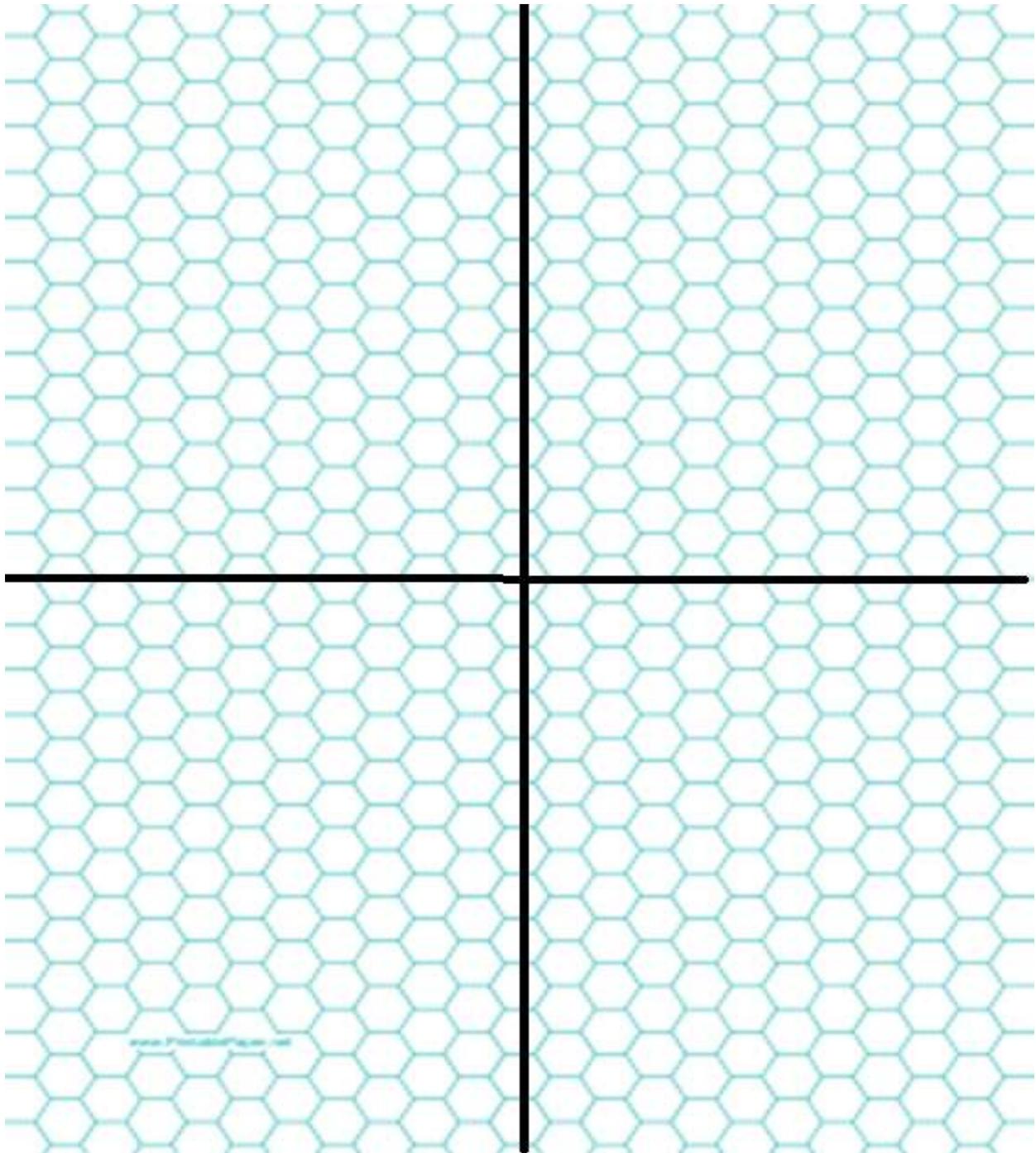
Distribute a second copy of the **White Christmas Symmetry: Lace and Snow** graph paper and a pencil to each student. Ask students to create a second design. Ask students to consider quantity, size, shape and symmetry as they create their designs.

Once students have completed a second design, place the **Chegg Study** Algebraic And Geometric Patterns information sheet on an ELMO, SMART board or Promethean Board where it can be visible to the whole class. As a class, read and discuss the information. During the discussion, ask students to reflect on their own designs. Consider the patterns each of their designs created. How can each of their design be expressed as a sequence of numbers? How does this sequence determine their design? What is the sequence?



Symmetry: Lace and Snow

NAME _____



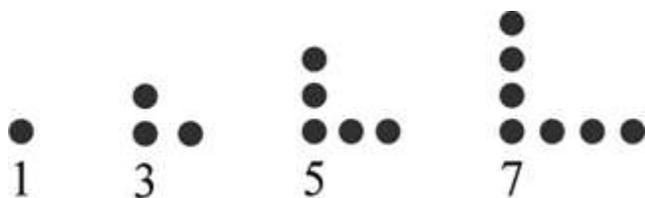


Algebraic And Geometric Patterns

The Pattern is defined as the series or sequences that are replicates. The sequence of objects that are arranged based on particular rule is known as number pattern.

Algebraic pattern:

The sequence of number pattern based on the addition or subtraction is known as algebraic pattern.



Example:

Consider the sequence 1, 5, 9, 13, 17, 21, 25,...

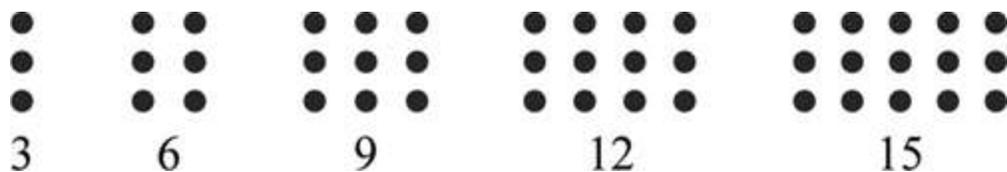
Here, the numbers are arranged by following certain rule, which is explained below:

- (i) First number in the given number pattern is 1.
- (ii) Add 4 to the first number of the sequence. That is, $1 + 4 = 5$, is the second number of the sequence.
- (iii) Add 4 to the second number of the sequence. That is, $5 + 4 = 9$, is the third number of the sequence.
- (iv) Add 4 to the third number of the sequence. That is, $9 + 4 = 13$, is the fourth number of the sequence.
- (v) Add 4 to the fourth number of the sequence. That is, $13 + 4 = 17$, is the fifth number of the sequence. Similarly, the remaining numbers will be obtained.

