Date _____

Warm-Up

CST/CAHSEE: 7NS 1.3	Review: 6NS 1.3
If Freya makes 4 of her 5 free throws in a basketball game, what is her free throw shooting percentage? • *Show two ways to solve*	A farmer harvested 14,000 pounds of almonds from an 8-acre orchard. Write a proportion that will find x, the expected harvest of a 30-acre orchard. What are some common mistakes a student may make on this problem?
Current: 7NS 1.2	**Other: 6NS 1.4**
Roberto paid $43.08 for 3 CDs. All 3 CDs were the same price. How much did each CD cost? • Show two ways to solve.	What is 60% of 30?

Today's Objective/Standards: 7NS 1.3, 6NS 1.4

Bar Models for Rate, Percent and Solving Equations: 6th and 7th Grade

Using Multiple Methods to find Unit Rate:

Say: "There are three ways we can solve a unit rate. The first is using a bar model, a proportion and also division."

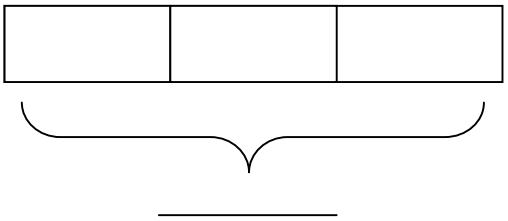
Example #1:

Find the unit rate: You paid $0.72 for three apples. How much did you pay for one apple?

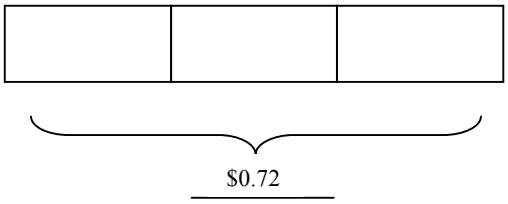
"What are we trying to find?" (The price for one apple)

"We already know the cost for three apples, finding the unit rate will tell us the cost for one."

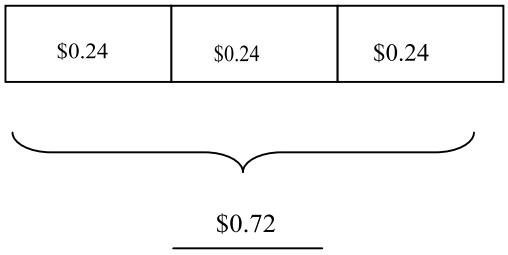
Using a Bar Model



Bar models can either break down or build up a problem. In this problem we are breaking down or dividing a number that we already know.



In this problem we are breaking down $0.72.
How many pieces are we breaking it into?



Using a Proportion

First, set a verbal model:

$$\frac{\text{Cost}}{\text{Apple}} = \frac{\$0.72}{3} = \frac{x}{1}$$

Use Cross-Products to solve the proportion:

$$\frac{\$0.72}{3} \quad \frac{x}{1}$$

$$3 \bullet x = \$0.72 \bullet 1$$

$$3x = \$0.72$$

$$\frac{3}{3}x = \frac{\$0.72}{3}$$

$$x = \frac{2 \bullet 2 \bullet 2 \bullet 3 \bullet 3}{1 \bullet 3}$$

$$x = 24 \rightarrow \$0.24$$

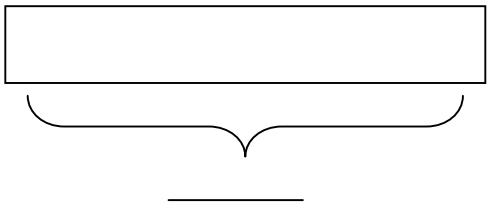
Using Division

We can also divide the total cost of three apples, by three. This will also give us a unit rate.

$$\begin{array}{r} 0.24 \\ 3\overline{)0.72} \\ \underline{0.6} \\ 0.12 \\ \underline{-0.12} \\ 000 \end{array}$$

You Try #1:
Find the unit rate: You can climb 102 steps in 17 seconds. How many steps can you climb in 1 second?

