



OUR LADY OF THE SACRED HEART COLLEGE
KENSINGTON

STUDENT NUMBER:

MATHEMATICS TEACHER: AGI CHA JOU/LOM

Preliminary Assessment Task 1

GENERAL MATHEMATICS

2nd May 2016

General Instructions:

- Reading time - 5 minutes
- Working time - $1\frac{1}{2}$ hours
- Write using black pen
- Board-approved calculators may be used
- A formulae and data sheet is provided
- A multiple-choice answer sheet is provided
- Answer Section I on the multiple-choice answer Sheet
- Attempt ALL questions
- In Questions 11 - 16, show relevant mathematical reasoning and/or calculations in the spaces provided
- Marks may be deducted for careless or badly arranged work

Total marks - 70

Section I Pages 2 - 4

10 marks

- Attempt Questions 1 - 10
- All answers are of equal value
- Allow about 15 minutes for this section

Section II Pages 5 - 19

60 marks

- Attempt Questions 11 - 16
- Allow about 1 hour and 15 minutes for this section

Section I

10 marks

Attempt Questions 1 - 10

Allow about 15 minutes for this section

Use the multiple-choice answer sheet for Questions 1 - 10

1. The height of the Skywalk at Sydney Tower Eye was measured at 268 m.

What is the percentage error in this measurement?

- (A) $\pm 0.018\%$
- (B) $\pm 0.037\%$
- (C) $\pm 0.187\%$
- (D) $\pm 0.373\%$

2. Simplify $\frac{6a}{5} \times 3a$

- (A) $\frac{9a}{5}$
- (B) $\frac{9a^2}{5}$
- (C) $\frac{18a}{5}$
- (D) $\frac{18a^2}{5}$

3. The scale on an aerial photograph is given as 1 mm = 200 m.

If the distance between two landmarks A and B is 350 m, what is the distance between A and B on the photograph.

- (A) 0.25 mm
- (B) 0.57 mm
- (C) 1.75 mm
- (D) 2 cm

4. Find the value of $\sqrt{a^2 + b^2}$ if $a = 4$ and $b = 3$

- (A) $\sqrt{7}$
- (B) $\sqrt{5}$
- (C) 5
- (D) 25

5. A concentration of a certain drug in a hospital drip is 4 mg / mL.
Belinda needs to give a dose of 11 mg of the drug to her patient over the course of one day.

How many millilitres of the drug will Belinda administer to her patient?

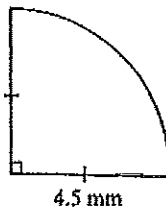
- (A) 2.75
- (B) 27.5
- (C) 275
- (D) 2750

6. A straight line has an equation $y = -3x + 1$. What is the y -intercept?

- (A) -3
- (B) -1
- (C) 1
- (D) 3

7. The diagram shows a quadrant of a circle with radius 4.5 mm.
Find the perimeter of the quadrant, correct to 1 decimal place.

- (A) 7.1 mm
- (B) 28.3 mm
- (C) 16.1 mm
- (D) 11.6 mm



8. Factorise $16m^2 + 24m$

- (A) $4(4m^2 + 6m)$
- (B) $4m(4m + 6)$
- (C) $8m(2m + 3)$
- (D) $16m(m + 8)$

9. What is 2'449'300' km written in scientific notation correct to two significant figures?

- (A) 24.5×10^5 km
- (B) 2.5×10^6 km
- (C) 2.45×10^5 km
- (D) 2.4×10^6 km

10. A truck is travelling at a constant speed. It travels 80 km in 4 hours. The situation is described by the equation $d = mt$. What is the value of m ?

- (A) 0.05
- (B) 3
- (C) 20
- (D) 60

End of Section I

Section II

60 marks

Attempt Questions 11 - 16

Allow approximately 1 hour and 15 minutes for this section.

Answer the questions in the spaces provided.

Your responses should include relevant mathematical reasoning and/or calculations.

Marks may be deducted for careless or badly arranged work

Extra writing space is provided on pages 18 and 19. If you use this space, clearly indicate which question you are answering.

