Equations Review

$\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$

EQUATIONS REVIEW I
Lesson Notes

Example 1 Simple Equations

a) $a - 7 = 12$

$+7 \quad +7$

$a = 19$

b) $m - 9 = -7$

c) $16r = 24$

$\overline{16} \quad \overline{16}$

$r = \frac{3}{2}$ or 1.5

d) $27 = -9x$

Example 2 Simple Equations

a) $6p + 12 = 24$

$-12 \quad -12$

$\frac{6p}{6} = \frac{12}{6}$

$p = 2$

b) $4 = 3k + 16$

c) $9 + k = 1 + 3k$

$-k \quad -k$

$9 = 1 + 2k$

$-1 \quad -1$

$\frac{8}{2} = \frac{2k}{2}$

$k = 4$

d) $8 - 3n = -8n + 23$

EQUATIONS REVIEW I
Lesson Notes

Equations Review

$$\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$$

Example 3

Simple Equations

a) $-2(a - 1) = 3a + 7$

b) $x - 2(3x + 1) = 8$

$x - 6x - 2 = 8$

$-5x - 2 = 8$

$+2 \quad +2$

$-5x = 10$

$\overline{-5} \quad \overline{-5}$

$x = -2$

c) $5 - x = 4 + (2x - 2)$

d) $3x - (x - 1) = 1 - (3x - 9)$

Example 4

Cross Multiplication

a) $\frac{6}{x} = \frac{2}{3}$

b) $\frac{-3}{\cancel{5}} = \frac{x}{\cancel{2}}$

$\sqrt{5 \times 2}$

$-6 = 5x$

$\overline{5} \quad \overline{5}$

$x = \frac{-6}{5}$

c) $\frac{x}{2} = 9$

d) $\frac{4}{\cancel{x}} = -12$

$\cdot x$

$4 = -12x$

$\overline{-12} \quad \overline{-12}$

$x = \frac{4}{-12}$

Equations Review

$$\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$$

EQUATIONS REVIEW I
Lesson Notes

Example 5

Cross Multiplication

a) $\frac{1}{3}^{\times 3}x = -3^{\times 3}$

$1x = -9$

b) $-\frac{5}{\cancel{x}} = \frac{20}{\cancel{3}}$

$\times 3 \cdot x \quad 3 \cdot x$

$\frac{-15}{20} = \frac{20x}{20}$

$x = \frac{-15}{20}$

c) $\frac{x+1}{\cancel{2}}^{\times 2} = 4^{\times 2}$

$x + 1 - 1 = 8 - 1$

$x = 7$

d) $\frac{3}{2}(x - 4) = 6$

EQUATIONS REVIEW I
Lesson Notes

Equations Review $\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$

Example 6 Cross Multiplication

a) $-2 = \dfrac{-9 - a}{4 - (-3)}$

b) $-\dfrac{5}{4} = \dfrac{-2 - 3}{a - (-3)}$

c) $\frac{8 - 5}{-4 - (-9)} = \frac{1 - (-5)}{a - (-4)}$

Can use as challenge.

Nope

!!

d) $-7 - a = \frac{6 - (-3)}{1 - 5}$

EQUATIONS REVIEW II
Lesson Notes

Equations Review

$\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$

Example 7 Lowest Common Multiple (LCM)

a) $\overset{\times 7}{3} + \frac{x}{7}^{\times 7} = \frac{3}{2}^{\times 7}$

$21 = x \qquad 21 = 7$

$\overset{\times 2}{21} + \overset{\times 2}{x} = \frac{21}{\cancel{2}}^{\times 2}$

$\overset{-42}{42} + 2x = \overset{-42}{21}$ $\qquad \frac{2x}{2} = \frac{-21}{2}$ $\qquad x = -\frac{21}{2}$

b) $\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$

c) $\frac{3}{4}x - \frac{3}{2} = 1$

d) $\frac{2}{5} - \frac{1}{10} = \frac{x}{2}$

EQUATIONS REVIEW II
Lesson Notes

Equations Review

$$\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$$

Example 8 Lowest Common Multiple (LCM)

a) $\frac{3}{4}x + \frac{3}{2}x - 6 = 0$

Challange

b) $\frac{x - 1}{2} - \frac{x + 2}{7} = 2$

Equations Review

$$\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$$

c) $\frac{x-1}{3} + 1 = \frac{x}{2}$

d) $2x + 5 = -\frac{3}{4}(x + 8)$

EQUATIONS REVIEW II

Lesson Notes

Equations Review

$$\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$$

Example 9

Cross Multiply or LCM?

a) $\frac{2x}{\cancel{3}} \times \cancel{3} = 4 \times 3$

$$\frac{2x}{2} = \frac{12}{2}$$

$$x = 6$$

b) $\frac{2}{\cancel{3}} \times 3 \times 4 - \frac{x}{\cancel{4}} \times 3 \times 4 = 1 \times 3 \times 4$

$$8 - 3x = 12$$
$$-8 \qquad -8$$

$$\frac{-3x}{-3} = \frac{+4}{-3}$$

$$x = -\frac{4}{3}$$

c) $\frac{2}{3}(x - 2) = x - 1$

d) $\frac{x - 1}{3} + 1 = \frac{x}{2}$

EQUATIONS REVIEW II

Lesson Notes

Equations
Review
$\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$

Example 10

Isolate y

a) $4x - 2y + 9 = 0$

$-4x \qquad -4x$

$-2y + 9 = -4x - 9$

$\frac{-2y}{-2} = \frac{-4x - 9}{-2}$

$y = \frac{-4x - 9}{-2}$

b) $y + 5 = \frac{1}{2}(x - 1)$

Equations Review $\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$

EQUATIONS REVIEW II
Lesson Notes

c) $y - 7 = -\frac{10}{9}(x + 4)$

d) $\frac{3}{4}x - \frac{3}{2}y - 6 = 0$

EQUATIONS REVIEW II
Lesson Notes

Equations Review

$$\frac{5}{2}x + \frac{2}{3} = \frac{1}{6}$$

Example 11 General Form: $Ax + By + C = 0$

a) $y = -\frac{2}{3}x + 5$

Not yet till later

b) $y - 2 = \frac{3}{4}(x + 1)$

c) $y + 1 = -\frac{1}{7}(x - 3)$

Example 12 Plugging in Numbers

a) $y = -\frac{1}{4}x + 3$

(x = 8, y = ?)

$y = \frac{-1}{4}(8) + 3$ $\quad y = -2 + 3$

$y = 1$

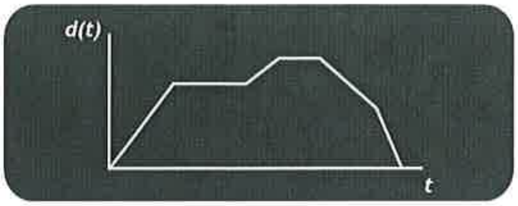
b) $y + 3 = -\frac{1}{2}(x - 5)$

(x = ?, y = -5)

c) $\frac{3}{4}x - \frac{3}{2}y - 6 = 0$

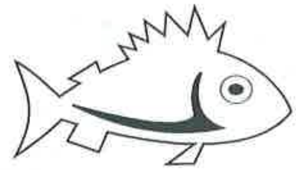
(x = ?, y = 8)

Key



Relations and Functions
LESSON FIVE - *Interpreting Graphs*
Lesson Notes

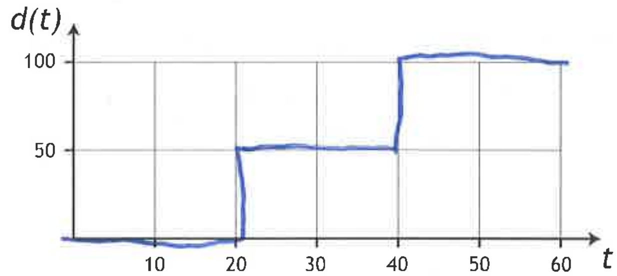
Introduction



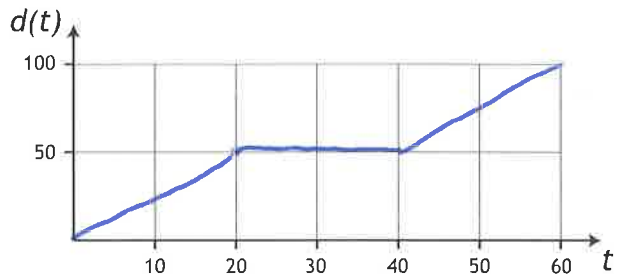
In a 100 m fish race, there are three competitors.

