



Student _____

Teacher _____

BRIGIDINE COLLEGE RANDWICK

YEAR 10 MATHEMATICS

2011 Half Yearly

Time 2 hour (includes 10 minutes before the start of section D)

90 minutes Sections A, B, and C (Stages 5.1 - 5.2)

20 minutes section D (Stages 5.1 - 5.3)

Directions to candidates

* Put your name at the top of this page and the Answer Sections that will be collected.

* All questions are to be attempted and they will be divided into

Section A Multiple Choice (tear off answer sheet last page)

Section B Short and Longer Response

Section C Short and Longer Response ... collected 90 minutes after start ...

Section D Short and Longer Response

* All necessary working should be shown in Sections B, C and D.

* Full marks may not be awarded for careless or badly arranged work.

Section A Answer on the Answer Sheet provided (30 marks)

1. Calculate $\frac{0.604}{12.9 \times 0.8^4}$ correct to two decimal places.

- a. 0.11 b. 0.12 c. 0.02 d. 0.01
-

2. The ratio of boys to girls at a party was 4 : 5. If there were 20 girls at the party, how many were at the party altogether.

- a. 16 b. 25 c. 36 d. 45
-

3. $4\frac{1}{4}\%$ =

- a. 4.25 b. 0.0425 c. 0.425 d. 4.025
-

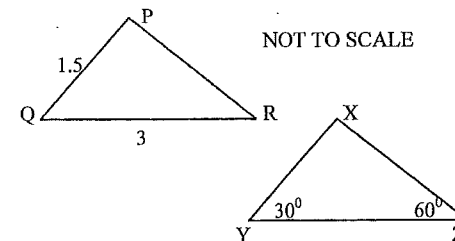
4. There are 820 pupils in a school and 55% of them are girls. How many boys are there in this school?

- a. 450 b. 451 c. 369 d. 550
-

5. Triangle PQR is congruent to triangle XYZ, with lengths and angles shown.

Which of the following is true?

- a. $\angle PRQ = 60^\circ$
b. $XZ = 3$
c. $\angle QPR = 90^\circ$
d. $YZ = 1.5$

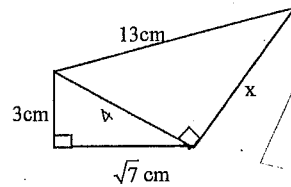


6. The number of seconds in 1 week correct to 2 significant figures is

- a. 8.64×10^4 b. 1.0×10^4 c. 6.0×10^5 d. 6.04×10^5

7. For the diagram to the right the value of x in cm would be

- a. $\sqrt{120}$
- b. $\sqrt{144}$
- c. $\sqrt{153}$
- d. $\sqrt{160}$



8. $(2x^2)^3 =$

- a. $6x^5$
- b. $6x^6$
- c. $8x^5$
- d. $8x^6$

9. A television cost \$520. The price increases by 7%. The new price of the television is

- a. \$ 527
- b. \$ 483.60
- c. \$ 556.40
- d. \$ 36.40

10. Solve $8 - 6(2y + 1) = 3$

- a. $\frac{-1}{12}$
- b. $\frac{1}{12}$
- c. $\frac{11}{12}$
- d. $\frac{1}{4}$

11. Simplify

$$\frac{a}{2} + \frac{1}{3} \quad \frac{3a+2}{6}$$

- a. $\frac{3a+2}{6}$
- b. $\frac{3a+2}{5}$
- c. $\frac{a+1}{5}$
- d. $\frac{a+1}{6}$

12. The solution to the equation $3(x + 2) = 5x - 2$ is

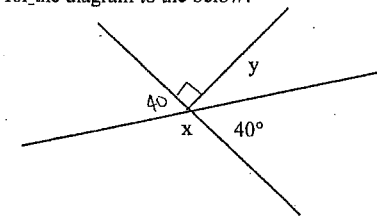
- a. $x = -4$
- b. $x = -1$
- c. $x = 4$
- d. $x = 1$

13. A scrap metal dealer pays 50 cents per kg for cans. 40 cans weigh 1 kg. How many of these cans must be collected to earn \$ 100?

