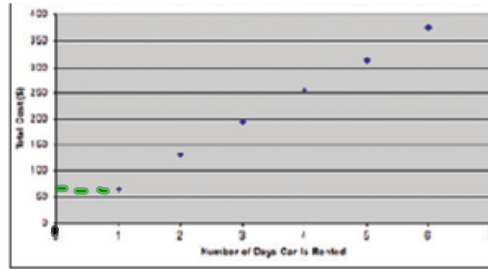


Lesson 5: Properties of Linear Relations

Scheduled Review

To rent a car for less than one week from Ace Car Rentals, the cost is \$65 per day for the first three days, then \$60 a day for each additional day.

Number of Days Car Is Rented	Total Cost (\$)
1	65
2	130
3	195
4	255
5	315
6	375



1. Why are the points on the graph not joined?

Discrete : we can't rent a car for $\frac{1}{2}$ a day.

2. Is this relation a function? How can you tell?

Vertical lines hit 1 or 0 dots.

3. What is the domain? What is the range?

$D: \{1, 2, 3, 4, 5, 6\}$ $R: \{65, 130, 195, 255, 315, 375\}$

In the workplace, a person's gross pay, P dollars, often depends on the number of hours worked, h . So we say P is the dependent variable. Since the number of hours worked, does not depend on the gross pay, P , we say that h is the independent variable.

independent variable x	Hours Worked, h	Gross Pay, P (\$) ← dependent variable y
domain	1	12
	2	24
	3	36
	4	48
	5	60
		range

If we work more hours we get paid more \$\$\$.

A table of values usually represents a sample of the ordered pairs in a relation.

The values of the independent variable are listed in the first column of a table of values. These elements belong to the domain.

The values of the dependent variable are listed in the second column of a table of values. These elements belong to the range.

Lesson 5: Properties of Linear Relations

4.3 Demonstrate an understanding of slope with respect to • rise and run • line segments and lines • rate of change • parallel lines • perpendicular lines.

The cost for a car rental is \$60, plus \$20 for every 100 km driven. The independent variable is the distance driven and the dependent variable is the cost.

Linear: straight line.

■ a table of values

Independent variable	Distance (km)	Cost (\$)	Dependent variable
	0	60	
+100	100	80	+20
+100	200	100	+20
+100	300	120	+20
+100	400	140	+20

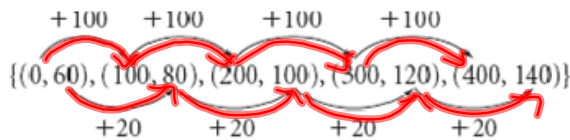
* if we drive more 1km it costs more \$\$\$

For a linear relation, a constant change in the independent variable results in a constant change in the dependent variable

* Our distance increases by the same amount each time

Cost increases by same amount each time ∴ linear.

■ a set of ordered pairs



■ a graph



We can use each representation above to calculate the **rate of change** = Slope

The rate of change can be expressed as a fraction:

$$\frac{\text{change in dependent variable}}{\text{change in independent variable}} = \frac{\$20}{100 \text{ km}} = \$0.20 / \text{km}$$

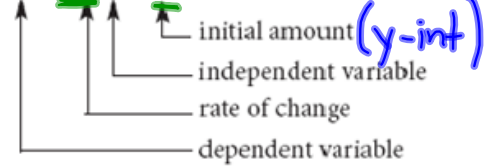
$$\frac{\Delta y}{\Delta x} = \frac{80 - 60}{100 - 0} = \frac{20}{100} = \underline{\underline{\$0.20 / \text{km}}}$$

We can determine the rate of change from the equation that represents the linear function.

Let the cost be C dollars and the distance driven be d kilometres.

An equation for this linear function is:

$$C = 0.20d + 60$$



* The number in front of the variable is the rate of change/Slope.

