FAIRFIELD METHODIST SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2006
SECONDARY TWO EXPRESS

MATHEMATICS PAPER 1

Date: 10th October 2006 **Time: 1 h 15 min**

NAME: _____ ( ) CLASS: _____

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions.
2. All answers are to be written in **INK** in the spaces provided.
3. Omission of essential working will result in loss of marks.
4. Use of calculator is **NOT ALLOWED** in this paper.

INFORMATION TO CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

You should not spend too much time on any one question.

For Examiner's Use

Paper	Marks
1	/50
2	/50
Total	%

This question paper consists of 12 printed pages.

Name: _____ ( ) Class: _____

1.(a) Evaluate $2\frac{3}{5} - 1\frac{2}{3}$.

Answer (a) _____ [1]

(b) Calculate 45% of 4.8 kg.

Answer (b) _____ [1]

(c) Divide 2.34 by 0.2 exactly.

Answer (c) _____ [1]

Name: _____ ( ) Class: _____

2.(a) Find the HCF of $12a^2bc^3$ and $18ab^2c^2$.

Answer (a) _____ [2]

(b) A map is drawn to scale of 1 : 50 000.

(i) Calculate the actual distance of a path, in km, which is represented by 30 cm on the map.

Answer (b)(i) _____ [2]

(ii) Calculate the actual area of a lake, in km^2, which is represented on the map by an area of 12 cm^2?

Answer (ii) _____ [2]

Name: _____ ( ) Class: _____

3.(a) Given that y is directly proportional to $x+2$, and that $y = 10$ when $x = 3$,.
(i) express y in terms of x.

Answer (a)(i) _____ [2]

(ii) Hence, find the value of y when $x = -5$.

Answer (ii) _____ [1]

(b) Solve the inequality $2x - 1 < 4(1 - x)$. Illustrate your solution on a number line.

Answer (b) _____ [2]

Name: _____ ( ) Class: _____

4.(a) Expand and simplify $(4x + 3y)(x - 2y)$.

Answer (a) _____ [2]

4.(b) Factorise completely

(i) $9a^2 - 4b^2$,

Answer (b)(i) _____ [2]

(ii) $9x^2 + 3x - 6$.

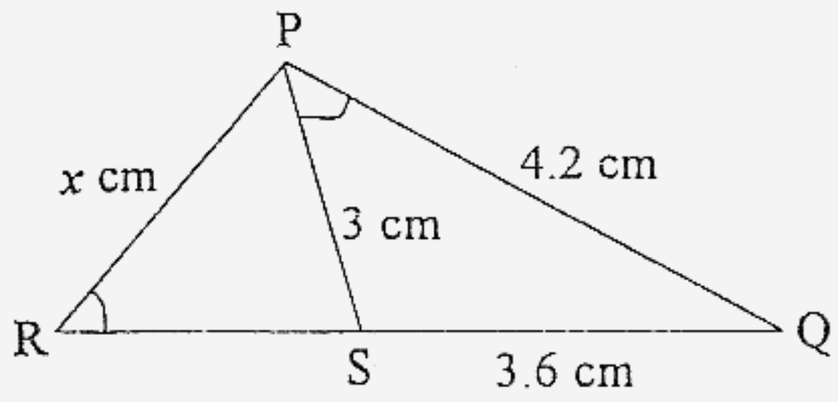
Answer (ii) _____ [2]

Name: _____ ( ) Class: _____

4.(c) Solve the equation $\frac{2x-5}{3}-\frac{x-3}{6}=\frac{1}{2}$.

Answer (c) _____ [3]

5.(i) Given that $PR = x$ cm, $PQ = 4.2$ cm, $PS = 3$ cm and $SQ = 3.6$ cm and $\angle PRQ = \angle SPQ$. Write down a pair of similar triangles.



Answer (i) _____ [1]

(ii) Find the length of x.

Answer (ii) _____ [2]

Name: _____ ( ) Class: _____

6. (i) The interior angle of a n-sided regular polygon is 3 times its exterior angle. Find the value of n.

(ii) Name this polygon.

Answer *(i)* _____ [2]

(ii) _____ [1]

7.(a) Solve the simultaneous equations

$3x - 4y = 2$,

$2x + 7 = 6y$.

Answer *(a)* _____ [3]

Name: _____ ( ) Class: _____

7.(b) (i) Mr Low walked for 1 hour 15 minutes at an average speed of 10 km/h. How far did he walk?

Answer *(b)(i)* _____ [1]

(ii) Assuming he is in a rush and he takes a taxi travelling at 25 km/h for the same distance as in part (i). How long does the journey take?

