



NAME: SOLUTIONS
TEACHER: GON KAU FDE ABU

St Aloysius' College

Year 9

Yearly Examination

2016

MATHEMATICS (5.3 course)

General Instructions

Reading time – 5 minutes

Working time – $1\frac{1}{2}$ hours

- Write using black pen only.
- Board approved calculators may be used
- All necessary working should be shown in every question in the spaces provided.
- Marks will be deducted for careless and poorly arranged work
- Examination papers must NOT be removed from the examination room.

Total marks – 80

Attempt all questions

Section A – Multiple Choice (20 Marks)

- All questions are of equal value
- These are objective response questions.
- Circle the correct answer on the examination booklet.

Section B – Short answer (20 marks)

Section C – Working required (40 marks)

SECTION A**MULTIPLE CHOICE:**

- The following 20 Multi-Choice questions have only one correct answer.
- Circle the correct answer (A), (B), (C) or (D) in the examination booklet.

1. Round 758.758 to the nearest tenth:

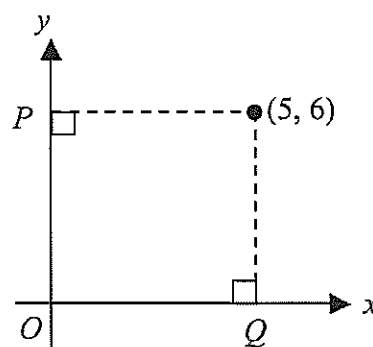
- (A) 758.76 (B) 759 (C) 758.7 (D) 758.8

2. Nathan spends $\frac{1}{5}$ of his pay on food and $\frac{1}{2}$ on rent. He banks the remainder.
What fraction of his pay is banked?

- (A) $\frac{3}{10}$ (B) $\frac{7}{10}$ (C) $\frac{2}{7}$ (D) $\frac{5}{7}$

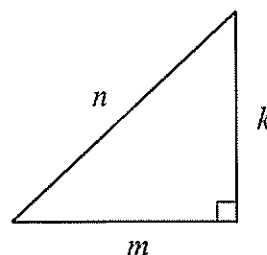
3. What are the coordinates of P and Q?

- (A) P(0, 5) and Q(6, 0)
(B) P(0, 6) and Q(5, 0)
(C) P(6, 0) and Q(0, 5)
(D) P(5, 0) and Q(0, 6)



4. For the triangle shown, Pythagoras' Theorem states that:

- (A) $k^2 = m^2 - n^2$
(B) $n^2 = (m + k)^2$
(C) $m^2 = n^2 - k^2$
(D) $n^2 = m^2 - k^2$



5. Luke earns \$1,746.50 per fortnight.

What is his yearly income, to the nearest dollar?

- (A) \$45,409 (B) \$91,132 (C) \$90,818 (D) \$45,566

6. $\frac{m^4 \times m^8}{m^2}$ simplifies to:

(A) m^{16}

(B) m^{10}

(C) m^8

(D) m^6

7. The simple interest on \$1,200 for 5 months at 6% per annum is:

(A) \$3,000

(B) \$72

(C) \$360

(D) \$30

8. Factorise $3x^2 + 24x$.

(A) $3(x^2 + 8)$

(B) $3x(x + 8)$

(C) $3(x^2 + 12)$

(D) $3x(x + 12)$

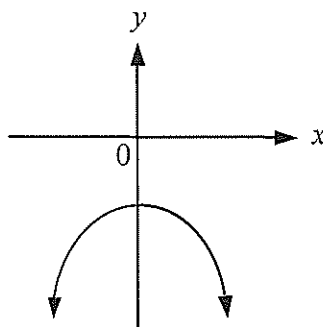
9. The parabola shown could have equation:

(A) $y = -x^2 + 3$

(B) $y = -x^2 - 3$

(C) $y = x^2 - 3$

(D) $y = x^2 + 3$



10. Julianne draws one card from the eight which are shown below.

What is the probability that she draws a card which has an A or a 9, but not both?