- a. 200
- b. 2000
- c. 4000
- d. 8000

14. What is the value of $x + y$ for the diagram to the below?

- a. 180°
- b. 190°
- c. 230°
- d. 280°



15. Which of the following gives the highest annual income?

- a. \$652 per week
- b. \$1300 per fortnight
- c. \$2850 per month
- d. \$33 500 per year

16. Which of the following could be the graph of $3x - 2y = 5$?

- a.
- b.
- c.
- d.

17. In a race, the total prize-money is shared among the first three placegetters in the ratio 5 : 3 : 2. Third prize is \$ 300. What is the total prize-money?

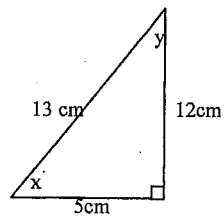
- a. \$ 150
- b. \$ 750
- c. \$ 1500
- d. \$ 3000

18. Belinda is paid an hourly rate of \$19.60. She is paid at the normal rate for a 40 hour week and is paid time and a half for any overtime. Her gross pay for a week where she works 42.5 hours is:

- a. \$833.00
- b. \$857.50
- c. \$882.00
- d. \$897.50

19. For the diagram on the right, which one of the following ratios is the largest?

- a. $\sin x$
- b. $\sin y$
- c. $\tan x$
- d. $\tan y$



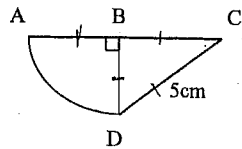
20. The solution of $2x + 1 > 3$ may be represented by

- a.
- b.
- c.
- d.

21. A railway track climbs 20m over a horizontal distance of 250m. The angle of elevation is closest to:

- a. 2°
- b. 5°
- c. 88°
- d. 85°

22. Given $AB = BC = BD$, then the perimeter of this figure below to 2 decimal places would be:

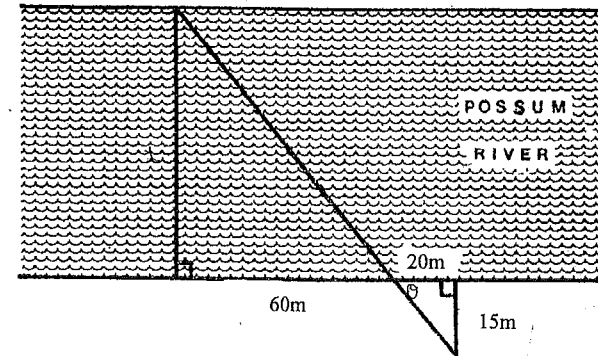


- a. 16.16
- b. 12.62
- c. 17.62
- d. 21.62

23. Which one of the following is NOT equal to $5b$

- a. $5b^2 - b$
- b. $\frac{5b^2}{b}$
- c. $6b - b$
- d. $\frac{10b}{2}$

24. To find the width of Possum River, the measurements shown were made.



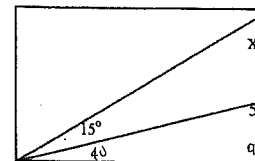
The width of the river is:

- a. 45m
- b. 60m
- c. 70m
- d. 80m

25. Which of the following is best value?

- a. 2 Litres for \$22.10
- b. 4 Litres for \$39.95
- c. 10 Litres for \$81.90
- d. 15 Litres for \$138.50

26. This figure is a rectangle. Find the value of the angle x



- a. 35
- b. 40
- c. 45
- d. 55

27. If $\sin \phi = \frac{3}{5}$ then the $\tan \phi =$

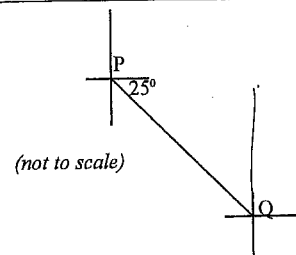
- a. $\frac{5}{3}$ b. $\frac{3}{4}$ c. $\frac{4}{3}$ d. $\frac{4}{5}$

28. For the statement "ten more than twice a number, n , is five more than the square of the number" may be represented by:

- a. $\frac{n}{2} + 10 = 5 + n^2$ b. $2(n + 10) = n^2 + 5$
c. $2n + 10 = n^2 + 5$ d. $2n + 10 = (n + 5)^2$

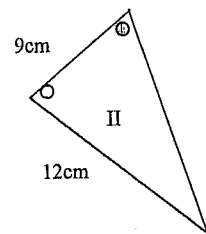
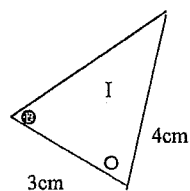
29. The Bearing of Point P from Point Q in this diagram to the right would be

- a. S25°E b. N25°W
c. N75°W d. S75°W



30. Triangle II is drawn so it is similar to triangle I.

(not to scale)



What is the scale factor.