Answer *(ii)* _____ [1]

(iii) If he boards the taxi at 2.35 pm, at what time will he reach his destination?

Answer *(iii)* _____ [1]

Name: _____ ( ) –Class: _____

8.(a) It is given that $\varepsilon = \{x : 1 \leq x \leq 15, x \text{ is a positive integer}\}$. Sets A, B and C are subsets of the universal set, ε. List the elements of

(i) $A = \{x : x + 3 \leq 10\}$,

Answer (a)(i) _____ [1]

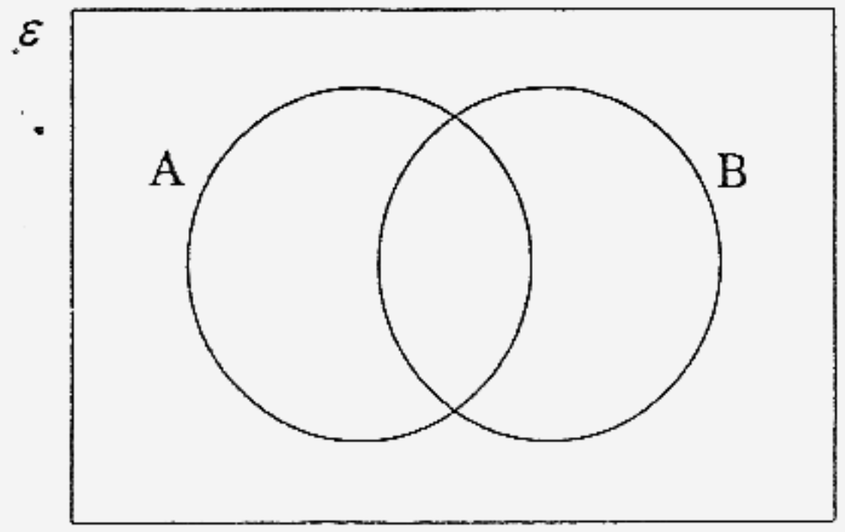
(ii) $B = \{x : x \text{ is a multiple of } 3\}$,

Answer (ii) _____ [1]

(iii) $C = A' \cap B$.

Answer (iii) _____ [1]

(iv) Hence, shade in the Venn Diagram below the region representing the set C. [1]

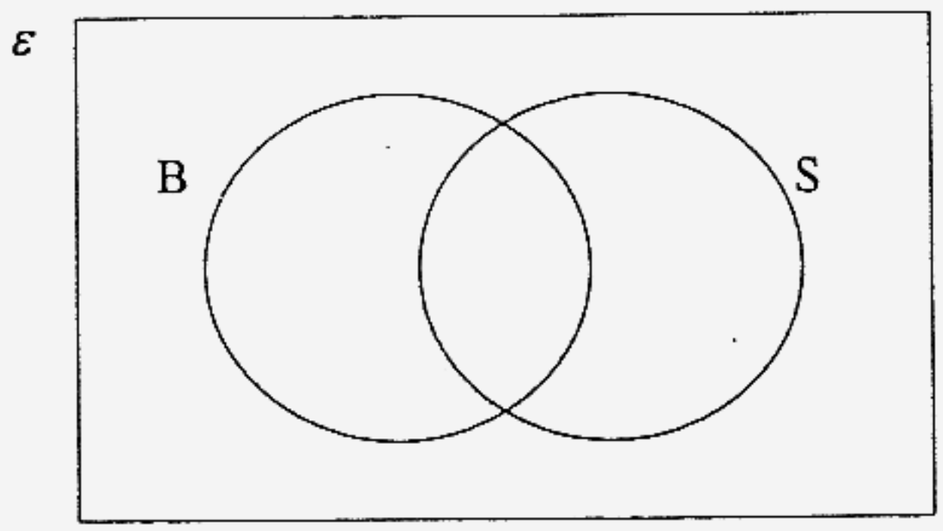


Name: _____ ( ) Class: _____

8.(b) 44 students were given a choice to join a CCA of their choice. It is given that

B = students who choose basketball, S = students who choose soccer, $n(B \cap S) = x$, $n(S) = 23$ and $n(B) = 30$.

