

Applications of Ratio and Percent

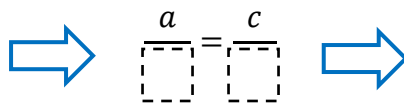


Objective

In this lesson, you will

Solving Ratio Problems

if two ratios, $a:b$ and $c:d$, are
in a proportional relationship



can find an unknown value in a
_____ relationship if the
other three values are known

Ryan discovers that the ratio of tigers to lions at a popular national park is 3:4. There are 24 lions in the park, but he doesn't know the number of tigers. He can find the number of tigers.

Suppose the park has _____ tigers. The ratio of tigers to lions is 3:_____.

The actual number of tigers to the actual number lions is _____:24. These two ratios must be equal.

$$\frac{\text{number of tigers}}{\text{number of lions}} = \frac{3}{4} = \frac{\boxed{}}{\boxed{}}$$

Solve the equation to find x :

First, get rid of all the denominators.

Remove the denominator _____ from the fraction $\frac{3}{4}$ by

_____ multiplying _____ dividing both sides of the equation by $\frac{4}{1}$.

Next, remove the denominator 24 from the fraction $\frac{4x}{24}$ by

_____ multiplying _____ dividing both sides of the equation by $\frac{24}{1}$.

There are _____ tigers at the park.

$$\frac{3}{4} \times \frac{4}{1} = \frac{x}{24} \times \frac{4}{1}$$

$$\boxed{} = \frac{4x}{24}$$

$$3 \times \frac{24}{1} = \frac{4x}{24} \times \frac{24}{1}$$

$$3 \times 24 = 4x$$

$$72 = \boxed{}$$

$$x = \frac{72}{4}$$

$$x = 18$$

Cross Multiplication

Cross multiplication is a quicker method for solving ratio and percent problems. To cross multiply two fractions, we multiply the _____ of each fraction by the numerator denominator of the other fraction.

Use cross multiplication to solve Ryan's problem and find the number of tigers in the park.

$$\frac{\boxed{}}{\text{number of lions}} = \frac{3}{4} = \frac{x}{24}$$

$$\frac{3}{4} = \frac{x}{24}$$

$$3 \times 24 = 4 \times x$$

$$72 = \boxed{}$$

$$x = \frac{72}{4}$$

$$x = \boxed{}$$

Notice that 18 is the same answer we got earlier.



$$\frac{a}{b} = \frac{c}{d}$$

$$ad = bc$$



Hank is building a dog run for his dog. He wants the ratio of the length to the width of the dog run to be 5:2. If he builds the dog run so the length is 10.5 feet, which equation can be used to solve for the width, w ? What is the value of w ?

The equation that can be used to solve for the width (w) is _____.

The width is _____ feet.

The ratio of length to width is 5:2. The length is 10.5 feet, and the width is w :

$$\frac{5}{2} = \frac{10.5}{w}$$

$$5w = 2 \times \boxed{}$$

$$w = \frac{2 \times 10.5}{\boxed{}} = \frac{21}{5} = 4.2$$

The width = _____ feet.

Solving Percent Problems

Cross multiplication can be used to solve not just fraction problems but _____ problems too.

Peter bought a soccer ball for \$20. He paid an additional 10% sales tax. What is the total amount Peter paid for the ball?

A percentage can be expressed as a fraction with 100 as its denominator. A tax of _____% written as a fraction is $\frac{10}{100}$.

That means the tax would be \$_____ on a \$100 purchase.

Let's find out how much tax Peter paid on his \$20

purchase. t is the _____ amount.

$$\frac{\text{tax \%}}{100} = \frac{\text{tax amount}}{\text{price}}$$

$$\frac{10}{100} = \frac{t}{\boxed{}}$$

$$100 \times t = 20 \times 10$$

$$\boxed{} = 200$$

$$\frac{100t}{100} = \frac{200}{100}$$

$$t = \boxed{}$$

Use cross multiplication:

Divide both sides of the equation by 100:

The tax is \$2. Peter paid \$20 (the price) + \$2 (tax), or a total of \$_____, for the soccer ball.

Discounts

Discounts are expressed as a percentage of the _____ price.

Lena wants to buy a pair of shoes. The marked price of the shoes is \$60, but the store is offering a 40% discount. Let the amount of the discount be d :

$$\frac{\text{discount \%}}{\boxed{}} = \frac{\text{amount of discount}}{\boxed{}}$$

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

Cross multiply:

$$60 \times 40 = d \times \boxed{}$$

$$\boxed{} = 100d$$

Divide both sides by 100:

$$\frac{2,400}{100} = \frac{100d}{100}$$

$$d = \frac{2,400}{100} = \boxed{}$$

The amount of the discount is \$24. The discounted price is the difference of the marked price and the discount: _____ - 24 = 36. Lena should plan to pay \$_____ for the shoes.

Percent Increase and Decrease

Quantities such as _____ of items and other measures often increase or decrease. Understanding _____ change (increase or decrease) gives you an idea about how much the quantities have changed.

$$\boxed{} = \frac{\text{amount of change}}{\text{original amount}} \times \boxed{}$$

To find a percent change, rearrange the quantities and the formula:



$$\frac{\text{percent change}}{100} = \frac{\text{amount of change}}{\text{original amount}}$$

The amount of change is the difference sum of the original amount and the new amount:



$$\text{amount of decrease} = \text{original amount} - \text{new amount}$$

$$\text{amount increase} = \text{new amount} - \text{original amount}$$

Last year, Joe earned \$10,000 working part-time at a craft store. This year, he's going to earn \$12,000. Find the percent increase in his earnings from last year to this year.

First, find the amount of increase:

$$\boxed{} = \text{new amount} - \text{original amount}$$
$$= 12,000 - 10,000 = 2,000$$

Plug the amount of change and the original amount into the formula:

$$\frac{\text{percent change}}{100} = \frac{\text{amount of change}}{\text{original amount}}$$

$$\frac{\text{percent change}}{\boxed{}} = \frac{2,000}{10,000}$$

Use cross multiplication:

$$\boxed{} \times \text{percent change} = 2,000 \times 100$$

$$\text{percent change} = \frac{200,000}{10,000} = 20$$

Joe's salary increased _____% between last year and this year.



Eden bought a new phone. The phone's retail price is \$199. In addition, she paid sales tax of 8% of the retail price. A few days after the purchase, she filled out a mail-in rebate form and got back \$50 from the store. How much did Eden pay for the phone after tax and the mail-in rebate?

$$\underline{\quad \$268.92 \quad \$229.08 \quad \$214.92 \quad \$164.92 \quad}$$

$$\frac{\boxed{\quad}}{199} = \frac{8}{100}$$

$$100t = 8 \times 199$$

$$t = \frac{8 \times 199}{100} = \frac{1,592}{100} = \boxed{\quad}$$

Find the _____ price of the phone (retail price + tax):

$$\text{total price} = \$199.00 + \$15.92 = \$\boxed{\quad}$$

Eden got a rebate of \$50. Subtract this amount from the total price:

$$\$214.92 - \$50.00 = \$\boxed{\quad}$$

Eden paid \$164.92 for the phone.

Percent Error



$$\text{percent error} = \frac{|\text{actual value} - \text{estimated value}|}{\text{actual value}} \times 100$$

A person measured a distance to be 6.25 inches, but the actual distance was 6 inches:

$$\text{percent error} = \frac{|6 - 6.25|}{6} \times 100 = 4\%$$

Summary

How can knowing the mathematics of ratios and percents be used to help make decisions when shopping?