GRADE 9 APPLIED MATH
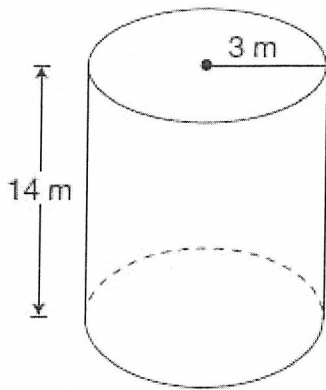
UNIT 3
PRACTICE TEST QUESTIONS

3

SOLUTIONS

1) Consider the cylinder below.

3 m

14 m

$V = \pi r^2 h$

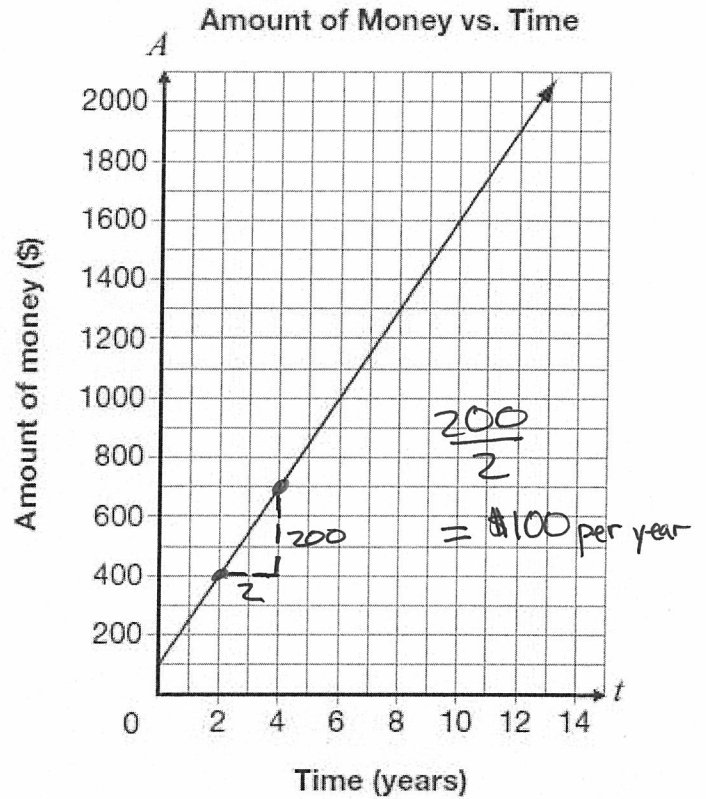$= \pi(3)(3)(14)$

$\doteq 395.8 m^3$

Which of the following is closest to the volume of the cylinder?

a 126 m^3

b 132 m^3

c 264 m^3

d 396 m^3

2) Use first differences to determine which table of values shows data from a linear relationship.

a

n	C
1	1
2	3
3	6
4	10

+2
+3
+4

c

n	C
0	0
1	1
2	4
3	9

+1
+3
+5

b

n	C
1	−1
2	−2
3	−1
4	−2

−1
+1
−1

d

n	C
0	0
1	3
2	6
3	9

+3
+3
+3

3)

A graph representing the relationship between the amount of money in a bank account and time, in years, is shown below.

Amount of Money vs. Time

$\frac{200}{2}$

$= \$100 \text{ per year}$

What is the rate of change for this relationship?

a $200 per year

b $160 per year

c $150 per year

d $100 per year

4) Enviro-Car rents vehicles. The company is advertising a change in its total costs as shown below.

Our Costs Are

**Changing**

Old total cost:
$25 fixed cost
$0.25 per km

New total cost:
$32 fixed cost
$0.15 per km

Enviro-Car plans to graph the relationship between the total cost, C, and number of kilometres, n, for both total costs.

How will the graph of the new total cost be different from the graph of the old total cost?

The graph of the new total cost will be

a   steeper and start higher on the C-axis.

b   steeper and start lower on the C-axis.

c   ~~less steep and start higher on the C-axis.~~

d   less steep and start lower on the C-axis.
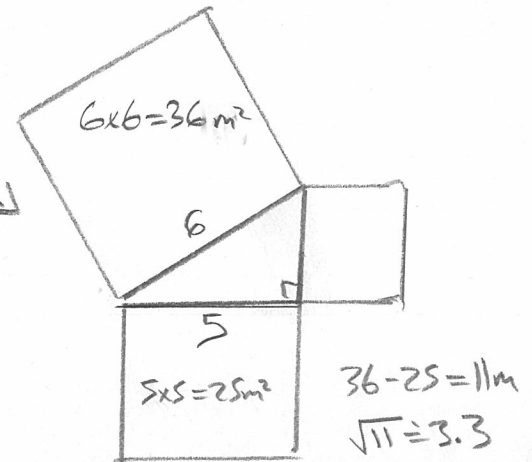
32 ← new