Using a Bar Model



Using a Proportion

Using Division

Percent Problem Introduction:

"Given 100, what is 50%, what is 25%, what is 10%, and what is 1%?" (50, 25, 10, 1)
Encourage students to phrase their answers as "50 is 50% of 100, or 25% of 100 is 25." Students should begin to see the how the same answer can be written several ways, as a percent question is asked several ways.

Repeat the process with the following percent questions:
Ask: "Given 200, what is 50%, what is 25%, what is 10%, and what is 1%? (100, 50, 20, 2)
Ask: "Given 90, what is 50%, what is 25%, what is 10%, and what is 1%? (45,22.5,9,0.9)

Solve Percent Problems:

There are many ways to solve a percent problem. We will use bar models, proportions, and direct translation.

Example 2: What number is 40% of 60?

Direct Translation

What number is 40% of 60?

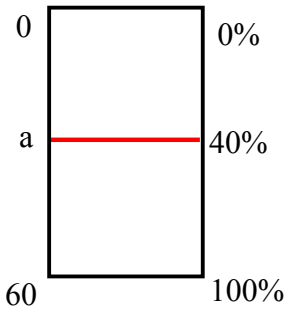
$x = 40\% \bullet 60$

$x = 0.40 \bullet 60$

$x = 24$

$\therefore$ 24 is 40% of 60.

Using Proportions



$$\frac{a}{60} = \frac{40}{100}$$

$$\frac{a}{60} = \frac{2}{5}$$

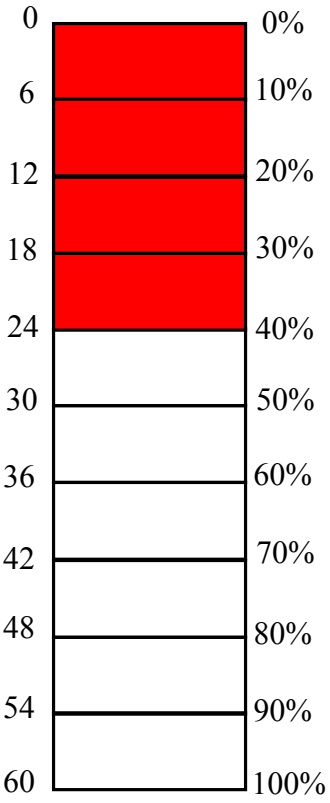
$$\frac{a}{60} = \frac{2}{5} \bullet \frac{12}{12}$$

$$\frac{a}{60} = \frac{24}{60}$$

$$a = 24$$

$\therefore$ 24 is 40% of 60.

Bar Model

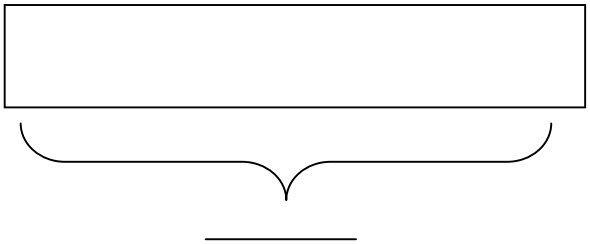


$\therefore$ 24 is 40% of 60.

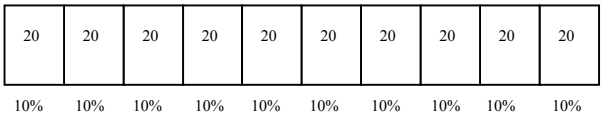
You Try #2*:* What number is 30% of 80?

Example #3: 24 is what percent of 200?

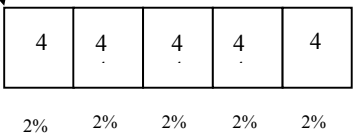
Bar Model



"This problem will involve a break down. However, we will have to break this unit bar down twice. First, take the unit bar, which represents 100%, and divide it into10 equal pieces.



"Now the unit bar is divided into 10% pieces, each worth 20. But the problem asks what percent 24 is of 200. Now we must take one of the units and divide that."



$10\% + 2\% = 12\%$
$20 + 4 = 24$

ANSWER!