Teleporting Fish - has the ability to instantly warp from location to location.
Instant-Speed Fish - can reach any desired speed instantly without accelerating.
Real-World Fish - must speed up and slow down, just like objects in reality.

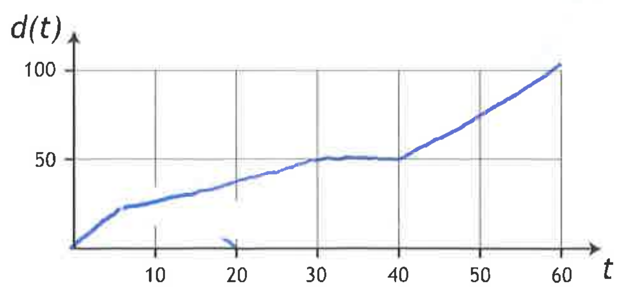
a) Teleporting Fish spends the first 20 s of the race resting at the start line. He then warps to the midpoint of the track and rests for another 20 seconds. Finally, he warps to the end and waits 20 seconds while the other fish arrive. Graph this motion.



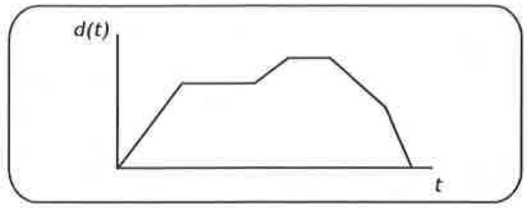
b) Instant-Speed Fish begins the race at 2.5 m/s, and sustains that speed for 20 seconds until she reaches the midpoint. After resting for 20 seconds, she resumes her speed of 2.5 m/s and heads to the finish line.



c) Real-World Fish accelerates to a speed of 2.5 m/s in 6 seconds, holds that speed for 8 seconds, and then decelerates to zero in 6 seconds - this brings him to the midpoint.
After resting for 20 seconds, Real-World fish repeats the motion - accelerate for 6 seconds, hold the speed for 8 seconds, and decelerate for 6 seconds. This brings him to the finish line.



Relations and Functions
LESSON FIVE - *Interpreting Graphs*
Lesson Notes



Example 1

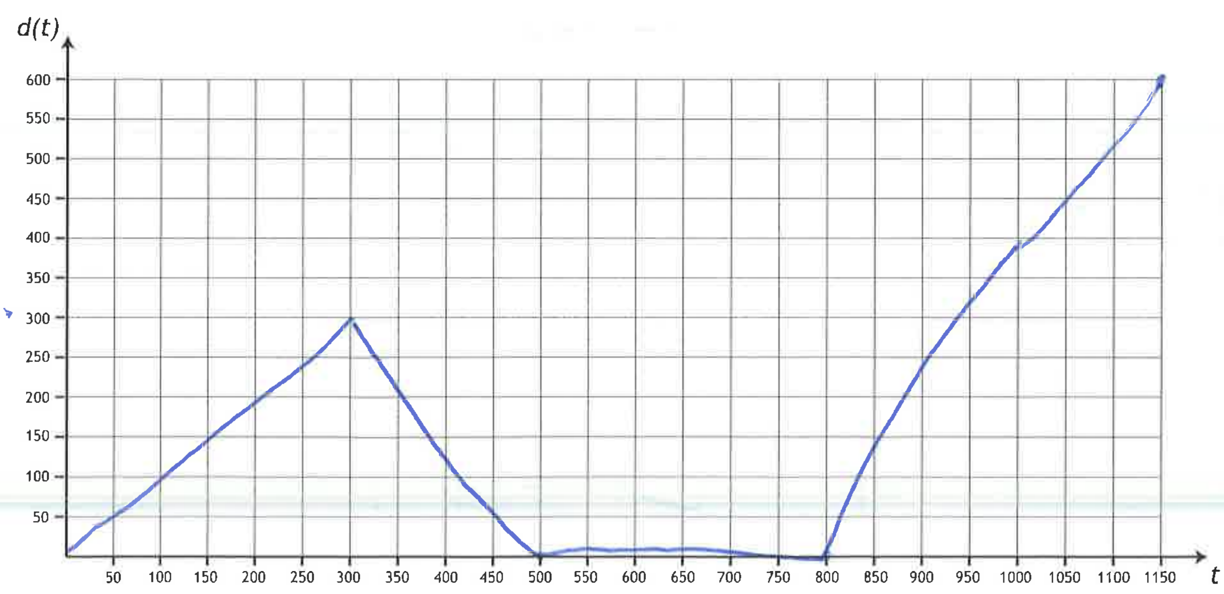
Alex walked halfway to school, but realized he forgot his calculator. He turned around, ran back home, and searched his room for five minutes trying to find the calculator. He then ran two-thirds of the way back to school, but got tired and had to walk the remaining third. Draw a graph representing Alex's journey. Assume instant speed changes.

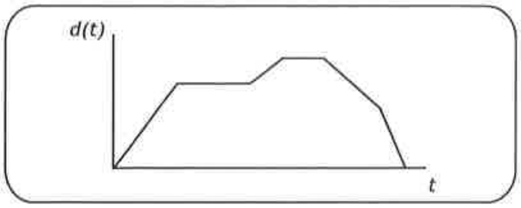
Distance from home to school	600 m
Alex's running speed	2 m/s
Alex's walking speed	1 m/s

Drawing the graph exactly requires calculations using time = $\dfrac{\text{distance}}{\text{speed}}$.

