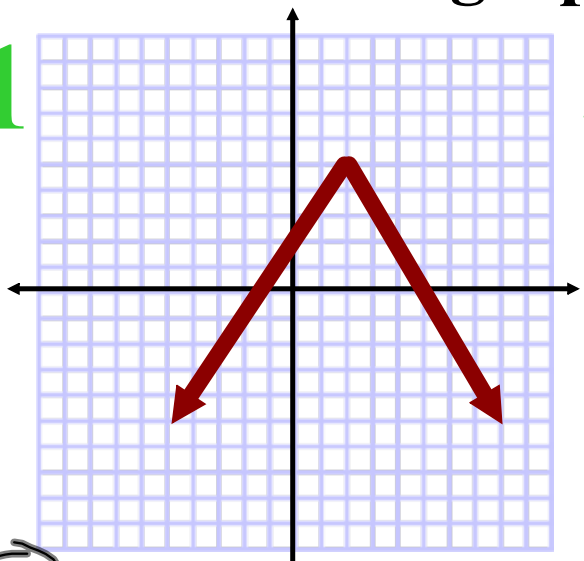
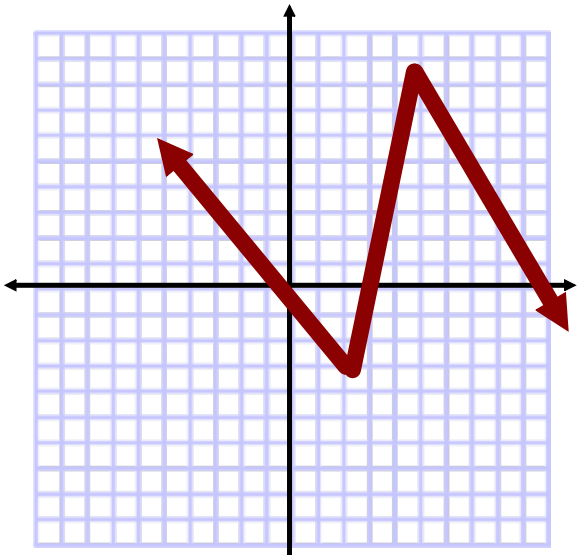
Properties of Linear Relations

Which graph is linear?

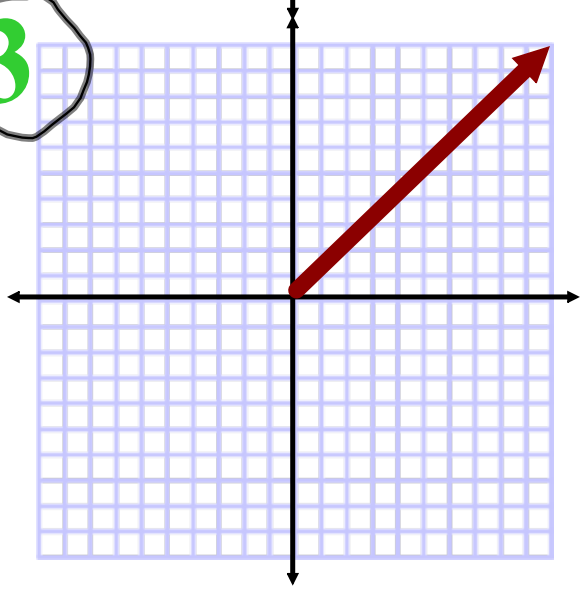
1



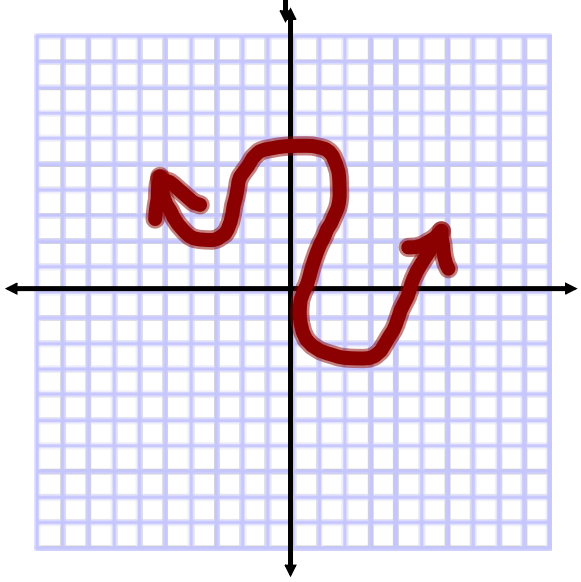
2



3



4



Number of Extra Toppings	Cost ($)
0	12.00
1	12.75
2	13.50
3	14.25
4	15.00
5	15.75