Thus, the given sequence is ordered by using the addition rule. Hence, the pattern followed by the sequence is an algebraic pattern.

Geometric pattern:

The sequence of number pattern based on the multiplication or division is known as geometric pattern.



Example:

Consider the sequence 90, 45, 22.5, 11.25,...

Here, the numbers are arranged by following certain rule, which is explained below:

- (i) First number in the given number pattern is 90.
- (ii) One-half of the first number gives the second number of the pattern. That is, $90 \div 2 = 45$, is the second number of the sequence.
- (ii) One-half of the second number gives the third number. That is, $45 \div 2 = 22.5$, is the third number of the sequence. Similarly, the remaining numbers will be obtained.

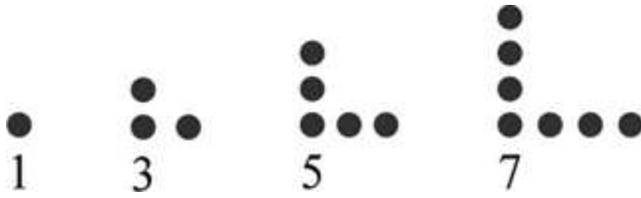
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Algebraic And Geometric Patterns

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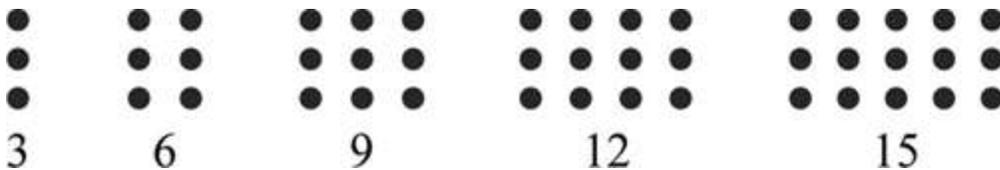
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RETRIEVED FROM: <https://www.chegg.com/homework-help/definitions/algebraic-and-geometric-patterns-67>

K-12 Student Standards for Mathematics» Grade 1

Number and Operations in Base Ten 1.NBT

A. Extend the counting sequence.

1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

B. Understand place value.

3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols $>$, $=$, and $<$.

Measurement and Data 1.MD

C. Represent and interpret data.

4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

K-12 Student Standards for Mathematics» Grade 4

Number and Operations in Base Ten 4.NBT

2. Read and write multi-digit whole numbers less than or equal to 1,000,000 using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.

Measurement and Data 4.MD

A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit

1. Know relative sizes of measurement units within one system of units including ft, in; km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, **express measurements in a larger unit in terms of a smaller unit.**

2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving **whole numbers** and/or simple fractions (addition and subtraction of fractions with like denominators and multiplying a fraction times a fraction³ or a whole number), and problems that require expressing **measurements given in a larger unit in terms of a smaller unit.** Represent measurement quantities using diagrams such as number line diagrams that feature a **measurement scale.**

K-12 Student Standards for Mathematics» Grade 7

Ratios and Relationships 7.RP

A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

2. Recognize and represent proportional relationships between quantities.

b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and **verbal descriptions** of proportional relationships.

Expressions and Equations

B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Adinkra Symbols and Snow Flakes: Further Reflection



Ntesie - Mate Masie

Dilation in Adinkra Symbols

In dilation you change the scale of a shape (like dilating your pupils). By repeating dilation on each copy (an "iterative loop"), we get a scaling sequence. In the image to the right, the leaves of the fern create a scaling sequence, gradually become larger as the fern grows upwards.

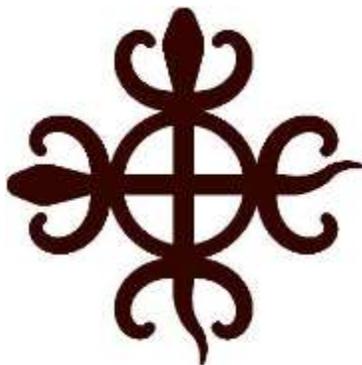
This symbol is called Aya, or the fern. It represents defiance, endurance, and resourcefulness (ferns can even grow in rocky cliffs).



Aya

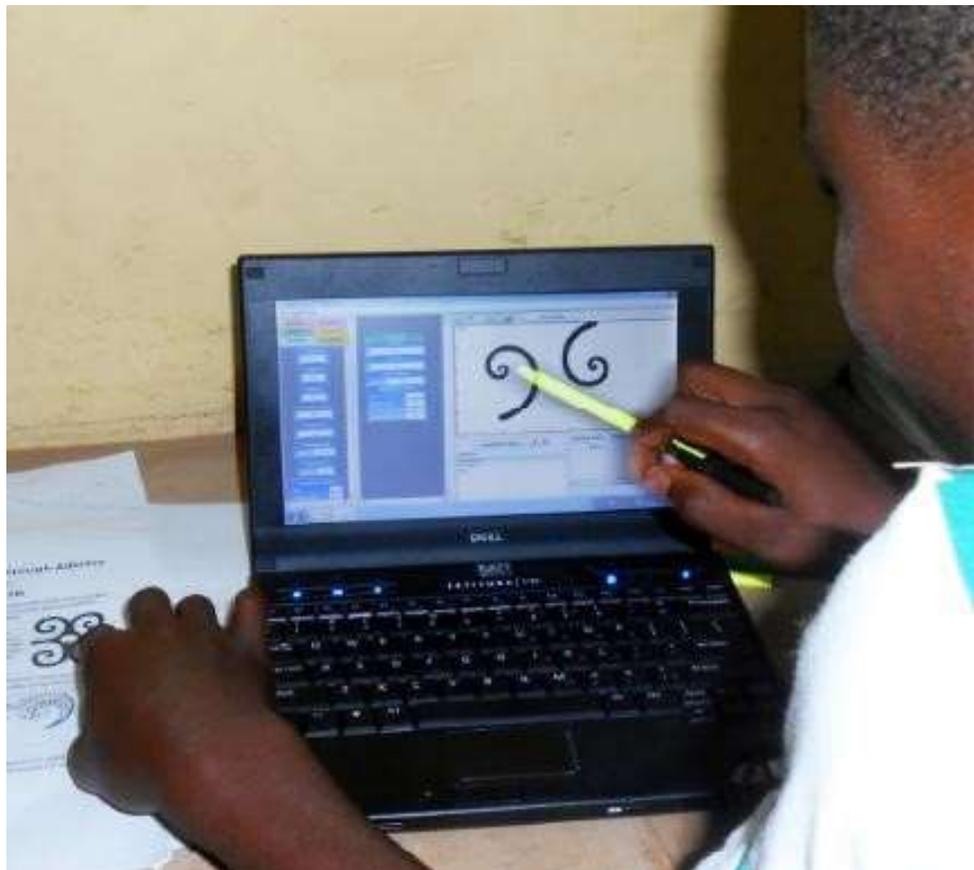
RETRIEVED FROM : <https://csdt.rpi.edu/culture/adinkra/geometry.html>