Find ordered pairs that will let you draw the graph. Use the space below for your work.

i) walking to school	ii) running back home	iii) looking for calculator	iv) running to school	v) walking to school

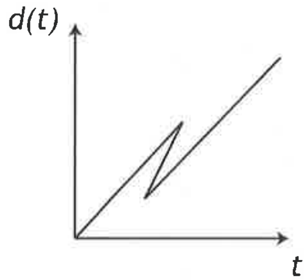




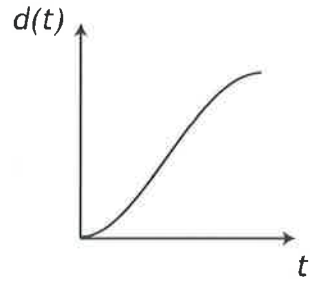
Relations and Functions
LESSON FIVE - *Interpreting Graphs*
Lesson Notes

Example 2

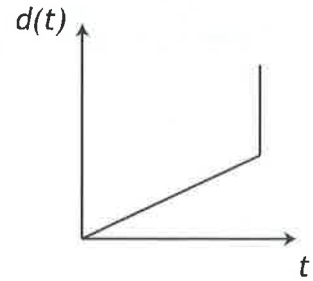
Each of the following graphs represents a potential path Naomi can take from home to school. Determine if each graph represents a possible or impossible motion.

a)


Possible: Yes No

b)


Possible: Yes No

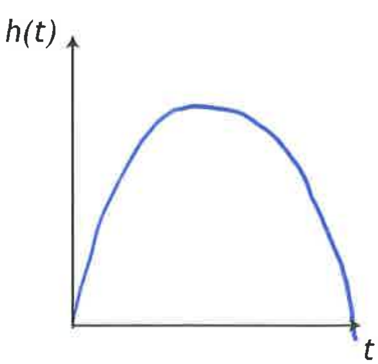
c)


Possible: Yes No

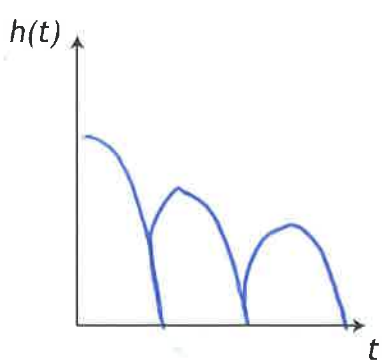
Example 3

Represent each of the following motions in graphical form.

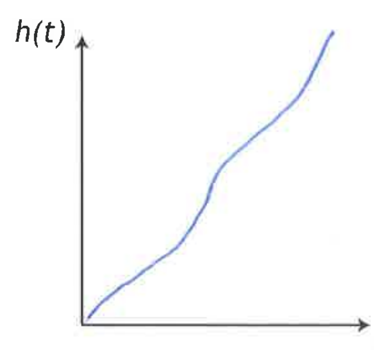
a) A ball is thrown straight up and falls back down.



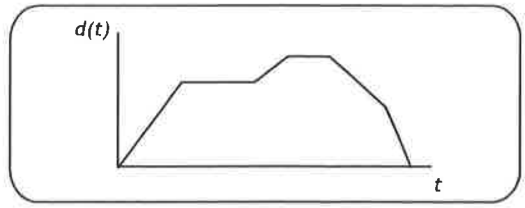
b) A rubber ball is dropped and bounces three times.



c) The swimming pool below is filled with water.



Relations and Functions
LESSON FIVE - *Interpreting Graphs*
Lesson Notes

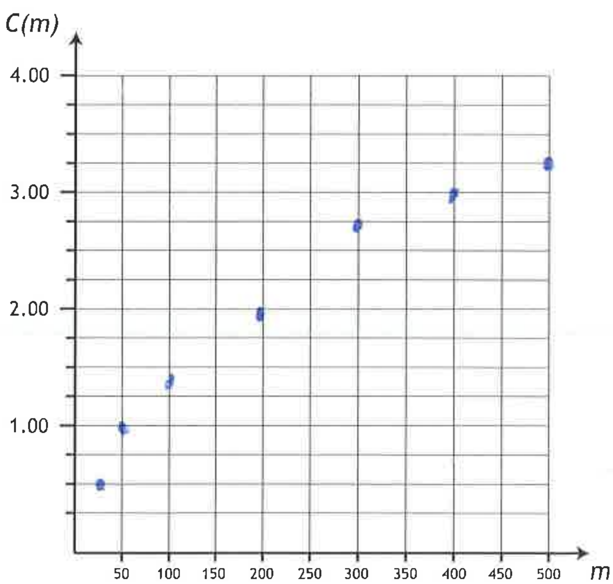


Example 4

The following table shows the Canada Post 2010 price list for mailing letters within Canada.

Letter Mass	Price
up to (and including) 30 g	\$0.57
up to (and including) 50 g	\$1.00
up to (and including) 100 g	\$1.22
up to (and including) 200 g	\$2.00
up to (and including) 300 g	\$2.75
up to (and including) 400 g	\$3.00
up to (and including) 500 g	\$3.25

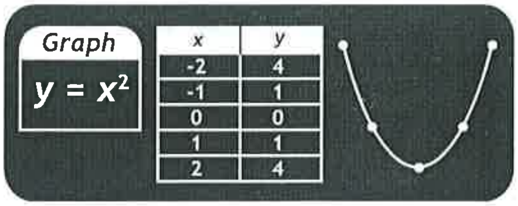
a) Graph this data



b) State the domain and range Not yet

Domain:

Range:



Relations and Functions
LESSON ONE - *Graphing Relations*
Lesson Notes

Introduction

Caitlin rides her bike to school every day. The table of values below shows her distance from home as time passes.

time (minutes)	distance (metres)
0	0
1	250
2	500
3	750
4	1000
5	1250

a) Write a sentence that describes this relation.

She rides to school @ a Constant Speed.

b) Represent this relation with ordered pairs.

(0,0) (1,250) . . . . .

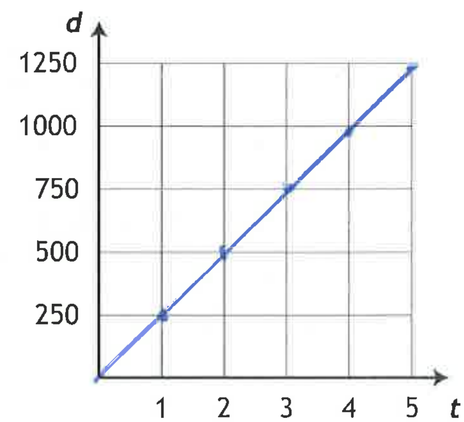
c) Represent this relation with an arrow diagram.

Not to worry

d) Write an equation for this scenario.

d= 250(m)

e) Graph the relation.

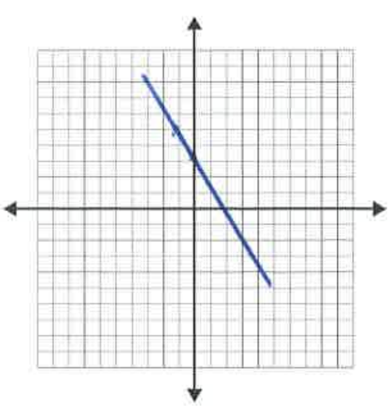


Example 1

For each relation, complete the table of values and draw the graph.

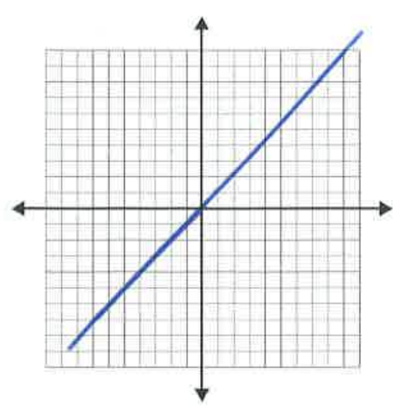
a) $y = -2x + 3$

x	y
-2	7
-1	5
0	3
1	1
2	-1



b) $y = x$

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



Relations and Functions
LESSON ONE - *Graphing Relations*
Lesson Notes

Graph $y = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4

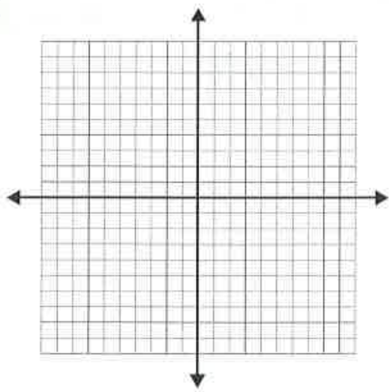
Example 2

For each relation, complete the table of values and draw the graph. State if the relation is linear or non-linear.