- a. 3 b. 4 c. $\frac{3}{4}$ d. $\frac{1}{3}$

- end of multiple choice -

YEAR 10 Half Yearly 2011
Stages 5.1 – 5.2 Common

Student: _____

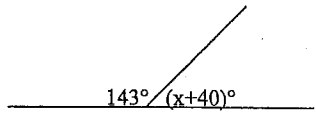
Section B (20 marks)

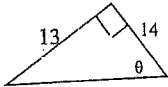
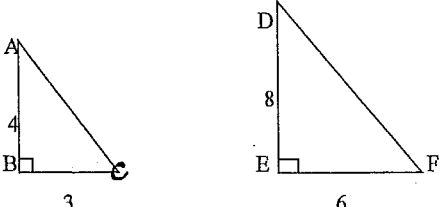
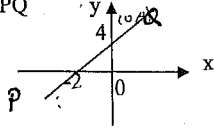
Teacher: _____

Show all necessary working.

Neatness may be taken into consideration in the awarding of marks.

Final answers must be written in the answer column, neatly and clearly.

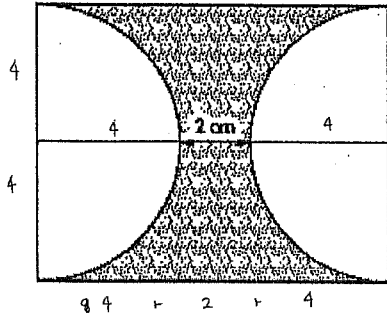
QUESTIONS	ANSWER
1 Simplify $5x^2 + 3x - 2x^2$	/1
2 Find the value of $\cos 38^\circ 12'$, to 4 decimal places.	/2
3 Solve for x : $\frac{x+3}{3} = 4$	/1
4 A 2 kg of sugar is dissolved in 10 litres of water. Express the density in mg/mL.	/2
5 A dress valued at \$580 is discounted by \$80. What is the percentage discount on the dress?	/1
6 Find the value of x . 	/2
7 Find the the median of the following scores 80, 60, 25, 35, 40.	/1
8 $\frac{3}{5} < \frac{2}{B}$ where B is a whole number. What is the largest possible value for B?	/1

9	The relationship between the length of your forearm in centimetres, L, and your height in centimetres, H, can be given by the formula $H = 4.3 \times L + 62$ A girl is 150cm tall. Use the formula to calculate the length of her forearm.	/2
10	A score was added to the set of scores below. 3, 6, 9, 9, 9, 10 The new mean is equal to 7. What score was added?	/2
11	Sonya claims that $2^2 \times 2^3 = 4^5$. Explain why Sonya is incorrect.	/1
12	 Find the size of θ , correct to the nearest degree.	/2
13	The diagram shows two triangles. (Not to scale) Explain why $\angle ACB = \angle DFE$. 	/1
14	Find the gradient of PQ. 	/1

Student: _____

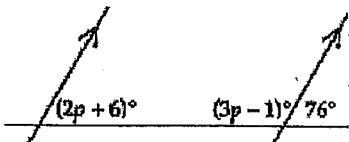
Teacher: _____

1. The shaded region has been obtained by two semicircles of radius 4 cm from a rectangle. What is the area of the shaded region, correct to two decimal places?



/3

2. a. Using the diagram below write an equation that could be used to find p , and then write the reason.



/1

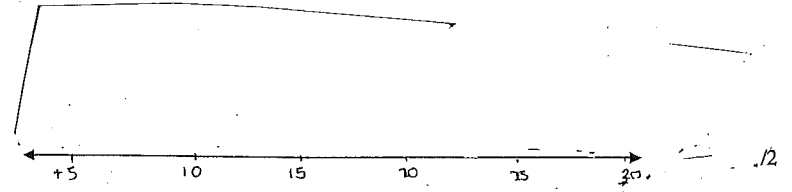
Reason:

/1

- b. Find the value of p .

