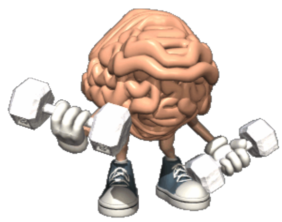
Warm Up



1) $t(x) = 3x^2 + 5$ $p(x) = \dfrac{-3x - 1}{2}$

a) Evaluate
$p(-5) \times t(4)$

b) Evaluate
$p(t(-2))$

c) Evaluate
$p(x) = -17$

d) Evaluate
$t(x) = 113$

$t(x) = 3x^2 + 5$

$p(x) = \dfrac{-3x - 1}{2}$

a) Evaluate

p(-5) x t(4)

$p(-5) = \dfrac{-3(-5) - 1}{2}$

$= \dfrac{(+15) - 1}{2}$

$= \dfrac{14}{2}$

$\boxed{p(-5) = 7}$

$t(4) = 3(4)^2 + 5$

$= 3(16) + 5$

$= 48 + 5$

$\boxed{t(4) = 53}$

$p(-5) \times t(4)$

$= 7 \times 53$

$= 371$ Final Answer

b) Evaluate

p(t(-2))

$t(-2) = 3(-2)^2 + 5$

$= 3(4) + 5$

$= 12 + 5$

$= 17$

$p(17) = \dfrac{-3(17) - 1}{2}$

$= \dfrac{-51 - 1}{2}$

$= \dfrac{-52}{2}$

$= \boxed{-26}$

1) $t(x) = 3x^2 + 5$　　　　$p(x) = \dfrac{-3x - 1}{2}$

c) Evaluate
$p(x) = -17$

$$-17^{\times 2} = \frac{-3x - 1}{2} \times 2$$

$$-34^{+1} = -3x - 1 + 1$$

$$\frac{-33}{-3} = \frac{-3x}{-3}$$

$$\boxed{+11 = x}$$

d) Evaluate
$t(x) = 113$

$$113^{-5} = 3x^2 + 5^{-5}$$

$$\frac{108}{3} = \frac{3x^2}{3}$$

$$36 = x^2$$

$$\sqrt{36} = \sqrt{x^2}$$

$$\boxed{\pm 6 = x}$$

Linear Relationships

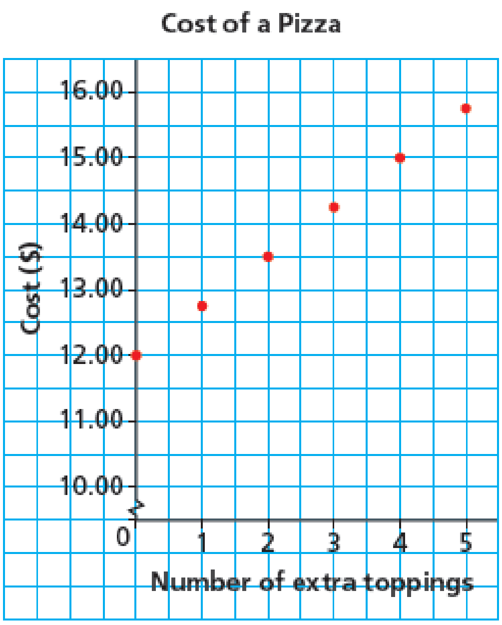
The table of values and graph show the cost of a pizza with up to 5 extra toppings.

Independent x / y dependent

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   0.75

Graph



What is the independent variable?
# of Extra toppings

What is the dependent variable ?
cost

depends on distance

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

We can identify that this is a linear relation in different ways.

Make

- a table of values

let x represent every 100 km

↳ We depend on distance

$$C = 60 + \frac{20}{1}x$$

$$C = 20x + 60$$

distance, x	cost, \$, y
0	60
100	80

+20

Graph is on 2 slides over

- a table of values

Independent variable → Distance (km); Dependent variable → Cost ($)