25 ← old
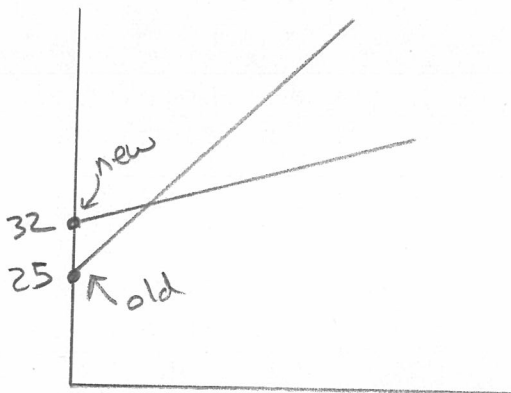
5) The diagram below represents the front view of a house.

6 m   3.3m ?   6 m

5m

4 m   4m   4 m

h

10 m
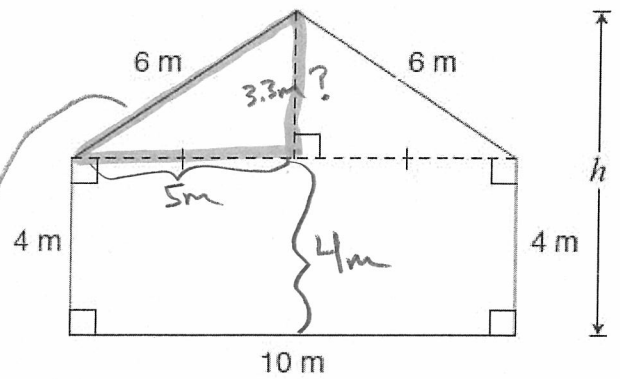
Which is closest to the height, h, of the house?

a   3 m

b   7 m

c   10 m

d   12 m

$6 \times 6 = 36 m^2$

6

5

$5 \times 5 = 25 m^2$

$36 - 25 = 11 m$

$\sqrt{11} = 3.3$

$4m + 3.3m = 7.3m$

6) A restaurant charges $3 for a cheese pizza plus $2 per additional topping.

Which of the following shows two models that represent the relationship between the total cost of a pizza, C, and the number of additional toppings on it, n?
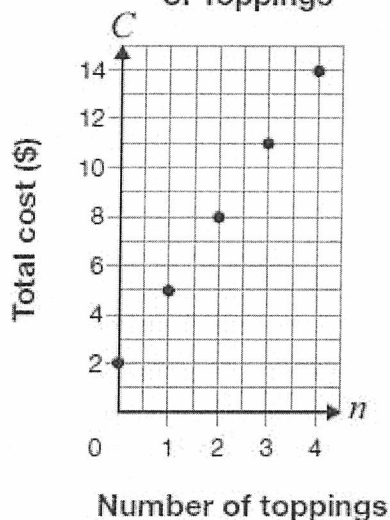
a

Number of toppings, n	Total cost, C ($)
0	3
2	7
4	11
6	15

Total Cost vs. Number of Toppings

Total cost ($)

Number of toppings

b

$C = 3n + 2$

Total Cost vs. Number of Toppings

Total cost ($)
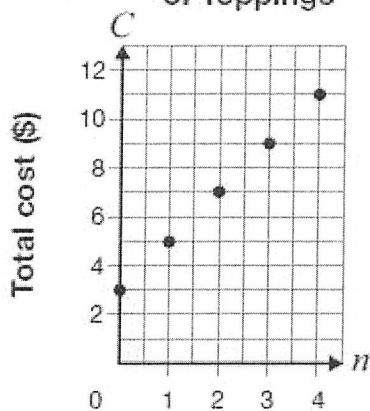
Number of toppings

c

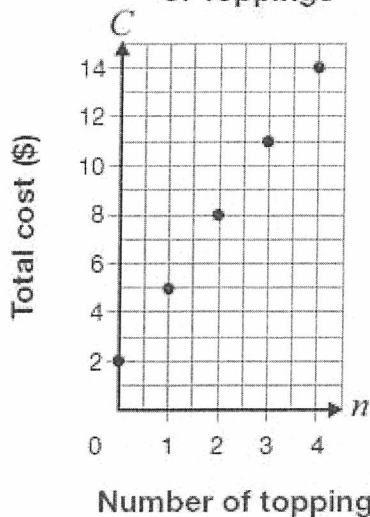| Number of toppings, n	Total cost, C ($)
0	2
2	8
4	14
6	20

