

St Catherine's School Waverley

Year: 10
Pathway: A/B/C
Time Allowed: 55 minutes
Date: August 21st 2008

Name: _____

Teacher: _____

Directions to students:

- All questions are to be attempted.
- Not all questions are of equal value.
- All necessary working must be shown in every question.
- Full marks may not be awarded for careless or badly arranged work.
- Answer questions in the space provided.
- Approved calculators may be used.

TEACHER'S USE ONLY
Total Marks

Section 1

Section 2

TOTAL

Section 1 Equations and Formulae

1. Solve the following:

a) $12 + 5p = 2p - 9$

2

b) $8 - 2(x - 4) = 4x + 9$

2

c) $\frac{5x+3}{7} > \frac{1-2x}{3}$

3

d) $\frac{2a+1}{3} - \frac{a+4}{2} = 6$

3

2. Make y the subject in $mx + ay = b$

2

3. Given $C = a^2 - 4$ find:

a) the value of C when $a = 7.8$

1

b) the value of a when $C = 10.5161$

2

4. The length of a rectangle is three more than three times its width.
The perimeter of the rectangle is 54cm.
Form an equation and solve it to find the dimensions of the rectangle.

3

6. Solve the following:

a) $2x + y = 7 \dots \textcircled{1}$
 $x - y = 2 \dots \textcircled{2}$

2

b) $y = 2x + 3$ and $x + y = 12$

2

c) $3a - b = 11$
 $2a - 3b = 12$

3

d) At the Paris cinema it costs \$105 for 5 adults and 4 children while it costs \$90 for 3 adults and 6 children.
Form equations and solve to find the cost of a child's ticket

3

5.

Solve by factorising:

a) $x^2 + 6x = 0$

2

b) $2x^2 - 7x + 3 = 0$

2

c) Solve using the formula:

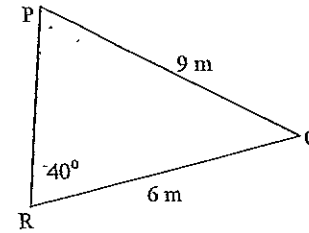
$2x^2 + x - 4 = 0$ (leave answers as surds)

3

Section 2 Trigonometry

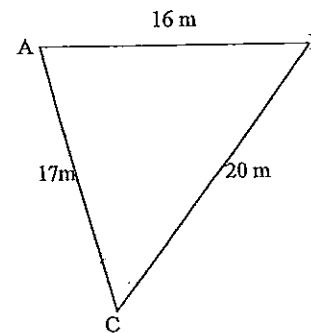
1. Find the size of angle P to nearest degree

3

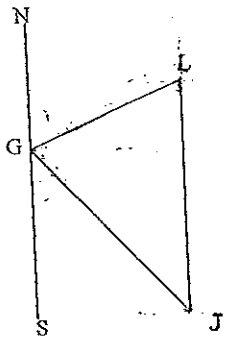


2. Find the size of angle C to the nearest minute

3



3.



Georgia is standing on the beach looking out to sea. She sees Les at a lighthouse L on a bearing of 045° T and Jim on a jet ski J at a bearing of 125° T. The jet ski is due south of the lighthouse.

a) Show that $\angle LGJ = 80^\circ$ and $\angle GLJ = 45^\circ$

2

b) Georgia knows she is 3 km from the lighthouse. How far is she from the jet ski? (answer in km to 1 decimal place)

3

Not to Scale

4.