Origins



Adinkra are symbols from the West African nation of Ghana. Each symbol holds a meaning that represents important aspects of their knowledge system. In the “twin crocodile” symbol, for example, both animals share a single stomach. This symbol represents the concept that fighting among ourselves for resources is pointless: “By feeding you, I feed myself.” Cloth stamped with Adinkra symbols can tell a story about which concepts are most important to you. They are worn during special occasions or ceremonies.

Present Day







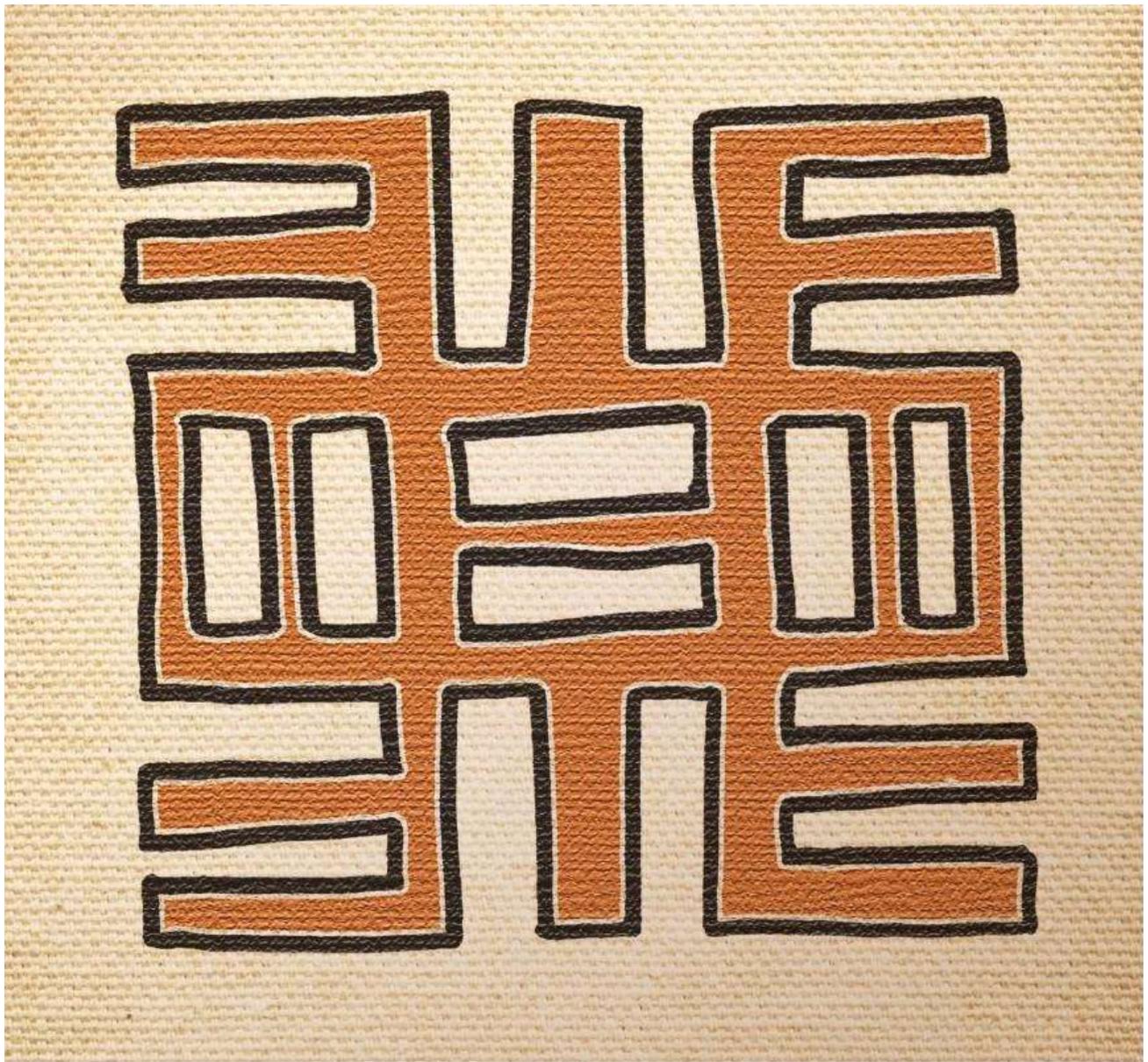
New innovations have used Adinkra to empower communities in many ways. Architects in Ghana have used the shapes in buildings, such as the ram's horn symbol in this balcony. Educators have used them to teach math and computing. An Adinkra-like symbol, found in an African American burial ground from 1760, inspired the National Park Service to use Adinkra for its memorial in New York City. And in Albany, NY, the Adinkra symbol "knot of reconciliation" became the logo for the anti-gun violence group "SNUG," which buys back guns to keep them off the streets.