/1

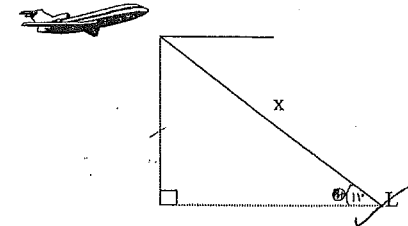
3. Solve $3(x + 4) \leq 4x - 3$, and graph the solution on the number line below.



4. A plane flying at an altitude of 1.2 km spots its landing strip L at an angle of depression of 11° .

- a. Mark in all the relevant information on to this diagram

/1



- b. Hence, determine the direct distance, x , from the plane to the landing strip L. (to the nearest metre)

/2

5. Triangle ABC is isosceles, $AB = AC$ and D is the mid-point of line BC. Complete the following to show that $\triangle ABD \cong \triangle ACD$. Give reasons, (reasons are in the brackets)

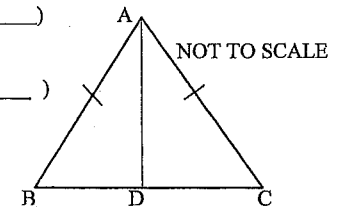
/5

$AB = AC$ (_____)

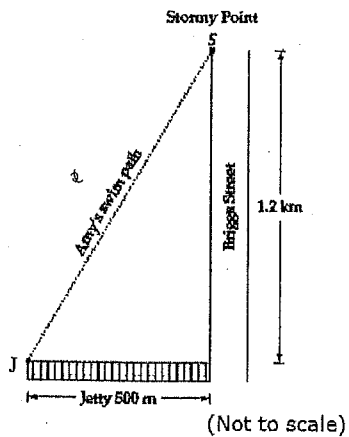
_____ (_____)

_____ (common side)

$\triangle ABD \cong \triangle ACD$ (_____)



6. Amy swims each morning from Stormy Point (S) to the end of the jetty (J). She leaves at 6 am and it takes her 20 minutes to complete the swim.



- a. Show that the distance that Amy swims from Stormy Point to the end of the jetty is 1.3km.

(12)

- b. Calculate Amy's average speed for the swim, in kilometres per hour.

(1)

- c. Erin jogs from Stormy Point along Briggs Street, and then to the end of the jetty, at an average speed of 6.8 km/h. At what time should Erin leave Stormy Point if she wants to arrive at the end of the jetty at the same time as Amy?

(12)

- d. Convert Erin's average speed of 6.8 km/h to metres per second. Give your answer correct to two decimal places.

(12)

END OF SECTION C

1. Expand and simplify $(2\sqrt{3} + 1)(5 - \sqrt{3})$

/2

2. Solve the following equation $3x^2 + 5x = 2x + 6$

/2

3. A bag contains 12 marbles. The marbles are either black or green. When one marble is chosen at random from the bag, the probability that it is black is $\frac{1}{3}$.

- a. On the diagram, colour in the circles to show how many marbles are black.

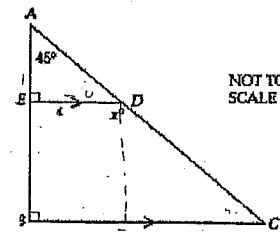


/1

- b. Some red marbles are added to the bag so that the probability of choosing a red marble will be $\frac{1}{3}$. How many red marbles are added to the bag?

4. If $(x + 2)(x + k) = x^2 + nx + 8$, find the values of k and n.

5. In triangle ABC, angle BAC is 45° and ED is parallel to BC. Two right angles are shown.



- a. Calculate the size of x° . Give a reason for your answer.

- b. The height of the trapezium EDCB is three times the height of triangle ADE.

Complete this statement:
The length of BC is _____ times the length of ED.

/1

- c. The area of triangle AED is 50 cm^2 . What is the area of the trapezium EDCB?

/2

6. a. Simplify

$$\frac{m^2 - mc + 3m - 3c}{m^2 - c^2}$$

/2

- b. Without use of a calculator, show that $\frac{1}{2+\sqrt{3}} + \frac{\sqrt{3}}{\sqrt{3}}$ is a rational number.

