

7.1 Developing Systems of Linear Equations

A system of equations consists of 2 or more equations with the same variables.

eg. $2x + 3y = 12$
 $x - 4y = 8$

find the unknown values.

In order to solve a system of equations, we need to have as many equations as we have variables. (eg. To solve for 2 variables, we need 2 equations.) When the equations in a system are all linear functions, we call the system a linear system.

Throughout this unit we will look at 3 different methods of solving linear systems: graphing, elimination, and substitution.

Today we will focus on setting up a linear system, but not solving it.

Example:

a) Define your variables and create a linear system to model this situation:

A total of 85 adults and students attended a school play. Tickets cost \$5 for adults and \$3 for students. The total ticket revenue for the night was \$305.

*let $a = \#$ of adults
 $s = \#$ of students*

$$\begin{aligned} a + s &= 85 \\ 5a + 3s &= 305 \end{aligned}$$

b) Use the linear system to verify whether 25 adults and 60 students attended the play.

$$a = 25, s = 60$$

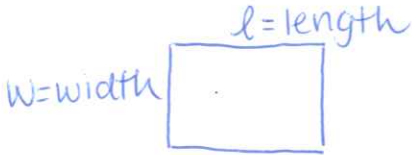
$$\begin{aligned} a + s & \\ = 25 + 60 & \\ = 85 \checkmark & \end{aligned}$$

$$\begin{aligned} 5a + 3s & \\ = 5(25) + 3(60) & \\ = 125 + 180 & \\ = 305 \checkmark & \end{aligned}$$

Example:

a) Define your variables and create a linear system to model this situation:

The stage at the Lyle Victor Albert Centre in Bonnyville, Alberta, is rectangular. Its perimeter is 158 ft. The width of the stage is 31 ft. less than the length.



$$l + w + l + w = 158$$
$$\text{OR } 2l + 2w = 158$$
$$w = l - 31$$

b) Sebi has determined that the stage is 55 ft. long and 24 ft. wide. Use the linear system to verify that Sebi is correct.

$$l = 55 \text{ ft. } w = 24 \text{ ft.}$$

$$2l + 2w = \dots$$
$$= 2(55) + 2(24)$$
$$= 110 + 48$$
$$= 158 \checkmark$$

$$w = l - 31$$
$$24 = 55 - 31$$
$$24 = 24 \checkmark$$

Example:

a) Create a linear system to model this situation:

A school raised \$140 by collecting 2000 cans and glass bottles for recycling. The school received 5¢ for a can and 10¢ for a bottle.

c = # of cans

$$c + b = 2000$$

b = # of bottles

$$0.05c + 0.10b = 140$$

b) The school collected 1200 cans and 800 bottles. Use the linear system to verify these numbers.

$$c = 1200$$

$$b = 800$$

$$c + b$$

$$= 1200 + 800$$
$$= 2000 \checkmark$$

$$0.05c + 0.10b$$
$$= 0.05(1200) + 0.10(800)$$
$$= 60 + 80$$
$$= 140 \checkmark$$