(A) $\frac{1}{8}$

(B) $\frac{1}{4}$

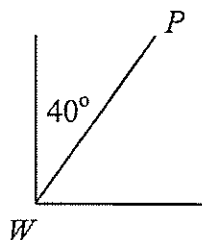
(C) $\frac{3}{8}$

(D) $\frac{1}{2}$

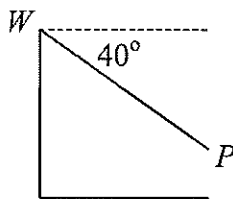
A1	B4	A7	U2
K9	W8	Q8	A9

11. In which diagram is the angle of depression of P from W equal to 40° ?

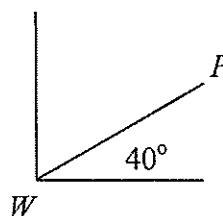
(A)



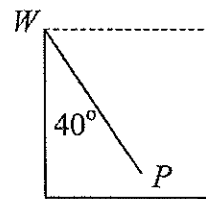
(B)



(C)



(D)



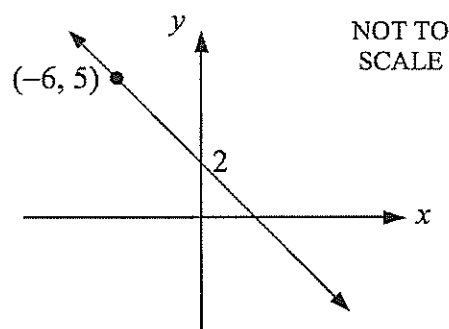
12. The gradient of the line is:

(A) -2

(B) $-\frac{1}{2}$

(C) $\frac{1}{2}$

(D) 2



13. Susilo has a gross annual income of \$69 000.00 and eligible tax deductions which total \$1 255.00. Use the table below to calculate the amount of income tax he must pay.

Taxable Income	Tax on Taxable Income
\$0 – \$18,200	NIL
\$18,201 – \$37,000	19 ¢ for each \$1 over \$18,200
\$37,001 – \$80,000	\$3,572 plus 32.5 ¢ for each \$1 over \$37,000
\$80,001 – \$180,000	\$17,547 plus 37 ¢ for each \$1 over \$80,000
\$180,001 – and over	\$54,547 plus 45 ¢ for each \$1 over \$180,000

(A) \$3 572.00

(B) \$9 992.13

(C) \$13 564.13

(D) \$22 425.00

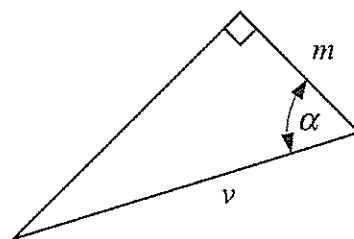
14. Which statement is correct?:

(A) $m = v \cos \alpha$

(B) $v = m \sin \alpha$

(C) $m = v \sin \alpha$

(D) $v = m \cos \alpha$



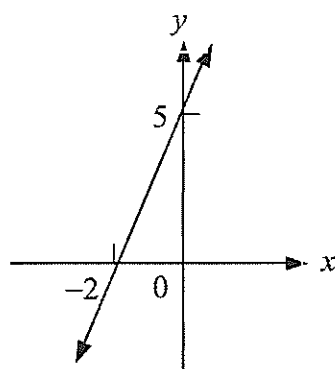
15. The equation of the graph is:

(A) $2x - 5y - 5 = 0$

(B) $5y - 2x + 5 = 0$

(C) $5x - 2y + 10 = 0$

(D) $2y + 5x - 10 = 0$



16. $5x^{-\frac{1}{2}} = ?$

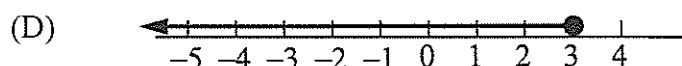
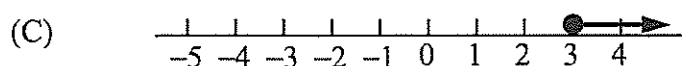
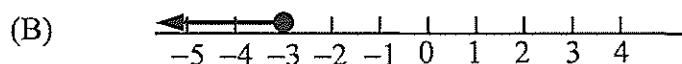
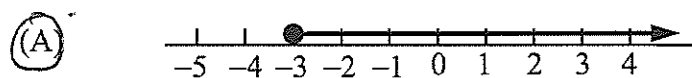
(A) $-\frac{1}{\sqrt{5x}}$

(B) $\frac{5}{\sqrt{x}}$

(C) $\frac{1}{5\sqrt{x}}$

(D) $\frac{5}{x^2}$

17. The solution to $1 - 2x \leq 7$ can be represented by:



18. If $16m^2 - 24m + P = (4m + Q)^2$, then:

- (A) $P = 9$ and $Q = 3$
 - (B) $P = -9$ and $Q = -3$
 - (C) $P = -9$ and $Q = 3$
 - ☒ (D) $P = 9$ and $Q = -3$
-

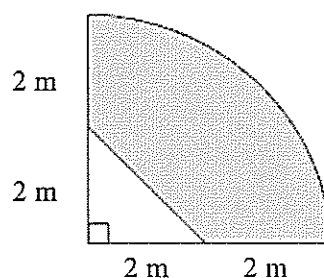
19. Make G the subject of the formula $V = \frac{G^2 h}{4\pi}$ for $G > 0$.

- ☒ (A) $G = \sqrt{\frac{4\pi V}{h}}$
 - (B) $G = \frac{V^2 h}{4\pi}$
 - (C) $G = \frac{\sqrt{4\pi V}}{h}$
 - (D) $G = \sqrt{4\pi V - h}$
-

20. The diagram shows a quadrant of a circle, and a right triangle.

The shaded area is:

- (A) $(4\pi - 4) \text{ m}^2$
- (B) $(16\pi - 2) \text{ m}^2$
- (C) $(16\pi - 4) \text{ m}^2$
- ☒ (D) $(4\pi - 2) \text{ m}^2$



End of SECTION A – Multiple-Choice Section

SECTION B

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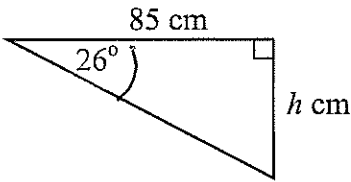


Short Answer Questions: 20 questions. All questions are worth one mark.

20 marks

Give your answer only in the right-hand column.

Working out may be shown in the left-hand column.

	Answer
1. Evaluate $\frac{\sqrt{6.8^2 - 24}}{17}$ correct to two decimal places.	0.28
2. What percentage of \$5 is 80 cents? $\frac{0.8}{5} \times 100$	16%
3. Expand and simplify $-2(3x + 4)$	$-6x - 8$
4. Find the value of $4h^3 - 3gh$ if $g = 6$ and $h = -2$. $4(-2)^3 - 3(6)(-2)$ $-32 + 36$	4
5. Calculate the value of h . (to 1 dec.pl.) $\tan 26 = \frac{h}{85}$ $h = 85 \tan 26$ 	41.5 cm
6. Expand and simplify $(3x - 8)(2x + 5)$. $6x^2 + 15x - 16x - 40$	$6x^2 - x - 40$

7. Expand and simplify
- $(2m - 5)^2$
- .

$$4m^2 - 20m + 25$$

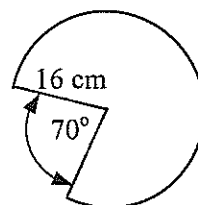
8. Express
- $x^{\frac{3}{4}}$
- in surd form.