a) What patterns do you notice in the table above?

b) Graph the following relation.

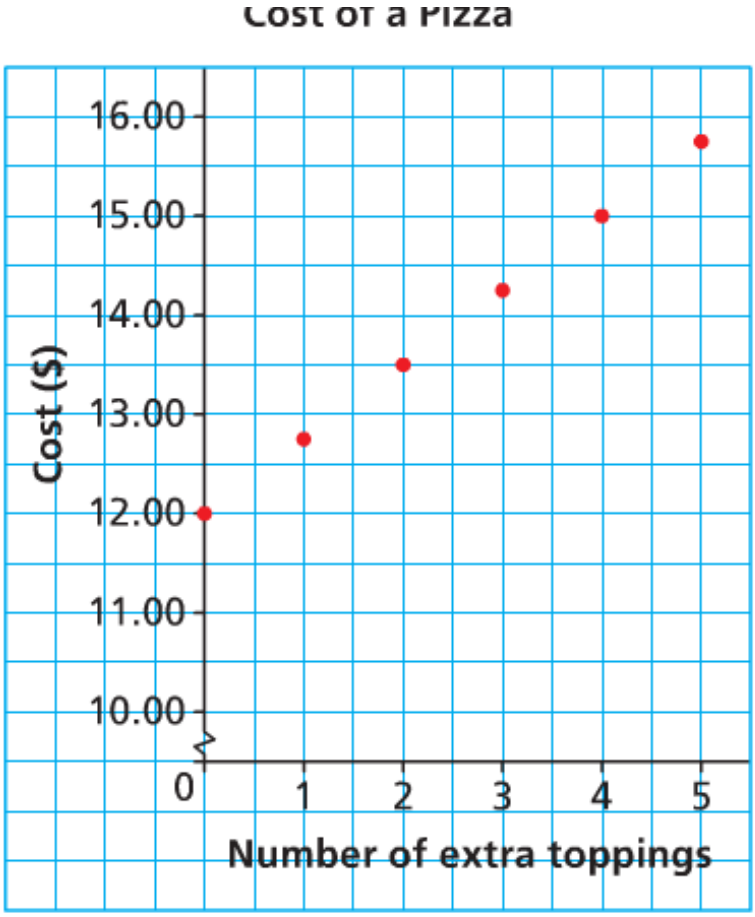
a)

Number of Extra Toppings	Cost ($)
0	12.00
1	12.75
2	13.50
3	14.25
4	15.00
5	15.75

+1 +0.75
+1 +0.75
+1 +0.75
+1 +0.75
+1 +0.75

Both sets are increasing by a constant amount !!