(i) Complete the Venn diagram to illustrate the above information. [1]



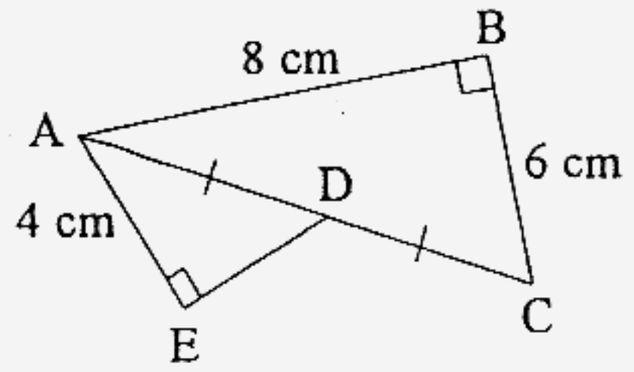
(ii) Hence, find the number of students who play soccer only.

Answer (b)(ii) _____ [2]

8.(b) (iii) Describe the set $B \cap S$ in words. [1]

Name: _____ ( ) Class: _____

9. Given that AB = 8cm, BC = 6 cm, AE = 4 cm, DE = x cm and AD = DC, find the value of



(i) AD,

Answer (i) _____ [2]

(ii) ED.

Answer (ii) _____ [1]

10. The following are marks scored by 10 students in a Mathematics test marked out of a total of 10:

3, 6, 4, 3, 5, 6, 7, 9, 6, 4

Find (i) the modal mark,

Answer (i) _____ [1]

10. (ii) the median mark,

Answer *(ii)* _____ [1]

(iii) the mean of this set of marks.

Answer (iii) _____ [2]

End of Paper

PAPER 2 (50 MARKS)

Name_____( ) Class_____

1 a) Express as a single fraction in its simplest form

$$\frac{3}{2x-3}-\frac{8}{x+2}$$

Answer a)_____[2]

b) Simplify $\frac{2y^2-3y-5}{y^2-1}\div\frac{6y-15}{y^2+1}$

Answer b)_____[3]

Name_____( ) Class_____

2 Factorise $12ab-20a+18bc-30c$ completely.

Answer _____[2]

3 An oil trader bought some oil for \$500. He paid \$$x$ for each litre of oil.

i) Find, in terms of x, an expression for the number of litres of oil he bought.

Answer i)_____[1]

ii) Due to a leak, he lost 3 litres of oil. He sold the remainder of the oil for \$1 per litre more than he paid for it. Write down an expression, in terms of x, for sum of the money he received and show that it is equal to \$ $\frac{(500-3x)(x+1)}{x}$.

[2]

Name_____ ( ) Class_____

3 iii) He made a profit of $17.

(a) Write down an equation in x and show that it reduces to

$$3x^2 + 20x - 500 = 0.$$ [3]

iii) (b) Solve the equation $3x^2 + 20x - 500 = 0$.

Answer iii) (b)_____

Name_____ ( ) Class_____

3 iii) (c) Hence find the number of litres of oil he sold.

Answer iii) (c)_____[1]

4 i) Given that $t = \sqrt{\frac{g^2 + hr}{3r}}$, express r in terms of g, h and t.

Answer i)_____[2]

ii) Hence, calculate the value of r when $g = 21$, $h = -4$ and $t = 12$.

Answer ii)_____[1]

Name_____( ) Class_____

5 a) A biased die is thrown. If the probability of getting a six is 3 times higher than getting any one of the other five numbers, what is the probability of getting a four?

Answer a)_____[2]

b) Two unbiased dice are thrown. The possibility diagram when the two dice are thrown is shown below. *For example, (1, 3) represents that the first die shows a number 1 and the second die shows a number 3.*

(i) Complete the possibility diagram. [1]

6	(1, 6)		(3, 6)		(5, 6)	(6, 6)
5	(1, 5)	(2, 5)			(5, 5)	
4		(2, 4)	(3, 4)	(4, 4)		(6, 4)
3	(1, 3)		(3, 3)	(4, 3)	(5, 3)	
2		(2, 2)			(5, 2)	
1	(1, 1)		(3, 1)	(4, 1)		(6, 1)
	1	**2**	**3**	**4**	**5**	**6**

Name_____( ) Class_____

5 b) (ii) List all the possible outcomes that both the numbers are prime numbers and find the probability that both the numbers are prime numbers.

Answer b) (ii) P(both nos. are prime) is _____[2]

(iii) List all the possible outcomes that the difference of the two numbers is one and find the probability that the difference of the two numbers is one.

Answer b) (iii) P(the difference of the two nos. is one) is _____[2]

Name_____( ) Class_____

6 The distribution table below gives the ages of a group of 600 people:

Age (in completed years)	Number of people	Mid-Value
20-29	56	
30-39	87	
40-49	165	
50-59	184	
60-69	73	
70-79	23	
80-89	12	

i) Complete the table. [1]
ii) Write down the modal class of the distribution.
iii) Calculate an estimate mean age of the distribution.