Symbols of Power: Adinkras and the Nature of Reality

BY

S. JAMES GATES JR.

Physicists have long sought to describe the universe in terms of equations. Now, James Gates explains how research on a class of geometric symbols known as Adinkras could lead to fresh insights into the theory of supersymmetry — and perhaps even the very nature of reality.



Complex ideas, complex shapes Adinkras — geometric objects that encode mathematical relationships between supersymmetric particles — are named after symbols that represent wise sayings in West African culture. This adinkra is called *nea onnim no sua a, ohu*, which translates as “he who does not know can become knowledgeable through learning.”

In the land of theoretical physics, equations have always been king. Indeed, it would probably be fair to caricature theoretical physicists as members of a company called “Equations-R-Us”, since we tend to view new equations as markers of progress.

The modern era of equation prediction began with Maxwell in 1861, continued through the development of Einstein’s equations of general relativity in 1916, and reached its first peak in the 1920s with the Schrödinger and Dirac equations. Then a second, postwar surge saw the development of equations describing the strong force and the electroweak force, culminating in the creation of the Standard Model of particle physics in about 1973. The equations trend continues today, with the ongoing struggle to create comprehensive equations to describe superstring theory. This effort — which aims to incorporate the force of gravity into physical models in a way that the Standard Model does not — marks the extant boundary of a long tradition.

Yet equations are not the only story. To an extent, geometrical representations of physical theories have also been useful when correctly applied. The most famous incorrect geometrical representation in physics is probably Johannes Kepler’s model of planetary orbits; initially, Kepler believed the orbits could be described by five regular polygons successively embedded within each other, but he abandoned this proposition when more accurate data became available.

A less well known but much more successful example of geometry applied to physics is Murray Gell-Mann’s “eightfold way,” which is a means of organizing subatomic particles. This organization has an underlying explanation using triangles with quarks located at the vertices.

For the past five years, I and a group of my colleagues (including Charles Doran, Michael Faux, Tristan Hubsch, Kevin Iga, Greg Landweber and others) have been following the geometric-physics path pioneered by Kepler and Gell-Mann. The geometric objects that interest us are not triangles or octagons, but more complicated figures known as “adinkras,” a name Faux suggested.

The word “adinkra” is of West African etymology, and it originally referred to visual symbols created by the Akan people of Ghana and the Gyamen of Côte d’Ivoire to represent concepts or aphorisms. However, the mathematical adinkras we study are really only linked to those African symbols by name. Even so, it must be acknowledged that, like their forebears, mathematical adinkras also represent concepts that are difficult to express in words. Most intriguingly, they may even contain hints of something more profound — including the idea that our universe could be a computer simulation, as in the Matrix films.

If you knew SUSY like we know SUSY...

To understand what adinkras are, we must first examine the physical theory to which they relate: supersymmetry, commonly abbreviated as SUSY. The concept of symmetry is ubiquitous in nature, but on a more technical level it has been a powerful mathematical tool for the development of equations. Einstein recognized that there was a symmetry between the effects observed by someone in an accelerating spacecraft far away from all planets and those observed by someone standing on the planet’s surface. He called this recognition the “happiest thought” of his life, and he used it to determine the form of his equations of general relativity, which describe how matter warps space and time to create gravity.

Moving on to the Standard Model, the set of equations used to describe the physics of quarks, leptons (the family of particles that contains the electron) and force-carrying particles like the photon (carrier of the electromagnetic force) is also largely determined by symmetry groups. Photons, for example, possess a type of symmetry known as U(1), which means that two distinct photons can produce the same electric and magnetic forces on a charged particle. Another important symmetry is the SU(3) symmetry of quarks, which can be visualized using what mathematicians call a “weight-space diagram” (*figure 1*). This diagram shows the entire family of nuclear particles of which the proton, p, and neutron, n, are members. The location of particles in this diagram is determined by particle properties called isospin and strangeness, the values of which were first measured in the 1950s and 1960s. Six triangles lurk inside it — you can see them if you draw lines from the centre to each vertex — and this “triangular” symmetry is part of what leads to the designation SU(3).

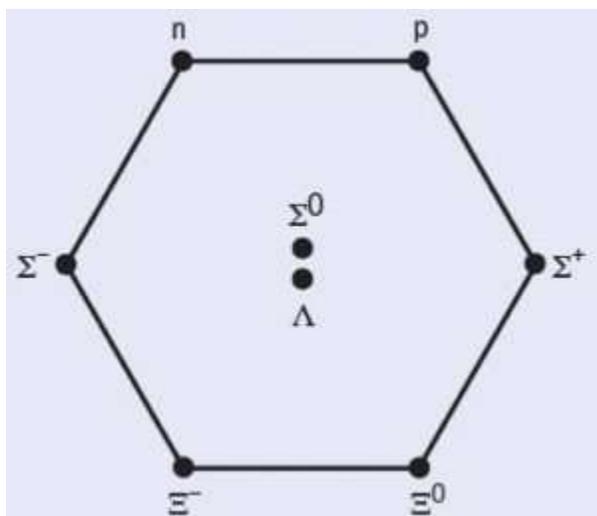


Figure 1. Weight-space diagrams This weight-space diagram shows the “baryon octet” group of particles, including the proton (p), neutron (n) and six more exotic species known as hyperons. Particles are arranged according to their isospin (how they interact with the strong nuclear force) and the number of strange quarks they contain (their “strangeness”).

