5.2 Lesson

$\dfrac{is}{of} = \dfrac{\%}{100}$

Key Idea

The Percent Proportion

Words You can represent "a is p percent of w" with the proportion
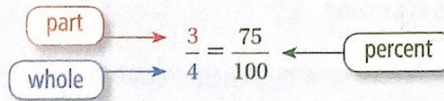
$$\frac{a}{w} = \frac{p}{100}$$

where a is part of the whole w, and $p\%$, or $\dfrac{p}{100}$, is the percent.

> In percent problems, the word *of* is usually followed by the whole.

Numbers   3 out of 4 is 75%.

part → $\dfrac{3}{4} = \dfrac{75}{100}$ ← percent

whole →

Example 1 Finding a Percent

What percent of 15 is 12?

$\dfrac{12}{15} = \dfrac{X}{100}$

cross multiply
and divide

$X = 80\%$

$\dfrac{a}{w} = \dfrac{p}{100}$	Write the percent proportion.
$\dfrac{12}{15} = \dfrac{p}{100}$	Substitute 12 for *a* and 15 for *w*.
$100 \cdot \dfrac{12}{15} = 100 \cdot \dfrac{p}{100}$	Multiplication Property of Equality
$80 = p$	Simplify.

▶ So, 80% of 15 is 12.

2 MTR USE ANOTHER METHOD

Show how to use a ratio table to find the percent.

_____
_____
_____
_____
_____
_____
_____
_____
_____

Check

Use a model to check your answer.

Percent
0%   20%   40%   60%   80%   100%

0   3   6   9   12   15
Number
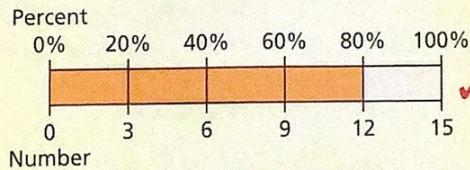
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$$\frac{is}{of} = \frac{\%}{100}$$

Try It Write and solve a proportion to answer the question.

1. What percent of 5 is 3?

$$\frac{3}{5} = \frac{x}{100}$$

$$x = 60\%$$

2. 24 is what percent of 20?

$$\frac{24}{20} = \frac{x}{100}$$

$$x = 120\%$$

Example 2 Finding a Part

What number is 0.5% of 200?

$$\frac{x}{200} = \frac{0.5}{100} \quad (x = 1)$$

$$\frac{a}{w} = \frac{p}{100} \qquad \text{Write the percent proportion.}$$

$$\frac{a}{200} = \frac{0.5}{100} \qquad \text{Substitute 200 for } w \text{ and 0.5 for } p.$$

$$a = 1 \qquad \text{Multiply each side by 200.}$$

▶ So, 1 is 0.5% of 200.

Try It Write and solve a proportion to answer the question.

3. What number is 80% of 60?

$$\frac{x}{60} = \frac{80}{100}$$

$$x = 48$$

4. 10% of 40.5 is what number?

$$\frac{x}{40.5} = \frac{10}{100}$$

$$x = 4.05$$

Example 3 Finding a Whole

150% of what number is 30?

$$\frac{a}{w} = \frac{p}{100} \qquad \text{Write the percent proportion.}$$

$$\frac{30}{w} = \frac{150}{100} \qquad \text{Substitute 30 for } a \text{ and 150 for } p.$$

$$3000 = 150w \qquad \text{Cross Products Property}$$

$$20 = w \qquad \text{Divide each side by 150.}$$

$$\frac{30}{x} = \frac{150}{100}$$

$$x = 20$$

▶ So, 150% of 20 is 30.

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Try It Write and solve a proportion to answer the question.

5. 0.1% of what number is 4?

$$\frac{4}{x} = \frac{0.1}{100}$$

$$x = 4000$$

6. $\frac{1}{2}$ is 25% of what number?

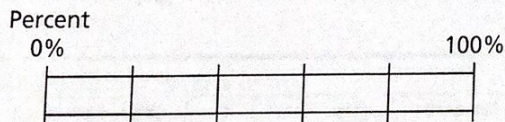$$\frac{\frac{1}{2}}{x} = \frac{25}{100}$$

$$x = 2$$

In-Class Practice

| 1 | I don't understand yet. | 2 | I can do it with help. | 3 | I can do it on my own. | 4 | I can teach someone else. |

7. USING THE PERCENT PROPORTION Write and solve a proportion to determine what percent of 120 is 54.

2 MTR

8. MODEL A PROBLEM Use a model to find 60% of 30.

Percent
0%   100%

4 MTR

9. WHICH ONE DOESN'T BELONG? Which proportion at the right does *not* belong with the other three? Explain your reasoning.

$$\frac{15}{w} = \frac{50}{100} \qquad \frac{15}{50} = \frac{p}{100}$$

$$\frac{15}{30} = \frac{p}{100} \qquad \frac{a}{30} = \frac{50}{100}$$

Example 4 Modeling Real Life **7** MTR

Tornadoes are classified based on wind speed and resultant damage using the Enhanced Fujita (EF) scale. All the tornadoes in a state in a recent year were EF-0s and EF-1s. The ratio of EF-0s to EF-1s was 11 : 4. What percent of the tornadoes were EF-0s?

Understand the problem.

You are given the ratio of EF-0s to EF-1s and that all the tornadoes were EF-0s and EF-1s. You are asked to find the percent of the tornadoes that were EF-0s.

Make a plan.

The ratio 11 : 4 is a part-to-part ratio. The part that represents EF-0s is 11 and the whole is 11 + 4 = 15. Use the percent proportion to find the percent of the tornadoes that were EF-0s.

Solve and check.

$$\frac{a}{w} = \frac{p}{100}$$ Write the percent proportion.

$$\frac{11}{15} = \frac{p}{100}$$ Substitute 11 for a and 15 for w.

$$100 \cdot \frac{11}{15} = 100 \cdot \frac{p}{100}$$ Multiplication Property of Equality

$$73.\overline{3} = p$$ Simplify.

▶ So, $73.\overline{3}\%$ of the tornadoes were EF-0s.

Check Reasonableness

The part that represents EF-0 tornadoes, 11, is less than four-fifths the whole, 15. So, the percent of the tornadoes that were EF-0s should be less than 80%. Because $73.\overline{3}\% < 80\%$, the answer is reasonable. ✓

In-Class Practice

1 I don't understand yet. **2** I can do it with help. **3** I can do it on my own. **4** I can teach someone else.

10. An arctic woolly-bear caterpillar lives for 7 years and spends 90% of its life frozen. How many days of its life is the arctic woolly-bear frozen?

$$\frac{part}{whole(total)} = \frac{\%}{100}$$

$$\frac{x}{7} = \frac{90}{100}$$

$$x = 6.3 \text{ years} \cdot 365$$

$$2299.5 \text{ days}$$

11. **Dig Deeper** The table shows the numbers of pictures you upload to a social media website for 5 days in a row. How many total pictures do you upload during the week when 32% of the total pictures are uploaded on Saturday and Sunday?

Day	Pictures Uploaded
Monday	2
Tuesday	2
Wednesday	4
Thursday	1
Friday	8

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