Total Cost vs. Number of Toppings

Total cost ($)

Number of toppings

d

$C = 2n + 3$

Number of toppings, n	Total cost, C ($)
0	2
1	5
2	8
3	11

7) Solve the following equations. Show all work leading to your final answer.

a) $x + 5 = 15$
$\frac{-5}{} \quad \frac{-5}{}$
$x = 10$

b) $x - 7 = -3$
$\frac{+7}{} \quad +7$
$x = 4$

c) $-5x = -20$
$\frac{}{-5} \quad \frac{}{-5}$
$x = 4$

d) $\frac{x}{2} = 16$
$\times 2 \quad \times 2$
$x = 32$

e) $2x - 9 = 7$
$\frac{+9}{} \quad +9$
$2x = 16$
$\frac{}{2} \quad \frac{}{2}$
$x = 8$

f) $-3x + 6 = -15$
$\frac{-6}{} \quad -6$
$-3x = -21$
$\frac{}{-3} \quad \frac{}{-3}$
$x = 7$

g) $-4x - 6 = 18$
$\frac{+6}{} \quad +6$
$-4x = 24$
$\frac{}{-4} \quad \frac{}{-4}$
$x = -6$

8) For each of the following triangles, determine the **length of the unknown side**.

a)

400 m²   16 × 16 = 256 m²
?   16 m
12 m
12 × 12 = 144 m²
256 + 144 = 400
$\sqrt{400}$ = 20 m

b)
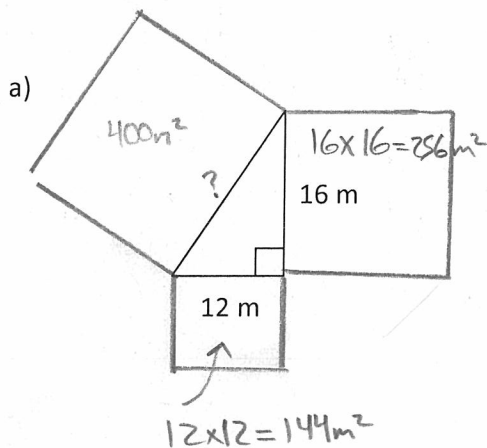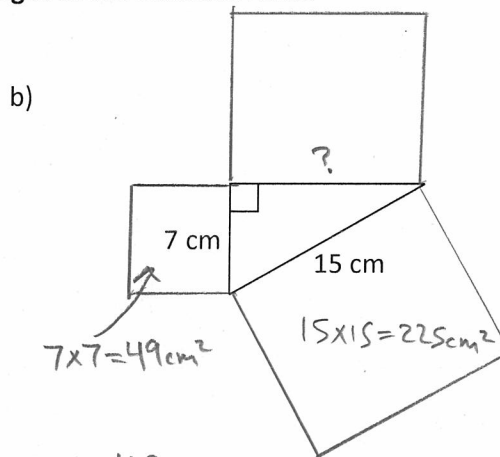
?
7 cm   15 cm
7 × 7 = 49 cm²   15 × 15 = 225 cm²
225 - 49
= 176
$\sqrt{176}$ ≐ 13.3 cm

9) A ladder that is 8 feet long is leaned against the wall of the school. If the bottom of the ladder is 5 feet from the bottom of the wall, **how far up the wall does the ladder reach**?

8 × 8
= 64 ft²
8 ft.   ?
5 ft
5 × 5 = 25 ft²
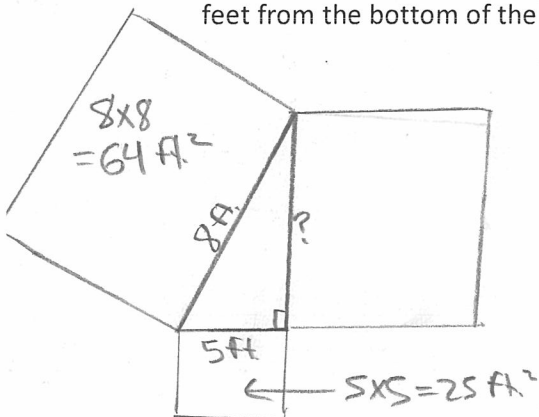
64 - 25 = 39
$\sqrt{39}$ ≐ 6.2 ft.

10) Chandra uses the map below to determine the distance from home to school. Determine the total distance she will travel from home to school if she walks along the dark, solid lines shown on the map.

Home

800m

$\leftarrow$ 400 m $\rightarrow$

$\uparrow$

1200 -400

?