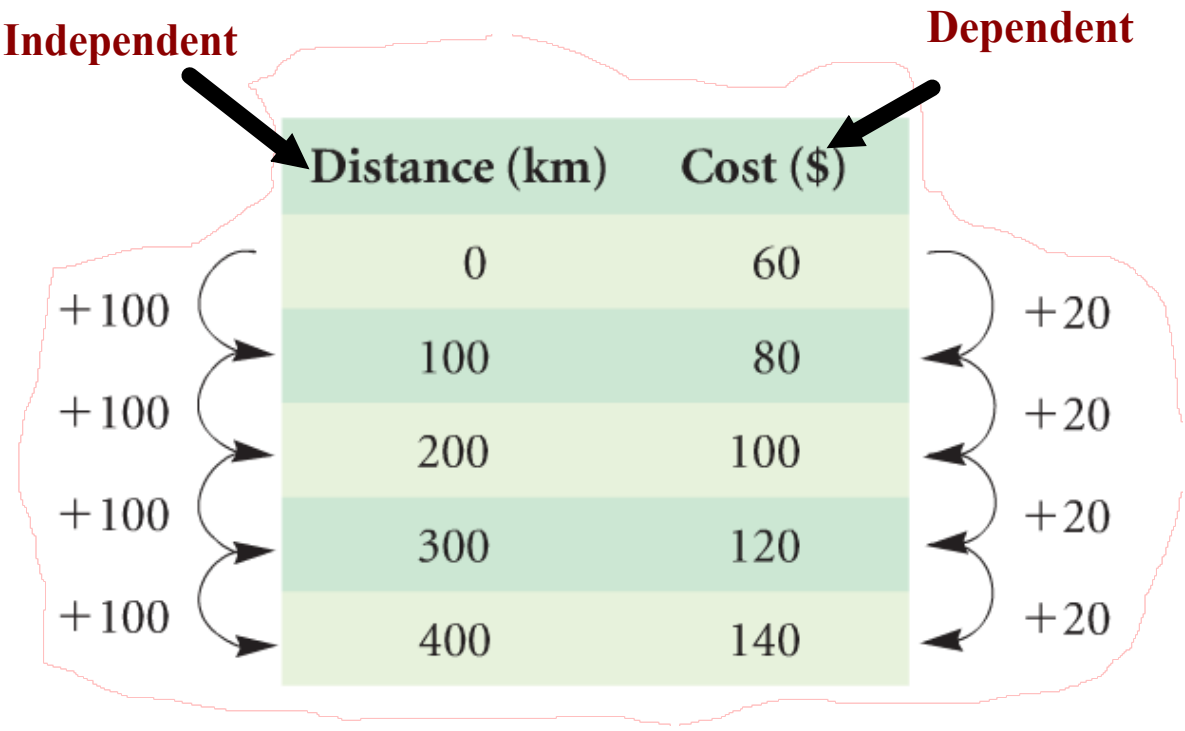
Therefore, this is a linear function !!


Cost of a Pizza
16.00
15.00
14.00
13.00
12.00
11.00
10.00
Cost ($)
0
1
2
3
4
5
Number of extra toppings

There are many ways to determine if a relation is a linear function!!

A table of values:

Distance (km)	Cost ($)
0	60
100	80
200	100
300	120
400	140

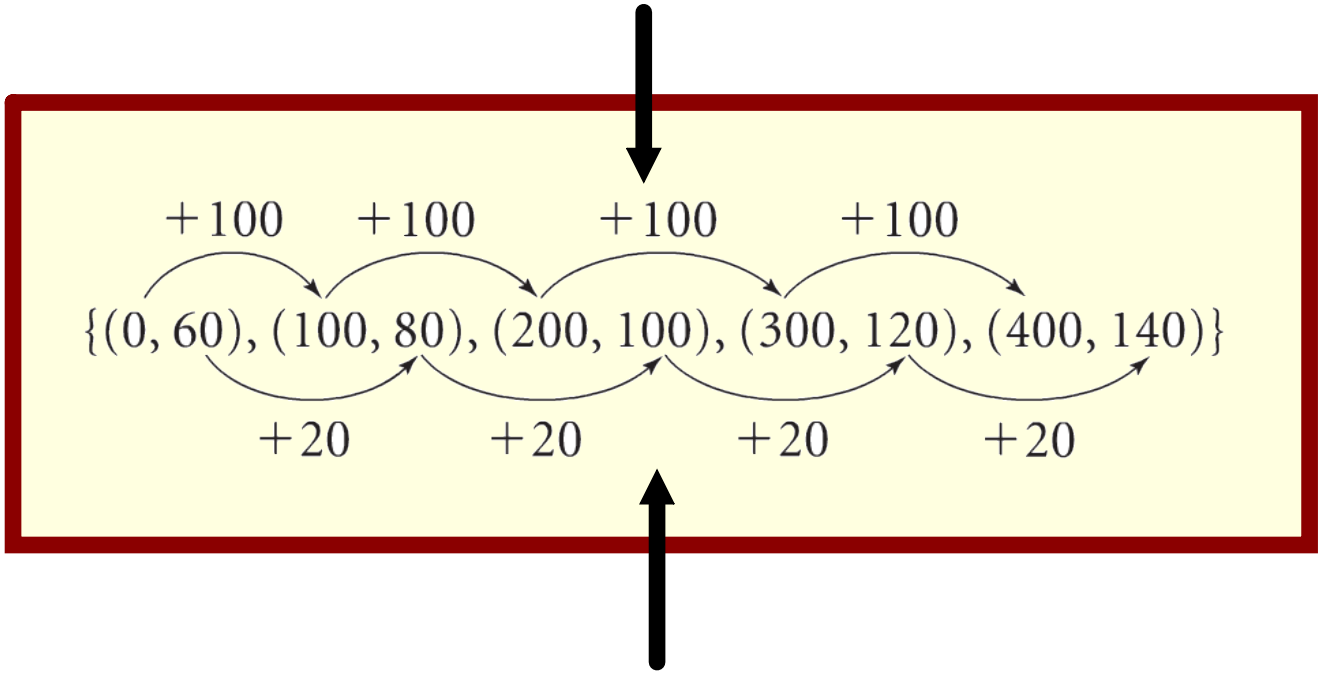


A constant change in the independent results in a constant change in the dependent

Set of Ordered Pairs:

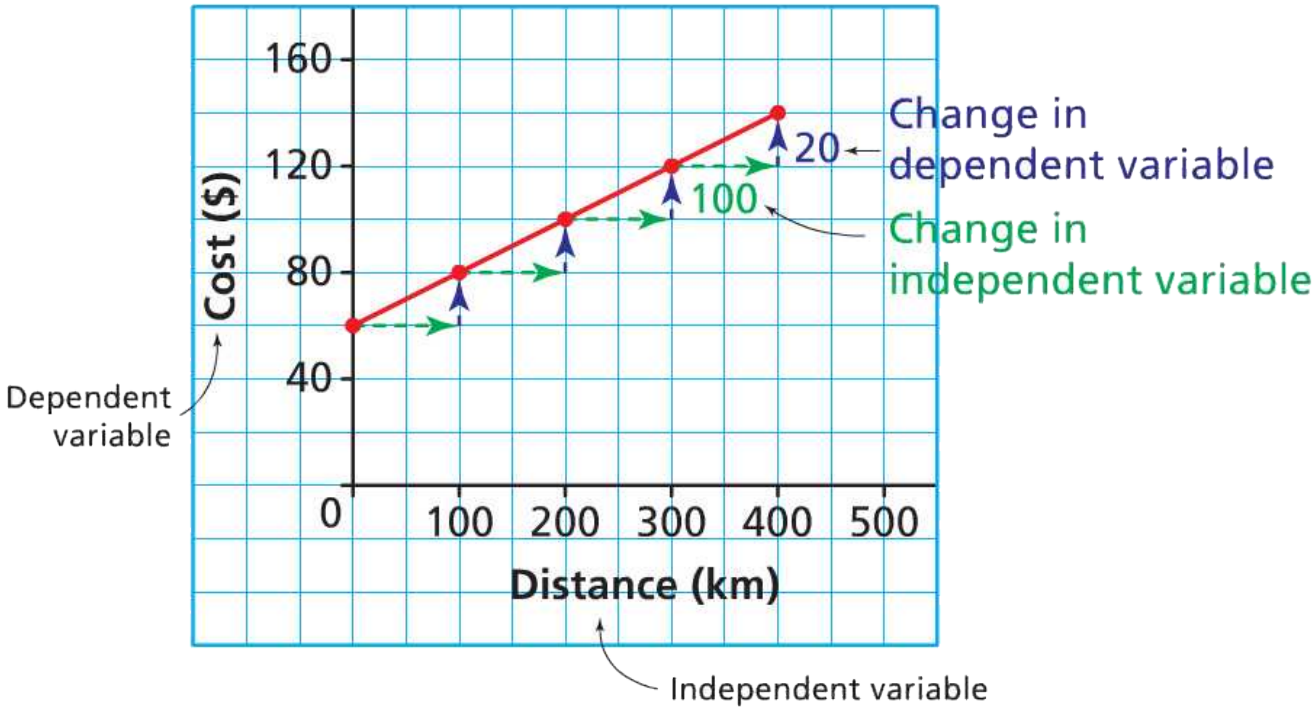
$$\{(0, 60), (100, 80), (200, 100), (300, 120), (400, 140)\}$$

