Lesson Context

BIG PICTURE of this UNIT:	• What is meant by the term FUNCTIONS and how do we work with them? • What are the most important components of "Problem Solving"? • From last year's course, what are the major topics from linear relations that we have worked with, remember, and are fluent with? • How do we apply the concept of linear relations to (i) geometry & (ii) data analysis & (iii) functions

Lesson Objectives

    a. Write equations of linear models in multiple forms to model applications

    b. Continue working with systems of equations and multiple ways to solve linear systems

PART 1 – Skills REVIEW

1. Graph each of the following lines on the same grid: $f(x) = 2x - 4$ and $g(x) = 5 - x$

Graphic Solution:	**Algebraic Verification ➔ Option #1 (Substitution)**
	Algebraic Verification ➔ Option #2 (Elimination)

2. Applying Linear Systems

Yasser is renting a car. Zeno Car Rental charges $45 for the rental of the car and $0.10 per kilometre driven. Erdos Car Rental charges $35 for the rental of the same car and $0.25 per kilometre driven. Which company should Yasser choose to rent the car from?
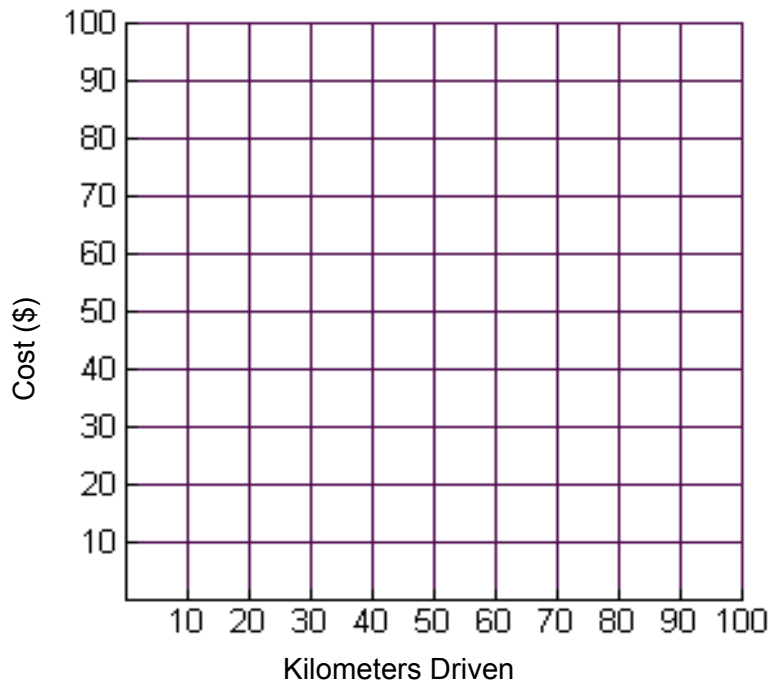
To solve the question, complete the table of values, and the graph.

Zeno

Distance (km)	Cost
0	
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	

Erdos

Distance (km)	Cost
0	
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	

Zeno vs. Erdos

Cost ($) vs. Kilometers Driven

a. How can the car rental cost and the cost per kilometre be used to draw the graph?

b. What is the point of intersection of the two lines? What does it represent?

c. Under what conditions is it best to rent from Zeno Car Rental?

d. Under what conditions is it best to rent from Erdos Car Rental?

3. **Applying Linear Systems**

The school is putting on the play "Algebra: The Musical". Adult tickets were sold at a cost of $8 and student tickets were sold at a cost of $5. A total of 220 tickets were sold to the premiere and a total of $1460 was collected from ticket sales.

