

4.5 Modelling With Algebra

Part 1: English to Algebra

Example 1: Write an algebraic expression for each English phrase.

a) the sum of 5 and y

$$\underline{5+y}$$

b) the product of 4 and x

$$\underline{4x}$$

c) the product of 4 and m, then increase the result by 7

$$\underline{4m+7}$$

d) the sum of 4 and d, then multiply the result by 2

$$\underline{2(4+d)}$$

e) add 4 to d, then double the result

$$\underline{2(d+4)}$$

f) three consecutive numbers

$$\underline{x, x+1, x+2}$$

Example 2: Write an algebraic expression for each English phrase.

- a) 7 more than twice a number $\underline{2x + 7}$
- b) one-quarter of a number increased by 3 $\underline{\frac{x}{4} + 3}$
- c) double the sum of a number and 5 $\underline{2(x+5)}$
- d) triple a number $\underline{3x}$
- e) 6 less than one-half of a number $\underline{\frac{x}{2} - 6}$
- f) the quotient of a number and 4 $\underline{\frac{x}{4}}$

Example 3: Write an equation for each English statement.

- a) Five more than a number is twenty-seven. $\underline{x + 5 = 27}$
- b) Seven less than a number is 4. $\underline{x - 7 = 4}$
- c) Double a number less eleven is sixteen. $\underline{2x - 11 = 16}$
- d) The sum of 4 consecutive integers is fifty. $\underline{x + (x+1) + (x+2) + (x+3) = 50}$
- e) Six times a number is 42. $\underline{6x = 42}$

Example 4: Write an equation for each sentence.

a) A number increased by six is twenty $x+6=20$

b) A number multiplied by four is sixteen $4x=16$

c) Seven less than a number is fifteen $x-7=15$

d) One fifth of a number is six $\frac{x}{5}=6$

e) A number divided by six is seven. $\frac{x}{6}=7$

f) Two more than triple a number is 14 $3x+2=14$

Part 2: Word Problems

When solving word problems,

- define the unknowns.
- write an equation to model the situation.
- solve the equation.
- answer the question asked in the problem.

Example 5: Mr. Jensen operates a variety store with his two best friends, Sidney and Evgeni. Sidney makes twice as much as Evgeni. Mr. Jensen makes \$200 a week more than Sidney. The total weekly payroll is \$1450. How much does each friend make?

Step 1: Let's define our variables:

Worker	Expression
Evgeni	x
Sidney	$2x$
Mr. Jensen	$2x + 200$
Total	1450

Step 2: Write an equation that relates these expressions to the total payroll

$$x + 2x + 2x + 200 = 1450$$

Step 3: Solve the equation

$$5x + 200 = 1450$$

$$5x = 1450 - 200$$

$$\frac{5x}{5} = \frac{1250}{5}$$

$$x = 250$$

Step 4: Answer the question in context.

Each Friend makes the following amount per week:

$$\text{Eugeni} = x = \$250$$

$$\text{Sidney} = 2x = \$500$$

$$\text{Mr. Jensen} = 2x + 200 = \$700$$

Example 6: Curtis works at a ballpark selling peanuts. He is paid \$6/h plus a 50 cent commission for every bag of peanuts he sells.

a) Find Curtis' earnings if he sells 42 bags of peanuts during a 4 hour shift.

$$E = 6h + 0.50p$$

$$E = 6(4) + 0.5(42)$$

$$E = 24 + 21$$

$$E = \$45$$

He would earn \$45.

E = earnings
 h = hours
 p = peanuts

b) How many bags of peanuts must he sell to earn \$100 in 7 hours?

$$E = 6h + 0.5p$$

$$100 = 6(7) + 0.5p$$

$$100 = 42 + 0.5p$$

$$100 - 42 = 0.5p$$

$$\frac{58}{0.5} = \frac{0.5p}{0.5}$$

$$116 = p$$

He must sell 116 bags.

Example 7: The length of a rectangle is 7m more than its width. The perimeter of the rectangle is 60m. What are the dimensions?

$$\text{Length} = x + 7$$

$$\text{width} = x$$

$$P = 2(\text{length}) + 2(\text{width})$$

$$60 = 2(x + 7) + 2(x)$$

$$60 = 2x + 14 + 2x$$

$$60 - 14 = 4x$$

$$\frac{46}{4} = \frac{4x}{4}$$

$$x = 11.5$$

$$\text{Length} = x + 7 = 18.5 \text{ m}$$

$$\text{width} = x = 11.5 \text{ m}$$

Homework: worksheet