Question 11 (10 marks)

a) Katie tried to solve this problem and made a mistake in one line

$\frac{2M-4}{5} + 3 = 5$ Line 1

$\frac{2M-4}{5} = 8$ Line 2

$2M - 4 = 4$ Line 3

$2M = 8$ Line 4

$M = 4$ Line 5

Copy the equation in Line 1 and continue your solution to solve this equation for M . Show all lines of working.

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b) The distance d in kilometres that a person can see the horizon from h metres above the Sea level, is given by the formula: $d = 5 \times \sqrt{\frac{h}{2}}$

i) Find d when h is 18 metres

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Question 11 continues on page 6

Question 11 (continued)

ii) Find h when d is 10 kilometres

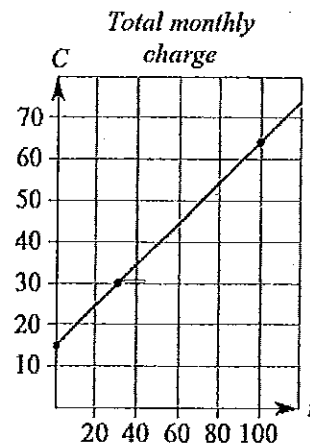
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c) A phone company charges a monthly service fee plus the cost of calls. The graph, below, gives the total monthly charge, C dollars for making n calls. This includes the service fee.



- i) How much is the monthly service fee?
- ii) How much does the company charge if you make 20 calls a month?
- iii) How many calls are made if the total monthly charge is \$30?
- iv) Find the equation of the line in terms of monthly charge (C) and the number of calls (n).

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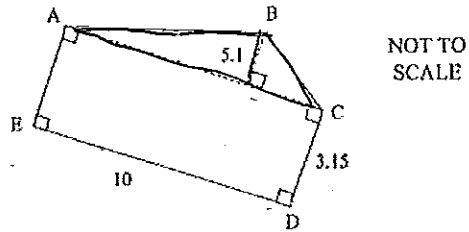
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End of Question 11

Question 12 (10 marks)

a) The diagram shows the shape of Daisy's garden bed. All measurements are in metres.



(i) Show that the area of the garden bed is 57 m^2 .

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(ii) Daisy decides to add a 5 cm layer of mulch to the garden bed. Calculate the volume of mulch required. Give your answer in cubic metres.

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(iii) If each bag holds 0.25 cubic metres of mulch. How many bags does she need to buy?

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Question 12 continues on page 8

Question 12 (continued)

(iv) Daisy plans to fertilise her garden bed with Yates 'Thrive All Purpose Liquid Plant Food'. She reads that the fertiliser needs to be spread at the rate of $0.3 \text{ L} / 100 \text{ m}^2$. How much liquid plant food does she require for her garden bed? Express your answer in mL.

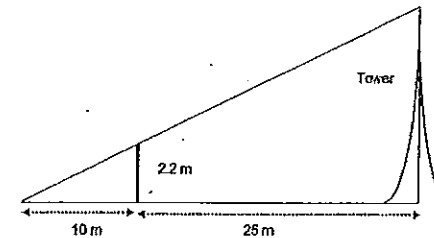
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b) An engineer places a stick in the ground so that its height above the ground is 2.2m. He then lines up the top of the stick and the top of a nearby tower. After making some measurements he draws the following diagram. Given the distances in the diagram, calculate the height of the tower.



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End of Question 12

Question 13 (10 marks)

Katie buys and sells T-shirts. Income received by selling n T-shirts is calculated using the formula $I = 16n$. Costs associated with selling n T-shirts are calculated using the formula $C = 8n + 24$.

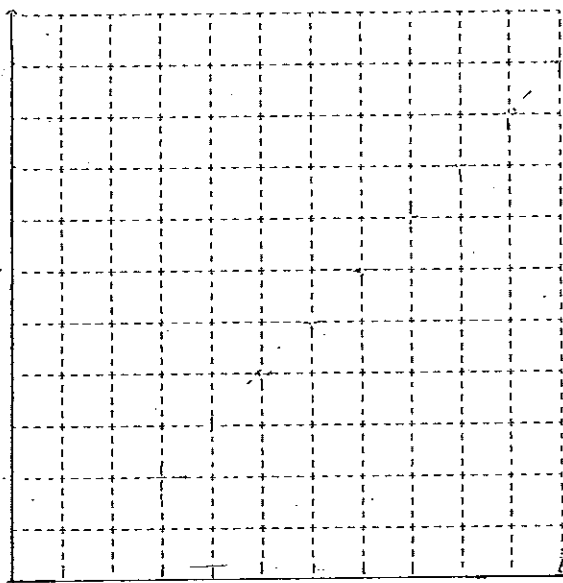
- a) Set up a table of values for I and C . Draw the graphs on the same number plane, using a scale of 1 unit = 1 T-shirt on the horizontal axis and 1 unit = \$8 on the vertical axis.