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

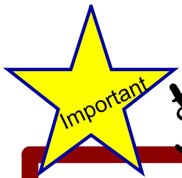
100, 100, 100, 100

20, 20, 20, 20

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

$= \$0.20/$ Km

Rate of Change



Study

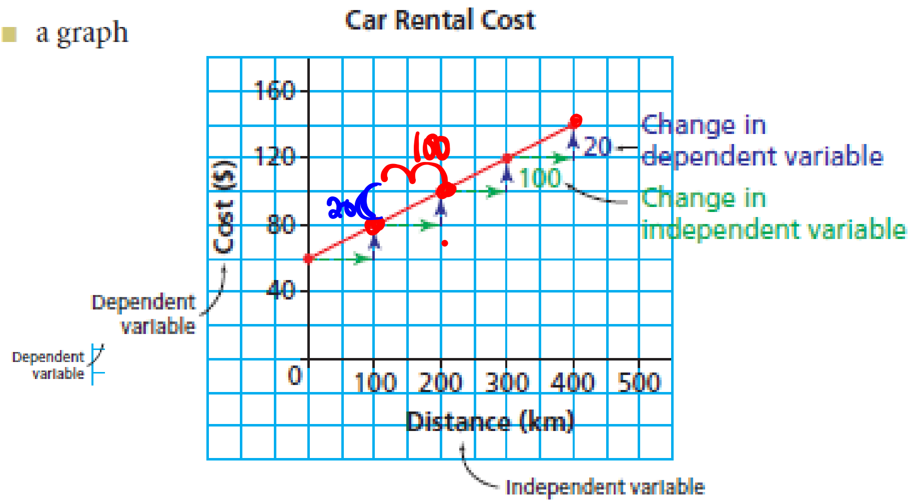
$$\text{rate of change} = \frac{\text{change in dependent variable } (y)}{\text{change in independent variable } (x)} = \frac{\text{rise}}{\text{run}} = \frac{\$20}{100\text{ km}}$$

Rate of change for this question is $0.20/km

We can use each representation to calculate the **rate of change**.

Rate of Change $= \dfrac{\text{change } y}{\text{change } x}$

- a graph



The rate of change can be expressed as a fraction:

Important

Rate of Change $= \dfrac{\text{change in dependent}}{\text{change in independent}} = \dfrac{\text{rise}}{\text{run}}$

.

The rate of change is $0.20/km; that is, for each additional 1 km driven, the rental cost increases by 20¢. The rate of change is constant for a linear relation.

The cost of just renting a car is $60.00

Example 2 Determining whether an Equation Represents a Linear Relation

a) Graph each equation.

i) $y = -3x + 25$

dep Ind

SOLUTION

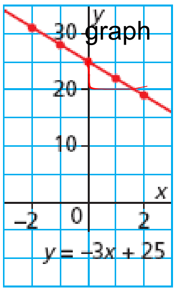
a) Create a table of values, then graph the relation.

i) $y = -3x + 25$

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

+1 +1 +1 +1

-3 -3 -3 -3



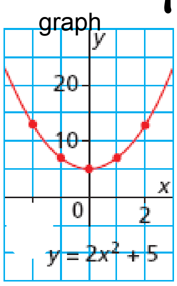
$\text{Rate} = \frac{-3}{+1} = -3$

Example 2 Determining whether an Equation Represents a Linear Relation

ii) $y = 2x^2 + 5$

	x	y	
+1	−2	13	−6
+1	−1	7	−2
+1	0	5	+2
+1	1	7	+6
	2	13	

graph



Not Linear

$y = 2x^2 + 5$

$2(-2)^2 + 5$

$2(4) + 5$

$8 + 5$

13

$y = 2(0)^2 + 5$

$2(0) + 5$

$0 + 5$

$y = 2x^2 + 5$

$2(-1)^2 + 5$

$2(1) + 5$

$2 + 5$

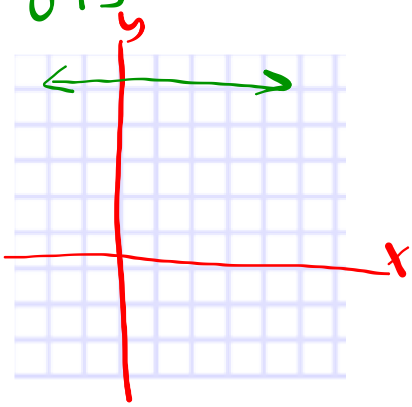
7

iii) $y = 5$

x	y
0	5
1	5
2	5

graph

linear



Example 2 Determining whether an Equation Represents a Linear Relation

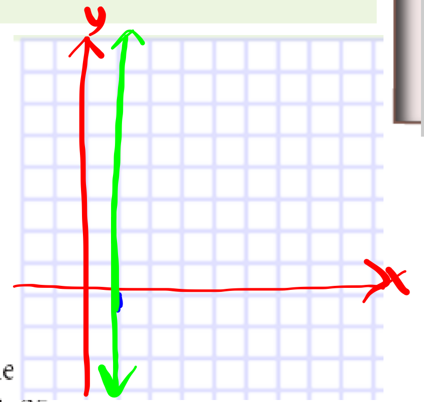
iv) $x = 1$

x	y
1	1
1	2
1	3

graph

Yes

linear



NOTICE

b) The graphs in parts i, iii, and iv are straight lines, so the equations represent linear relations; that is, $y = -3x + 25$, $y = 5$, and $x = 1$.

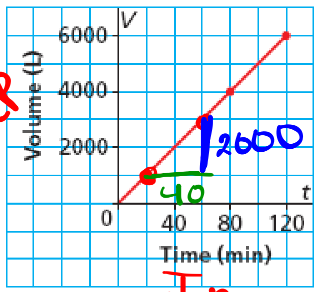
The graph in part ii is not a straight line, so its equation does not represent a linear relation.

