

## Introduction to Linear Systems

A linear system typically refers to a scenario involving two linear equations each containing two variables. Solving a linear system involves using a mathematical technique to find the point of intersection of these two lines. In this unit, we will consider the following techniques:

1. Graphing (with and without technology)
2. Substitution (algebraic method)
3. Elimination (algebraic method)

### Solving Linear Systems Using the Graphing Technique

#### Warm – Up

Determine the coordinates of the point of intersection for each pair of lines.

a)  $y = \frac{1}{2}x + 2$

$y = 3x - 3$

b)  $y = \frac{1}{3}x + 2$

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

m =

m =

m =

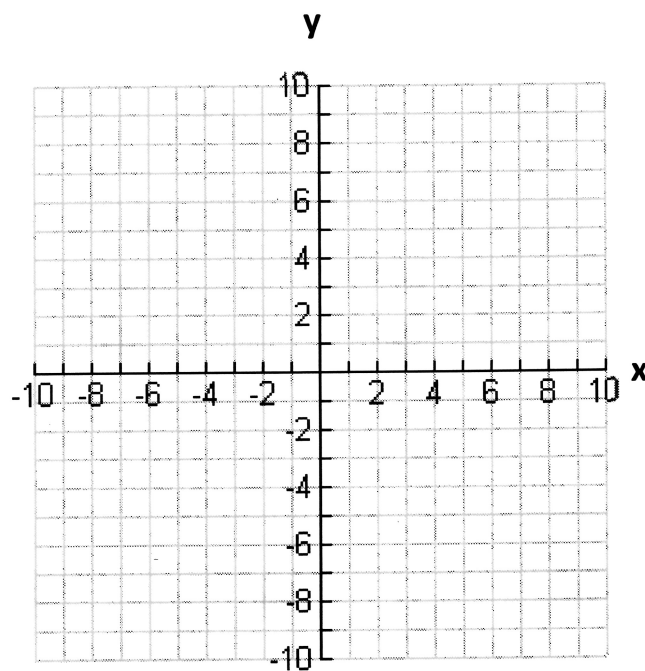
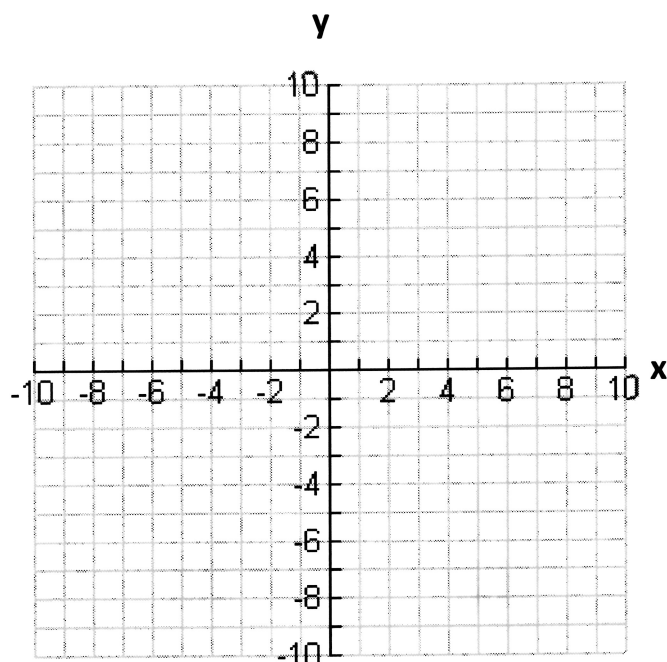
m =

b =

b =

b =

b =



## Activity

The Tran family is looking to rent a hall to host their family reunion.

They are considering two options:

- Queen's Palace will rent their hall for \$1500 plus \$25 per person.
- The Charming Convention Center is available for \$200 plus \$50 per person.

Both halls offer similar amenities. Which hall is cheaper?