Samantha stands at the viewing platform of Centrepoint Tower 295 m above the ground. She sees Gwen who is at ground level. Sam finds the angle of depression of Gwen to be $19^\circ 40'$.

a) Draw a diagram showing this information

1

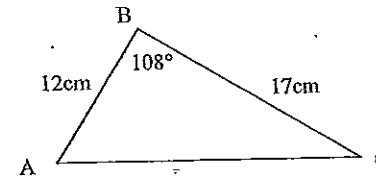
b) Calculate the distance from Gwen's feet to the base of the tower. (answer to the nearest metre)

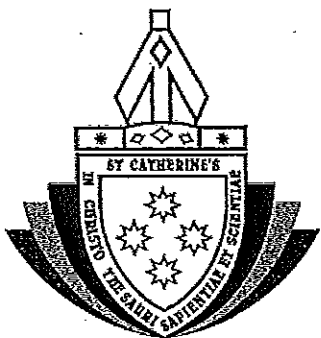
3

5. For the figure below find a) the length AC to the nearest mm
b) the area of $\triangle ABC$ to nearest cm^2

3

3





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SOLUTIONS

Teacher: _____

MASTER CORY

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TEACHER'S USE ONLY	
Total Marks	
Section 1	11
Section 2	10
TOTAL	21

Section 1 Equations and Formulae

1. Solve the following:

a) $12 + 5p = 2p - 9$ 2

$$\begin{aligned} 5p - 2p &= -9 - 12 \\ 3p &= -21 \\ p &= -7 \end{aligned}$$

✓ 2

b) $8 - 2(x - 4) = 4x + 9$ 2

$$\begin{aligned} 8 - 2x + 8 &= 4x + 9 \\ -2x + 16 &= 4x + 9 \\ -2x - 4x &= 9 - 16 \\ -6x &= -7 \\ x &= \frac{-7}{-6} \\ &= 1\frac{1}{6} \end{aligned}$$

✓ 2

c) $\frac{5x+3}{7} > \frac{1-2x}{3}$ 3

$$\begin{aligned} 3(5x+3) &> 7(1-2x) \\ 15x+9 &> 7-14x \\ 15x+14x &> 7-9 \\ 29x &> -2 \\ x &> \frac{-2}{29} \end{aligned}$$

✓ 3

$\frac{11}{21} >$

d) $\frac{2a+1}{3} - \frac{a+4}{2} = 6$ 3

$$\begin{aligned} 2(2a+1) - 3(a+4) &= 36 \\ 4a+2 - 3a-12 &= 36 \\ a-10 &= 36 \\ a &= 46 \end{aligned}$$

✓ 3

10/10

38/38

2. Make y the subject in $mx + ay = b$

$$\begin{aligned} ay &= b - mx \\ y &= \frac{b - mx}{a} \end{aligned}$$

2

2

3. Given $C = a^2 - 4$ find:

a) the value of C when $a = 7.8$

$$\begin{aligned} C &= 7.8^2 - 4 \\ &= 60.84 - 4 \\ &= 56.84 \end{aligned}$$

1

b) the value of a when $C = 10.5161$

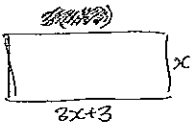
$$\begin{aligned} a^2 - 4 &= 10.5161 \\ a^2 &= 14.5161 \\ a &= \pm \sqrt{14.5161} \\ &= \pm 3.81 \end{aligned}$$

2

2

4. The length of a rectangle is three more than three times its width. The perimeter of the rectangle is 54cm. Form an equation and solve it to find the dimensions of the rectangle.

3



$$\begin{aligned} 2(3x+3) + 2x &= 54 & 2(3x+3) + 2x &= 54 \\ 6x + 6 + 2x &= 54 & 6x + 6 + 2x &= 54 \\ 8x + 6 &= 54 & 8x &= 54 - 6 \\ 8x &= 48 & 8x &= 48 \\ x &= 6 & x &= 6 \end{aligned}$$

3

\therefore the length is 21 cm and the width is 6 cm

$$\frac{10}{1.0}$$

5. Solve by factorising:

a) $x^2 + 6x = 0$

2

$$x(x+6) = 0$$

$$\therefore x = 0 \text{ or } x = -6$$

b) $2x^2 - 7x + 3 = 0$

2

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

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

$$(x-3)(2x-1) = 0$$

$$\therefore x = 3 \text{ or } 2x - 1 = 0$$

$$2x = 1$$

$$x = \frac{1}{2}$$

c) Solve using the formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

3

$$2x^2 + x - 4 = 0 \text{ (leave answers as surds)}$$

$$\begin{aligned} x &= \frac{-1 \pm \sqrt{(-1)^2 - 4(2)(-4)}}{2(2)} \\ &= \frac{-1 \pm \sqrt{1 - (-32)}}{4} \\ &= \frac{-1 \pm \sqrt{33}}{4} \end{aligned}$$