984.9m

900 m

1100 m

1100-900 $\rightarrow$ 200 m

School

$\leftarrow$ 1200 m $\rightarrow$

400×400
= 160000 m²

400m

? 900m

900×900
= 810000 m²

160000+810000
= 970 000

$\sqrt{970000} \doteq 984.9m$
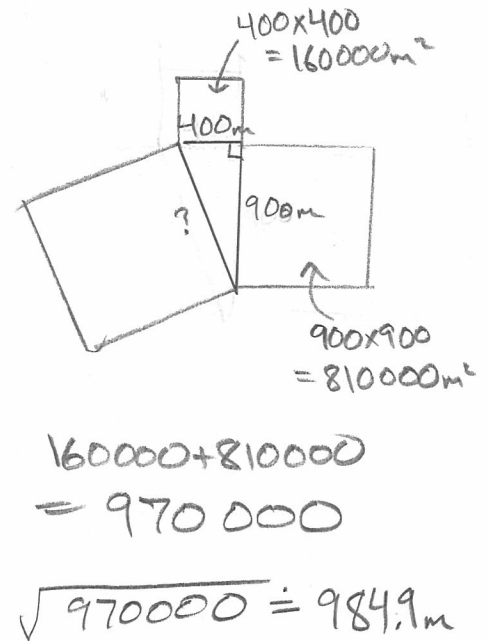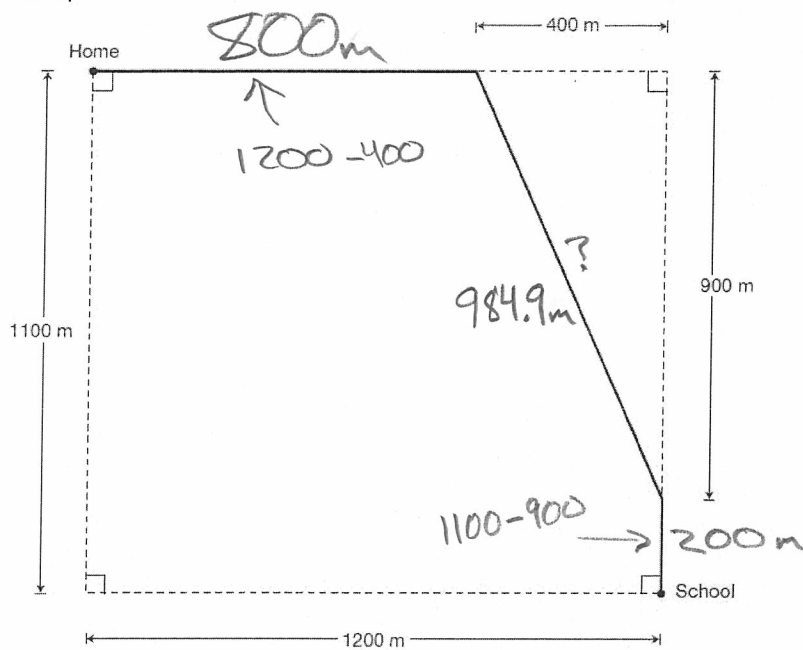
Total distance = 800+ 984.9 +200

= **1984.9 m**

11) Determine the circumference and the area of the following circle.
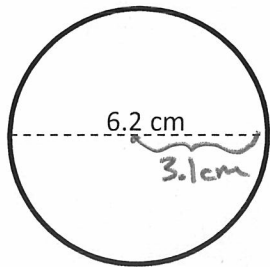
6.2 cm

3.1cm

Circumference

$C = 2\pi r$

$= 2 \times \pi \times 3.1$

$\doteq 19.5 cm$

Area

$A = \pi r^2$

$= \pi \times 3.1 \times 3.1$

$\doteq 30.2 cm^2$

12) A cylinder has a radius of 2.5 m and a height of 6.4 m. Determine the volume of the cylinder.

$V = \pi r^2 h$

$= \pi \times 2.5 \times 2.5 \times 6.4$

$\doteq 125.7 m^3$

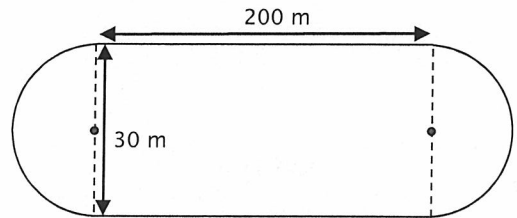13) Find the **area of the shaded region** in the diagram to the right.
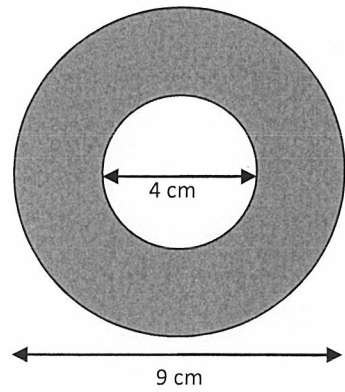
Large circle: $A = \pi r^2$
$= \pi \times 4.5 \times 4.5$
$\doteq 63.6 \, cm^2$

Small circle: $A = \pi r^2$
$= \pi \times 2 \times 2$
$\doteq 12.6 \, cm^2$

Shaded area $= 63.6 - 12.6$
$= \underline{51.0 \, cm^2}$

14) Consider the track shown to the right.