Answer ii)_____[1]

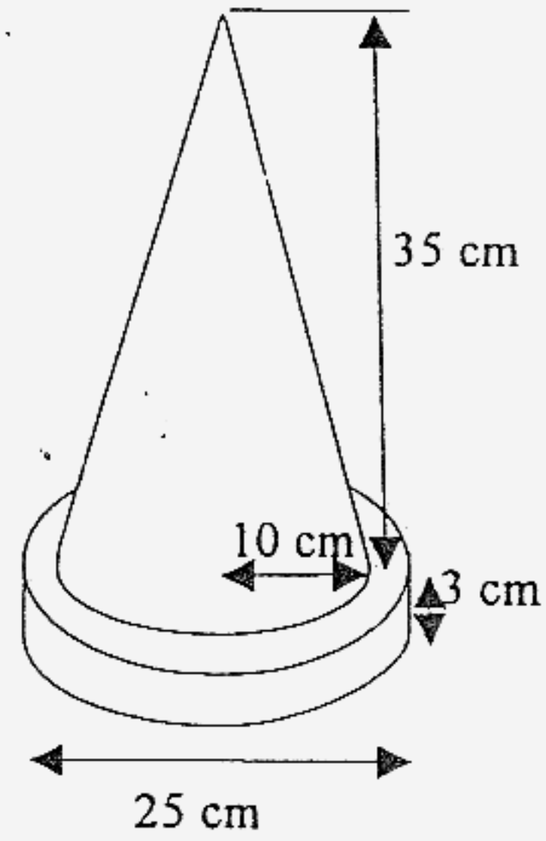
iii)_____[3]

Name_____( ) Class_____

[Take the value of π to be 3.142, leave your answers correct to 1 decimal place]

7 a) A Traffic Marker consists of a solid cone, of height 35 cm and radius 10 cm, with a solid cylindrical base of diameter 25 cm and thickness 3 cm.

(i) Calculate the volume of the cone in cm^3.



Answer a)(i)_____[2]

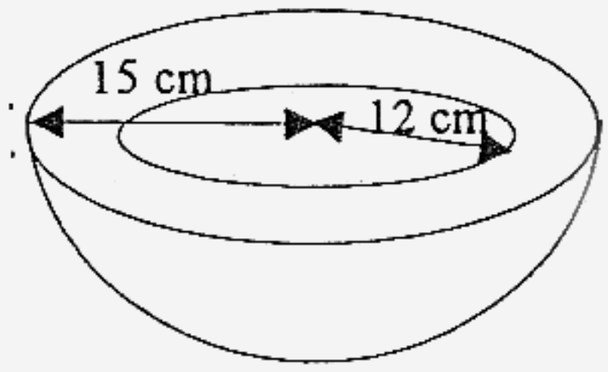
(ii) Calculate the **total** volume of the Marker in cm^3.

Answer a)(ii)_____[2]

Name_____( ) Class_____

7 b) A hemispherical bowl with internal radius of 12 cm and external radius of 15 cm is made from wood.

(i) Every part of the surface of the hemispherical bowl is to be painted gold. Calculate the area of the painted part of the bowl in cm^2.



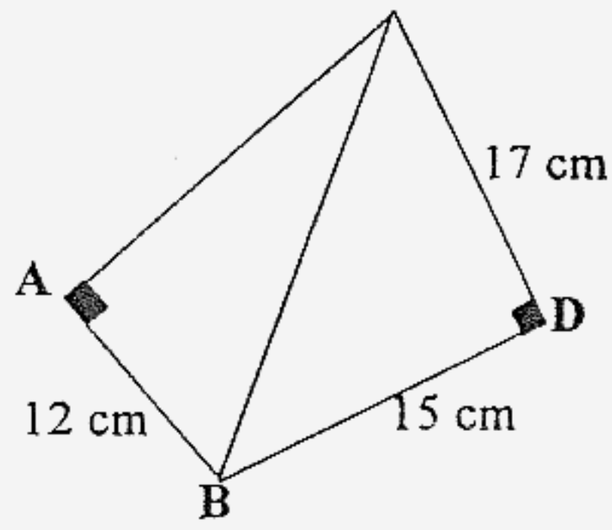
Answer b)(i)_____[3]

Name_____( ) Class_____

7 b) (ii) Calculate the number of litres of water it can hold when it is completely filled.