Proportion

"In a proportion we are often asked to find a missing part, a whole or a percent."
"What are we are looking for in this problem?" (a missing percent.)

$$\frac{24}{200} \times \frac{x}{100}$$

$$200 \bullet x = 24 \bullet 100$$
$$200x = 2400$$
$$\frac{200}{200}x = \frac{2400}{200}$$

$$x = \frac{2400}{200}$$
$$x = 12 \rightarrow 12\%$$

Direct Translation

24 is what percent of 200?

$24 = x \bullet 200$
$24 = 200x$

$$\frac{24}{200} = \frac{200}{200}x$$

$$\frac{24}{200} = x$$

$$\frac{12}{100} = x$$

$x = 12\%$

Example #4: 18 is 45% of what number?

Direct Translation

$$18 = \frac{45}{100} \bullet x$$

$$18 = \frac{9}{20} \bullet x$$

$$\frac{20}{9}(18) = \frac{20}{9}\left(\frac{9}{20}x\right)$$

$$\frac{20 \bullet 18}{9} = x$$

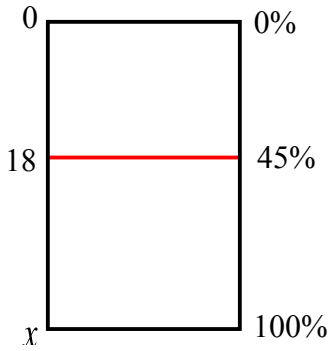
$$\frac{20 \bullet 2 \bullet \cancel{9}}{\cancel{9}} = x$$

$$20 \bullet 2 = x$$

$$40 = x$$

$\therefore 18$ is 45% of 40.

Using a Bar Model to set up a Proportion



$\therefore$ 18 is 45% of 40.

$$\frac{18}{x} = \frac{45}{100}$$

$$\frac{18}{x} = \frac{9}{20}$$

$$\frac{x}{18} = \frac{20}{9}$$

$$18\left(\frac{x}{18}\right) = 18\left(\frac{20}{9}\right)$$

$$x = \frac{18 \bullet 20}{9}$$

$$x = \frac{2 \bullet 9 \bullet 20}{9}$$

$$x = 40$$

You Try #4: 12 is 8% of what number?

Extra Problems:

1) 24 is what percent of 200?

2) 22 is what percent of 110?

3) What number is 80% of 500?

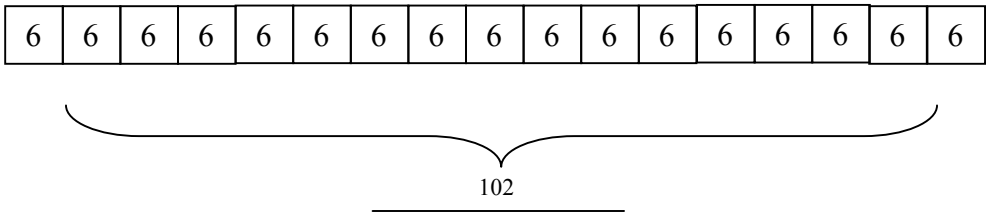
4) What is 18% of 50?

5) 17 is what percent of 68?

You Try Solutions:

You Try #1:
Find the unit rate: You can climb 102 steps in 17 seconds. What is the unit rate?

Using a Bar Model



6 steps

Using a Proportion

$$\frac{102}{17} = \frac{x}{1}$$

$$17 \bullet x = 102 \bullet 1$$

$$17x = 102$$

$$\frac{17}{17}x = \frac{102}{17}$$

$$x = 6$$

Using Division

$$17\overline{)102}\quad 6,\ 102,\ 000$$

Always look for "**Think, Pair, Share and Choral Response**" opportunities.

You Try #2: What number is 30% of 80?