6. Solve the following:

a) $2x + y = 7 \dots \textcircled{1}$ 2
 $x - y = 2 \dots \textcircled{2}$
 $x = 2 + y \dots \textcircled{3}$

Substitute $\textcircled{3}$ into $\textcircled{1}$	Substitute $y = 1$ into $\textcircled{1}$
$2(2+y) + y = 7$	$2x + 1 = 7$
$4 + 2y + y = 7$	$2x = 6$
$3y = 3 \rightarrow y = 1$	$x = 3$
	$\therefore x = 3 \text{ and } y = 1$ ✓

b) $y = 2x + 3$ and $x + y = 12$ 2
 $y = 2x + 3 \dots \textcircled{1}$
 $x + y = 12 \dots \textcircled{2}$

Substitute $\textcircled{1}$ into $\textcircled{2}$	Substitute $x = 3$ into $\textcircled{2}$
$x + 2x + 3 = 12$	$3 + y = 12$
$3x + 3 = 12$	$y = 9$
$3x = 9$	$\therefore x = 3, y = 9$
$x = 3$	

c) $3a - b = 11 \dots \textcircled{1}$ 3
 $2a - 3b = 12 \dots \textcircled{2}$ 3

$\textcircled{1} - \textcircled{2}$	
$a = 21$	$-b = 11 - 9$
$a = 3$	$-b = 2$
$3 \times 3 - b = 11$	$b = -2$
$9 - b = 11$	$\therefore a = 3, b = -2$

d) At the Paris cinema it costs \$105 for 5 adults and 4 children while it costs \$90 for 3 adults and 6 children. 3
Form equations and solve to find the cost of a child's ticket

$5a + 4c = 105 \dots \textcircled{1}$	Substitute $c = 7.5$ into $\textcircled{2}$
$3a + 6c = 90 \dots \textcircled{2}$	$3a + 6 \times 7.5 = 90$
$3a + 6c = 90$	$3a + 45 = 90$
$3a = 90 - 6c$	$3a = 45$
$a = \frac{90 - 6c}{3} \dots \textcircled{3}$	$a = 15$

Substitute $\textcircled{3}$ into $\textcircled{1}$

$$5\left(\frac{90 - 6c}{3}\right) + 4c = 105$$

$$\frac{5(90 - 6c)}{3} + 4c = 105$$

$$5(90 - 6c) + 12c = 315$$

$$450 - 30c + 12c = 315$$

$$-18c = 315 - 450$$

$$-18c = -135$$

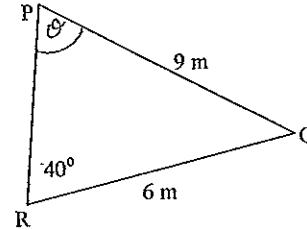
$$1c = \frac{135}{18}$$

$$c = 7.5$$

\therefore adult tickets cost \$15
~~child ticket costs \$7.50 each~~

Section 2 Trigonometry

1. Find the size of angle P to nearest degree 3



$$\frac{\sin \theta}{6} = \frac{\sin 40^\circ}{9}$$

$$\sin \theta = \frac{6 \sin 40^\circ}{9}$$

$$= 0.428525 \dots$$

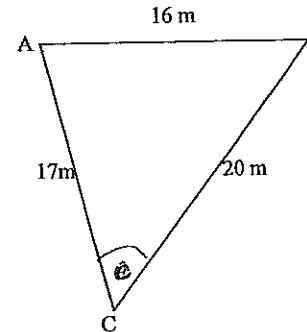
$$\theta = \sin^{-1}(0.428525)$$

$$= 25^\circ \text{ (nearest degree)}$$

2. Find the size of angle C to the nearest minute 3

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$\frac{a^2 + b^2 - c^2}{2ab}$$