Answer b)(ii)_____[2]

8 Given that triangles ABC and BCD are right-angled triangles, find the length of AC.



Answer _____[2]

Name_____( ) Class_____

9 **Answer the whole of this question on a piece of graph paper.**

The following shows a table of values of x and y for the equation $y = 4x^2 - 4x - 15$.

x	-3	-2.5	-1	0	1	2	3	4
y	***a***	20	-7	-15	***b***	-7	9	33

i) Find the values of *a* and *b*. [1]

ii) Using a scale of 2cm to represent 1 unit for the x-axis and 1cm to represent 5 units for the y-axis, draw the graph of $y = 4x^2 - 4x - 15$ for $-3 \le x \le 4$.
[3]

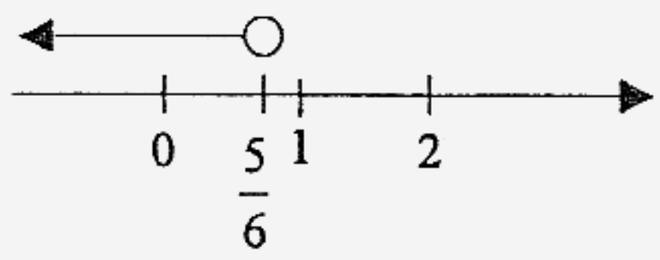
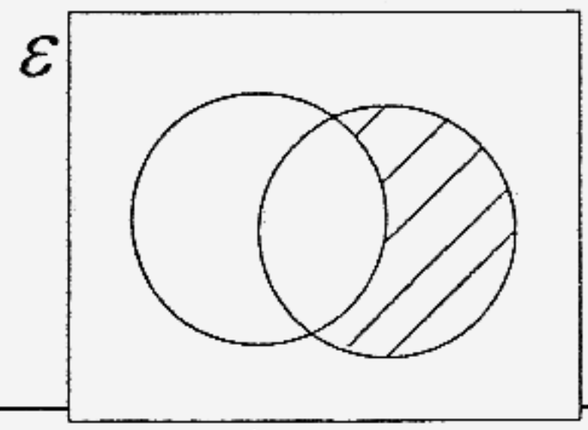
iii) Write down the equation of the line of symmetry of this curve. [1]

iv) On the same graph, draw the graph of the straight line $y = 25$ and hence write down the coordinates of the points at which the two graphs intersect.
[2]

v) Using your graph, solve the equation $4x^2 - 4x - 15 = 0$ [1]

–End of paper–

Answers

1.(a) $\frac{14}{15}$	(b) 2.16 kg
(c) $11\frac{7}{10}$ or 11.7	
2.(a) $6abc^2$	(b)(i) 15 km
	(ii) 3 km^2
3.(a)(i) $y = 2(x + 2)$	(ii) $y = -6$
(b) $x < \frac{5}{6}$ 	
4(a) $4x^2 - 5xy - 6y^2$	(b)(i) $(3a + 2b)(3a - 2b)$
	(ii) $3(3x - 2)(x + 1)$
(c) $x = \frac{10}{3}$ *or* $3\frac{1}{3}$	
5(i) PQR SPQ	(ii) $x = 3.5$ cm
6.(a)(i) n = 8	(ii) Octagon
7.(a) x = 4, y = 2.5	(b)(i) $12\frac{1}{2}$ km
	(ii) hr
	(iii) 3.05 pm
8.(a)(i) A = 1, 2, 3, 4, 5, 6, 7	(ii) B = 3, 6, 9, 12, 15
(iii) C = 9, 12, 15	(iv) 
9.(i) AD = 5 cm	(ii) $x = 3$ cm
10.(i) 6	(ii) 5.5
(iii) 5.3	

Marking Scheme

Name: _____ ( ) Class: _____

1. (a) Evaluate the following:

$2\frac{3}{5} - 1\frac{2}{3}$ [1]

(b) Find 45% of 4.8 kg [1]

(c) Divide 2.34 by 0.12 exactly [1]

(a) $2\frac{3}{5} - 1\frac{2}{3} = \frac{13}{5} - \frac{5}{3}$ [M]

$= \frac{39-25}{15}$

$= \frac{14}{15}$ [A]

(b) $\frac{45}{100} \times 4.8$ [M]

$= 2.16$ kg [A]

(c) $\frac{2.34}{0.2} = \frac{23.4}{2}$ [M]

$= 11\frac{7}{10}$ or 11.7 [A]

2.(a) Find the HCF of $12a^2bc^3$ and $18ab^2c^2$.

$12a^2bc^3 = 2^2 \times 3 \times a^2 \times b \times c^3$ [M]

$18ab^2c^2 = 2 \times 3^2 \times a \times b^2 \times c^2$ [M]

HCF of $12a^2bc^3$ and $18ab^2c^2 = 2 \times 3 \times a \times b \times c^2$ [M]

$= 6abc^2$ [A]

2.(b) (i) On a map with a scale of 1 : 50 000, what is the actual distance, in km, is represented by 30 cm on the map?