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- b) What are the initial costs?
- c) Use the graph to decide the number of T-shirts that must be sold to break even
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Question 13 continues on page 10

- d) How much is the profit or loss when 6 T-shirts are sold?

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- e) Solve these equations:

i) $2m - 7 = 5$

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ii) $m - 12 = 2(m - 7)$

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iv) $6 - \frac{x}{4} = 9$

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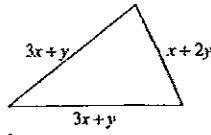
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End of Question 13

Question 15 (10 marks)

- a) The isosceles triangle has three sides whose lengths are $3x+y$, $3x+y$ and $x+2y$. Write, in simplified terms, the perimeter of the triangle.



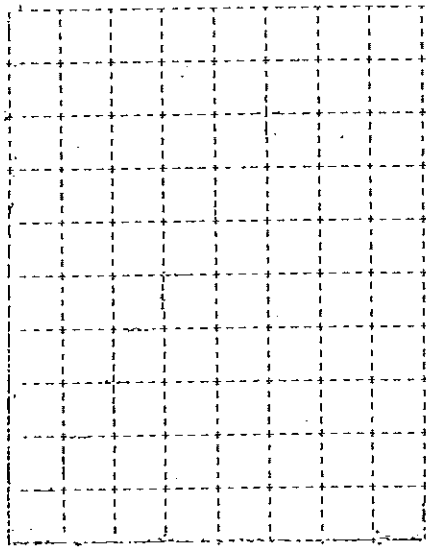
- b) Express $\frac{8x^3y^2}{16x^2y^3}$ in its simplest form.

- c) Find the value of $\frac{1}{2\pi fc}$ when $f = 10$ and $c = 2$. Give your answer correct to 3 decimal places.

- d) It is known that y varies directly with x . When x is 4, y is 12.

- i) Write a linear equation in the form $y = mx$ to describe the situation,

- ii) Draw the graph of y against x .

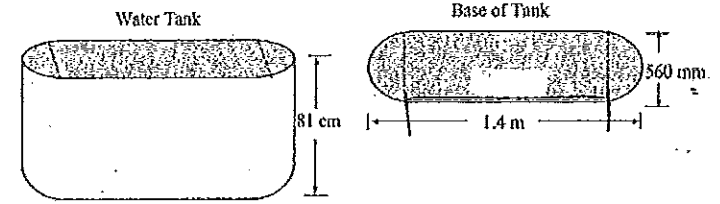


End of Question 15

Question 16 (10 marks)

- a) The base of a water tank is in the shape of a rectangle with a semi-circle at each end, as shown.

The Tank is 1.4 m long, 560 mm wide and has a height of 81 cm.



NOT TO SCALE

- (i) Find the area of the base of the tank.

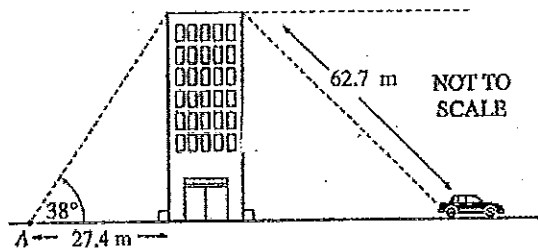
- (ii) Calculate the volume of the tank in square metres.

- (ii) What is the capacity of the tank to the nearest litre?

Question 16 continues on page 15

Question 16 (continued)

- b) The point A is 27.4 m from the base of a building. The angle of elevation from A to the top of the building is 38° .



- (i) Show that the height of the building is approximately 21.4 m

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- (ii) The distance from the top of the building to a parked car is 62.7 m.

What is the angle of depression from the top of the building to the car?
Give your answer to the nearest degree.

