

Section 2.5 One-Step Equations with Percentages

Review of Percentages

Compare these two quiz scores:  $\frac{42}{50}$  and  $\frac{17}{20}$ . Which is the higher score?

$$\frac{42}{50} = .84 = 84\%$$

$$\frac{17}{20} = .85 = 85\%$$

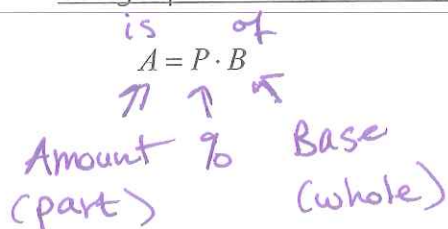
percent means per 100  
Now it is easier to compare and see that  $17/20$  is higher.

1. Complete the missing values in the tables.

Decimal	Percent
0.50	50%
0.93	93%
0.06	6%
1.2	120%

Decimal	Percent
.80	80%
1.50	150%
.165	16.5%
.02	2%

Using Equations to Solve Percent Problems



2. Write an equation and solve it algebraically. Check it mentally and write the answer in a complete sentence.

a. What is 37% of 42?

$$A = P \cdot B$$

$$A = .37(42)$$

$$= 15.54$$

15.54 is 37% of 42

b. What percent of 60 is 52?

$$A = P \cdot B$$

$$52 = \frac{P(60)}{60}$$

87% of 60 is 52.  
 $P = .8\bar{6}$  87% or 86.7%

c. 24% of what number is 50.4?

$$A = P \cdot B$$

$$50.4 = .24 B$$

$$\frac{50.4}{.24} = \frac{.24 B}{.24}$$

$$210 = B$$

24% of 210 is 50.4.

3. Write an equation and solve it algebraically. Check it mentally and write the answer in a complete sentence.

a. 74% of what number is 120?

$\frac{P}{74} \quad \frac{B}{?} \quad \frac{A}{120}$

$$A = P \cdot B$$

$$\frac{120}{.74} = \frac{.74 B}{.74}$$

74% of 162.2 is 120.

b. What percent of 30 is 8?

$\frac{P}{?} \quad \frac{B}{30} \quad \frac{A}{8}$

$$A = P \cdot B$$

$$\frac{8}{30} = \frac{P(30)}{30}$$

$$162.2 \approx B$$

27% of 30 is 8.

$$P = .2\bar{6}$$

$$26.7\%$$

or 27%

c. What is 18% of 90?

$\frac{A}{?} \quad \frac{P}{18} \quad \frac{B}{90}$

$$A = P \cdot B$$

$$A = .18(90)$$

$$A = 16.2$$

16.2 is 18% of 90.

part whole

$$A = P \cdot B$$

### Percent Applications

4. Maria plays basketball and last season she attempted 48 free throws and made 38 of them. What percentage of her free throws did she make?

$$A = P \cdot B$$

$$\frac{38}{48} = \frac{P(48)}{48}$$

$$.79 \approx P$$

$$79\%$$

total whole

part

5. Jess earned \$550 in commissions last month, which is 5% of the jewelry they sell. How much did Jess

sell?  
whole B

part A

P

$$A = P \cdot B$$

$$\frac{550}{.05} = \frac{.05(B)}{.05}$$

Jess sold \$11,000 in jewelry.

$$\$11,000 = B$$

## Percent Increase/Decrease

$$A = P \cdot B$$

↑ increase amount or decrease  
↑ original whole

6. The cafeteria used to sell chocolate chip cookies for  $\$0.75$  each. They recently raised the price to  $\$1.00$ .

a. What is the amount of the increase?

$$1.00 - .75 = .25$$

A

b. What is the percentage increase?

$$A = P \cdot B$$
$$.25 = P(.75)$$
$$\frac{.25}{.75} = P$$

$$P = .33 \approx 33.3\%$$

This was a 33.3% increase

7. In a city there were 5,000 people unemployed which went down to 4,325 the following year.

a. What was the decrease in the number of unemployed people?

$$5,000 - 4,325 = \frac{675}{A} \text{ people}$$

b. What was the percentage decrease in unemployment?

$$A = P \cdot B$$
$$\frac{675}{5000} = P \left( \frac{5000}{5000} \right)$$

$$P = .135 = 13.5\%$$

Unemployment went down by 13.5%

## Section 2.6 Modeling with Equations and Inequalities

### \*\*Finding an Original Price given a Percentage and the Total

8. The price of a restaurant bill, including an 18% gratuity charge was \$110.43. What was the price of the bill before the gratuity was added?

let  $b$  = the amount of the bill, before tip

$$b + .18b = 110.43$$

No solving yet :)

9. The company Metromile sells car insurance based on how many miles you drive rather than a fixed rate. As an example, on [www.Metromile.com](http://www.Metromile.com), it could cost \$30 per month and 3.2 cents per mile (rates may vary).

a. To compare with yearly insurance rates, let's make a table with the number of miles driven per year. Define a variable:

Let  $m$  = number of miles driven per year

b. Fill in a few rows of the table to understand the pattern, and write an expression in terms of the variable in the last row.

base fee =  $30 \times 12 = 360$

$m$ , miles	Cost of Insurance for 1 year
10,000	$\$360 + 10,000(.032) = \$680$
15,000	$\$360 + 15,000(.032) = \$840$
20,000	$\$360 + 20,000(.032) = \$1000$
$m$	$\$360 + m(.032)$

$360 + .032m$

expression for the cost of insurance

c. If you are currently paying \$800 per ~~month~~<sup>year</sup> with a fixed-price insurance company, how many miles would you have to drive to get a better deal with Metromile? Write an inequality. (We will not solve it yet.)

$$360 + .032m = 800$$

$$360 + .032m < 800 \leftarrow \text{better deal}$$

### Translating Phrases

#### Written form

Addition: The sum of 4 and a number

Subtraction: The difference of a number and 2

Multiplication: The product of 7 and a number

Division: The quotient of 14 and a number

#### Algebraic form

$$4 + n$$

$$n - 2$$

$$7n$$

$$14 \div n$$

$$\frac{14}{n}$$

### 10. Translate the Following Expressions/Equations/Inequalities

a. Two less than a number  $n - 2$

b. The product of 4 and a number is greater than 6.  $4n > 6$

c. 45% of a number  $.45n$

d. The quotient of a number and nine is 8.5.

$$\frac{n}{9} = 8.5$$

More Practice

11. A book was on sale for 15% off and the sale price was \$16.99. What was the original price of the book? Write an equation to model this scenario. Do not solve it yet.

Let  $b$  = price of the book

$$b - .15b = 16.99$$

12. At the Mad Genius Escape Room on Hawthorne, the cost is \$30 per person. If you want the room to be private for your party the cost is \$27 plus \$24 per person. Define a variable and write an expression for each scenario. Source: <https://www.madgeniuses escapes.com/faq>

$P$ , # of people	Total Cost (not private)	Total Cost (private)
5	$30(5) = \$150$	$27 + 24(5) = \$147$
10	$30(10) = \$300$	$27 + 24(10) = \$267$
15	$30(15) = \$450$	$27 + 24(15) = \$387$
$P$	$30P$	$27 + 24P$

Write an equation that represents how many people it would take for the two plans to be equal. (We will not solve it yet.)

$$30P = 27 + 24P$$

13. A rental car company charges a base weekend fee of \$35.95 and then \$0.58 cents per mile. If the total bill is \$120, how many miles were driven? Write an equation to model this scenario. Do not solve it yet.

let  $m$  = # of miles driven

$$35.95 + .58m = 120$$

14. Translate the Following Expressions/Equations/Inequalities

a. The quotient of a number and 7 is 3.  $\frac{n}{7} = 3$

b. Half of a number.  $\frac{1}{2}n$

c. A number increased by 12  $n + 12$

d. Five less than two times a number is greater than or equal to 87.

after  $2n - 5 \geq 87$

15. Write an equation and solve it algebraically. Check it mentally and write the answer in a complete sentence.

a. What percent of  $\underbrace{40}_B$  is  $\underbrace{160}_A$ ?

$$A = P \cdot B$$

$$\frac{160}{40} = \frac{P(40)}{40}$$

160 is 400% of 40.

b. What is  $\underbrace{75\%}_P$  of  $\underbrace{32}_B$ ?

$$A = P \cdot B$$

$$A = .75(32)$$

$$= 24$$

$$4 = P$$

or 400%

24 is 75% of 32.

c.  $\underbrace{82}_A$  is  $\underbrace{15\%}_P$  of what?  $\underbrace{\quad}_B$

$$A = P \cdot B$$

$$\frac{82}{.15} = \frac{.15 B}{.15}$$

$$B = 546.\bar{6}$$

82 is 15% of about 546.7.

16. Ronin has an annual salary of \$36,000 and he is getting a  $\underbrace{2.5\%}_P$  raise. How much is  $\underbrace{\text{his raise}}_A$  and his new salary?

$$A = P \cdot B$$

$$A = .025(36,000)$$

$$= 900$$

$$\underbrace{\text{whole}}_B$$

$$36,000 + 900$$

$$= 36,900$$

$\underbrace{\text{part}}_A$   
His raise is \$900 for a new salary of \$36,900.

17. A book was on sale for \$15.99 and the original price was \$26.99. What percent off was the book?

$$\text{Decrease amount: } 26.99 - 15.99 = \$11$$

$$A = P \cdot B$$

$$\frac{11}{26.99} = \frac{P(26.99)}{26.99}$$

$$P \approx .40756$$

$$\approx 41\%$$

The book was about 41% off.

18. The population of dogs in a shelter decreased from 52 to 39. What is the percentage decrease?

$$52 - 39 = 13$$

$$A = P \cdot B$$

$$\frac{13}{52} = \frac{P(52)}{52}$$

$$P = .25$$

$$25\%$$

The shelter population decreased by 25%.