a) $y = x^2$

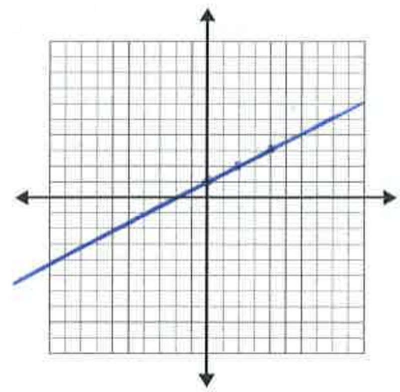
not to worry

x	y
-2	
-1	
0	
1	
2	



b) $y = \frac{1}{2}x + 1$

x	y
-4	-1
-2	0
0	1
2	2
4	3



Example 3

For each scenario, state the dependent variable, the independent variable, and the rate. Write the equation.

a) A fruit vendor generates a revenue of *R* dollars by selling *n* boxes of plums at \$3 each.

i) the dependent variable is Rev.
ii) the independent variable is plums.
iii) the rate is \$3.
iv) the equation is R=3P.

b) A runner with a speed of 9 m/s can run *d* metres in *t* seconds.

i) the dependent variable is Distance.
ii) the independent variable is Speed.
iii) the rate is 9 m/s.
iv) the equation is D= 9(t).

c) A diver experiences a pressure of *P* kilopascals at a depth of *d* metres. Underwater pressure increases at 10 kilopascals/metre.

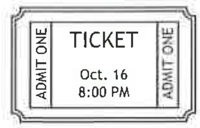
i) the dependent variable is Pressure.
ii) the independent variable is depth.
iii) the rate is Pr: 10.
iv) the equation is P=10d.

Graph	x	y
$y = x^2$	-2	4
	-1	1
	0	0
	1	1
	2	4

Relations and Functions
LESSON ONE - *Graphing Relations*
Lesson Notes

Example 4

Tickets to a concert cost \$12 each. The revenue from ticket sales is R, and the number of tickets sold is n.



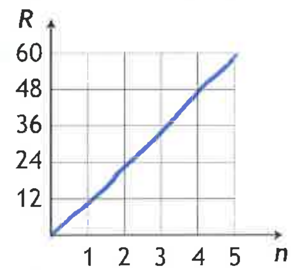
a) Write an equation for this scenario.

$R = 12n$

b) Generate a table of values.

n	R
1	12
2	24
3	36
4	48
5	60
6	72

c) Draw the graph.



d) Is the relation continuous or discrete?

discrete.

Example 5

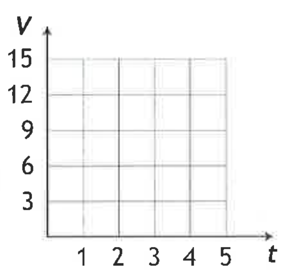
A cylindrical tank is being filled with water at a rate of 3 L/min. The volume of water in the tank is V, and the elapsed time is t.

a) Write an equation for this scenario.

b) Generate a table of values.

t	V

c) Draw the graph.



d) Is the relation continuous or discrete?

Example 6

A relation is represented by $4x + 2y = 8$.

$-4x \quad -4x$

$\frac{2y}{2} = \frac{-4x}{2} + \frac{8}{2}$

$y = -2x + 4$

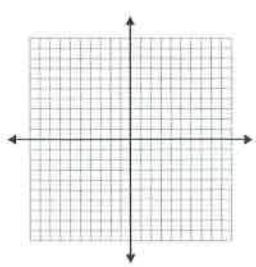
a) Isolate y so this relation can be graphed.

~~y=~~ $y = -2x + 4$

b) Generate a table of values.

x	y

c) Draw the graph.



d) Is the relation continuous or discrete?

Relations and Functions
LESSON ONE - *Graphing Relations*
Lesson Notes

Graph

$y = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4

Example 7

Nick, a salesman, earns a base salary of \$600/week plus an 8% commission on sales. The amount of money Nick earns in a week is E, and the total value of his sales is s.

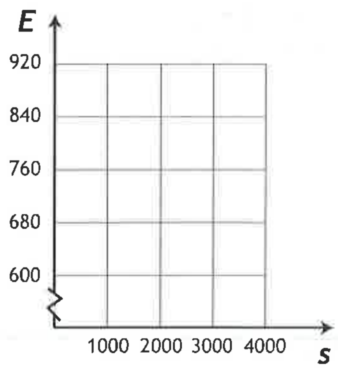
a) Write an equation that relates the variables.

Earnings = 600 + 0.08(s)

b) Complete the table of values.

s	E
0	
1000	
2000	
3000	
4000	

c) Draw the graph.



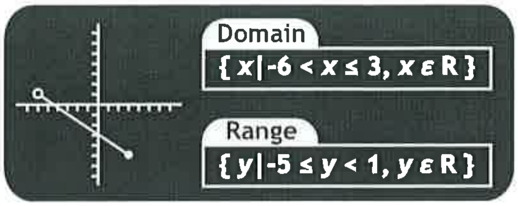
d) Is this relation linear or non-linear?

e) Is this relation discrete or continuous?

f) What are the dependent and independent variables?

g) If Nick makes \$6200 in sales one week, what will his earnings be?

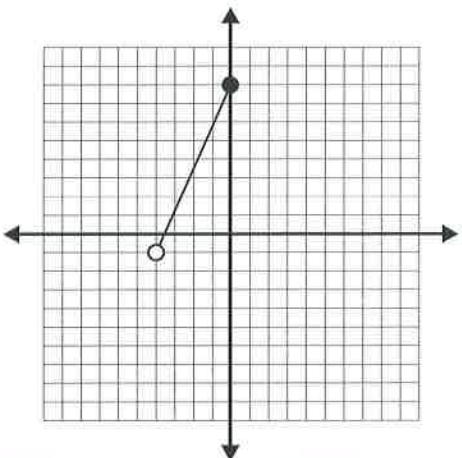
h) How much will Nick have to sell if he makes \$1560 in one week?



Relations and Functions
LESSON TWO - *Domain and Range*
Lesson Notes

Introduction

a) Write the domain and range of this graph *in sentence form*.



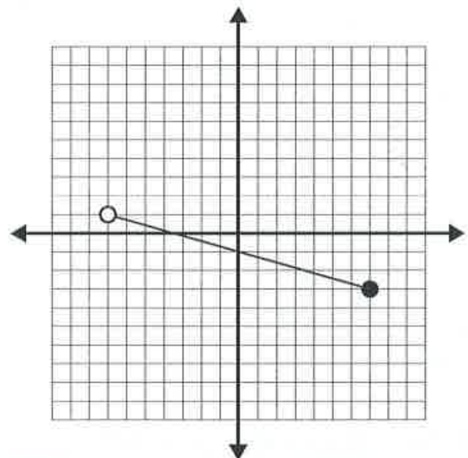
Domain:

$-4 < x \le 0$

Range:

$-1 < y \le 8$

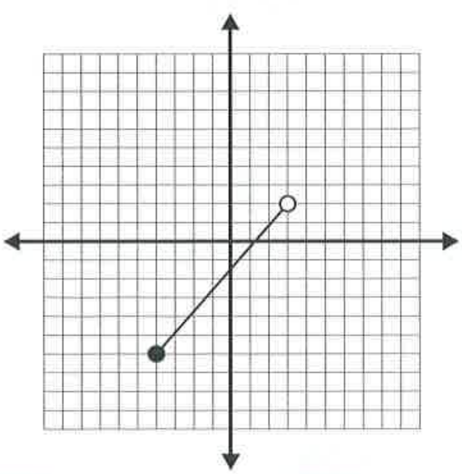
b) Write the domain and range of this graph *as number lines*.



