Concept: Linear Relations

Name:

COMPUTER COMPONENT

Instructions: In UMATH X follow the **Content Menu** path:

Graphing > **Linear Relations**

💻 Work through all Sub Lessons of the following Lessons **in order**:

- *What is a Linear Relation?*
- Graphs of Linear Relations
- *The Taxi Example*
- *The Elastic Example*
- *Lightning Example*
- *Basketball Example*
- *Lines of Best Fit*

Additional Required Materials: *Graph/Grid Paper*

✎ As you work through the computer exercises, you will be prompted to make notes in your notebook/math journal.

NOTES

A **Linear Relation** produces a graph, which is a ***straight*** line.

1. Record **Example 1**, *The Taxi Example*, below.

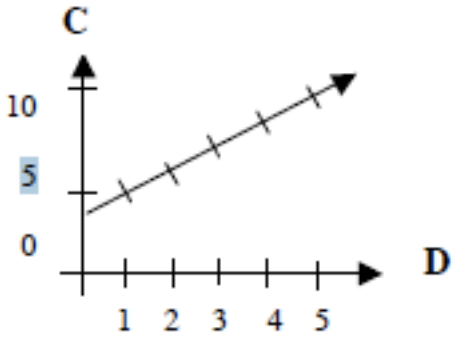
A Taxi charges a fixed fee of $4 plus $1 per kilometer.

➢ Pick 6 ordered pairs and complete the table below.

A chart/table helps us see patterns and find the equation of the relation.

Distance	Cost
0	4
1	5
2	6
3	7
4	8
5	9

➢ Plot the points on the graph below.



In general, **D**-0 and **C**-4 are called ***restrictions.***

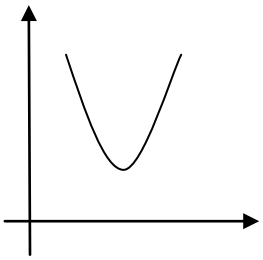
For the remaining **Examples**, fill in the table below.

Example	Can we join the points here?	Why or why not?
Elastic	***Yes***	***With restrictions, the elastic extends as more washers or parts of washers are added.***
Lightning	***Yes***	***We can stand at any given distance and expect that the time will increase in a predictable manner***
Basketball	***No***	***Only whole tickets may be sold in combinations of reserved and general admission.***

OFF COMPUTER EXERCISES

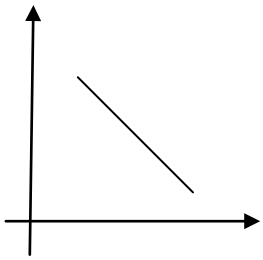
1. Classify each of the following graphs as **Linear** or **Non-Linear**.

(a)



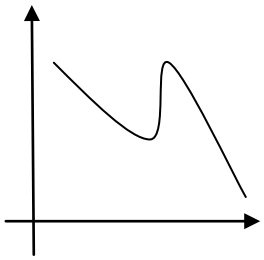
Nonlinear

(b)



Linear

(c)



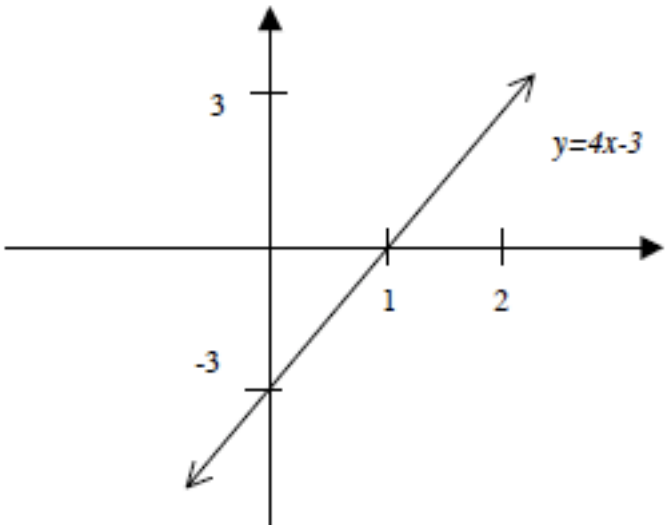
Nonlinear

2. You are given the equation y = 4x – 3

   - First fill in the following table.

x	-3	-2	-1	0	0.5	1	2	2.5	3
y	**-15**	**-11**	**-7**	**-3**	**-1**	**1**	**5**	**7**	**9**

   - Graph your results below.