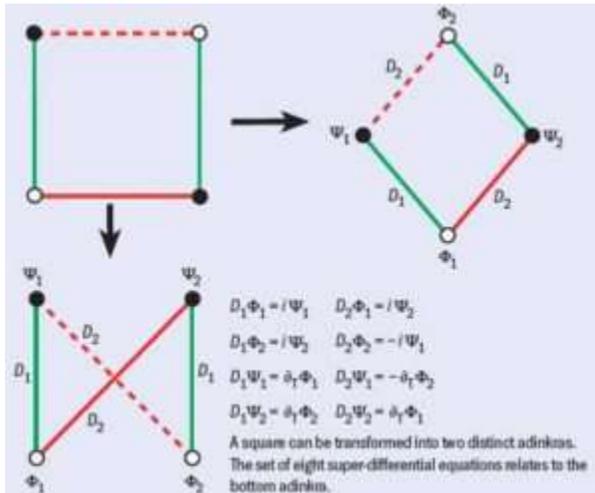


Figure 2. From squares to Adinkras

Such diagrams are more than pictures. In fact, it was an insight drawn from such diagrams that led Gell-Mann and George Zweig to a new understanding of nuclear matter. Gell-Mann and Zweig realized that patterns in diagrams showing families of nuclear particles meant that those particles must be made up of smaller, more fundamental particles: quarks. The nuclear-particle octet diagram gets its name because there are particles associated with each of its six vertices, and two additional particles associated with its centre, hence an “octet” of particles. This diagram is useful as a kind of accounting tool: in certain nuclear reactions, two or more experiments will lead to simply related results if one member of this family is replaced by another. For example, measuring how a proton is deflected from a neutron by the strong nuclear force will yield a result that is directly related to the deflection of a Λ -particle from a neutron. This is the power of using symmetries. When we know that certain symmetries are present in nature, we can use one experiment to predict the outcome of many others.

As its name implies, the theory of supersymmetry takes the idea of symmetry a step further. In the Standard Model there is a dichotomy between leptons and quarks — collectively called “matter particles” — and force-carrying particles like photons. All matter particles are fermions, particles with half-integer quantum spin that obey the Pauli exclusion principle. Force-carrying particles, in contrast, are bosons, which have integer spin and can violate the exclusion principle. This means that not only photons but also gluons (which carry the strong nuclear force), the W and Z bosons (which carry the weak nuclear force), and even the hypothetical Higgs boson are all free to possess any allowed quantum numbers in composite systems.

SUSY breaks this rule that all matter particles are fermions and all carriers are bosons. It does this by relating each Standard Model particle to a new form of matter and energy called a “superpartner”. In its simplest form, SUSY states that every boson has a corresponding “super-fermion” associated with it, and vice versa. These superpartners have not yet been observed in nature, but one of the main tasks of CERN’s Large Hadron Collider (LHC) will be to look for experimental evidence of their existence. If the LHC finds these superpartners, then the Standard Model will have to be replaced by the Minimal Supersymmetric Standard Model (MSSM), or perhaps another more exotic variant.

From the point of view of equations, however, SUSY presents an additional challenge. Even if the LHC finds evidence that we live in a supersymmetric universe, there are many different sets of equations that incorporate supersymmetry. How, then, do we pick the right ones? The answer, of course, is that we pick the equations that agree with experimental observations. However, we can also ask a more subtle question: how do we ensure that the SUSY property is made manifest at every stage of calculations involving the quantum behaviour of these equations? It is here that Adinkras might prove useful. Just as a weight-space diagram is a graphical representation that precisely encodes the mathematical relations between the members of $SU(3)$ families, so an Adinkra is a graphical representation that precisely encodes the mathematical relations between the members of supersymmetry families.

Building up adinkras

Now that we know a little bit about how Adinkras can be used, we can begin to discuss what they look like. All Adinkras are constructed by starting with squares, cubes and their higher-dimensional generalizations; these structures provide a “skeleton” that is then “decorated” by additional operations. Each of these decorations has a mathematical significance, which I will discuss later. For the moment, let us just concentrate on building a simple Adinkra.

To make a square into an Adinkra, we begin by placing a white dot at one vertex (*figure 2*). The rules of Adinkras then dictate that the two line segments connected to the white dot must have black dots at their opposite ends. This means that the final unpopulated vertex is connected to “black dot” vertices, so it must be populated by a white dot. Next, we need to assign directions to each line segment, or link. To keep track of these different directions, we assign distinct colours to each of them: all links that point in the same direction are assigned the same colour, and links that point in different directions are never assigned the same colour.

Then, we need to assign an “edge-parity” to each link: each coloured line can be drawn as either solid or dashed. Every two-colour closed path in an Adinkra must contain an odd number of dashed links. One last rule is that white dots and black dots are never allowed to have the same vertical position; that is, no black dot in an Adinkra is ever allowed to appear at the same height as a white dot. Figure 2 shows a square that has been “decorated” in two different ways and made into two distinct Adinkras.

There is no limit to the number of colours that may be used to construct an Adinkra. As a result, higher-dimensional Adinkras have a certain aesthetic appeal (*figure 3*). As Einstein once said, “After a certain high level of technical skill is achieved, science and art tend to coalesce in aesthetics, plasticity and form.” Perhaps the “artistic” depictions shown here are an example of this.

But Adinkras, like Gell-Mann’s octets, are not just pictures. In fact, they are in some ways rather similar to Feynman diagrams, which are the series of line drawings used to describe calculations in quantum electrodynamics. Like Feynman diagrams, Adinkras are a precise mathematical description of calculations. They also serve as an aid to performing these calculations, since the way that Adinkras are constructed provides a streamlined description of the most compact sets of equations with the SUSY property. But while Feynman diagrams describe calculations for particle quantum behaviour, Adinkras are connected instead to mathematical objects known as Clifford algebras and super-differential equations.

Clifford algebras were introduced by the English mathematician and philosopher William Kingdom Clifford in the 1870s as mathematical constructions that generalize complex numbers. However, they also provide the mathematical basis for our modern understanding of fermions. Where Adinkras are concerned, if one ignores the information contained in the vertical height of the same type of dots in an Adinkra, then that Adinkra provides an exact description of mathematical matrices associated with Clifford algebras. For example, using the rules associated with Adinkras, the bottom Adinkra in *figure 2* yields two of the three “Pauli matrices” (elements of a Clifford algebra) that describe the spin states of fermions.

A second connection to mathematics is even more similar to Feynman diagrams. It can be shown that each Adinkra corresponds to a distinct set of super-differential equations. Super-differential equations involve both the ordinary derivative operator (invented by Newton and Leibnitz) and a newer type of operator called a “super derivative”, which was invented in the mid-1970s by the mathematician Felix Berezin and then elaborated on by the physicists Abdus Salam and John Strathdee. Super derivatives, represented by the links in an Adinkra, are similar to the ordinary derivative, except that they are allowed to violate the usual product rule for derivatives. The super-differential equations for the bottom Adinkra derived from a square are shown in *figure 2*.