Domain:

Range:

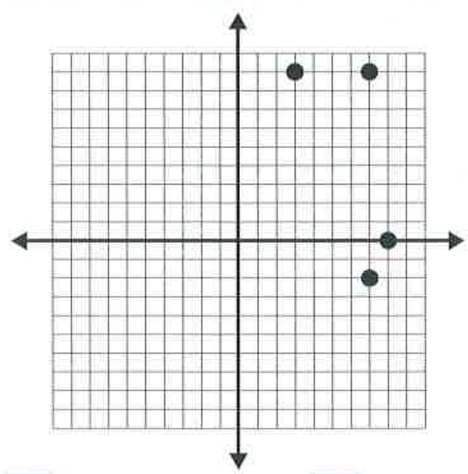
c) Write the domain and range of this graph *in set notation*.



Domain:

Range:

d) Write the domain and range of this graph *as a discrete list*.



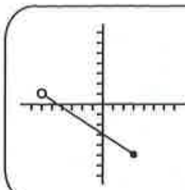
Domain:

3, 7, 8

Range:

-2, 0, 9

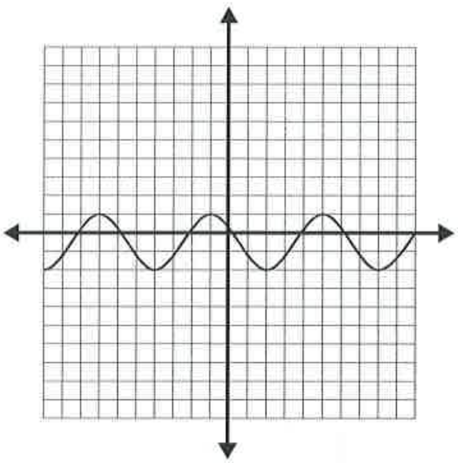
Relations and Functions
LESSON TWO - *Domain and Range*
Lesson Notes



Domain
$\{x \mid -6 < x \le 3,\ x \in R\}$

Range
$\{y \mid -5 \le y < 1,\ y \in R\}$

e) Write the domain and range of this graph ***using interval notation***.

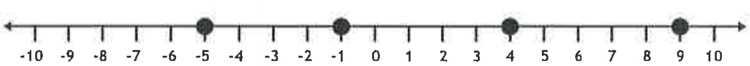


Domain:
$x \in R$

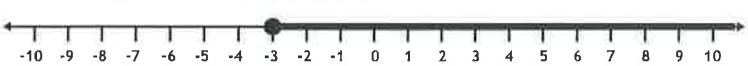
Range:
$y \mid -2 \le y < 1,\ y \in R)$

Example 1

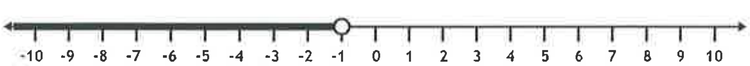
Write the domain of each number line.

a) 

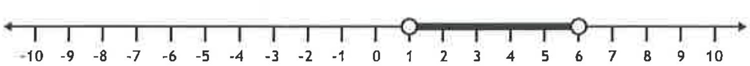
Domain:
$-5, -1, 4, 9$

b) 

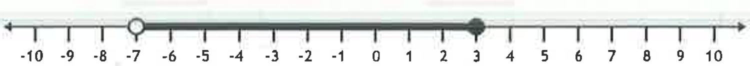
Domain:
$x \ge -3$

c) 

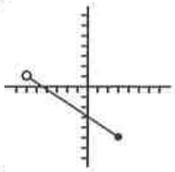
Domain:
$x \le -1$

d) 

Domain:
$1 < x < 6$

e) 

Domain:
$-7 < x \le 3$



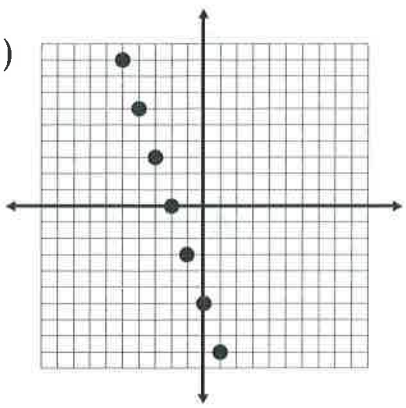
Domain
$\{x \mid -6 < x \leq 3, x \varepsilon R\}$

Range
$\{y \mid -5 \leq y < 1, y \varepsilon R\}$

Relations and Functions
LESSON TWO - *Domain and Range*
Lesson Notes

Example 2
domain and range of discrete graphs.

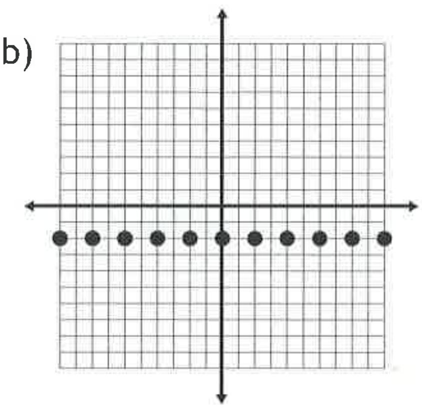
a)



Domain:

Range:

b)

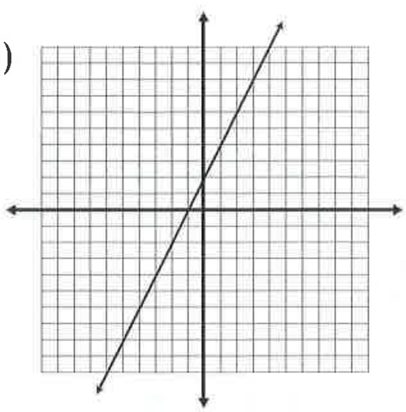


Domain: -10, -8, -6, -4, -2, 0, 2, 4, 6, 8, 10

Range: $y = -2$

Example 3
domain and range of continuous graphs.

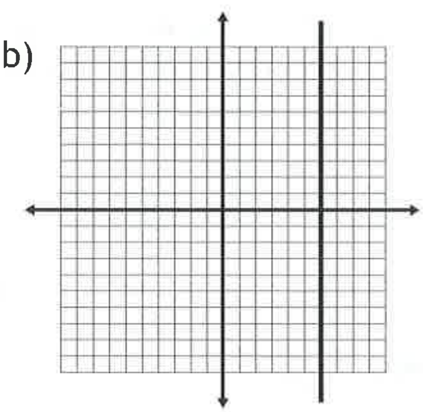
a)



Domain: $x \in R$

Range: $y \in R$

b)

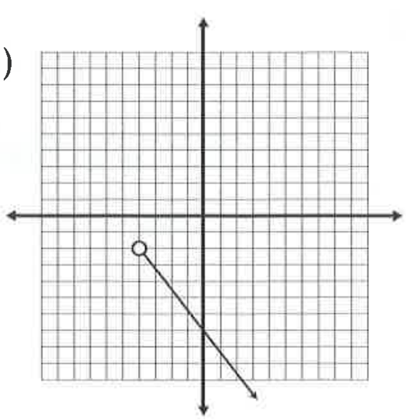


Domain: $x = 6$

Range: $y \in R$

Example 4
domain and range of graphs with endpoints

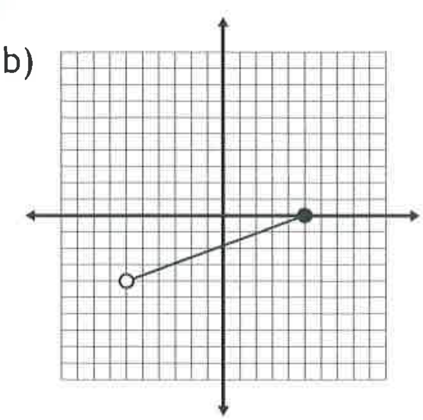
a)