✳ two semicircles treated as one full circle

a) Find the **perimeter** of the field.

Circle: $C = 2\pi r$
$= 2 \times \pi \times 15$
$\doteq 94.2 \, m$

top bottom

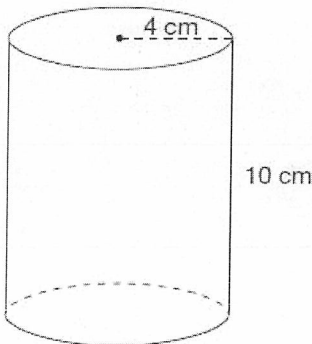∴ total perimeter $= 94.2 + 200 + 200$
$= \underline{494.2 \, m}$

b) Find the **area** of the field.

Circle: $A = \pi r^2$
$= \pi \times 15 \times 15$
$\doteq 706.9 \, m^2$

Rectangle: $A = lw$
$= (200)(30)$
$= 6000 \, m^2$

Total area $= 706.9 + 6000$
$= \underline{6706.9 \, m^2}$

15) Orange Dream sells drinks in two sizes of cylindrical cans. The smaller can is pictured below.

The larger can has the same height and a radius that is triple the radius of the smaller can.

a) **How many cm³ bigger** is the volume of the larger can than that of the smaller can?

radius $= 3 \times 4$
$= 12$

Small Can
$V = \pi r^2 h$
$= \pi \times 4 \times 4 \times 10$
$\doteq 502.7 \, cm^3$

Large Can
$V = \pi r^2 h$
$= \pi \times 12 \times 12 \times 10$
$= 4523.9 \, cm^3$

Difference $= 4523.9 - 502.7$
$\boxed{= 4021.2 \, cm^3}$

b) **How many times bigger** is the volume of the larger can than that of the smaller can?

$4523.9 \div 502.7 \doteq 9$ times bigger.

16) A stage in the shape of a semicircle is shown below
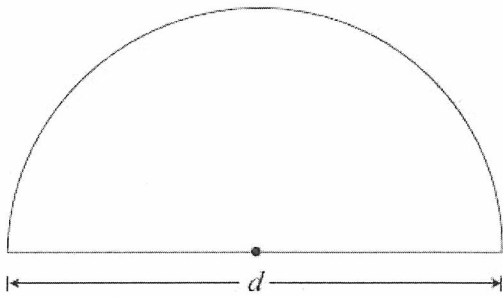
Hint:

Area of semicircle $= \dfrac{\pi r^2}{2}$

The area of the stage is 200 m². Determine the measure of the diameter.

$$\frac{\pi r^2}{2} = 200$$

$$\pi r^2 = 400$$

$$r^2 = 400 \div \pi$$

$$r^2 = 127.3239545$$

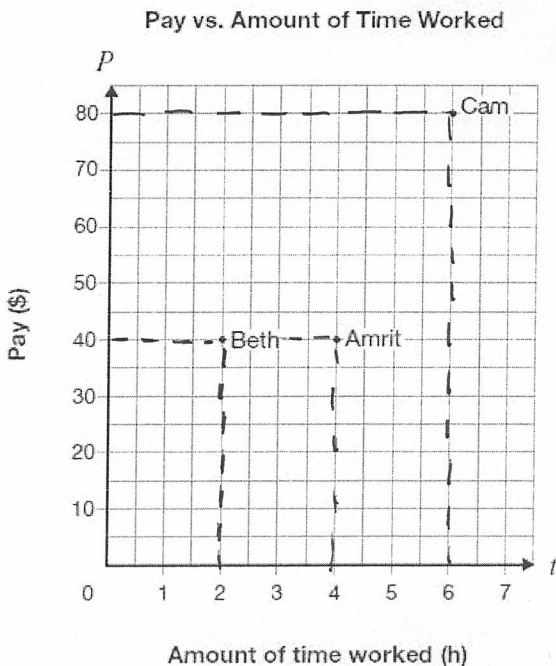$$r = \sqrt{127.3239545}$$

$$r \doteq 11.3$$

$$\therefore \text{diameter} = 11.3 \times 2 = \underline{22.6cm}$$

NOTE: This question could also be completed using trial and error.