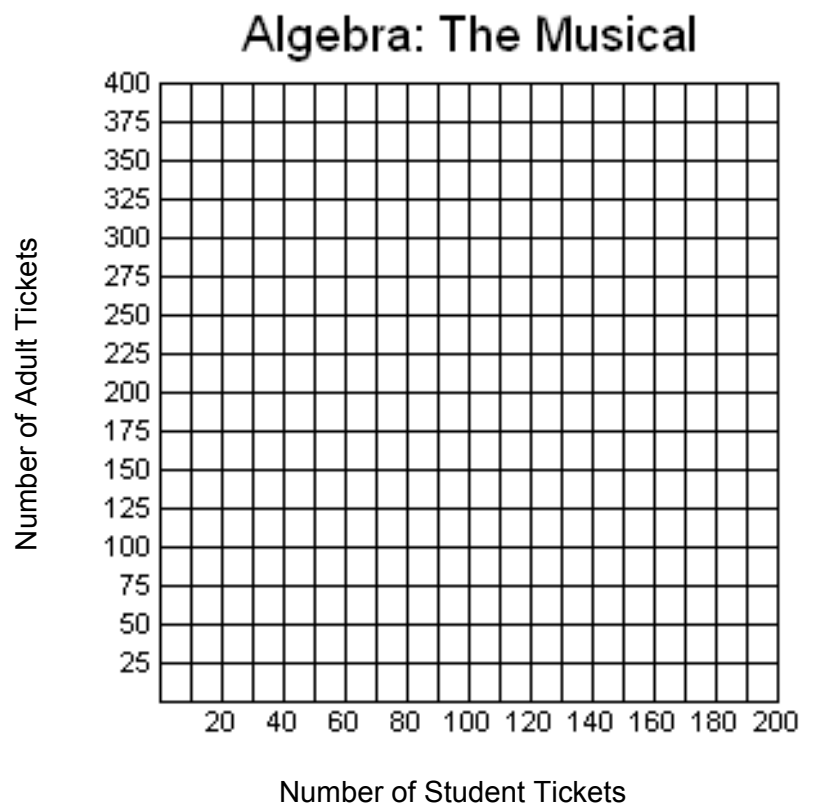How many adult and student tickets were sold to the premiere of the musical?

To solve the question complete the table of values, and the graph.

Let x represent the # of student tickets sold
Let y represent the # of adult tickets sold

x	y
0	
40	
80	
120	
160	
200	

x	y
0	
40	
80	
120	
160	
200	

Algebra: The Musical

(Graph with y-axis labeled "Number of Adult Tickets" ranging 25 to 400 in increments of 25, and x-axis labeled "Number of Student Tickets" ranging 20 to 200 in increments of 20.)
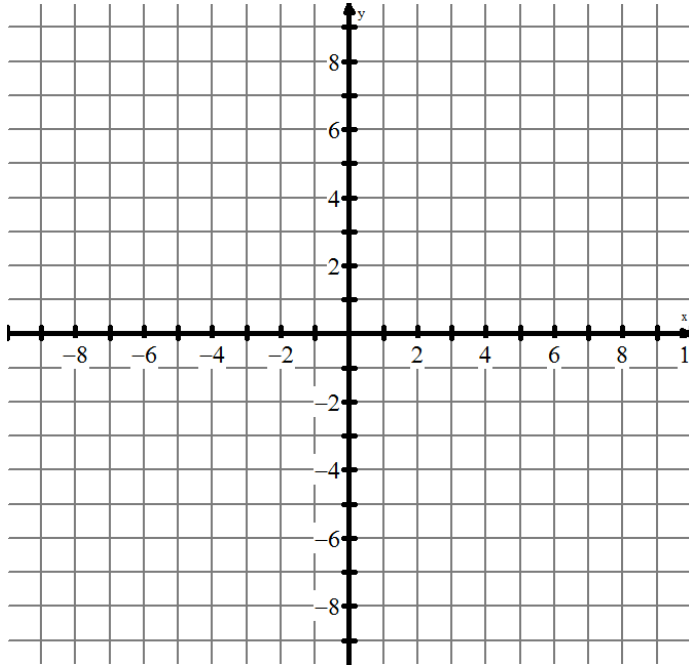
a. What is the approximate point of intersection of the two lines? What does it represent?

b. State a reasonable domain and range for this SCENARIO. Justify/defend your D/R.