Domain:

Range:

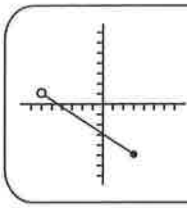
b)



Domain:

Range:

Relations and Functions
LESSON TWO - *Domain and Range*
Lesson Notes



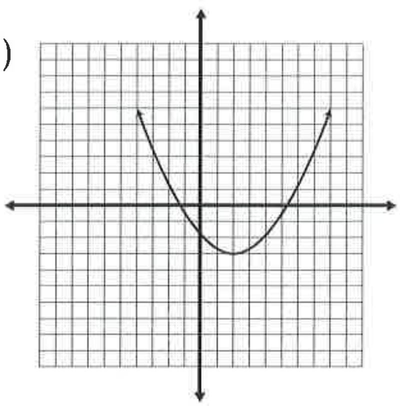
Domain
$\{x \mid -6 < x \leq 3,\ x \in R\}$

Range
$\{y \mid -5 \leq y < 1,\ y \in R\}$

Example 5

domain and range of parabolas and enclosed shapes

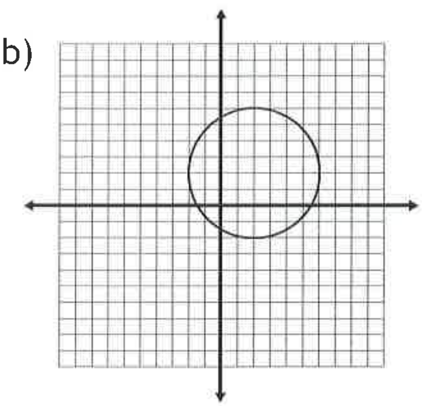
a)



Domain:
$x \in R$

Range:
$y \geq -3$

b)

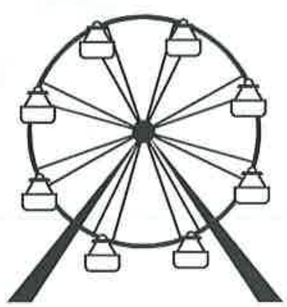


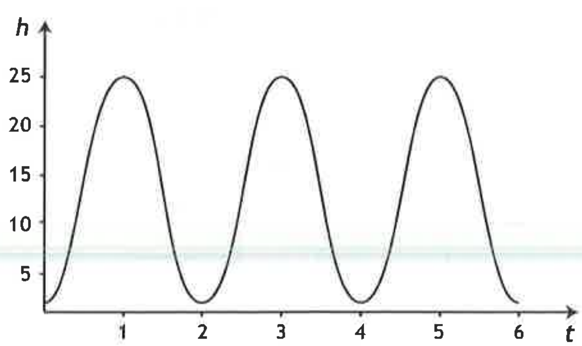
Domain:
$-2 \leq x \leq 6$

Range:
$-2 \leq y \leq 8$

Example 6

A Ferris wheel has a radius of 12 m and makes one complete revolution every two minutes. Riders board the wheel at a height of one metre above the ground. A ride lasts for three revolutions of the wheel. The graph of the motion is shown below. State the domain and range, in as many ways as possible.





Sentence

Number Lines

Set Notation

Discrete List

Interval Notation

Relations and Functions
LESSON THREE - *Functions*
Lesson Notes

Introduction

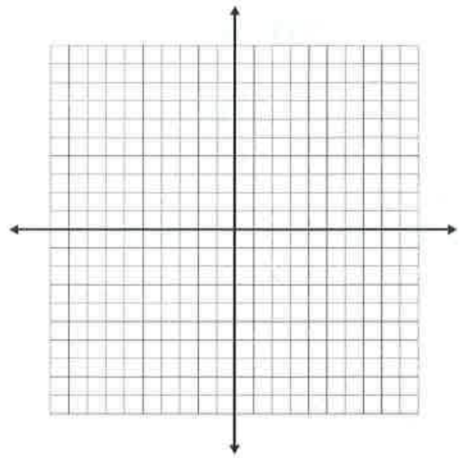
For each of the following functions, complete the table of values and draw the graph.

a) $f(x) = x + 4$

x	$f(x)$
-2	2
-1	3
0	4
1	5
2	6

$-2+4=2$

$-1+4=3$

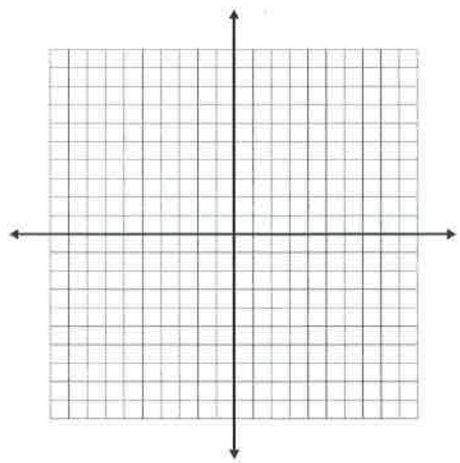


b) $f(x) = 3x - 4$

x	$f(x)$
-2	-10
-1	-7
0	-4
1	-1
2	2

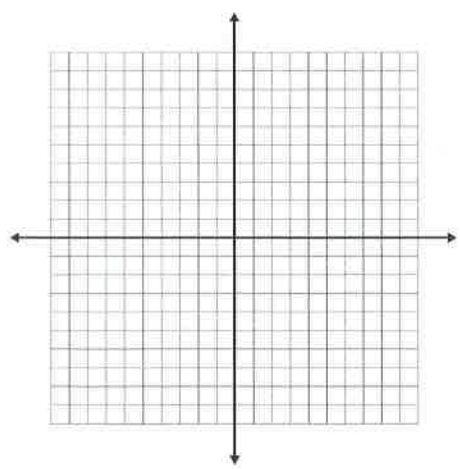
$3(-2)-4=-10$

$3(-1)-4=-7$

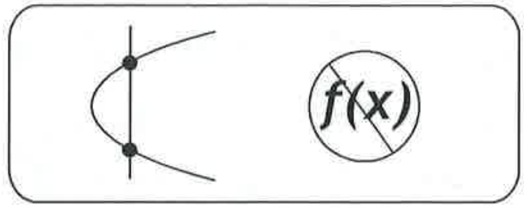


c) $f(x) = x^2 - 3$ nope :)

x	$f(x)$
-2	
-1	
0	
1	
2	



Relations and Functions
LESSON THREE - *Functions*
Lesson Notes



Example 1

For each function, calculate f(3).

a) $f(x) = -3x - 7$

$-3(3) - 7$

$= -16$

$F(-3) = -16$

b) $f(x) = \frac{5}{3}x + 2$

c) $f(x) = -\frac{1}{3}x - 3$

d) $f(x) = x^2 - 2$

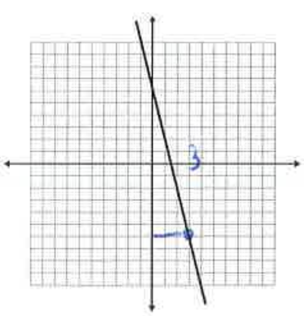
e) $f(x) = (x - 1)^2$

f) $f(x) = 2x^3 - 5x^2 + x - 7$ Nope!! ☺

Example 2

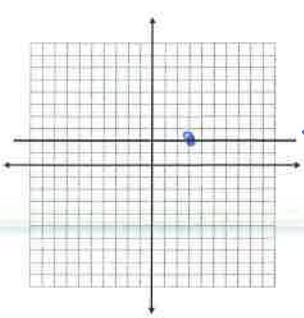
Use the graph of each function to determine the value of f(3).