(ii) What will be the actual area of a lake in km^2, on the map with an area of 12 cm^2?

(i) 1 cm represented 50 000 cm = 0.5 km [M1]

hence, 30 cm will represented 30 × 0.5 = 15 km (actual distance) [A1]

(ii) 1 cm : 0.5 km

1 cm^2 will represent $0.5 \times 0.5 = 0.25$ km^2 [M1]

hence, 12 cm^2 will represented $12 \times 0.25 = 3$ km^2 (actual area of lake)

[A1]

3.(a) Given that y is directly proportional to $x+2$, and that $y = 10$ when $x = 3$.

(i) Express y in terms of x.

(ii) Hence, find the value of y when x = – 5.

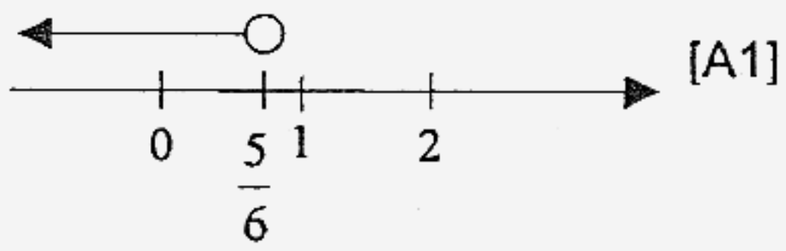
Name: _____ ( ) Class: _____

(i) $y \propto (x + 2)$ [M]
$\Rightarrow \quad y = k(x + 2)$ [M]
when $y = 10$, $x = 3$, we have
$10 = k(3 + 2)$
$\Rightarrow \quad k = 2$ [M]
Hence, $y = 2(x + 2)$ [A]

(ii) when $x = -5$
$y = 2(-5 + 2) = 2(-3)$ [M]
$= -6$ [A]

3.(b) Solve the inequality $2x - 1 < 4(1 - x)$. Illustrate your solution on a number line.

$2x - 1 < 4(1 - x)$
$2x - 1 < 4 - 4x$ [M]
$6x < 5$
$x < \frac{5}{6}$ [A]



[A1]

4.(a) Expand and simplify the following:

$(4x + 3y)(x - 2y)$
$= 4x^2 - 8xy + 3xy - 6y^2$ [M1]
$= 4x^2 - 5xy - 6y^2$ [A1]

4.(b) Factorise the following:

(i) $9a^2 - 4b^2$
$= (3a)^2 - (2b)^2$ [M1]
$= (3a + 2b)(3a - 2b)$ [A1]

(ii) $9x^2 + 3x - 6 = (3x - 2)(3x + 3)$ [M]
$= 3(3x - 2)(x + 1)$ [A]

$-3x \quad -2$
$3x \quad 3$ [M1]
$(-6x) + 9x = 3x$

4.(c) Solve the equation $\frac{2x - 5}{3} - \frac{x - 3}{6} = \frac{1}{2}$

$\frac{2(2x - 5) - (x - 3)}{6} = \frac{1}{2}$ [M1]
$2(2x - 5) - (x - 3) = 3$ [M]
$4x - 10 - x + 3 = 3$ [M]

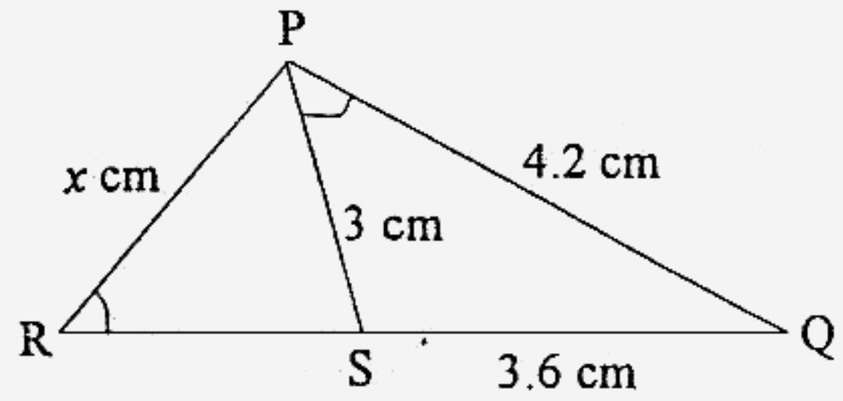
Name: _____ ( ) Class: _____

$3x = 10$ [M]

$x = \frac{10}{3}$ *or* $3\frac{1}{3}$ [A]

5.(i) Given that $PR = x$ cm, $PQ = 4.2$ cm, $PS = 3$ cm and $SQ = 3.6$ cm and $\angle PRQ = \angle SPQ$. Write down a pair of similar triangles.

