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Wording for the legal statement above is adapted from the legal statement for *Trigonometry*, published in 2009 by The CK-12 Foundation: <http://about.ck12.org/>

Part 1: Making Difficult Proportions Easy

2.4

Some proportions are hard to solve with Equivalent Fractions (the method we know). We’re going to learn a new way to solve proportions to help us with ones like that.

* Below, please solve the proportions that are easy to solve by equivalent fractions.

1).

* Please circle the harder ones and put a question mark next to them.

It’s actually pretty easy to solve proportions like . What we do first is get a common denominator for both fractions. Then it’s easy to solve. Let’s think about proportions where the denominators are the same.

• 2

• 2

*x* = 6

What’s harder about this one? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

?

**Example**

**Example**

2).

a). What do you notice about the denominators?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b). What does *x* have to be? Show work or explain your reasoning:

3).

4).

Please solve each of the following for *x*. Show work or explain your reasoning for each.

5).

6).

7).

8).

Now let’s see the whole process. It’s called “Cross-Multiplying”. There are just 5 steps.

**Cross-Multiplying to Solve Proportions**

• 10

• 10

• 4

• 4

• 10

• 10

• 4

• 4

• 10

• 10

• 4

• 4

**Step 2:**

**Multiply each fraction by the other denominator.**

**Step 3:**

**Simplify each fraction.**

**Step 4:**

**The fractions are equal. And the denominators are the same….**

**…So the numerators have to be equal, too.**

• 10

• 10

• 4

• 4

**Step 5:**

**Solve for *x*.**

7.5 = *x*

**Step 1:**

**Original**

**problem**

**The denominators will be the same.**

• 5

• 5

• 3

• 3

9).

*x* =1.2

11).

10).

12).

13).

If you tip at a 15% rate, how much do you tip on a $35 meal?

14).

15).

How much do they take off the price of a $15 DVD if it’s 30% off?

In the end, how much will the DVD cost? \_\_\_\_\_\_\_\_

Here’s a proportion that solves a percent question. What did the question say?

16).

17).

What did the question say? (It was on percents). \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Part 2: Making Rate Problems Easier

There are two ways to write any rate: as a **fractional rate** or as a **unit rate.**

**Fractional Rate**

8 ÷ 2 = 4

This means “$4 every hour”

This means “$8 every 2 hours”

**Unit**

**Rate**

What is the difference between a fractional rate and a unit rate? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

16).

**Fractional Rate**

This means

This means

**Unit**

**Rate**

Please fill in

Please fill in

17).

18). Please label each example as a “fractional rate” or a “unit rate”:

**Example Is it a Fractional Rate or a Unit Rate?**

$2.10 for 3 pens \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

$0.70 for each pen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Now let’s focus on how we use rates.

19). There is a big mistake in the problem below. Can you see what doesn’t make sense?

**Incorrect**:

(0.75 days per inch) • 4 days

Hint: this is the rate for **each inch**

What needs to be changed for the problem to make sense?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

20). Let’s use a picture to explain the mistake:

**Incorrect**:

(0.75 days per inch) • 4 days

**4 days**

To add it all up, we need the rate for **each \_\_\_\_\_\_**

But “0.75 days per inch” is the rate for each \_\_\_\_\_\_.

21). Here is a rate problem that is correct. Why is this one correct, unlike the last one?

**Correct**:

(1.2 lbs/dollar) • 170 dollars

Hint: this is the rate for **each** \_\_\_\_\_

Why is this one correct? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

22). One way of doing the problem below is correct. The other is not. Please circle the correct way, and

put a big “X” through the incorrect way.

0.25 • 11 hours or 4 • 11 hours

This is rate the

for each \_\_\_\_\_\_

This is rate the

for each \_\_\_\_\_\_

Small Group Practice

We’ve been setting up problems with unit rates. But sometimes, it’s easier to use a fractional rate.

**Unit Rate method**

**Fractional Rate method**

Unit Rate:

SCENARIO: You make $15 every 3 hrs. How much will you make in 17 hrs?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

23). What’s the difference between setting up a problem with a unit rate versus a fractional rate?

24). How would the two different methods look for the problem below?

SCENARIO: How far could you go on 4 gallons of gas, if your car went 385 miles on 11 gallons?

**Unit Rate method**

**Fractional Rate method**

Please fill in

Unit Rate:

Please fill in

25). Please label each example as a “fractional rate” or a “unit rate”:

**Example Is it a Fractional Rate or a Unit Rate?**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

50 miles per hour \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Worked example:

26). Can you explain this example?

**Incorrect** **Correct**

• 30 days or • 30 days

Why is this way wrong, and why is the other way right? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

27). Please use the table below to set up a fractional rate problem for each question like #26.

|  |  |  |
| --- | --- | --- |
| **Student** | **Minutes spent typing** | **Words typed** |
| Carole | 10.5 | 653 |
| Quinton | 6 | 490 |
| DeLisa | 3 | 173 |

a). How long would it take Quinton to type 150 words?

• 150 words

b). How many words could Carole type in 8 minutes? (Just set up the problem).

28). In this question, let *x* = the number of dollars earned. Which way to set up the problem is correct? (Please circle the correct way, and put a big “X” through the incorrect way).

• *x* • *x*

or

5 • *x*

0.2 • *x*

29). Please create your own example of correct and incorrect ways to set up a fractional rate problems like #28. In your example, **let *x* = number of shirts washed.**

**Correct: Incorrect:**

Worked example:

30). You ask the DJ to play hip-hop songs 60% of the time. If he plays 114 songs tonight, how many hip-hop songs will he play?

**2: Unit Rate**

**3: Answer**

68.4

He will play about 68 hip-hop songs.

**1: Fractional Rate**

Question: How would you solve this problem differently if the DJ played hip-hop 75% of the time (out of 114 songs)? Explain or show work below:

Practice:

31). 27.5% of the students in the class have A’s. There are 40 students in the class. Please fill in:

**2: Unit Rate**

**3: Answer**

**1: Fractional Rate**

Worked Example

32). 88% of the shirts were XL. Please answer the questions below.

b). *y* represents \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c). How did we get 0.88? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

a). *x* represents \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

33). In a can of peaches, 2% of the contents were insect parts. The can’s total contents weighed 14 ounces (oz). How many ounces of insect parts were in the can? Solve this like #30.

34). You got 105% on a quiz (because of extra credit). The quiz was out of 40 points. How many points did you earn?

35). Below is an equation that solves a percent question. What did the question say?

What did the question say? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

37). If you tip 18% on a bill of $65, how much do you tip? Please solve this with a **proportion.**

38). If you tip 18% on a bill of 65, how much do you tip? Please solve this using the method shown in #30.

Please solve for the variable:

39).

40).