$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

$$= \frac{20^2 + 17^2 - 16^2}{2 \times 20 \times 17}$$

$$= \frac{433}{680}$$

$$C = \cos^{-1}\left(\frac{433}{680}\right)$$

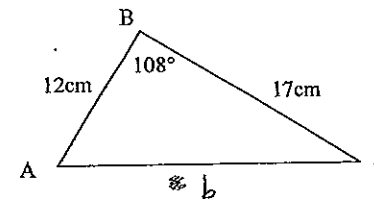
$$= 50.46900 \dots$$

$$= 50^\circ 27' \text{ (nearest minute)}$$

6/6

5. For the figure below find a) the length AC to the nearest mm
b) the area of ΔABC to nearest cm^2

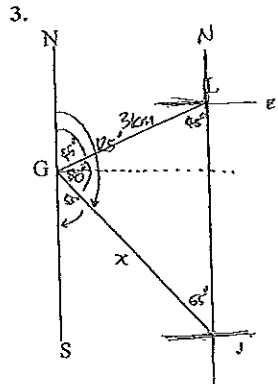
3
3



a) $b^2 = 12^2 + 17^2 - 2 \times 12 \times 17 \times \cos 108^\circ$
 $= 559.0789337\dots$
 $b = 23.64485\dots$
 $\therefore \text{Length of AC} = 236 \text{ mm (nearest mm)}$

b) $\text{Area} = \frac{1}{2} ab \sin C$
 $= \frac{1}{2} \times 12 \times 17 \times \sin 108^\circ$
 $= 102 \times \sin 108^\circ$
 $= 97.00776\dots$
 $= 97 \text{ cm}^2 \text{ (nearest cm}^2\text{)}$

$\frac{6}{6}$



Georgia is standing on the beach looking out to sea. She sees Les at a lighthouse L on a bearing of 045° T and Jim on a jet ski J at a bearing of 125° T .

The jet ski is due south of the lighthouse.

a) Show that $\angle LGJ = 80^\circ$ and
 $\angle GLJ = 45^\circ$ since $\angle NGL = 45^\circ$ (given)
 $\therefore \angle GLJ = 45^\circ$ (alt. \angle s, $NS \parallel LJ$)
 $\therefore \angle LGJ = \angle NGJ - \angle NGL$
 $= 125^\circ - 45^\circ$ (given)
 $= 80^\circ$

b) Georgia knows she is 3 km from the lighthouse. How far is she from the jet ski? (answer in km to 1 decimal place)

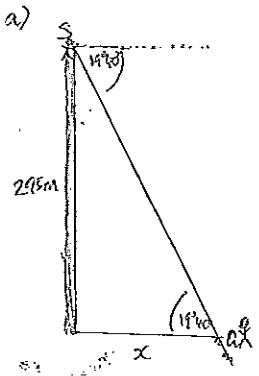
$\frac{x}{\sin 45^\circ} = \frac{3}{\sin 55^\circ}$
 $x = \frac{3 \sin 45^\circ}{\sin 55^\circ}$
 $= 2.5526\dots$
 $= 2.6 \text{ km (1 d.p.)}$

Not to Scale

4. Samantha stands at the viewing platform of Centrepoint Tower 295 m above the ground. She sees Gwen who is at ground level. Sam finds the angle of depression of Gwen to be $19^\circ 40'$.

- a) Draw a diagram showing this information
b) Calculate the distance from Gwen's feet to the base of the tower. (answer to the nearest metre)

1
3



b) $\tan 19^\circ 40' = \frac{295}{x}$

$x = \frac{295}{\tan 19^\circ 40'}$

$= 825.4158\dots$
 $= 825 \text{ m (nearest metre)}$

\therefore Gwen is standing 825 m (nearest metre) away from the base of the tower.

$\frac{9}{9}$