Since there are only two types of coloured links, there are only two super derivatives: D_1 associated with green links and D_2 associated with red links. We also have two bosonic superfunctions (ψ_1 and ψ_2) associated with the correspondingly labelled white dots and two fermionic superfunctions (χ_1 and χ_2) associated with the correspondingly labelled black dots. As complex numbers generally consist of both a real and imaginary part, a superfunction consists of both bosonic and fermionic parts. To turn these components of the Adinkra into a set of equations, we begin by picking one dot — let’s use the bottom-left one as an example — and writing its associated superfunction, ψ_1 , to the left of an equal sign. Next, we choose one of the coloured links and write its associated D to the left of the superfunction. For the green link this would be D_1 ; for the red link it would be D_2 . Then we look to see what dot is at the other end of this link. If we pick the

green link, the “target dot” is the one associated with the superfunction Ψ_1 , so this symbol belongs on the right of the equals sign. These rules alone are enough to give us the upper four equations in figure 2.

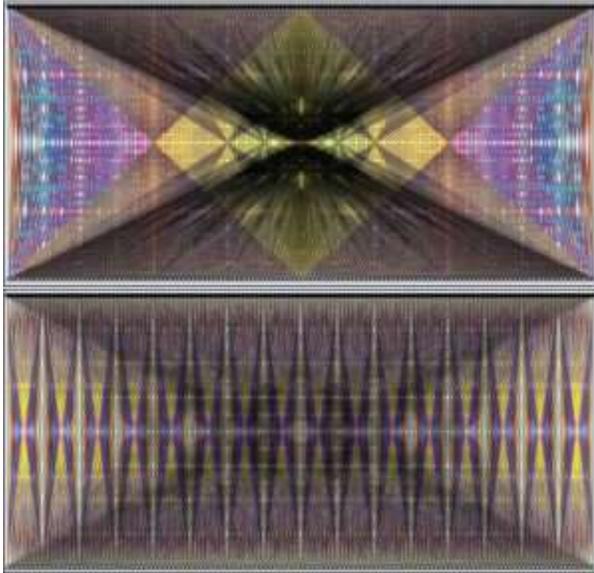


Figure 3. Multidimensional Adinkras

These large n-colour folded adinkras represent complex systems of super-differential equations. To “derive” the second group of four equations we need to introduce the ordinary differential operation, denoted by ∂_T . The manner in which it appears in the equations is controlled by the relative height of the dots within each diagram: whenever the “starting” dot is higher in the Adinkra than the “target” dot, this ordinary derivative appears on the right-hand side of the corresponding equation. The dashed links simply insert minus signs into some equations. You should have enough information now to apply this analysis to the second diagram in order to write down its associated equations — although, in time-honoured fashion, I have left this as an exercise for the reader.

SUSY and Adinkras

Returning now to the concept of supersymmetry, Salam and Strathdee devised a simple test to determine when systems of equations possess the property of SUSY. The system shown in figure 2 easily passes Salam and Strathdee’s test, but this does not necessarily mean that they are the equations that theorists from the Equations-R-Us company are seeking. In fact, they are not: aside from the Pauli matrices, the square-derived Adinkras are just too simple to be associated with differential equations that have physical meaning. The same is true for Adinkras based on a 3D cube. However, with a 4D hypercube, or tesseract, it is a different story. The four-colour adinkra (figure 4) demonstrates a behaviour that is not present for Adinkras with fewer colours: it can be broken into two separate, smaller Adinkras. These smaller Adinkras *do* have physical meaning. The one on the far right is in fact related to Maxwell’s equations. If one first removes the uppermost open dot and then performs the Salam-Strathdee test, then Maxwell’s equations involving current charges emerge. Similarly, removing the two uppermost dots from the centre adinkra followed by the Salam-Strathdee test leads to

the equations for the behaviour of the electron and its SUSY partner (known as the “selectron”).

Some of the equations described here have been known for some time to physicists who study SUSY. Yet it was not until 2009 that research on Adinkras (arXiv: 0902.3830) showed that these geometric objects can mimic the behaviour of the equations, and thus provided the first evidence that Adinkras could be related to physics. The next key question to answer is whether the reverse process can also occur — beginning with an Adinkra and using it to derive, via a set of well-defined rules, something like the Maxwell or Dirac equations. In 2001 (arXiv: hep-th/0109109) my students and I conjectured that this could indeed be the case, but only if we could encode the properties of 4D equations onto objects in a mathematical 1D format. Though this conjecture has not yet been proven, work completed by Faux, Iga and Landweber in 2009 (arXiv: 0907.4543, arXiv: 0907.3605) has provided the strongest evidence to date of its correctness. So, just as weight-space diagrams opened a new way to conceptualize the physics of nuclear matter, it is conceivable that Adinkras may yield an entirely new way to formulate theories that possess the property of SUSY.

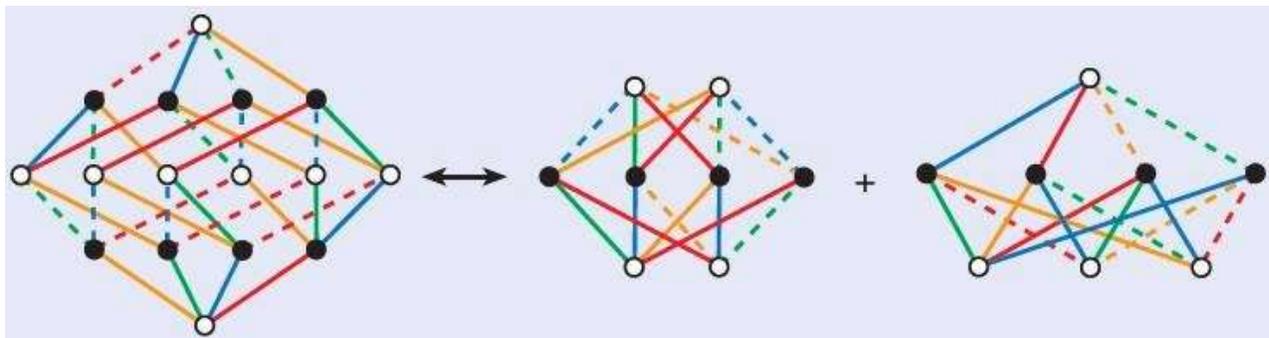


Figure 4. Adinkras within Adinkras

The “decorated tesseract” Adinkra on the left can be broken down into two separate Adinkras. The author’s collaboration of mathematicians and other physicists has introduced the name “gnomoning” for this process of subtracting a smaller Adinkra from larger ones. The name gnomoning was used by Euclid, the founder of geometry, to describe a plane figure obtained by removing a smaller figure that is similar to the large one.

