

1. Write each of the following as an algebraic expression in one variable.

a) 3 times a number

$$3x$$

b) a number increased by 4

$$x + 4$$

c) a number decreased by 3

$$x - 3$$

d) the length increased by 5

$$l + 5$$

e) Tara's age 2 years ago

$$T - 2$$

f) Adam's age 5 years from now

$$A + 5$$

g) twice the width increased by 3

$$2W + 3$$

h) one-half the speed

$$\frac{1}{2}x \text{ or } \frac{x}{2}$$

i) the product of 6 and a number

$$6y$$

j) three times the volume decreased by 20

$$3V - 20$$

k) the value in cents of y dimes ^{10 cents coin}

$$10y$$

l) one-half Kent's age 6 years ago $K = 10$ years old

$$\left(\frac{K-6}{2}\right)$$

m) one-third of Johnny's age, ten years from now

$$\frac{(x+10)}{3}$$

n) six times a number decreased by 2

$$6x - 2$$

2. Write each of the following as an equation in one variable.

a) A number increased by 35 is 82

$$x + 35 = 82$$

b) Five times a number is 185

$$5x = 185$$

c) Four times a number less 47 is 293

$$4x - 47 = 293$$

d) When 57 is added to 9 times a number the result is 795.

$$57 + 9x = 795$$

e) Six times the number of students less 87 is 999.

$$6n - 87 = 999$$

f) Gina's age 5 years ago was 10.

$$G - 5 = 10$$

g) Craig's age thirteen years from now will be 27.

$$C + 13 = 27$$

h) Three times Jason's age 5 years ago was 48.

$$3(J - 5) = 48$$

i) Five times Shawn's age plus 13 is 163.

$$5(S + 13) = 163$$

j) Twice the length increased by 4 is 26.

$$2l + 4 = 26$$

k) Three times the width decreased by 7 is 92.

$$3W - 7 = 92$$

l) One half the length plus 11 is 43.

$$\frac{l}{2} + 11 = 43$$

3. Write the following as algebraic expressions in two variables.

- The sum of the length and the width.
- Twice the length added to three times the width.
- Three times the length decreased by the width.
- The sum of Jeff's age and three times Kyle's age.
- The value of x nickels and y dimes. in dollar.
- The value of x dimes and y quarters. in dollar.
- The value of x loonies and y toonies. in dollar
- Five times Mike's age decreased by 4 times Bob's age.
- Twice the length increased by 3 plus 4 times the width.
- Amanda's age increased by 4 plus twice Jenn's age.

$$\begin{array}{l} l + w \\ 2l + 3w \\ 3l - w \\ J + 3K \\ 0.05x + 0.1y \\ 0.1x + 0.25y \\ x + 2y \\ 5M - 4B \\ 2L + 3 + 4W \\ A + 4 + 2J \end{array}$$

4. Write each of the following as an algebraic equation in two variables.

- The sum of 2 numbers is 50.
- The difference between 2 numbers is 40.
- There are a total of 35 boys and girls in the class.
- Sophia counted 8 more cars than trucks.
- Jared's history and English marks totalled 170.
- Twice one number plus three times another is 48.
- Four times the number of boys less twice the number of girls is 33.
- The sum of Kim's and Alison's age is 32.
- Eight times Magda's age plus JJ's age 2 years ago is 251.
- The length plus 3 times the width is 48.
- Seven times the length less 5 times the width is 38.
- Five times the sum of two numbers is 60.
- The value of the dimes and quarters was 180 cents.

$$\begin{array}{l} x + y = 50 \\ x - y = 40 \\ B + G = 35 \\ T + 8 = C \\ H + E = 170 \\ 2x + 3y = 48 \\ 4B - 2G = 33 \\ K + A = 32 \\ 8M + (J - 2) = 251 \\ L + 3W = 48 \\ 7L - 5W = 38 \\ 5(x + y) = 60 \\ 10x + 25y = 180 \\ 10x + 5y = 765 \\ 10J + 2S = 170 \\ 3J + C = 540 \\ 2R + \frac{E}{2} = 203 \end{array}$$

- The \$10 bills and \$5 bills had a total value of \$765.
- Ten times Jessica's age plus twice Stephen's age is 170.
- Three times Jamie's weight plus Chris's weight is 540.
- Twice Rob's French mark plus half his English mark is 203.

Linear Systems – Word Problems

Translating Words into Algebra

Example 1 Write the following phrase as a mathematical expression:
the value five increased by a number

$$5 + x$$

Example 2 Write the following phrase as a mathematical equation.
Half of a value, decreased by seven is one.

$$\frac{x}{2} - 7 = 1$$

Example 3 Translate the following sentence into an equation, using two variables.
Mario's daily earnings are \$80 plus 12% commission on his sales

$$E = 80 + 0.12x$$

Let x = sales amount

Let E = his earning

How to solve linear system word problems

- Steps:
1. Choose your variables.
 2. Write down the given information (preferably organized in a table).
 3. Create the equations.
 4. Solve the system using substitution, or elimination.
 5. State the answer with a full sentence.

Example 4

Christian has a total of eight cars and trucks to play with. His birthday is soon. He hopes to double the number of cars he has now. If he does, he will have a total of 11 cars and trucks. How many cars does he have now? How many trucks?

Step 1: Let C represents # of cars

Let T // # of trucks

Step 3: $2C + t = 11$ — (A)

Step 4: $- | C + t = 8$ — (B)

↳ (A) - (B) $C + 0 = 3$

$$C = 3$$

* Sub $C=3$ into (B)

$$\begin{aligned} \textcircled{B} \quad 3 + t &= 8 \\ t &= 5 \end{aligned}$$

$$\therefore \text{POI} = (3, 5)$$

Step 5

\therefore Christian has 3 cars
and 5 trucks

Example 5

The sum of two numbers is 97. Their difference is 33. Find the numbers.

Step 1: Let x be the first number

Let y // Second //

Step 3: $x + y = 97$ (A)

+ | $x - y = 33$ (B)

(A) + (B): $2x + 0 = 130$

$2x = 130$

$\div 2 \quad \div 2$

$\therefore x = 65$

Sub $x = 65$ into (A)

(A) $65 + y = 97$

$y = 97 - 65$

$\therefore y = 32$

\therefore The two numbers are 65 and 32.

Example 6

The sum of the digits of a two-digit number is 7. When the digits are reversed, the number is increased by 27. Find the number.

(S1) Let x be the first

Let y // Second

$x + y = 7$ (A)

$(10x + y) - (10y + x) = 27$ (B)

original #

\downarrow
reversed #

(B) $10x + y - 10y - x = 27$

(B) $9x - 9y = 27$

(A) $\times 9$: $9x + 9y = 63$

(B) + 9(A): $18x = 90$

$x = 5$

Sub $x = 5$ into (A)

$5 + y = 7$

$y = 2$

\therefore The two digits are 5 and 2 or 52.