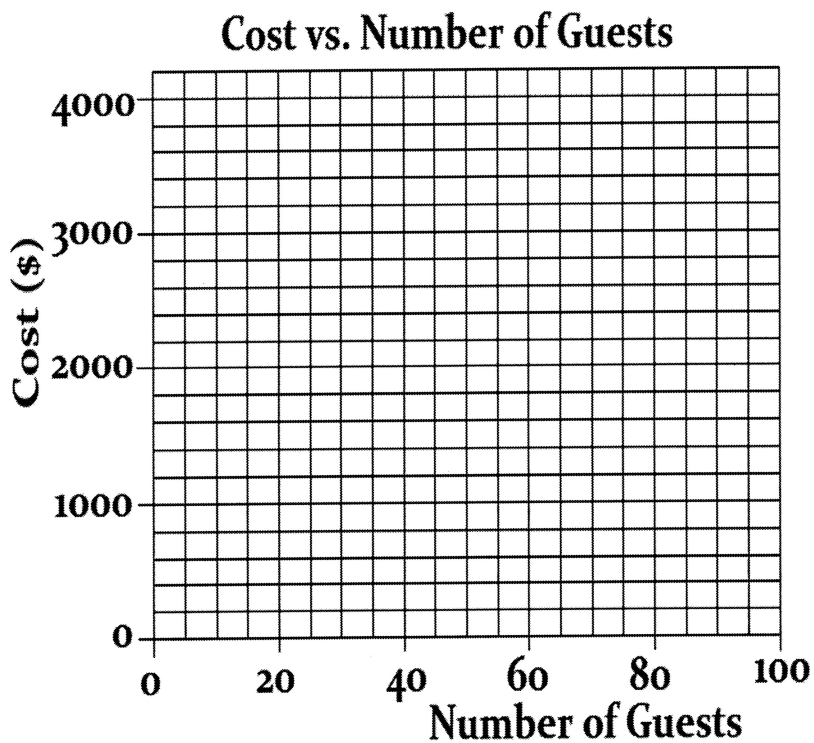
a) Create equations to relate the cost to rent each hall,  $C$ , in terms of the number of guests ( $n$ ) that plan to attend.

Queen's Palace :       $\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

Charming C. C. :       $\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

b) Complete the table of values and graph the relationships.

Queen's Palace	
Guests	Cost (\$)
0	
20	
40	
60	
80	
100	



Charming C. C.	
Guests	Cost (\$)
0	
20	
40	
60	
80	
100	

c) What are the coordinates of the point of intersection?  $\underline{\hspace{2cm}}$

d) Use your graph and the point of intersection to determine which hall is cheaper.

## Practice – Task 1

Lourdes is planning to purchase sweatshirts to celebrate its 50<sup>th</sup> anniversary.

The school is considering two sweatshirt companies:

- Walter Wears will charge \$300 for the design and then \$15 to produce each sweatshirt.
- Avalon's Shop will charge \$700 for the design and then \$10 to produce each sweatshirt.

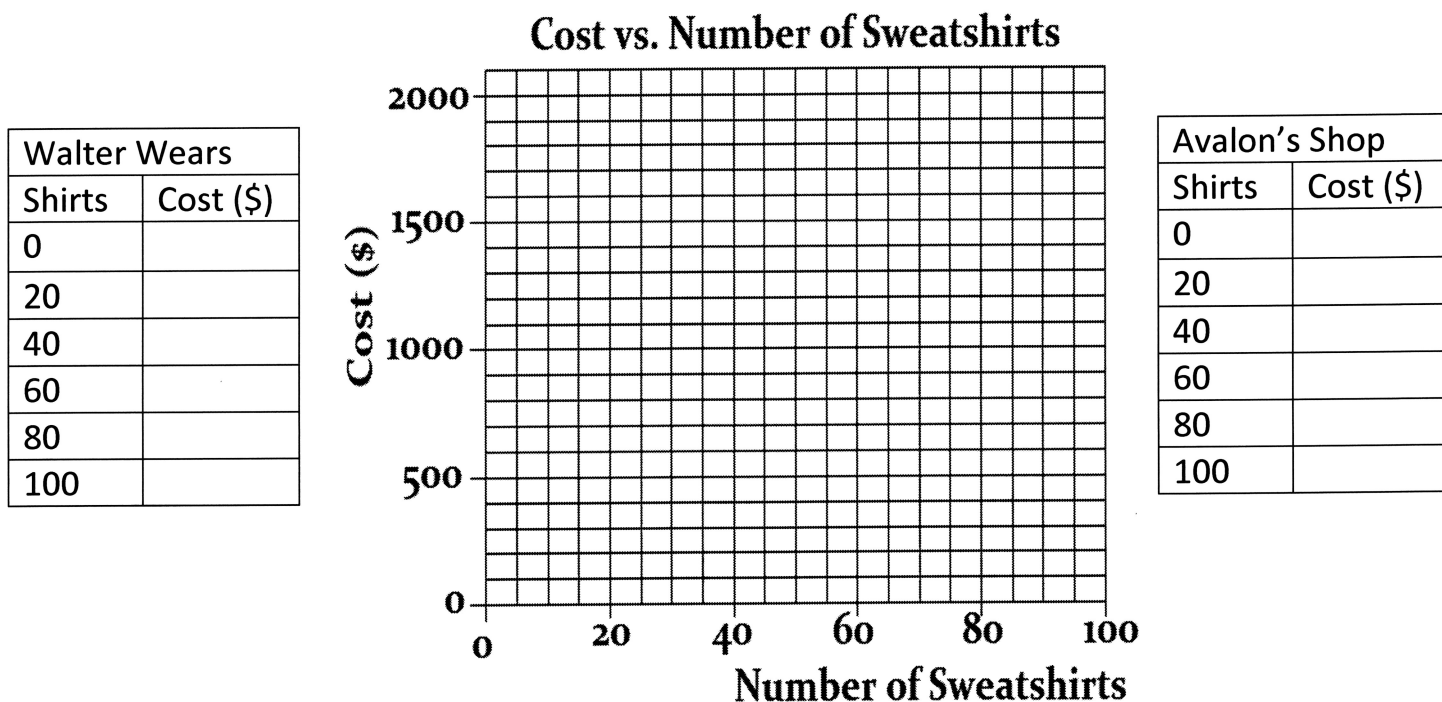
Both manufacturers can produce similar quality sweatshirts. Which offer is cheaper?