$$\left(x^{\frac{1}{4}}\right)^3 = \left(x^3\right)^{\frac{1}{4}}$$

$$4\sqrt{x^3}$$

9. Calculate the perimeter, giving answer to the nearest whole number.

$$P = 32 + \left(\frac{290}{360} \times 2\pi \times 16\right)$$



$$113 \text{ cm.}$$

10. Determine the gradient of the straight line with equation:
- $8 - 2y = 6x$

$$2y = 8 - 6x$$

$$y = 4 - 3x$$

$$m = -3$$

11. Simplify
- $2\sqrt{8} \times 3\sqrt{5}$

$$6\sqrt{40}$$

$$6 \times \sqrt{4} \times \sqrt{10}$$

$$12\sqrt{10}$$

12. Calculate the
- compound interest**
- earned when \$32 000 is invested for 6 years, at an interest rate of 8 % p.a., compounded yearly. Give answer to the nearest dollar.

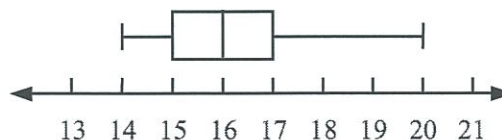
$$A = 32000 (1.08)^6$$

$$= \$50779.98$$

$$\therefore I = 50779.98 - 32000$$

$$\$18780$$

13. The ages of movie-goers at a cinema was recorded by management, and then displayed in the box-and-whisker plot. If there were 528 people at a session, how many were aged 17 or more?



$$25\% \times 528$$

$$132.$$

14. Solve for x , the equation: $8x - 15 = 6x + 9$

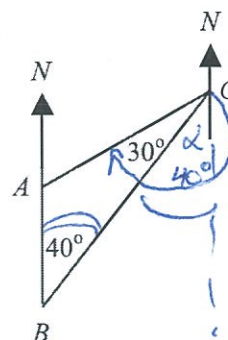
$$2x - 15 = 9$$

$$2x = 24$$

$$x = 12.$$

15. Determine the True bearing of A from C .

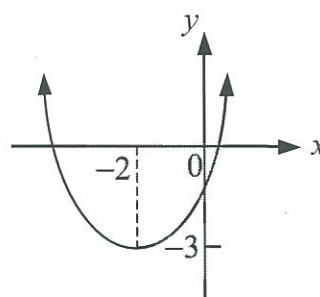
$$180^\circ + 40^\circ + 30^\circ$$



$$250^\circ \text{ T.}$$

16. The graph of the given parabola has its monic quadratic equation in the form: $y = (x - h)^2 + k$.

Write the equation of the parabola in the above form.



$$y = (x + 2)^2 - 3$$

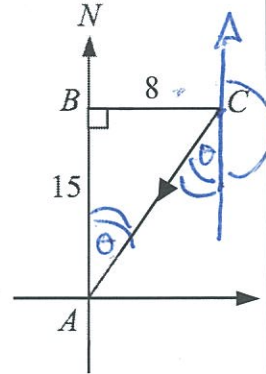
17. An army platoon, on manoeuvres, leaves its base camp A and walks due north for 15 km to camp B . They rest, and then walk 8 km due east to camp C . They then return to base camp A along a direct straight line AC . Calculate the True Bearing of A from C , to the nearest degree

$$\tan \theta = \frac{8}{15}$$

$$= 28^\circ$$

$$\therefore \text{Bearing} = 180^\circ + 28^\circ$$

$$= 208^\circ$$



208°

18. A car is now worth \$13 000. What was its original price, if it was bought 9 years ago, and depreciated at an average yearly rate of 12 % p.a. Give the answer to the nearest thousand dollars.