PQR SQP [A1]



Answer *(i)* _____ [1]

(ii) Find the length of x.

Using similar triangles,

$\frac{PR}{SP} = \frac{PQ}{SQ} = \frac{RQ}{PQ}$ [M]

$\frac{x}{3} = \frac{4.2}{3.6} = \frac{RQ}{4.2}$ [M]

$x = \frac{4.2}{3.6} \times 3$ [M]

$= 3.5$ cm [A]

Answer *(ii)* _____ [2]

6.(a) (i) The interior angle of a regular polygon of n sides is 3 times the exterior angle. Find the value of n.

(ii) Name this polygon.

(i) $\frac{(n-2)180^\circ}{n} = 3\left(\frac{360}{n}\right)$ [M]

$180^\circ n - 360^\circ = 1080^\circ$ [M]

$180°n = 1440°$ [M]

Name: _____ ( ) Class: _____

n = 8 [A]

(ii) Octagon [A1]

7.(a) Solve the pair of simultaneous equations.

$3x - 4y = 2$ — (1) × 2
$2x - 6y = -7$ — (2) × 3 } [M]

$6x - 8y = 4$ — (3) [M]

$-\ \underline{6x - 18y = -21}$ — (4) [M] take (3) – (4), we have

$10y = 25$

$y = 2.5$ [A]

sub y = 2.5 into (1), we have

$3x - 4(2.5) = 2$ [M]

$3x = 2 + 10 = 12$

$x = 4$ [A]

(b) (i) Mr Low walked for 1 hour 15 minutes at an average speed of 10 km/h. How far did he walk?

1 hour 15 minutes = $1\frac{15}{60} = 1\frac{1}{4}$ *or* $\frac{5}{4}$ [M]

Distance = speed × time

$= 10 \times \frac{5}{4} = 12\frac{1}{2}$ km. [A]

7.(b) (ii) Assuming he is in a rush and he takes a taxi travelling at 25 km/h for the same distance as above. How long does the journey take?

$\text{Time} = \frac{Distance}{speed} = \frac{12\frac{1}{2}}{25} = \frac{1}{2}$ hr. [A1]

The journey takes hr.

(iii) If he boards the taxi at 2.35 pm, at what time will he reach his destination?

$\begin{array}{r} 1435 \\ +\ 0030 \\ \hline 1505 \end{array}$ } [M]

or 3.05 pm [A]

8.(a) It is given that $\varepsilon = \{x : 1 \le x \le 15, x \text{ is a positive integer}\}$. Sets A, B and C are subsets of the universal set, ε. List the elements of

(i) $A = \{x : x + 3 \le 10\}$

A = 1, 2, 3, 4, 5, 6, 7 [A1]

(ii) $B = \{x : x \text{ is a multiple of } 3\}$

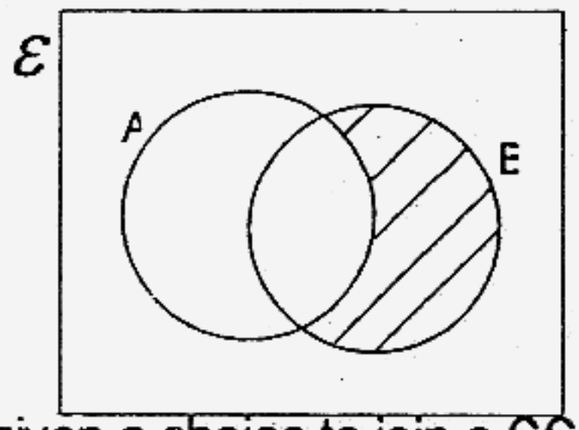
B = 3, 6, 9, 12, 15 [A1]

(iii) $C = A' \cap B$

A' = 8, 9, 10, 11, 12, 13, 14, 15 [M]

C = 9, 12, 15 [A]

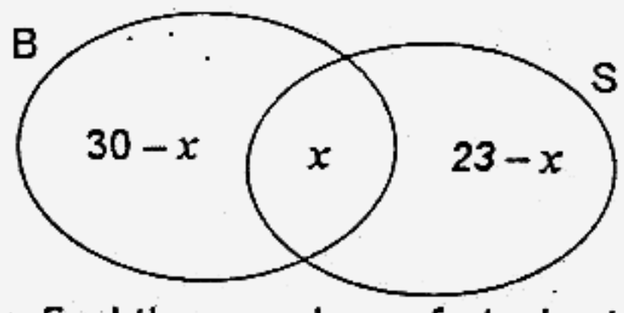
(iv) Hence, shade $A' \cap B$ [1]