From theoretical physics to codes

As it turns out, it is not just four-colour Adinkras that can be separated into two smaller Adinkras with the same number of colours; Adinkras with more than four colours also possess this property of separability. But why does this occur only for four or more colours? Investigating this question launched our “treasure hunt” in a completely unexpected direction: computer codes.

Modern computer and communication technologies have come to prominence by transmitting data rapidly and accurately. These data consist principally of strings of

ones and zeros (called bits) written in long sequences called “words”. When these computer words are transmitted from a source to a receiver, there is always the chance that static noise in the system can alter the content of any word. Hence, the transmitted word might arrive at the receiver as pure gibberish.

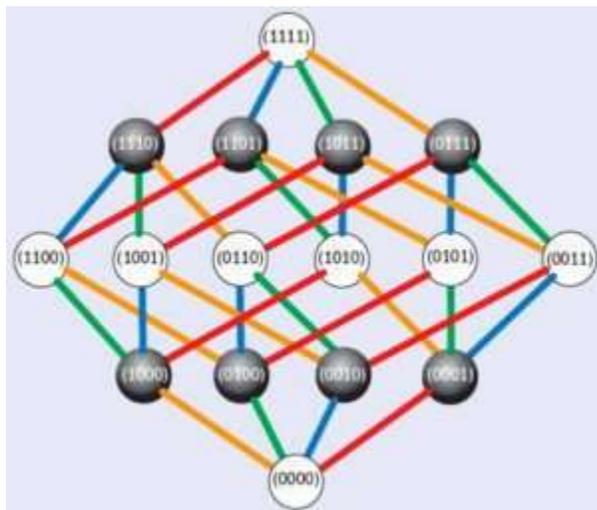
One of the first people to confront this problem was the mathematician Richard Hamming, who worked on the Manhattan Project during the Second World War. In 1950 he introduced the idea of “error-correcting codes” that could remove or work around any unwanted changes to a transmitted signal. Hamming’s idea was for the sending computer to insert extra bits into words in a specific manner such that the receiving computer could, by looking at the extra bits, detect and correct errors introduced by the transmission process. His algorithm for the insertion of these extra bits is known as the “Hamming code”. The construction of such error-correcting codes has been pursued since the beginning of the computer age and many different codes now exist. These are typically divided into families; for example, the “check-sum extended Hamming code” is a rather complicated variant of the Hamming code and it belongs to a family known as “doubly even self-dual linear binary error-correcting block codes” (an amazing mouthful!). Yet whatever family they belong to, all error-correction codes serve the same function: they are used to detect errors and allow the correct transmission of digital data.

How does this relate to Adinkras? The middle Adinkra in figure 4 is obtained by folding the image on the left of the figure. The folding involves taking pairs of the dots of the same type and “fusing them together” as if they were made of clay. In general, an Adinkra-folding process will lead to diagrams where the associated equations do not possess the SUSY property. In order to ensure that this property is retained, we must carry out the fusing in such a way that white dots are only fused with other white dots, black dots with other black dots, and lines of a given colour and dashing are only joined with lines that possess the same properties. Most foldings violate this, but there is one exception — and it happens to be related to a folding that involves doubly even self-dual linear binary error-correcting block codes.

The Adinkra in figure 5 is the same as the left-hand part of figure 4 but for simplicity it is shown without dashed edges. We pick the bottom dot as a starting point and assign it an address of (0000). To move to any of the dots at the second level requires traversing one of the coloured links. There are four distinct ways in which this can be done. To move to any dot at the third level from the bottom dot requires the use of two different coloured links, and so on for the rest of the Adinkra. In this way, every dot is assigned an address, from (0000) to (1111). These sequences of ones and zeros are binary computer words.

To accomplish the folding that maintains the SUSY property in the associated equations, we must begin by squeezing the bottom dot together with the upper dot. When their addresses are added bit-wise to one another, this yields the sequence (1111). If we continue this folding process, always choosing pairs of dots so that their associated “words” sum bit-wise to (1111), we can transform the adinkra on the left-hand side of figure 4 to the one on the right. Thus, maintaining the equations’ SUSY property requires that the particular sequence of bits given by (1111) be used in the folding

process. The process used to meet this criterion happens to correspond to the simplest member of the family containing the check-sum extended Hamming code.



5. Coded Adinkras

The “decorated tesseract” Adinkra and its associated computer “words.” For simplicity, the Adinkra is shown without dashed lines.

The part of science that deals with the transmission of data is called information theory. For the most part, this is a science that has largely developed in ways that are unrelated to the fields used in theoretical physics. However, with the observation that structures from information theory — codes — control the structure of equations with the SUSY property, we may be crossing a barrier. I know of no other example of this particular intermingling occurring at such a deep level. Could it be that codes, in some deep and fundamental way, control the structure of our reality? In asking this question, we may be ending our “treasure hunt” in a place that was anticipated previously by at least one pioneering physicist: John Archibald Wheeler.

Life in the Matrix?

Wheeler, who died in 2008, was an extremely well-regarded figure within physics. He served as advisor to a clutch of important physicists, including Richard Feynman, while his own work included the concept of the “S-matrix” (a mathematical tool that helps us understand Standard Model particles). Beyond the physics community, Wheeler is probably best known for coining the terms “black hole” and “wormhole”. But he also coined a slightly less familiar phrase — “it from bit” — and this is what concerns us here.