a) Create equations to represent the cost to purchase sweatshirts,  $C$ , as it relates to the number of sweatshirts ( $n$ ) being produced.

Walter Wears : \_\_\_\_\_ = \_\_\_\_\_

Avalon's Shop : \_\_\_\_\_ = \_\_\_\_\_

b) Complete the table of values and graph the relationships.



c) What are the coordinates of the point of intersection? \_\_\_\_\_

d) Use your graph and the point of intersection to determine which manufacturer is cheaper.

## Practice – Task 2

Darius has left Guelph and is driving in his car to see his mom Gilda who lives in Quebec city. Gilda is so excited to see her son that she gets into her car and starts driving towards Guelph to meet her son part way.

The location and travel speed for each person is as follows:

- Darius is currently 100 km from Guelph and traveling at 50km/hr **away** from Guelph.
- Gilda is currently 1000 km from Guelph and is traveling at 100 km/hr **towards** Guelph.

Assuming that they are driving along the same highway and moving towards each other, how long will it take until they meet? How far will they be from Guelph at that time?

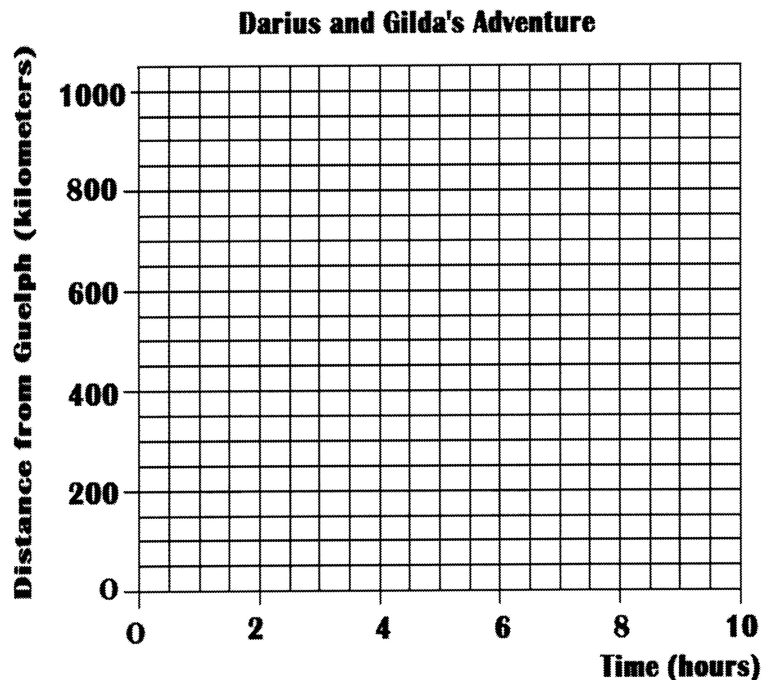
a) Create equations to represent the distance from Guelph,  $d$  in kilometers, as time,  $t$  measured in hours, elapses.

Darius : \_\_\_\_\_ = \_\_\_\_\_

Gilda : \_\_\_\_\_ = \_\_\_\_\_

b) Complete the table of values and graph the relationships.

Darius	
Time (Hours)	Distance (km)
0	
2	
4	
6	
8	
10	



Gilda	
Time (Hours)	Distance (km)
0	
2	
4	
6	
8	
10	

c) What are the coordinates of the point of intersection? \_\_\_\_\_

d) What does the point of intersection mean in terms of the Darius and Gilda's travels?