Part A Multiple Choice Answer Sheet.
Place an X through your choice for the
correct answer

26
29

- | | | | | | | | | | |
|-----|--------------|--------------|--------------|----------------|-----|--------------|--------------|--------------|----------------|
| 1. | a | b | c | d ✓ | 16. | a | b | c | d ✓ |
| 2. | a | b | c | d ✓ | 17. | a | b | c | d ✓ |
| 3. | a | b | c | d ✓ | 18. | a | b | c | d ✓ |
| 4. | a | b | c | d ✓ | 19. | a | b | c | d ✓ |
| 5. | a | b | <u>c</u> | d | 20. | a | b | c | d ✓ |
| 6. | a | b | <u>c</u> | d | 21. | a | b | c | d ✓ |
| 7. | a | b | c | d ✓ | 22. | a | b | c | d ✓ |
| 8. | a | b | c | d ✓ | 23. | a | b | c | d ✓ |
| 9. | a | b | c | d ✓ | 24. | a | b | c | d ✓ |
| 10. | a | b | c | d ✓ | 25. | a | b | c | d ✓ |
| 11. | a | b | c | d ✓ | 26. | a | b | c | d ✓ |
| 12. | a | b | c | d ✓ | 27. | a | b | c | d ✓ |
| 13. | a | b | c | d ✓ | 28. | a | b | c | d ✓ |
| 14. | a | b | c | d ✓ | 29. | a | b | c | d |
| 15. | a | b | c | d ✓ | 30. | <u>a</u> | b | c | d |

18
/ 20

Student: _____

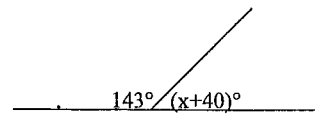
Section B (20 marks)

Teacher: _____

Show all necessary working.

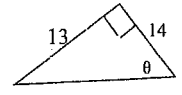
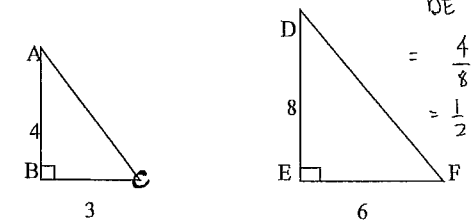
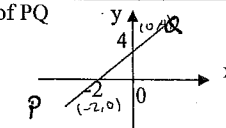
Neatness may be taken into consideration in the awarding of marks.

Final answers must be written in the answer column, neatly and clearly.

QUESTIONS	ANSWER
1 Simplify $5x^2 + 3x - 2x^2$	$3x^2 + 3x$ /1
2 Find the value of $\cos 38^\circ 12'$, to 4 decimal places. $\cos(38^\circ 12')$ 0.7858568932	0.7859 /2
3 Solve for x: $\frac{x+3}{3} = 4$ $x+3 = 12$ $x = 9$	9 /1
4 A 2 kg of sugar is dissolved in 10 litres of water. Express the density in mg/mL. $\frac{2 \text{ kg}}{10 \text{ L}} = \frac{2000 \text{ mg}}{10000 \text{ mL}} = 1 \text{ mg} / 5 \text{ ml}$	1mg/5ml /2
5 A dress valued at \$580 is discounted by \$80. What is the percentage discount on the dress? $\frac{80}{580} \times 100 = 13.79310345$	13.79% /1
6 Find the value of x.  $143 + (x+40) = 180$ $143 + x + 40 = 180$ $x + 40 = 37$ $x = -3$	$x = -3$ /2
7 Find the the median of the following scores 25 34 40 60 80 80, 60, 25, 35, 40.	40 /1
8 $\frac{3}{5} < \frac{2}{B}$ where B is a whole number. What is the largest possible value for B? $\frac{2}{B} > \frac{3}{5}$ $\frac{2}{B} > \frac{3}{5}$ $\frac{2 \times 5}{B \times 5} > \frac{3 \times 5}{5 \times 5}$ $\frac{10}{B} > \frac{15}{5}$ $\frac{10}{B} > 3$ $\frac{10}{3} > B$ $3.33 > B$ B = 3	3 /1