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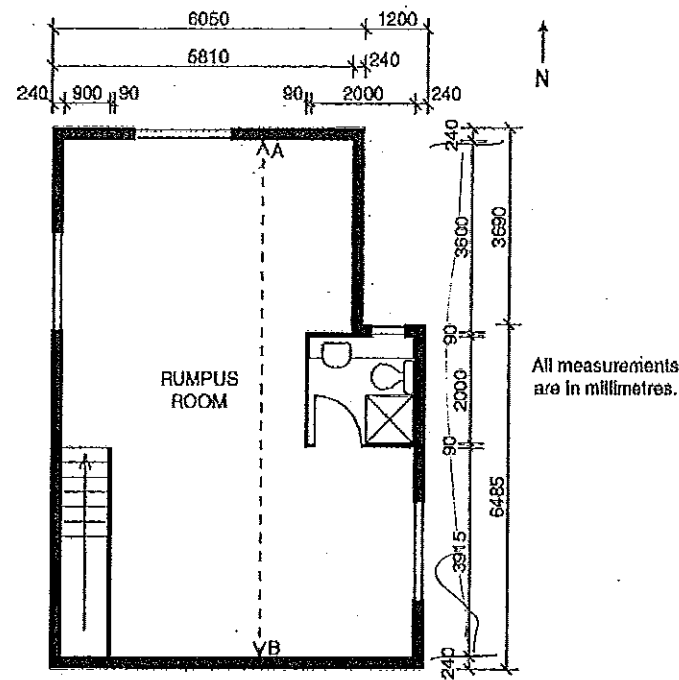
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Question 16 continues on page 16

Question 16 (continued)

- c) Part of a floor plan of a house is shown. The plan is NOT to scale.



- (i) What is the length AB, the internal length of the rumpus room, in millimetres?

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- (ii) Calculate the area of the bathroom floor in square metres.

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END OF EXAM

$$1. \frac{1}{268} \times \frac{1}{2} = \pm 0.187 = C$$

$$2. \frac{6g}{5} \times \frac{3a}{1} = \frac{18a^2}{5} = D$$

$$3. \frac{350}{200} \times 1 = 1.75 \text{ mm} = C$$

$$9. 2449300 \\ = 2.4493 \times 10^6 \\ \approx 2.4 \times 10^6 \text{ (rounded down)} \\ = D$$

$$4. \sqrt{3^2 + 4^2} = \sqrt{25} = 5 = C$$

$$5. \frac{11}{4} = 2.75 \text{ mL} = A$$

$$6. \text{y-intercept at } x=0 \\ \text{ie } y = -3(0) + 1 = 1 = C.$$

$$7. r = 4.5 \text{ mm} \\ d = 4.5 \text{ mm} \times 2 = 9 \text{ mm} \\ \text{Circumference} = \pi d = 9\pi \\ \text{Circumference of quarter circle} = \frac{9\pi}{4} \\ \text{ie } = 4.5 \text{ mm} + 4.5 \text{ mm} + \frac{9\pi}{4} \text{ mm} \\ \approx 16.1 \text{ mm} = C.$$

$$8. 16 \text{ m}^2 + 24 \text{ m} \\ = 8(2m+3) = C.$$

$$a) \frac{2m-4}{5} + 3 = 5$$

$$\frac{2m-4}{5} = (5-3) = 2 \quad *$$

$$2m-4 = 2(5) = 10$$

$$2m = 10 + 4 = 14$$

$$m = \frac{14}{2} = 7$$

$$b) d = 5 \times \sqrt{\frac{h}{2}}$$

$$i) \text{ when } h=18$$

$$d = 5 \times \sqrt{\frac{18}{2}} = 5 \times \sqrt{9} = 5 \times 3$$

$$d = 15$$

$$ii) \text{ when } d=10$$

$$10 = 5 \times \sqrt{\frac{h}{2}}$$

$$\frac{10}{5} = \sqrt{\frac{h}{2}}$$

$$2 = \sqrt{\frac{h}{2}}$$

$$2^2 = \left(\sqrt{\frac{h}{2}}\right)^2 = \frac{h}{2}, \text{ because both sides are non-negative}$$

$$4 = \frac{h}{2} \Rightarrow h = 4 \times 2 = 8$$

c) i) Monthly service fee is

the cost you pay even if you don't make any calls, so the y-intercept of the graph which $\approx \$15$

ii) at $n=20$, $C \approx \$25$

iii) at $C=\$30$, $n \approx 30$

iv) 15 is constant because that gets added in no matter.