Change in Independent



Change in Dependent

a graph:


160
120
80
40
0
Cost ($)
100
200
300
400
500
Distance (km)
20
100
Change in dependent variable
Change in independent variable
Dependent variable
Independent variable

Which of the following Represents a Linear Function?

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

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

c) The relation between the number of bacteria in a culture, n, and time, t minutes.

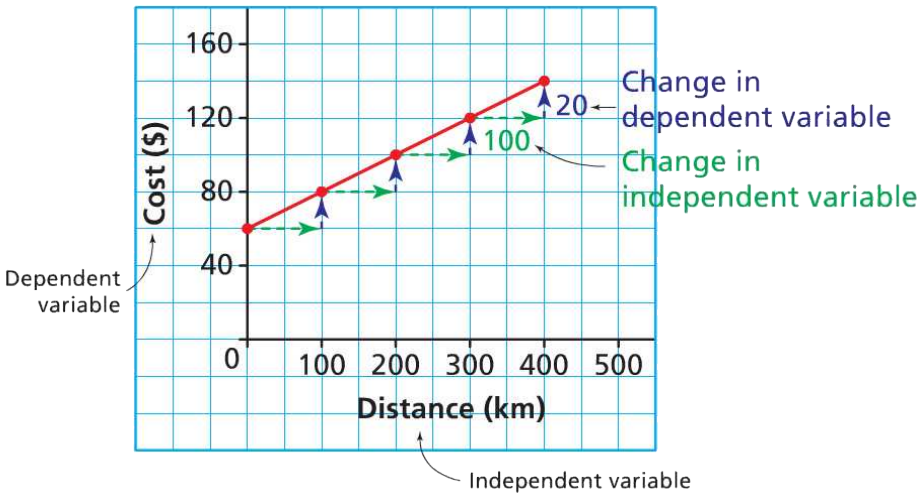
t	n
0	1
20	2
40	4
60	8
80	16
100	32

d) The relation between the amount of goods and services tax charged, T dollars, and the amount of the purchase, A dollars

A	T
60	3
120	6
180	9
240	12
300	15

Rate of Change

$$\text{Rate of Change} = \frac{\text{Change in Dependent}}{\text{Change in Independent}}$$

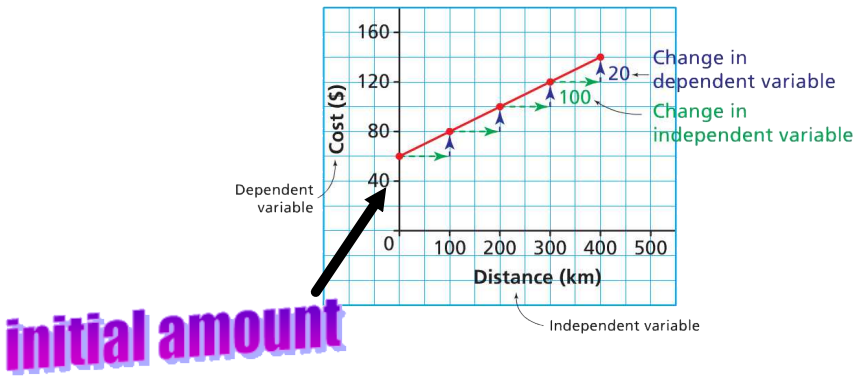


$$\text{Rate of Change} = \frac{\text{Change in Dependent}}{\text{Change in Independent}}$$