$\frac{3}{5} < \frac{2}{3}$
 $\frac{2}{3} - \frac{3}{5} = \frac{1}{15}$

9

9 The relationship between the length of your forearm in centimetres, L, and your height in centimetres, H, can be given by the formula $H = 4.3 \times L + 62$. A girl is 150cm tall. Use the formula to calculate the length of her forearm. $150 = 4.3 \times L + 62$ $88 = 4.3L$ $L = 20.46511628$ $L \approx 20.465 \text{ cm}$	$L \approx 20.465 \text{ cm}$ $\approx 20 \text{ cm}$ /2
10 A score was added to the set of scores below. 3, 6, 9, 9, 9, 10 The new mean is equal to 7. What score was added? $\frac{3+6+9+9+9+10+x}{7} = 7$ $46x - 49$ $x = 3$	3 /2
11 Sonya claims that $2^2 \times 2^3 = 4^5$. Explain why Sonya is incorrect. She multiplied the base numbers $2^2 \times 2^3 = 2^{2+3} = 2^5$ same base numbers multiplied base numbers = same base numbers $\therefore = 2^5$	/1
12  Find the size of θ , correct to the nearest degree. $\tan \theta = \frac{13}{14}$ $\tan^{-1}(\frac{13}{14}) = 42.5214405$ $\approx 43^\circ$	43° /2
13 The diagram shows two triangles. (Not to scale) Explain why $\angle ACB = \angle DFE$.  $\frac{AB}{DE} = \frac{BC}{EF}$ (ratios in $\triangle ABC$) $= \frac{4}{8} = \frac{3}{6}$ $= \frac{1}{2} = \frac{1}{2}$ $\angle ABC = 90^\circ = \angle DEF$ $\therefore \triangle ABC \sim \triangle DEF$ Sides are equal ratio $\therefore \angle C = \angle F$	angles are = in similar triangles /1
14 Find the gradient of PQ.  $\frac{\text{rise}}{\text{run}} = \frac{4}{2}$ $\frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 0}{0 - (-2)} = \frac{4}{2}$	2 /1

END OF SECTION B

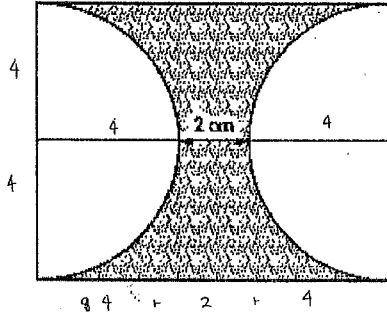
9

22/23

Student: _____

Teacher: _____

1. The shaded region has been obtained by two semicircles of radius 4 cm from a rectangle. What is the area of the shaded region, correct to two decimal places?



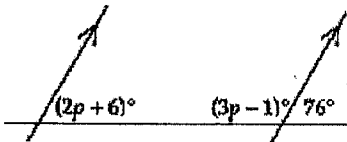
area of rectangle = 8×10
= 80 cm^2

circle = πr^2
= $\pi \times 16$
= 50.26548246

\therefore shaded region
= $80 - 16\pi$
= 29.73451754 cm^2
 $\approx 29.73 \text{ cm}^2$

3/3

2. a. Using the diagram below write an equation that could be used to find p , and then write the reason.



$(2p + 6) + (3p - 1) = 180^\circ$

Reason: CO interior

- b. Find the value of p .

$2p + 6 + 3p - 1 = 180$

$5p + 5 = 180$

$5p = 175$

$p = \frac{175}{5}$

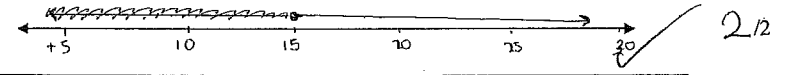
$p = 35$

$p = 35^\circ$

6

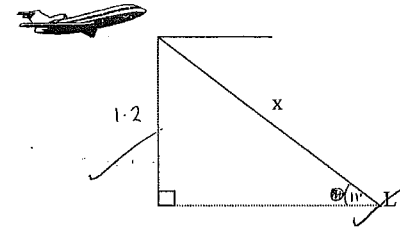
3. Solve $3(x + 4) \leq 4x - 3$, and graph the solution on the number line below.