Which table of values represents a linear relation? Justify your answer

a) The relation between temperature in degrees Celsius, C , and temperature in degrees Fahrenheit, F

C	F
0	32
5	41
10	50
15	59
20	68

Linear

b) The relation between the current, I amps, and power, P watts, in an electrical circuit

I	P
0	0
5	75
10	300
15	675
20	1200

> these are different
∴ not linear

a) Graph each equation.
 i) $y = -3x + 25$
 ii) $y = 2x^2 + 5$
 iii) $y = 5$
 iv) $x = 1$
 b) Which equations in part a represent linear relations?
 How do you know?

y_{int}

Linear

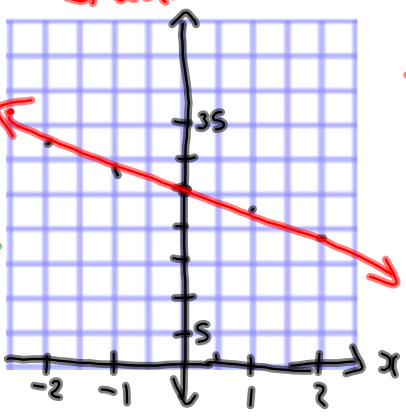
Not linear
2nd

Window

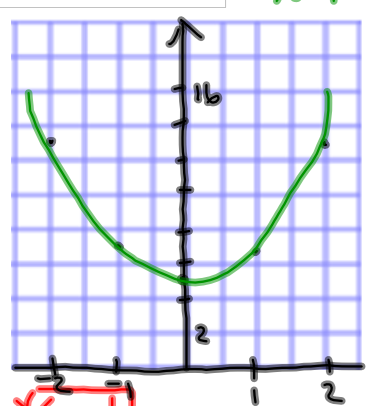
Tblstart = 0

$\Delta Tbl = 0.5$

x	y
-2	31
-1	28
0	25
1	22
2	19

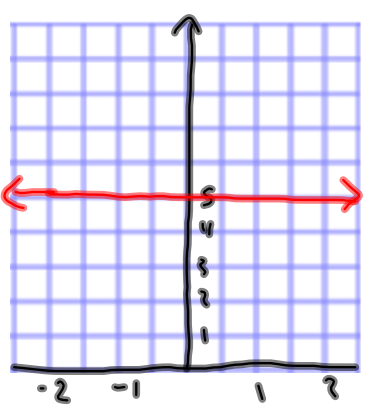


x	y
-2	13
-1	7
0	5
1	7
2	13

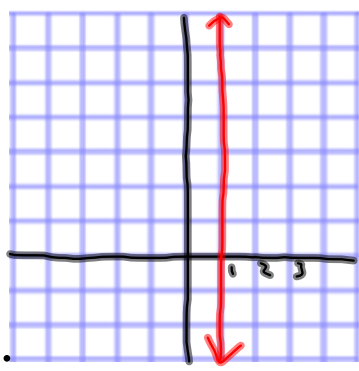


2nd Graph

x	y
-2	5
-1	5
0	5
1	5
2	5



x	y
1	



Which relation is linear? Justify the answer.

- a) A new car is purchased for \$24 000. Every year, the value of the car decreases by 15%. The value is related to time.
- b) For a service call, an electrician charges a \$75 flat rate, plus \$50 for each hour he works. The total cost for service is related to time.

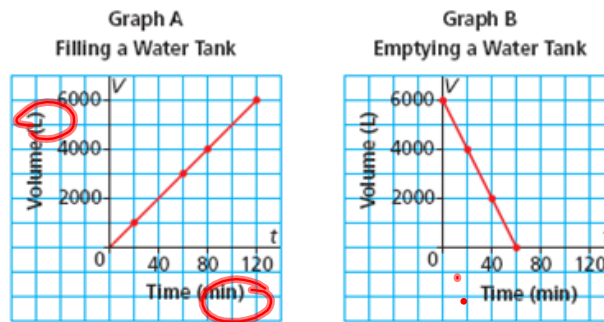
a

Time (years)	Value (\$)
0	24 000
1	20 400
2	17 340
3	14 739

b

Time (h)	Cost (\$)
0	75
1	125
2	175
3	225
4	275

A water tank on a farm near Swift Current, Saskatchewan, holds 6000 L.
Graph A represents the tank being filled at a constant rate.
Graph B represents the tank being emptied at a constant rate.



- a) Identify the independent and dependent variables.
b) Determine the rate of change of each relation, then describe what it represents.

Rate of change = $\frac{\Delta y}{\Delta x} = \frac{3000 - 1000}{60 - 20}$

Slope.

= $\frac{2000 \text{ L}}{40 \text{ min}} = 50 \text{ L/min}$

Rate of change = $\frac{\Delta y}{\Delta x} = \frac{2000 - 0}{40 - 60}$

= $\frac{2000}{-20}$

= -100 L/min