4. Further Examples for Classwork

    a. Graph each of the following lines on the same grid: $y = -\dfrac{1}{3}x - 2$ and $6x + 3y = 24$
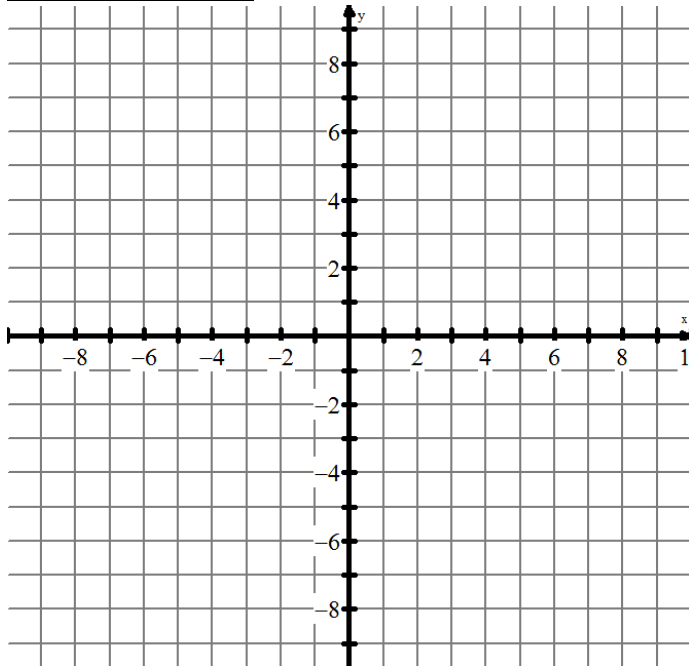
Graphic Solution:

Algebraic Verification → Option #1:

Algebraic Verification → Option #2:

    b. Graph each of the following lines on the same grid: $2x + 3y + 9 = 0$ and $-x - y - 2 = 0$

Graphic Solution:

Algebraic Verification → Option #1:

Algebraic Verification → Option #2:

PART 2 – Skills PRACTICE

1. Evaluate the following expressions given the functions below:

Given $g(x) = \frac{1}{4}(2)^{2x-3}$	Given $f(x) = x^2 + 7$	Given $j(x) = 2x + 9$
a. Evaluate $g(4) =$	**b.** Evaluate $f(3) =$	**c.** Evaluate $j(7) =$
d. Find x if $g(x) = 16$	**e.** Find x if $f(x) = 43$	**f.** Find x if $j(x) = 23$
g. $\dfrac{g(5)}{g(4)}$	**h.** $\left(f(5) - f(4)\right) - \left(f(4) - f(3)\right)$	**i.** $f\left(j(-4)\right)$

2. Guarantee Pool Repair Services charges $50 for a service call and $40/hour for labour. Oasis Pools and Spas charges $30 for a service call plus $45 for labour.

   a. Find the length of a service call for which both companies charge the same amount.
   b. Which company is "better"? Why?

3. Solve the linear system defined by the linear equations $4x + 2y = 10$ and $3y - 6x = 9$. Verify your answer using technology – your TI-84.

4. Regina is training for the upcoming cross country season. She needs to design a daily 45 minute workout using a combination of a stationary bike and a treadmill. To be in top shape, she should burn 400 calories in her workout. On a bike, she burns 8 cal/min and on the treadmill she burns 10 cal/min. How many minutes should she train on each piece of equipment?

5. Mr. S is exploring the relationship between the unemployment rates for men and women over the past 12 years.

   a. Draw a scatterplot. Does there appear to be a correlation between the unemployment rates of men and women? How do you know?

   b. Determine the equation of the line of best fit for the given data set.

Adult Males Unemployment Rate	Adult Females Unemployment Rate
2.9	4.0
6.7	7.4
4.9	5.0
7.9	7.2
9.8	7.9
6.9	6.1
6.1	6.0
6.2	5.8
6.0	5.2
5.1	4.2
4.7	4.0
4.4	4.4
5.8	5.2

Higher Level Extension Work