$3x + 12 \leq 4x - 3$
 $12 \leq x - 3$
 $15 \leq x$
 $15 \leq x$



4. A plane flying at an altitude of 1.2 km spots its landing strip L at an angle of depression of 11° .

- a. Mark in all the relevant information on to this diagram



- b. Hence, determine the direct distance, x , from the plane to the landing strip L. (to the nearest metre)

$\sin 11^\circ = \frac{1.2}{x} = \frac{1200}{x}$ $x \approx 6 \text{ km}$ 6289 m

$x = \frac{1.2}{\sin(11)} = \frac{1200}{\sin(11)}$

$x = 6289.011677$

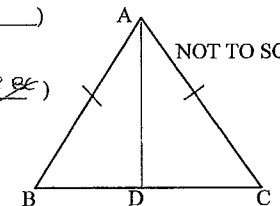
5. Triangle ABC is isosceles, $AB = AC$ and D is the mid-point of line BC. Complete the following to show that $\triangle ABD \equiv \triangle ACD$. Give reasons, (reasons are in the brackets)

$AB = AC$ (Given, Sides of an isos. \triangle is =)

$BD = DC$ (D is the mid point of line BC), Given

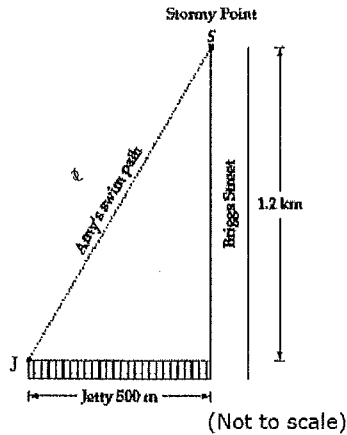
AD (common side)

$\triangle ABD \equiv \triangle ACD$ (S.S.S)



9

6. Amy swims each morning from Stormy Point (S) to the end of the jetty (J). She leaves at 6 am and it takes her 20 minutes to complete the swim.



- a. Show that the distance that Amy swims from Stormy Point to the end of the jetty is 1.3 km.

$$0.5^2 + 1.2^2 = 1.3^2$$

$$1.69 = 1.69$$

$$\therefore \text{distance} = 1.3 \text{ km}$$

- b. Calculate Amy's average speed for the swim, in kilometres per hour.

$$S = \frac{D}{T}$$

$$S = \frac{1.3}{0.3} = 3.9 \text{ km/hr}$$

- c. Erin jogs from Stormy Point along Briggs Street, and then to the end of the jetty, at an average speed of 6.8 km/h. At what time should Erin leave Stormy Point if she wants to arrive at the end of the jetty at the same time as Amy?

$$T = \frac{D}{S} \quad T = \frac{1.7}{6.8}$$

$$T = 15 \text{ minutes}$$

Amy takes 20 mins from 6:00 am = 6:20
 \therefore Erin = 6:05 + 15 min = 6:20
 \therefore 6:05 am

- d. Convert Erin's average speed of 6.8 km/h to metres per second. Give your answer correct to two decimal places.

$$\frac{6.8 \text{ km}}{\text{h}} = \frac{6800 \text{ m}}{3600 \text{ s}} = 1.89 \text{ m/s}$$

END OF SECTION C

12/19

Year 10 Half Yearly 2010

Name: _____

Stages 5.1 – 5.3 Common
 Section D (19 marks)

Teacher: _____

Show all necessary working.

1. Expand and simplify $(2\sqrt{3} + 1)(5 - \sqrt{3})$

$$10\sqrt{3} - 6 + 5 - \sqrt{3}$$

$$= 9\sqrt{3} + 1$$

$$10\sqrt{3}(2 \times 3) + 5 - \sqrt{3}$$

$$10\sqrt{3} - 6 + 5 - \sqrt{3}$$

$$10\sqrt{3} + 1 - \sqrt{3}$$

$$9\sqrt{3} + 1$$

12

2. Solve the following equation $3x^2 + 5x = 2x + 6$

$$3x^2 + 5x = 2x + 6$$

$$3x^2 + 3x - 6 = 0$$

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

$$x = 1 \text{ or } -2$$

2

12

3. A bag contains 12 marbles. The marbles are either black or green. When one marble is chosen at random from the bag, the probability that it is black is $\frac{1}{4} \times 12$

$$= 3$$

- a. On the diagram, colour in the circles to show how many marbles are black.