$$= \frac{\$20}{100\text{km}}$$

$$= \$0.20/\text{km}$$

Writing an Equation



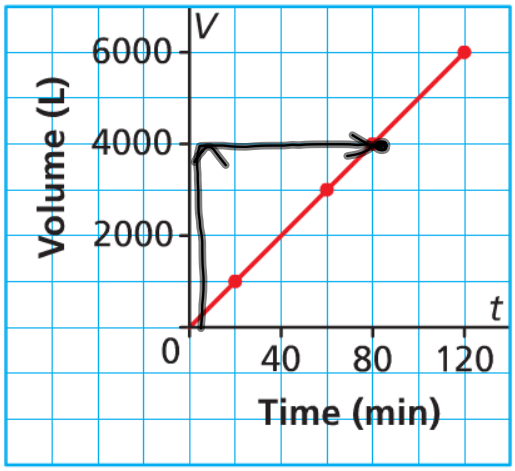
$$C = 0.20d + 60$$

- 60 — initial amount
- d — independent variable
- 0.20 — rate of change
- C — dependent variable

Calculate the Rate of Change

a) Graph A

Filling a Water Tank



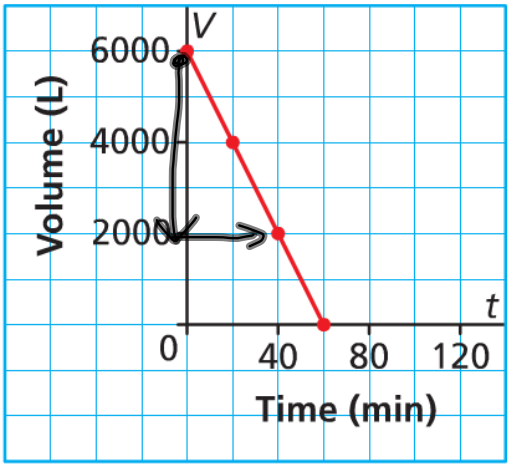
$\frac{4000}{80}$

$= 50$ L/min

$V = 50m + 0$

b) Graph B

Emptying a Water Tank



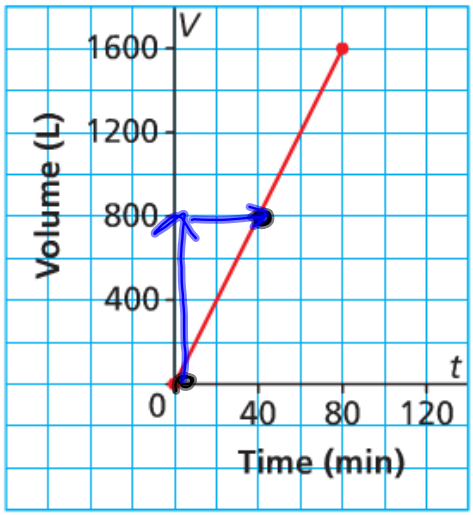
$\frac{-4000}{40}$

-100 L/min

$V = -100m + 6000$

c)

Graph A
Filling a Hot Tub



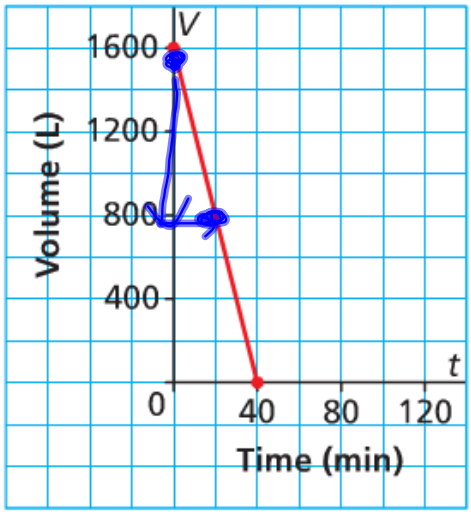
$\frac{800}{40}$

$= 20$ L/min

$V = 20m + 0$

d)

Graph B
Emptying a Hot Tub



$\frac{-800}{20}$

$= -40$ L/min

$V = -40m + 1600$

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#3, #4, #5, #7