a)



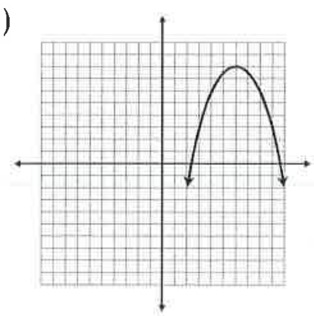
$= -6$

b)

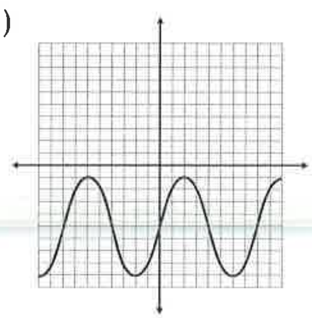


$= 2$

c)



d)

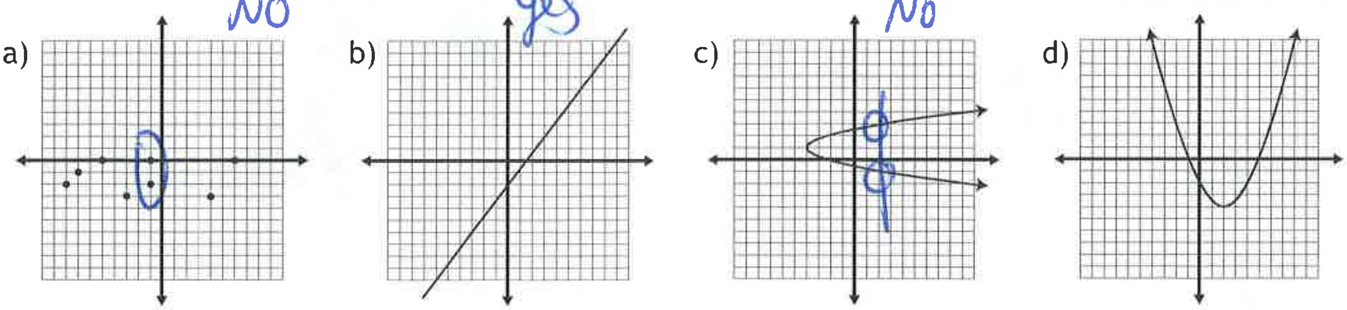


Relations and Functions
LESSON THREE - *Functions*
Lesson Notes

Example 3

Determine which of the following graphs represents a function.

a) NO b) Yes c) NO d)



Function: Yes No   Function: Yes No   Function: Yes No   Function: Yes No

Example 4

a) Given f(x) = 5x + 2, the point (*k*, 12) exists on the graph. Find *k*.

A) graph line and solve

B) $f(x) = 5x + 2$ really means what k gives us output of 12 so

$12 = 5x + 2$ (−2, −2)

$\frac{10}{5} = \frac{5x}{5}$ $x = 2$

Point is (2, 12).

b) Given $f(x) = -\frac{3}{4}x + 5$, the point (*k*, -13) exists on the graph. Find *k*.

A) graph   B) $-13 = -\frac{3}{4}x + 5$ (−5, −5) $-18 = -\frac{3}{4}x$ (·4, ·4) $\frac{-72}{-3} = \frac{-3x}{-3}$ $x = 24$

(24, -13).

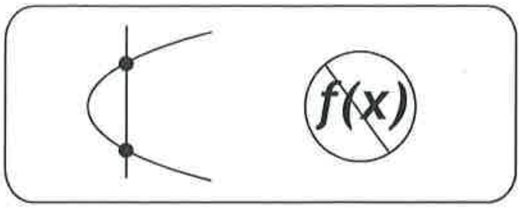
c) Does the point (-11, 81) exist on the graph of f(x) = -7x + 3?

$81 = -7(-11) + 3$

$81 = 77 + 3$

$81 = 80$ NO it doesn't.

Relations and Functions
LESSON THREE - *Functions*
Lesson Notes



Example 5

A speed walker walks with a speed of 6 km/hour.

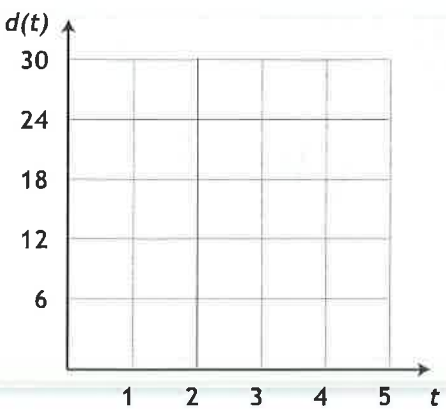
a) Use a table of values to determine the distance walked in the first five hours.

t	d
0	0
1	6
2	12
3	18
4	24
5	30

b) Write the distance function.

Distance Function
$f(t) = 6t$

c) Draw the graph of this function.
Is the graph continuous or discrete?



d) State the dependent and independent variables.

dependent:
independent:

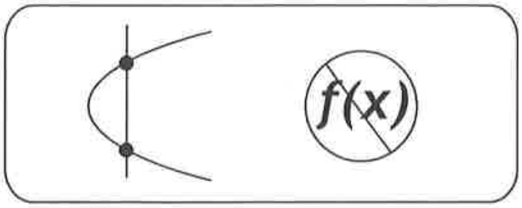
e) Write the domain and range.

Domain:

Range:

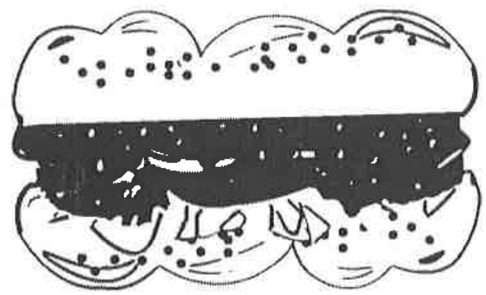
f) How far does the speed walker travel in 1.4 hours?

g) How long does it take for the speed walker to walk 15.6 km?



Relations and Functions
LESSON THREE - *Functions*
Lesson Notes

Example 6



The cost of a sandwich is $4.40 with two toppings, and $5.00 with five toppings.

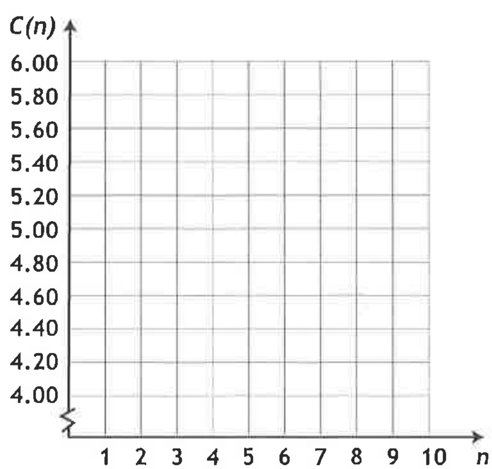
a) Use a table of values to determine the cost of the sandwich for the first five toppings.

n	*C*
0	
1	
2	
3	
4	
5	

b) Write the cost function.