Example 4 Determining the Rate of Change of a Linear Relation from Its Graph

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.

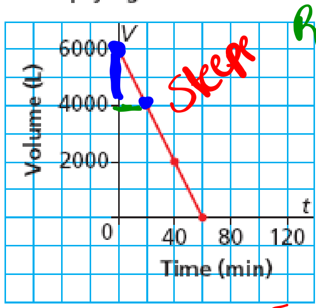
$$\text{Rate} = \frac{\text{change } y}{\text{change } x}$$

Graph A
Filling a Water Tank



In

Graph B
Emptying a Water Tank



$$R = \frac{2000\,L}{20\,min} = 100\,L/min$$

Empties at 100 L in one min

a) Identify the independent and dependent variables.

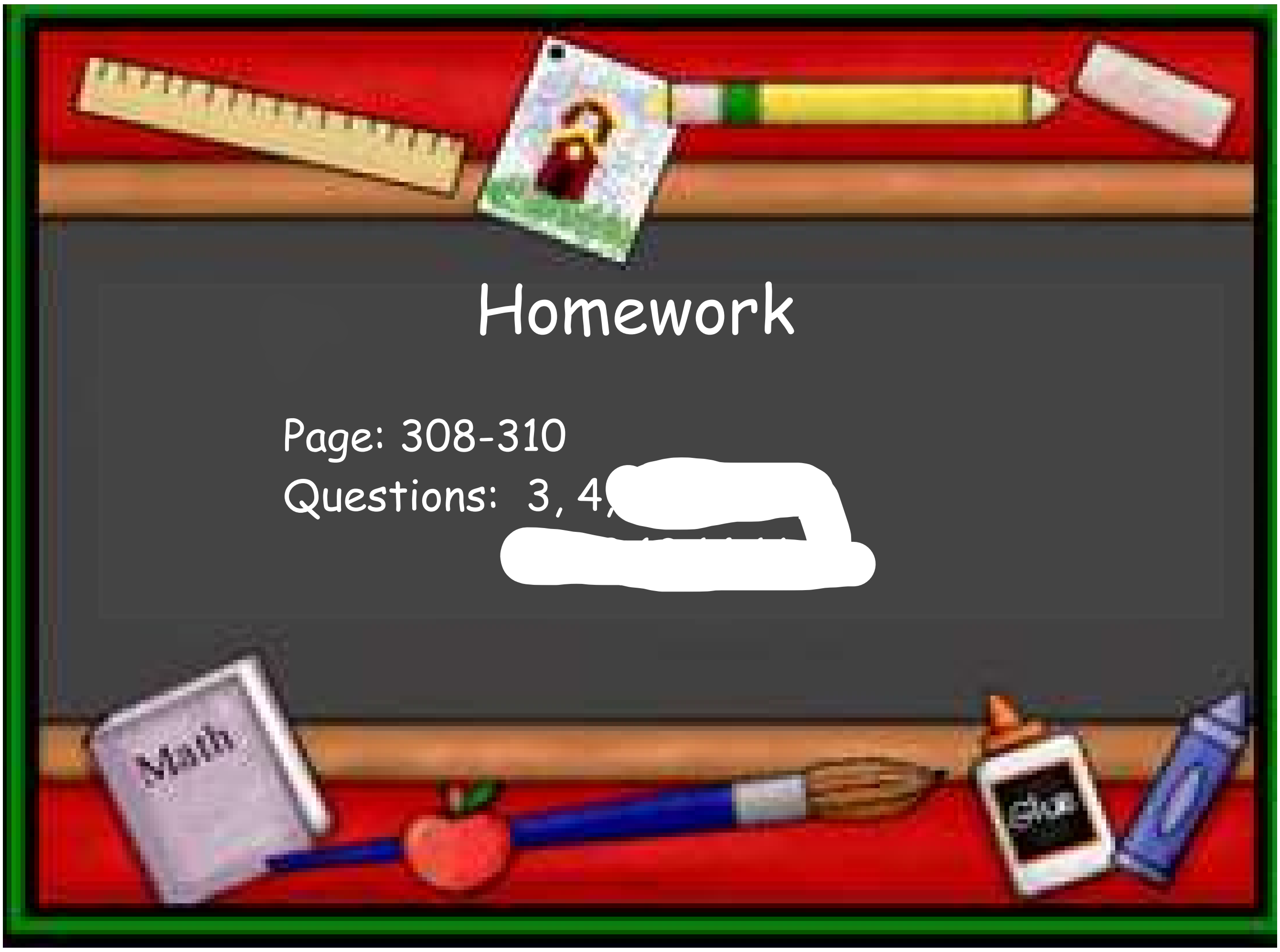
Time D Volume

b) Determine the rate of change of each relation, then describe what it represents.

graph 1 $\text{Rate} = \dfrac{2000\,L}{40\ min}$

$= 50\,L/min$

I am filling 50 L in 1 min


Homework
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