Direct Translation

What number is 30% of 80?

$$x = \frac{30}{100} \bullet 80$$

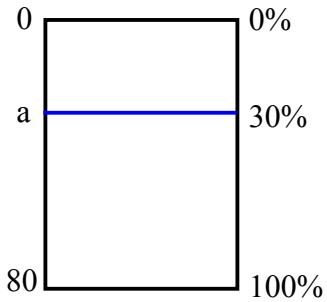
$$x = \frac{30}{100} \bullet 80$$

$$x = \frac{2 \bullet 2 \bullet 3 \bullet 5 \bullet 5 \bullet 8}{2 \bullet 2 \bullet 5 \bullet 5}$$

$$x = 24$$

$\therefore$ 24 is 30% of 80.

Using Proportions



$$\frac{a}{80} = \frac{30}{100}$$

$$\frac{a}{80} = \frac{3}{10}$$

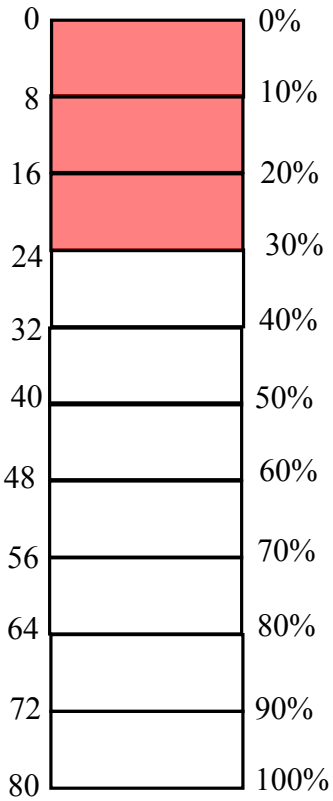
$$\frac{a}{80} = \frac{3}{10} \bullet \frac{8}{8}$$

$$\frac{a}{80} = \frac{24}{80}$$

$$a = 24$$

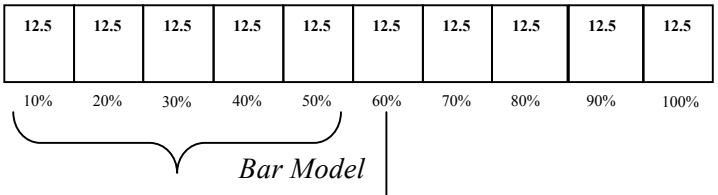
$\therefore$ 24 is 30% of 80.

Bar Model



$\therefore$ 24 is 30% of 80

You Try #3: 65 is what percent of 125?



$(12.5 \bullet 5) + 2.5 = 65$

$(10\% \bullet 5) + 2\% = 52\%$

Proportion

$$\frac{65}{125} = \frac{x}{100}$$

$$125 \bullet x = 65 \bullet 100$$

$$125x = 6500$$

$$\frac{125}{125}x = \frac{6500}{125}$$

$$x = \frac{6500}{125}$$

$$x = 52 \rightarrow 52\%$$

Direct Translation

65 is what percent of 125

$65 = x \bullet 125$

$65 = 125x$

$$\frac{65}{125} = \frac{125}{125}x$$

$$\frac{65}{125} = x$$

$0.52 = x$

$x = 52\%$

You Try #4: 12 is 8% of what number?

Direct Translation

$$12 = \frac{8}{100} \bullet x$$

$$12 = \frac{2}{25}x$$

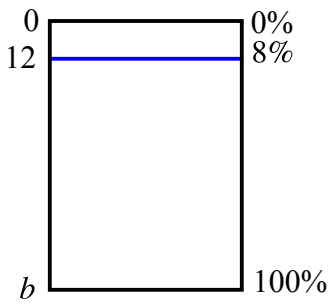
$$\frac{25}{2}(12) = \frac{25}{2}\left(\frac{2}{25}x\right)$$

$$25 \bullet 6 = x$$

$$150 = x$$

$\therefore$ 12 is 8% of 150.

Using a Proportion



$$\frac{12}{b} = \frac{8}{100}$$

$$\frac{12}{b} = \frac{2}{25}$$

$$2 \bullet b = 12 \bullet 25$$

$$2b = 300$$

$$\frac{2b}{2} = \frac{300}{2}$$

$$b = 150$$

$\therefore$ 12 is 8% of 150.