Cost Function

c) Draw the graph of this function. Is the graph continuous or discrete? There are 10 toppings available.



d) State the dependent and independent variables.

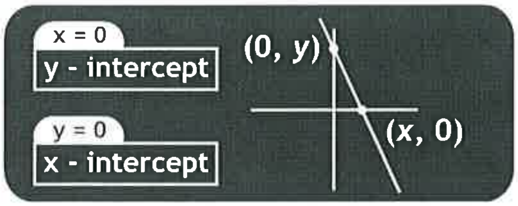
dependent:
independent:

e) Write the domain and range.

Domain:	Range:

f) What is the price of a sandwich with seven toppings?

g) How many toppings are on a $5.80 sandwich?

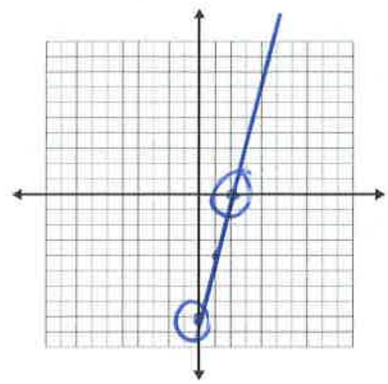


Relations and Functions
LESSON FOUR - *Intercepts*
Lesson Notes

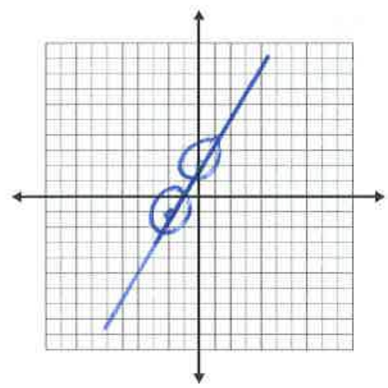
Introduction

Find the intercepts and draw the graph.

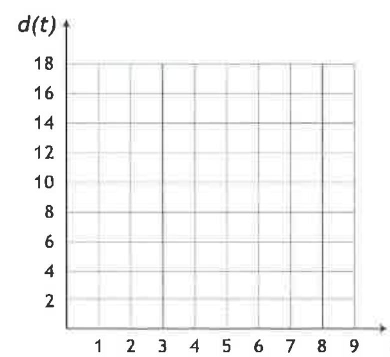
a) $y = 4x - 8$



b) $f(x) = \frac{2}{3}x + 2$



c) $d(t) = -2t + 18$

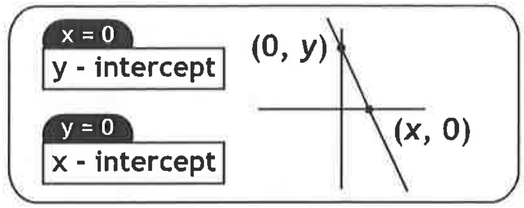


Example 1

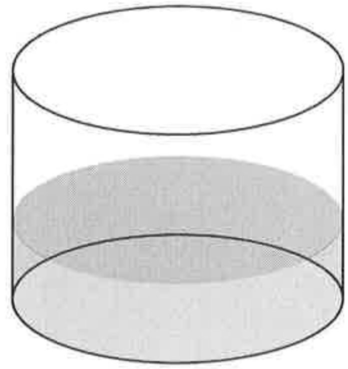
a) The function $f(x) = 2x + k$ has a y-intercept of -5. Find the value of k.

b) The function $f(x) = 3x + k$ has an x-intercept of -2. Find the value of k.

Relations and Functions
LESSON FOUR - *Intercepts*
Lesson Notes

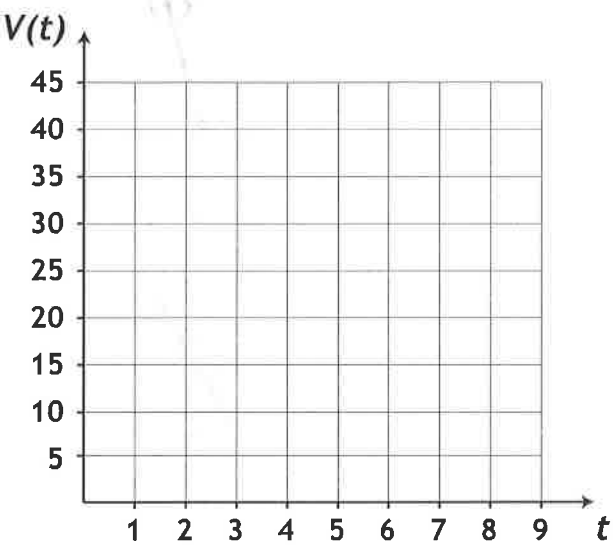


Example 2



A cylindrical tank with 45 L of water is being drained at a rate of 5 L/min.

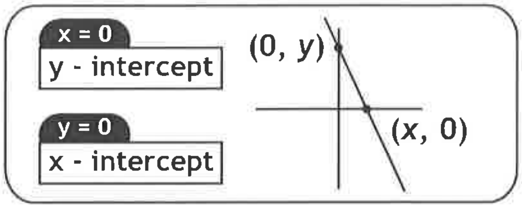
a) Graph the volume of the tank.



b) Write a function to represent this scenario.

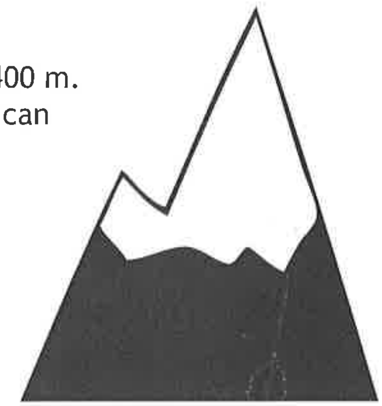
c) What does each intercept represent?

d) State the domain and range.



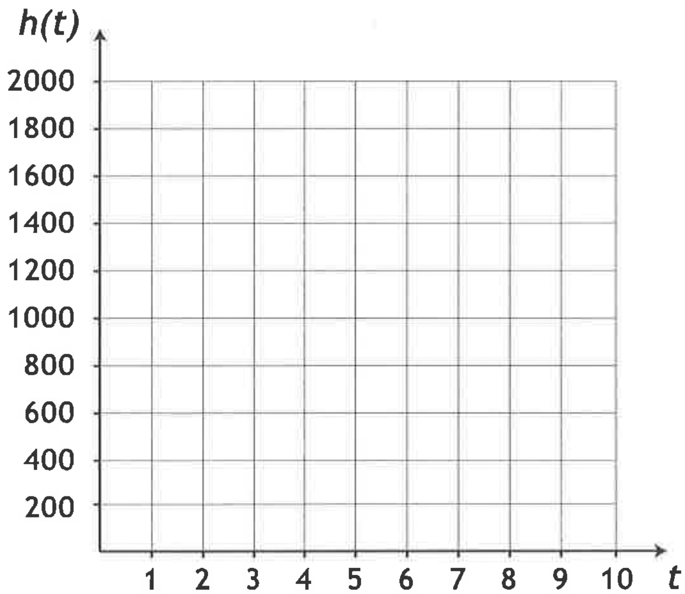
Relations and Functions
LESSON FOUR - *Intercepts*
Lesson Notes

Example 3



A mountain climber is at the peak of a mountain with an altitude of 1400 m. It takes 8 hours for the climber to return to ground level. The climber can descend the mountain at an average speed of 175 m/hour.

a) Graph the height of the mountain climber.



b) Write a function to represent this scenario.

c) What does each intercept represent?

d) State the domain and range.