17) Cam, Beth and Amrit are paid at an hourly rate for their time worked. The graph below shows the amount paid and the time worked for these three students. Determine which student is paid the highest hourly rate.

Pay vs. Amount of Time Worked

Beth: $40 \div 2 = \$20$ per hour

Amrit: $40 \div 4 = \$10$ per hour

Cam: $80 \div 6 = \$13.33$ per hour.

$\therefore$ Beth is paid the highest hourly rate.

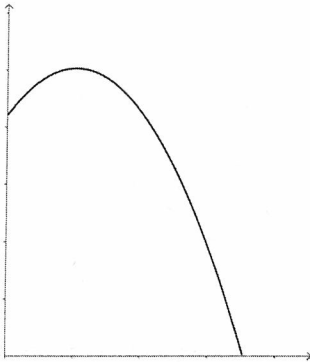18) Identify each of the following relations as linear or non-linear.

x	y
0	50
1	160
2	270
3	380
4	490

+110
+110
+110
+110

☑ Linear
☐ Non-linear

x	y
1	4
2	7
3	12
4	19
5	28

+3
+5
+7
+9

☐ Linear
☑ Non-linear

x	y
2	122
4	112
6	102
8	92
10	82

-10
-10
-10
-10

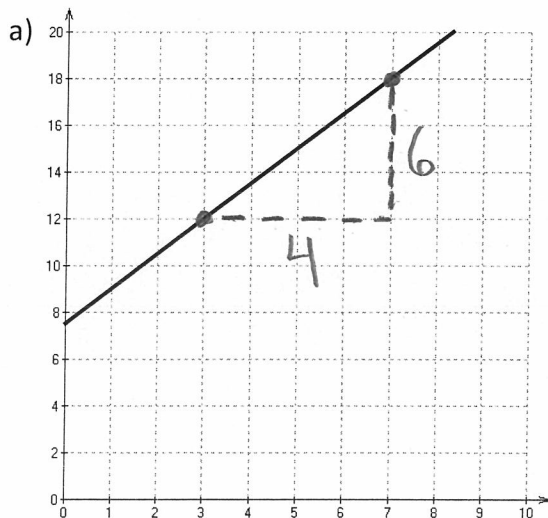☑ Linear
☐ Non-linear
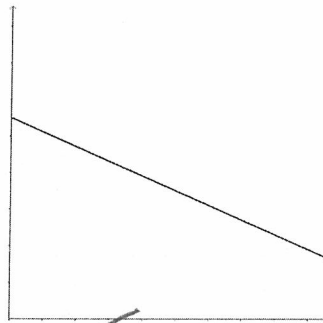
☐ Linear
☑ Non-linear

☑ Linear
☐ Non-linear

$h = 16 - 2t$

☑ Linear
☐ Non-linear

$y = 5x + 8$

☑ Linear
☐ Non-linear

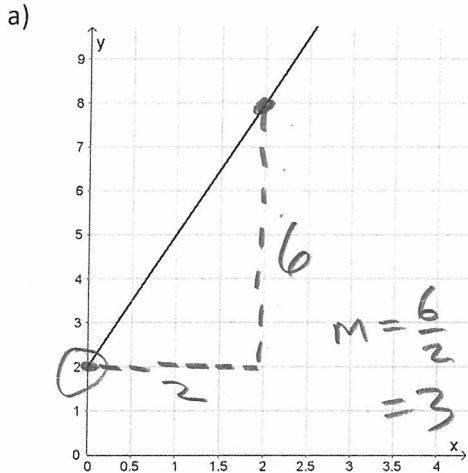19) Determine the slope for each of the following relations.

a)

6
4

$$Slope = \frac{rise}{run}$$
$$= \frac{6}{4}$$
$$= 1.5$$

b)

4
2
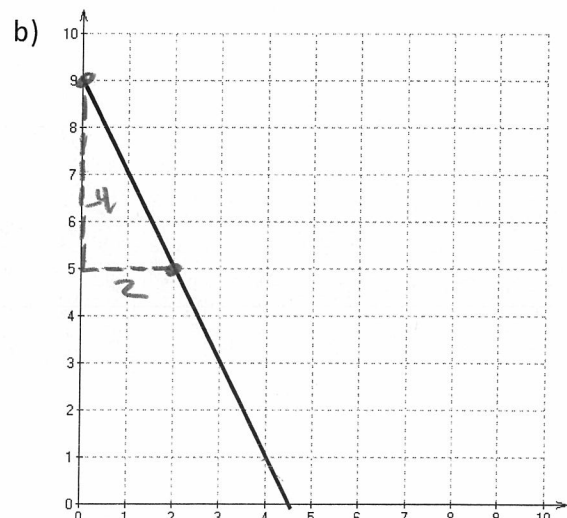
$$Slope = \frac{rise}{run}$$
$$= \frac{-4}{2}$$
$$= -2$$