Find gradient of the curve. from part (ii) and (iii) we have two points.

(20, 25) and (30, 30)

$$\left(\begin{matrix} \text{let } n=x \\ C=y \end{matrix}\right) \frac{30-25}{30-20} = \frac{5}{10} = \frac{1}{2} = m$$

using the point-gradient formula

$(y-y_1) = m(x-x_1)$ where (x_1, y_1) are any point on the curve.

Let's use (30, 30)

$$(y-30) = \frac{1}{2}(x-30)$$

$$y = \frac{1}{2}x - 15 + 30$$

$$y = \frac{1}{2}x + 15$$

12

a) Area of garden bed =

Area of $\triangle ABC$ + Area of $ACDE$ (1) Area of $\triangle ABC$

$$= \frac{1}{2}bh = \frac{1}{2}(10)(5.1) = 25.5$$

(2) Area of $ACDE = 3.15 \times 10 = 31.5$

$$\text{total area} = (1) + (2) = 25.5 + 31.5 = 57 \text{ m}^2$$

i) $50\text{m} = 0.05\text{m}$.Volume = Area \times height

$$= 57 \text{ m}^2 \times 0.05 \text{ m} = 2.85 \text{ m}^3$$

$$\text{iii) } \frac{2.85}{0.25} \approx 11.4$$

Rounded up to 12 because

11 days won't be enough.

iv) $0.3\text{L} = 300\text{mL} / 100\text{m}^2$.

$$\frac{57}{100} \times 300\text{mL} = 171\text{mL}$$

b) Using ratios and similar triangles. \Rightarrow let height be 'h'

$$\frac{2.2}{10} = \frac{h}{25+10}$$

$$\frac{2.2}{10} = \frac{h}{35}$$

$$h = 7.7\text{m}$$

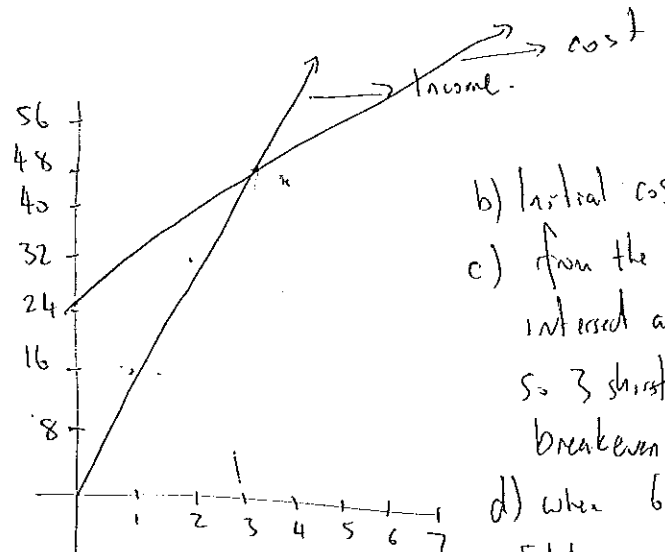
13. Income $\Rightarrow I = 16n$

$$\text{Cost} = 8n + 24$$

$$\text{Income} = 16n$$

	cost					
C	32	40	48	56	64	72
n	1	2	3	4	5	6

	Income					
I	16	32	48	64	80	96
n	1	2	3	4	5	6



b) Initial costs = \$24

c) from the graph, they intersect at (3, 48)

So 3 shirts must be the breakeven point.