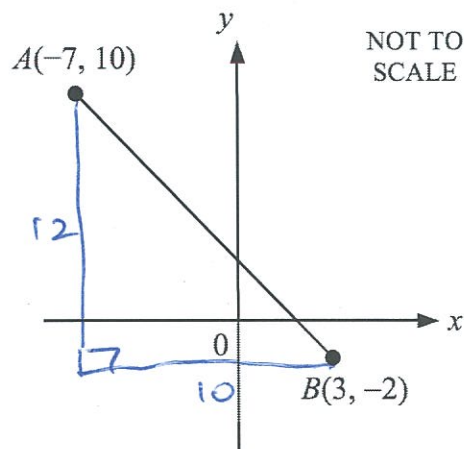
$$\$13000 = P(1 - 0.12)^9$$

$$P = \frac{13000}{0.88^9}$$

\$ 41000

19. Calculate the length of the interval AB . Give answer to one decimal place.

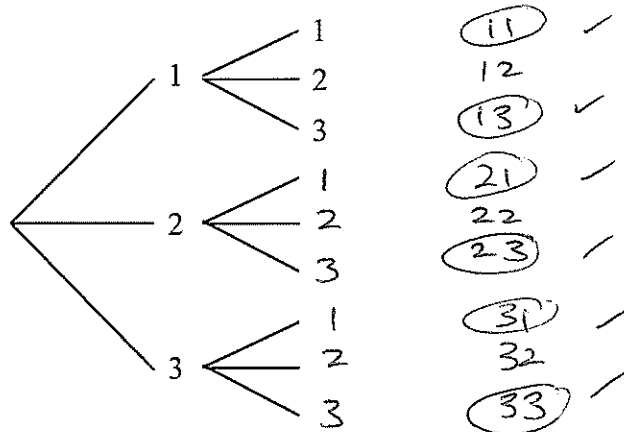
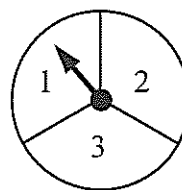
$$d = \sqrt{10^2 + 12^2}$$



15.6.

20. A spinner has 3 numbers 1, 2, and 3, as shown.

The spinner is spun twice, forming 2-digit numbers.
Complete the tree diagram below



$\frac{2}{3}$

Calculate the probability of spinning an odd 2-digit number.

$$P(\text{odd}) = \frac{6}{9}$$

End of SECTION B

SECTION C

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Free Response Questions:

40 marks

All necessary working is to be shown for Section C.
Marks for each question are given on the right hand side of the page.

1. Convert 257369473 into scientific notation, giving the answer to 3 significant figures.

$$2.57 \times 10^8$$

2

2. Simplify: $3k^7p^{-5} \times (2p^3k^4)^3$

$$\frac{3k^7}{p^5} \times \frac{8p^9k^{12}}{1}$$

$$24k^{19}p^4$$

2

3. Simplify $3\sqrt{32} + 4\sqrt{8}$, leaving answer in exact form.

$$3(4\sqrt{2}) + 4(2\sqrt{2})$$

$$20\sqrt{2}$$

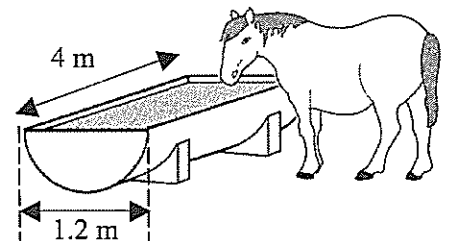
2

4. A water trough, in the shape of a half cylinder, is shown.
Calculate the capacity of the trough, to the nearest litre.

$$V = \frac{\pi \times 0.6^2 \times 4}{2}$$

$$= 2.262 \text{ m}^3$$

$$\text{Cap} = 2262 \text{ L}$$



2

5. Factorise fully $12p + 5m - 4mp - 15$

$$\begin{aligned} 12p - 4mp + 5m - 15 \\ 4p(3 - m) - 5(3 - m) \\ (4p - 5)(3 - m) \end{aligned}$$

2

6. Simplify $(27m^{12}p^6)^{\frac{2}{3}}$, giving answer in simplified index form.

$$\begin{aligned} \left(\sqrt[3]{27m^{12}p^6} \right)^2 \\ (3m^4p^2)^2 \qquad 9m^8p^4 \end{aligned}$$

2

7. The stem-and-leaf plot below represents the percentage marks scored by the Year 9 advance students in their Yearly exam.