The idea of “it from bit” is a complex one, and Wheeler’s own description of it is probably still the best. In 1990 he suggested that “every ‘it’ — every particle, every field of force, even the space-time continuum itself — derives its function, its meaning, its very existence entirely...from the apparatus-elicited answers to yes-or-no questions, binary choices, bits”. The “it from bit” principle, he continued, “symbolizes the idea that every item of the physical world has at bottom...an immaterial source and explanation:

that which we call reality arises in the last analysis from the posing of yes-no questions and the registering of equipment-evoked responses; in short, that all things physical are information-theoretic in origin and that this is a participatory universe”.

When I first heard the idea of “it from bit” as a young physicist, I thought Wheeler must be crazy. The concept of a world made up of information just sounded strange, and (although I did not know it at the time) I was not the only one who thought so. However, sometimes crazy ideas turn out to be true, and Wheeler has been proved right before. As Feynman said, “When I was [Wheeler’s] student, I discovered that if you take one of his crazy ideas and you unwrap the layers of craziness from it one after another, like lifting layers off an onion, at the heart of the idea you will often find a powerful kernel of truth.” Indeed, another of Wheeler’s “crazy” ideas — his suggestion that a positron can be treated as an electron moving backwards in time — played a role in Feynman later winning a Nobel prize.

As for my own collaboration on Adinkras, the path my colleagues and I have trod since the early 2000s has led me to conclude that codes play a previously unsuspected role in equations that possess the property of supersymmetry. This unsuspected connection suggests that these codes may be ubiquitous in nature, and could even be embedded in the essence of reality. If this is the case, we might have something in common with the Matrix science-fiction films, which depict a world where everything human beings experience is the product of a virtual-reality-generating computer network.

If that sounds crazy to you — well, you could be right. It is certainly possible to overstate mathematical links between different systems: as the physicist Eugene Wigner pointed out in 1960, just because a piece of mathematics is ubiquitous and appears in the description of several distinct systems does not necessarily mean that those systems are related to each other. The number pi, after all, occurs in the measurement of circles as well as in the measurement of population distributions. This does not mean that populations are related to circles.

Yet for a moment, let us imagine that this alternative Matrix-style world contains some theoretical physicists, and that one of them asks, “How could we discover whether we live inside a Matrix?”. One answer might be “Try to detect the presence of codes in the laws that describe physics.” I leave it to you to decide whether Wigner’s warning should be applied to the theoretical physicists living in the Matrix — and to us.

This article first appeared in *Physics World*, June 2010 and was reprinted with permission of the author and publisher.

RETRIEVED FROM: <https://onbeing.org/blog/symbols-of-power-adinkras-and-the-nature-of-reality/>

SCIENTIFIC AMERICAN

Why are snowflakes symmetrical? How can ice crystallizing on one arm 'know' the shape of the other arms on the flake?

Miriam Rossi, a professor of chemistry at Vassar College, offers the following reply:

Snowflakes are symmetrical because they reflect the internal order of the water molecules as they arrange themselves in the solid state (the process of crystallization). Water molecules in the solid state, such as in ice and snow, form weak bonds (called hydrogen bonds) to one another. These ordered arrangements result in the basic symmetrical, hexagonal shape of the snowflake. In reality, there are many different types of snowflakes (as in the cliché that 'no two snowflakes are alike'); this differentiation occurs because each snowflake is a separate crystal that is subject to the specific atmospheric conditions, notably temperature and humidity, under which it is formed.

The second question has to do with the way in which snowflakes are formed. The growth of snowflakes (or of any substance changing from a liquid to a solid state) is known as crystallization. During this process, the molecules (in this case, water molecules) align themselves to maximize attractive forces and minimize repulsive ones. As a result, the water molecules arrange themselves in predetermined spaces and in a specific arrangement. This process is much like tiling a floor in accordance with a specific pattern: once the pattern is chosen and the first tiles are placed, then all the other tiles must go in predetermined spaces in order to maintain the pattern of symmetry. Water molecules simply arrange themselves to fit the spaces and maintain symmetry; in this way, the different arms of the snowflake are formed.

Howard T. Evans, Jr., an x-ray crystallographer who is now scientist emeritus at the U.S. Geological Survey, adds a few details: But why are snowflake shapes so elaborate? Nobody has a good answer for that. The general explanation is that snowflakes form in the atmosphere where conditions are very complex and variable. A crystal might begin to grow in one manner and then minutes or even seconds later something changes (temperature or humidity), so it starts to grow in another manner. The hexagonal symmetry is maintained, but the ice crystal may branch off in new directions. The changes in environmental conditions take place over a large area compared with the size of a single snowflake, so all regions of the flake are similarly affected. In the end, there are all kinds of forms that can arise: everything from prisms and needles to the familiar lacy snowflakes. Water is an amazing substance!

Snowflakes are mysterious things. Their fundamental form derives from the arrangement of the water molecules in the ice crystal. When a liquid freezes, the molecules tend to settle in the lowest-energy state, and that almost always involves some form of symmetry. The higher the symmetry, the more stable the crystal is.

Water molecules floating freely in a vapor begin to arrange themselves into a crystalline solid when the temperature drops below freezing. The two hydrogen atoms of the molecules tend to attract neighboring water molecules. When the temperature (thermal motion) is low enough, the molecules link together to form a solid, open framework that has a strict hexagonal symmetry.

Answer originally posted October 21, 1999.

RETRIEVED FROM: <https://www.scientificamerican.com/article/why-are-snowflakes-symmet/>



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<https://www.rnh.com/videos.html?video=38>

<https://www.nytimes.com/2018/07/02/arts/music/irving-berlin-god-bless-america.html>

<https://www.allmusic.com/album/irving-berlins-white-christmas-the-musical-mw0000574751>

<https://www.rnh.com/news/1048/Oxford-University-Press-Releases-Two-New-Books-on-Irving-Berlin>

https://www.researchgate.net/publication/299437190_Adinkra_Symbols

<https://www.nationalww2museum.org/>

<http://linesdotsanddoodles.blogspot.com/2013/01/adinkra-style-prints-4th-grade.html>

<https://thestemlaboratory.com/snowflake-geometry/>

<http://bobhope.org/>