20) For each of the following relations, state the intercept, the slope, an equation and whether the relation is an example of direct variation or partial variation.
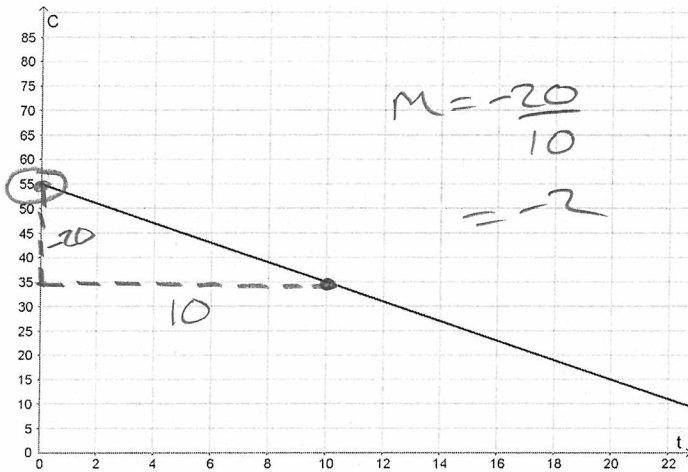
a)

$M = \dfrac{6}{2}$

$= 3$

y-intercept: __2__

Slope: __3__

Equation: $Y = 2 + 3x$

☐ Direct variation   ☑ Partial variation   (check one)

(doesn't start at 0)

b)

$M = \dfrac{-20}{10}$
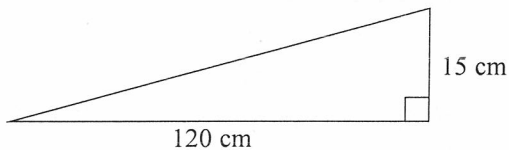
$= -2$

C-intercept: __55__

Slope: __-2__

Equation: $C = 55 - 2t$

☐ Direct variation   ☑ Partial variation   (check one)

21) If a wheelchair ramp has a slope **greater than 0.1**, then it is considered unsafe. Determine whether the following ramp is safe.

15 cm

120 cm

Safe or **Unsafe** (circle one)

$slope = \dfrac{rise}{run}$

$= \dfrac{15}{120}$

$= 0.125$ (too big)

22) Consider the following table, which shows the total cost based on the number of kilometres driven.

Number of Kilometers Driven (n)	Total Cost in Dollars (C)
0	5
20	85
40	165
60	245
80	325

+20 +20 +20 +20 +20

> +80
> +80
> +80
> +80

a) State the C-intercept for this relation: __5__

b) Determine the slope for this relation.

$$slope = \frac{rise}{run}$$

$$= \frac{80}{20}$$

$$= 4$$

c) State an equation that models this relation: $C = 5 + 4n$

d) **Use your equation** to determine the total cost for a distance of 123 kilometres.

$$C = 5 + 4n$$
$$C = 5 + 4(123)$$
$$C = 5 + 492$$
$$C = \$497$$

e) If the total cost is $257. Use your equation to determine the number of **kilometres driven**.

$$C = 5 + 4n$$
$$257 \overset{-5}{=} 5 \overset{-5}{+} 4n$$
$$\frac{252}{4} = \frac{4n}{4}$$
$$63 = n$$

∴ 63 km driven

f) Is this relation an example of direct variation or partial variation? **Explain your answer.**

Partial variation, since the start value is not zero (it's 5).

23) Arcadia charges players a $15 admission fee to their gaming centre. Arcadia also charges each
player $5 per game.

a) **Write an equation** to model the total cost of spending a day at Arcadia.