- (i) Determine the median.

72

- (ii) Determine the interquartile range.

$$\begin{aligned} IQR &= 82 - 64 \\ &= 18 \end{aligned}$$

Year 9 Test Marks	
5	4 7 8 9 Q_1
6	0 2 ④ 5 6 6 7 8
7	1 3 5 7 8 8 9
8	② 5 7 8
9	1 4 5
	Q_3

2

8. Factorise fully $100x^2 - 4y^2$.

$$\begin{aligned} 4(25x^2 - y^2) \\ 4(5x + y)(5x - y) \end{aligned}$$

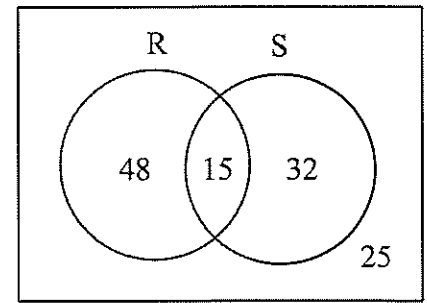
2

9. The Venn diagram shows the number of students playing Rugby (R) and/or Soccer (S)

What is the probability that a student chosen at random:

- (i) Plays Soccer?

$$\frac{47}{120}$$



2

- (ii) Does not play rugby?

$$\frac{57}{120} = \frac{19}{40}$$

10. Solve the equation for m . $6\left(\frac{5m-9}{3}\right) + 6\left(\frac{7-4m}{2}\right) = (4)6$

$$2(5m-9) + 3(7-4m) = 24$$

$$10m - 18 + 21 - 12m = 24$$

$$-2m + 3 = 24$$

$$-2m = 21$$

$$m = -\frac{21}{2}$$

3

11. Factorise $5x^2 + 6x - 8$.

$$(5x - 4)(x + 2).$$

2

12. Factorise and then simplify fully: $\frac{6}{x^2 + 2x - 15} - \frac{4}{x^2 - 9}$

$$= \frac{6}{(x-3)(x+5)} - \frac{4}{(x+3)(x-3)}$$

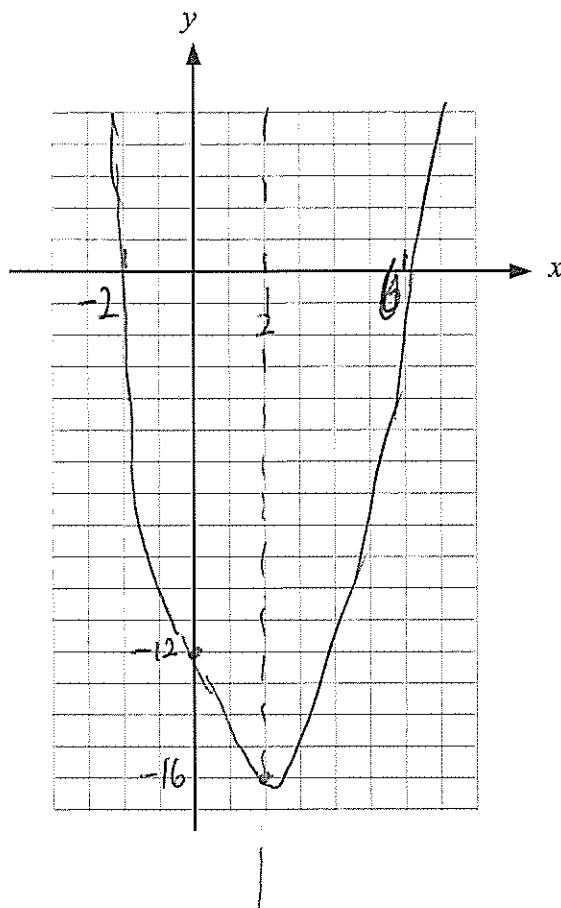
$$= \frac{6(x+3) - 4(x+5)}{(x-3)(x+5)(x+3)}$$

3

$$= \frac{6x + 3 - 4x - 20}{(x-3)(x+5)(x+3)}$$

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

13. By solving the quadratic equation $y = x^2 - 4x - 12$, sketch the graph of its parabola, on the number plane below, showing all the relevant features, such as the x and y intercepts, and coordinates of the vertex.