(a) *Is the relation **Linear** or **Non-Linear**?* ***Linear Equation***

(b) Use your graph on grid paper to help you predict the point at which y is 3.

When y is 3, then x is ***9.***

(c) Use the equation to check the value of x, when y is 3.

$y = 4x - 3$ ***x = 1.5***

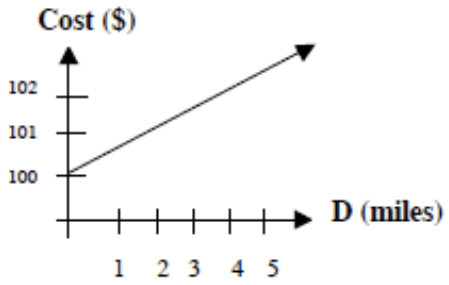
3. A Rent-A-Heap Car Rental Company charges a fixed fee of $100 per day plus an additional $0.50 for every mile driven.

A chart/table helps us see patterns.

- Pick 6 ordered pairs and complete the table below.

Distance	Cost
0	**100.00**
1	**100.50**
2	**101.00**
3	**101.50**
4	**102.00**
5	**102.50**

- Plot the points on the graph below.



The equation of the relation is ***linear.***

4. You are selling tickets to your High School musical.
The tickets for adults are $6 each and the tickets for students are $4 each.
If the total receipts from the musical amount to $2400, then complete the following.

(a) Let x represent the number of adult tickets sold at $6 per person.

Then, the total receipts from sales to adults are ***6x.***

(b) Let y represent the number of student tickets sold at $4 per person.

Then the total receipts from sales to students are ***4s.***

(c) The equation that represents the above situation is

6x + 4s = 2400

Complete the chart/table ordered pairs of the relation.

x	y	6x	4y	Total receipt
150	375	900	1500	2400
200	300	1200	1200	2400
250	225	1500	900	2400
300	150	1800	600	2400
350	75	2100	300	2400
400	0	2400	0	2400
0	600	0	2400	2400

NOTE: *You may need to add more points.*

- Use grid paper to accurately graph points, which represent the above situation.

NOTE: *Each point will represent another possibility for x (number of adults) & y (number of students) which will result in a receipt of $2400.*

(d) *Is it reasonable to join the points? (Thoughts)* _____

(e) Look for patterns on the graph. ***When x increases, then y decreases.***

NOTE: *You will require additional graph/grid paper for the following activities.*

5. Follow the instructions for each of the following equations (which represent relations.)

- Make a table of values.
- Plot/draw the corresponding graph on grid paper
- In each case, use ¯2, ¯1, 0, 1, 2 for the x-coordinates.

Part 1:

On the same set of axis, graph each of the following…

(a) $y = 2x + 1$
(b) $y = 2x + 3$
(c) $y = 2x + 5$
(d) $y = 2x - 4$
(e) $y = 2x - 6$

Analysis: *How are the above graphs alike?* ***Parallel lines are generated.***

Analysis: *How are the above graphs different?* ***Each line has a unique y-intercept.***

Part 2:

On the same set of axis, graph each of the following…

(a) $y = x + 2$
(b) $y = -3x + 2$
(c) $y = 5x + 2$
(d) $y = 4x + 2$
(e) $y = -2x + 2$

Analysis: *How are the above graphs alike?* ***Each line has the same y- intercept.***

Analysis: *How are the above graphs different****? Each line has a unique slope, with some positive and some being negative in value.***