d) when 6 t-shirts are

Sold
Profit = \$96

Costs = \$72

Net profit = $96 - 72 = \$24$

e) i) $2m - 7 = 5$

$$2m = 5 + 7 = 12$$

$$2m = 12$$

ii) $m - 12 = 2(m - 7)$

$$m - 12 = 2m - 14$$

$$2m - m = -12 + 14$$

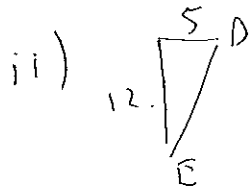
$$m = 2$$

iii) $6 - \frac{x}{4} = 9$

$$24 - x = 36$$

$$x = 24 - 36 = -12$$

i) $x = 27 - 22 = 5$

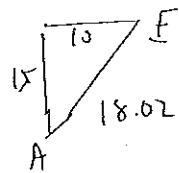
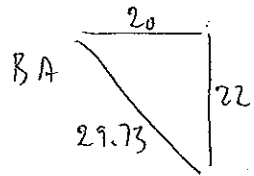
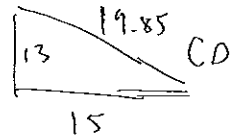
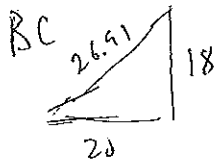


$$DE = \sqrt{5^2 + 12^2}$$

$$DE = 13$$

iii) Perimeter of the field.

$$= BC + CD + DE + EA + AB$$



$$DE = 13 \text{ (from i)}$$

$$= 26.91 + 19.85 + 18.02 + 29.73 + 13$$

$$\approx 107.51 \text{ m.}$$

b) 1.8 million

$$i) = \frac{1800000}{5+3+2} = 180000$$

$$180000 \times 5$$

$$180000 \times 3$$

$$180000 \times 2$$

$$= 900000 : 540000 : 360000$$

ii) The part ratio then becomes

$$900000 : 700000 : 200000$$

$$\Rightarrow 5 : 3.89 : 1.11$$

$$\Rightarrow 9 : 7 : 2$$

15
Perimeter

$$a) 3x + y + x + 2y + 3x + y$$

$$= 7x + 4y$$

$$b) \frac{8x^3y^2}{16x^2y^3} \Rightarrow \frac{x}{2y}$$

$$c) \frac{1}{2\pi f \cdot c} \quad f = 10, c = 2$$

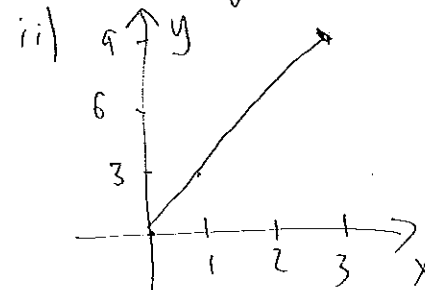
$$= \frac{1}{40\pi}$$

$$= 0.008$$

d) i) when x is 4, $y = 12$

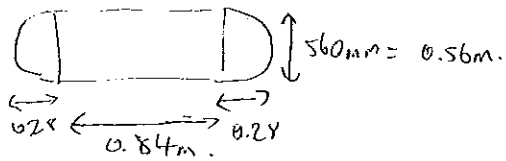
So y is 3 times 4

$$\text{ie } y = 3x$$



16. Base of tank.

Diameter of circle



$$\begin{aligned} \text{Area} &= 0.84 \times 0.56 \text{ (rectangle)} \\ &+ \pi (0.28)^2 \text{ (circle)} \\ &= 0.717 \text{ m}^2 \text{ (3dp.)} \end{aligned}$$

i) Volume = Area \times height

$$= 0.717 \text{ m}^2 \times 0.81$$

$$= 0.58 \text{ m}^3$$

$$1 \text{ m}^3 = 1000 \text{ Litres}$$

\therefore Capacity of the tank

is 580 Litres

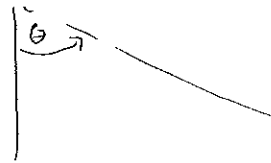
b) Let the building height be 'h'.

$$\frac{h}{27.4} = \tan 38^\circ$$

$$h = 27.4 \tan 38^\circ = 21.4 \text{ m.}$$

ii) Angle of depression (let this be θ)

i) cont



$$\text{height} = 21.4 \text{ m (from i)}$$

$$\text{so } \frac{21.4}{62.7} = \cos \theta$$

$$\theta \approx 70^\circ$$

c) i) AB = 6485 + 3690

$$= 10175 \text{ mm}$$

ii) Bathroom
measurements

$$\text{Area} = 2000 \times 2000 \text{ (mm)}$$

$$= 2 \text{ m} \times 2 \text{ m.}$$

$$= 4 \text{ m}.$$