3

$$x=0 \quad \underline{y \text{ int}} = -12$$

$$y=0 \quad \underline{x \text{ ints}} \quad (x-6)(x+2) = 0$$

$$x = 6 \text{ or } -2.$$

$$\underline{\text{axis sym}} = \frac{6+(-2)}{2}$$

$$= 2$$

$$\underline{\text{vertex}} \quad y = 2^2 - 4(2) - 12$$

$$= 4 - 8 - 12$$

$$= -16$$

14. Substance A (initially 30g) decays at a rate of $1\frac{1}{2}$ grams per min, while substance B (initially 20g), decays at a rate of $\frac{2}{3}$ grams per minute.

Let y_A and y_B grams be the amount of substances A and B respectively at time t minutes after the substances begin to decay.

- (i) Write down the equations for y_A and y_B in terms of t .

$$y_A = -\frac{3}{2}t + 30 \qquad y_B = -\frac{2}{3}t + 20$$

- (ii) Find the time it takes for substance A to decay to 0 grams.

$$0 = -\frac{3}{2}t + 30$$

$$\frac{3}{2}t = 30$$

$$3t = 60$$

$$t = 20$$

$\therefore 20 \text{ mins.}$

- (iii) How long does it take for both substances to have the same weight?

$$-\frac{2}{3}t + 20 = -\frac{3}{2}t + 30$$

$$\frac{5}{6}t = 10$$

$$5t = 60$$

$$t = 12$$

$\therefore 12 \text{ mins.}$

- 15 A gardener decides to subdivide a rectangular garden bed of area 30 m^2 into three equal sections.. He places edging along the outside of the garden bed and as dividers between each section. It takes 32 metres of edging. Each of the three sections of garden have length y metres (which is also the length of each divider), and width x metres.

- (i) Show that the area of the entire garden bed is:

$$A = \frac{3}{2}x(16 - 3x) \text{ m}^2.$$

$$E = 32 \text{ m}$$

$$E = 6x + 4y$$

$$\therefore 32 = 6x + 4y$$

$$32 = 2(3x + 2y)$$

$$16 = 3x + 2y.$$

$$2y = 16 - 3x$$

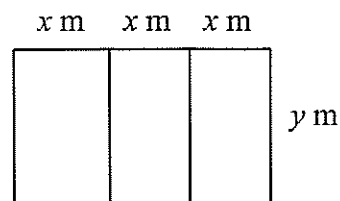
$$y = \frac{16 - 3x}{2}$$

$$A = lb$$

$$A = 3xy$$

$$= 3x \times \left(\frac{16 - 3x}{2} \right)$$

$$= \frac{3}{2}x(16 - 3x) \text{ m}^2$$



Question 15 continued

(ii) Hence find the two possible sets of dimensions of the garden bed.

$$30 = \frac{3}{2}x(16-3x)$$

$$60 = 48x - 9x^2$$

$$9x^2 - 48x + 60 = 0$$

$$3x^2 - 16x + 20 = 0$$

$$(x-2)(3x-10) = 0$$

$$x = 2 \text{ or } \frac{10}{3}$$

4.

$$\text{If } x = 2, y = \frac{16-3(2)}{2} = 5$$

\therefore dimensions
width $3(2) = 6\text{m}$
length $= 5\text{m}$

$$\text{If } x = \frac{10}{3}, y = \frac{16-3(\frac{10}{3})}{2} = 3$$

\therefore dimensions
width $3(\frac{10}{3}) = 10\text{m}$
length 3m

End of Exam