3 black marbles

1

- b. Some red marbles are added to the bag so that the probability of choosing a red marble will be $\frac{1}{3}$. How many red marbles are added to the bag?

$$P(R) = \frac{x}{12+x} = \frac{1}{3}$$

$$3x = 12 + x$$

$$2x = 12$$

$$x = 6$$

4. If $(x + 2)(x + k) = x^2 + nx + 8$, find the values of k and n.

$$x^2 + 2x + kx + 2k = x^2 + nx + 8$$

$$(x + 2)(x + k) = x^2 + nx + 8$$

$$x^2 + kx + 2x + 2k = x^2 + nx + 8$$

$$(x + 2)(x + k) = x^2 + nx + 8$$

$$2 \times 2 = 8$$

$$\therefore k = 4$$

$$n = 6$$

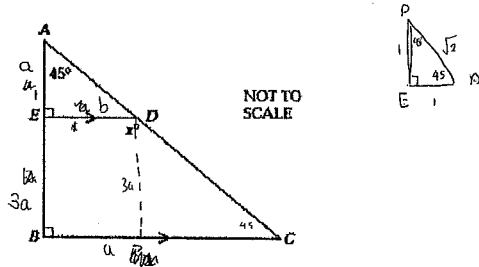
$$kx + 2x = nx$$

$$k = 4$$

2

7

5. In triangle ABC, angle BAC is 45° and ED is parallel to BC. Two right angles are shown.



NOT TO SCALE

- a. Calculate the size of x° . Give a reason for your answer.

~~180 - 45 - 90 = 45~~ $45 + 90 + \angle ADE = 180$ (sum of Δ)
 $\angle ADE = 45$ ✓ (2)
 $\angle DCB = 45$ (corresponding \angle 's are = in \parallel lines: $ED \parallel BC$)
 $\angle DEB = \text{RIGHT ANGLE}$
 $\therefore 90 + 90 + 45 + x = 360$ (sum of quad)
 $x = 135$ ✓

- b. The height of the trapezium EDCB is three times the height of triangle ADE.

Complete this statement:
 The length of BC is 4 times the length of ED.

- c. The area of triangle AED is 50 cm^2 . What is the area of the trapezium EDCB?

~~Area of $\Delta AED = \frac{1}{2} \times a \times b = 50$~~
 $50 = \frac{1}{2} \times a \times b$
 $100 = ab$
 $b = \frac{100}{a}$
 $\frac{ED}{BC} = \frac{1}{4}$ $\frac{A_{AED}}{A_{ABC}} = \frac{1}{16}$
 $A_{AED} = 50$
 $A_{ABC} = 800$
 $A_{EBCD} = 800 - 50 = 750 \text{ cm}^2$

6. a. Simplify

$$\frac{m^2 - mc + 3m - 3c}{m^2 - c^2}$$

$$\frac{m(m-c) + 3(m-c)}{(m+c)(m-c)}$$

$$= \frac{(m+3)(m-c)}{(m+c)(m-c)}$$

$$= \frac{m+3}{m+c}$$

$$\frac{m(m-c) + 3(m-c)}{(m+c)(m-c)}$$

$$= \frac{(m+3)(m-c)}{(m+c)(m-c)}$$

$$= \frac{m+3}{m+c}$$

- b. Without use of a calculator, show that $\frac{2-\sqrt{3}}{2+\sqrt{3}} + \frac{3}{\sqrt{3}}$ is a rational number.

$$\frac{2-\sqrt{3}}{2+\sqrt{3}} \times \frac{1}{2+\sqrt{3}} + \frac{3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$\frac{2-\sqrt{3}}{(2+\sqrt{3})^2} + \frac{3\sqrt{3}}{3}$$

$$= \frac{2-\sqrt{3}}{16-3} + \frac{3\sqrt{3}}{3}$$

$$= \frac{2-\sqrt{3}}{13} + \frac{3\sqrt{3}}{3}$$

$$\frac{3(2\sqrt{3}) + 13(3\sqrt{3})}{39}$$

$$= \frac{6-3\sqrt{3} + 39\sqrt{3}}{39}$$

$$= \frac{6 + 36\sqrt{3}}{39} = \frac{2 + 12\sqrt{3}}{13}$$

$$\frac{2-\sqrt{3}}{2+\sqrt{3}} + \frac{3\sqrt{3}}{\sqrt{3}}$$

$$= \frac{4-3\sqrt{3}}{1+3} + \frac{3}{1}$$

$$= \frac{4-3\sqrt{3}}{4} + \frac{3}{1}$$

$$= \frac{4-3\sqrt{3} + 12}{4} = \frac{16-3\sqrt{3}}{4}$$

$$= \frac{16-3\sqrt{3}}{4}$$