Equation: _____ $C = 15 + 5n$ _____

b) Graph the relation.
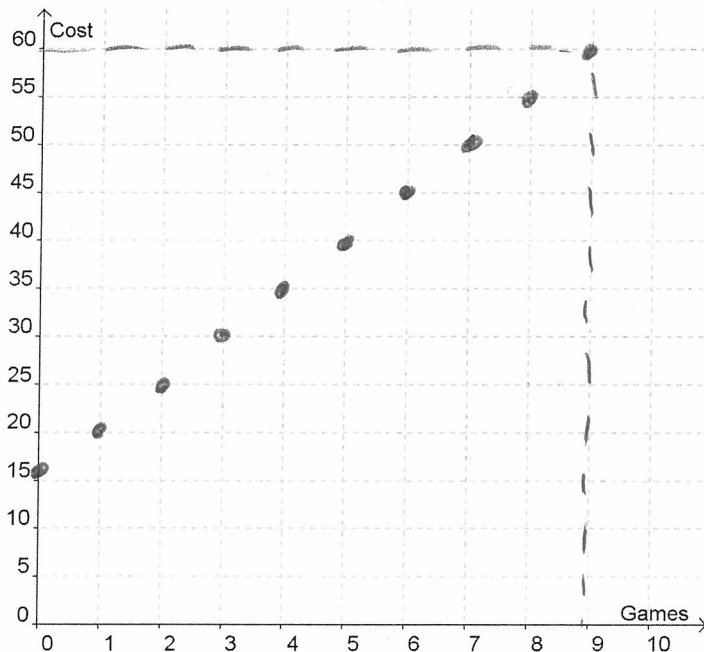
c) How many games can Jeremy play if he has saved $60 to play?

9 games (found using the graph)

d) How much will it cost Jen to spend a day at Arcadia if she plays 30 games?

$C = 15 + 5n$
$C = 15 + 5(30)$
$C = 15 + 150$

→ $C = \$165$

e) **Describe how the graph above would change** if Arcadia decreases the admission fee to $10.

The graph would start lower, but rise at the same rate (same steepness)

f) **How would the graph above change** if Arcadia increases the cost per game to $7 and the admission fee was $15?

The graph would rise at a higher rate (steeper)

24) A law office plans to do some landscaping around their building. They have two estimates:
    Company A: $240 for a full landscape plan plus $30 per hour for labour.
    Company B: $60 per hour for labour (no fee for the landscape plan)

    a) Complete the tables of values for each company.

Company A	
Time (h)	Cost ($)
0	240
2	300
4	360
6	420
8	480
10	540
12	600
14	660
16	720
18	780
20	840

Company B	
Time (h)	Cost ($)
0	0
2	120
4	240
6	360
8	480
10	600
12	720
14	840
16	960
18	1080
20	1200

   b) State whether each of the relations is an example of **direct variation** or **partial variation**.

   Company A: ___Partial___   Company B: ___Direct___

   c) Graph the data below. Label the axes and label each graph carefully.
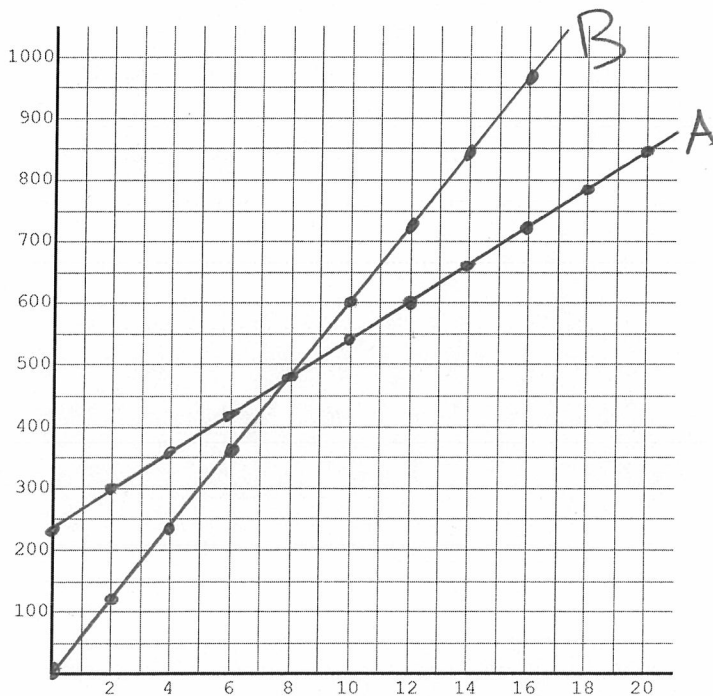
   d) Under what conditions would Company A be the better choice?

   If the job will take more than 8 hours.

   e) Under what conditions would Company B be the better choice?

   If the job will take less than 8 hours.

25) James is using a map that has a scale of 1 : 250 000. Using a ruler, he found the distance of his route on the map to be 8.5 cm. Determine the actual length of his route in kilometres.

$$\frac{1}{250\,000} = \frac{8.5}{x}$$

$$1x = 2125000$$

$$x = 2125000\,cm$$

÷100 → = 21 250 m
= 21.25 km ÷1000