[A1]

8.(b) 44 students were given a choice to join a CCA of their choice. If B = students who choose basketball , S = students who choose soccer . Given also $n(B \cap S) = x$, $n(S) = 23$ and $n(B) = 30$,

(i) Complete the Venn diagram to illustrate the above information. [1]



(ii) Hence, find the number of students who choose soccer only;

No. of students who choose soccer only

$30 - x + x + 23 - x = 44$ [M]

$53 - x = 44$ [M]

$x = 9$ [M]

No. of students who choose soccer = 23 – 9 = 14 [A]

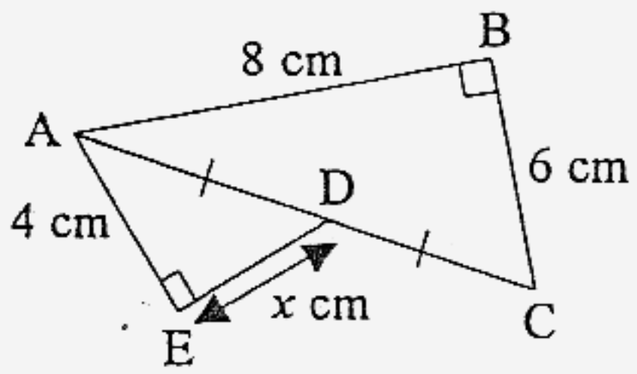
8.(b) (iii) Describe the set $B \cap S$. [1]

Students who choose both basketball & soccer as their CCA. [A1]

9. Given that AB = 8cm, BC = 6 cm, AE = 4 cm, DE = x cm and AD = DC, find the value of

(i) AD;

(ii) x.



Using Pythagoras' Thm,

(i) $AC = \sqrt{8^2 + 6^2} = \sqrt{100}$

= 10 cm [M1]

AD = 10 ÷ 2 = 5 cm [A1]

(ii) $x = \sqrt{5^2 - 4^2} = \sqrt{9}$ [M]

= 3 cm [A]

Name: _____ ( ) Class: _____

10. The following are marks scored by 10 students in a Mathematics test marked out of a total of 10:

3, 6, 4, 3, 5, 6, 7, 9, 6, 4

Find (i) the modal mark = 6 [A1]

(ii) the median mark;

3, 3, 4, 4, 5, 6, 6, 6, 7, 9 [M]

the median mark = $\frac{5+6}{2} = 5.5$ [A]

(iii) the mean of this set of marks.

Mean marks = $\frac{3+3+4+4+5+6+6+6+7+9}{10}$ [M1]

$= \frac{53}{10} = 5.3$ [A1]

FAIRFIELD METHODIST SECONDARY SCHOOL
Secondary Two Express
Mathematics Exam Paper 2 Answers

Name:_____ ( ) Class: 2___

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1. a) $\frac{-13x+30}{2x^2+x-6}$

b) $\frac{y^2+1}{3(y-1)}$

2. $2(3b-5)(2a+3c)$

3. i) $\frac{500}{x}$ **litres**

iii) (a) $\frac{(500-3x)(x+1)}{x}-500=17$

iii) (b) $x=10$ or $x=-\frac{50}{3}$ $(-16\frac{2}{3})$

iii) (c) 47 litres

4. i) $r=\frac{g^2}{3t^2-h}$

ii) $r=1\frac{5}{436}$ or 1.01 (to 3 sf)

5. a) $\frac{1}{8}$ **or 0.125**

b) (ii) $\{(2,2),(2,3),(2,5),(3,2),(3,3),(3,5),(5,2),(5,3),(5,5)\}$

$\frac{1}{4}$

(iii) $\{(1,2),(2,1),(2,3),(3,2),(3,4),(4,3),(4,5),(5,4),(5,6),(6,5)\}$

$\frac{5}{18}$

6. (ii) Modal class---50-59

(iii) Mean = 48.6 (to 3 sf)

7. a) (i) Volume of cone = 3665.7 cm^3

(ii) Total volume = 5138.5 cm^3

7. b) (i) Area = 2573.3 cm^3

(ii) Number of litres = 3.6 litres

8. Length of AC = 19.2 cm

9. i) a = 33 b = -15

iii) x = 0.5

iv) (3.7, 25) and (- 2.7, 25)

v) x = - 1.5 or 2.5 (+/- 0.1)