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. 3
The perimeter of the rectangle is 54cm.
Form an equation and solve it to find the dimensions of the rectangle.

6. Solve the following:

a) $2x+y=7 \quad \cdots ①$
$x-y=2 \quad \cdots ②$ 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. 3
Form equations and solve to find the cost of a child's ticket

5. Solve by factorising:

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

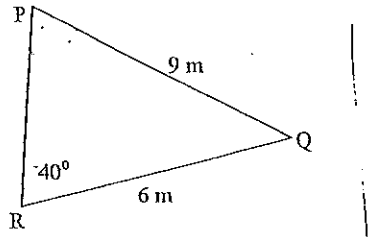
b) $2x^2 - 7x + 3 = 0$ 2

c) Solve using the formula: 3

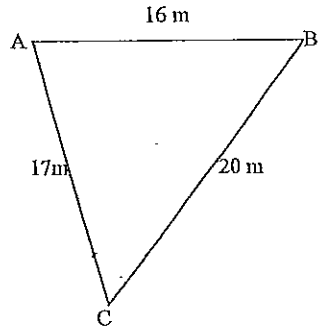
$2x^2 + x - 4 = 0$ (leave answers as surds)

Section 2 Trigonometry

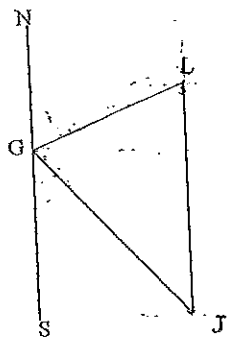
1. Find the size of angle P to nearest degree 3



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 $\angle LGJ = 80^0$ and $\angle GLJ = 45^0$ 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

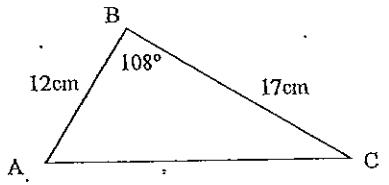
Not to Scale

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 $19^0 40'$.

a) Draw a diagram showing this information 1

b) Calculate the distance from Gwen's feet to the base of the tower. 3
(answer to the nearest metre)

5. For the figure below find a) the length AC to the nearest mm 3
b) the area of Δ ABC to nearest cm^2 3



St Catherine's School Waverley

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Name: SOLUTIONS

Teacher : MASTER CORY

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TEACHER'S USE ONLY Total Marks	
Section 1	/
Section 2	
TOTAL	

11/22

Section 1
Equations and Formulae

1. Solve the following:

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

$5p-2p=-9-12$
$3p=-21$
$p=-7$ ✓ 2

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

$8-2x+8=4x+9$
$-2x+16=4x+9$
$-2x-4x=9-16$
$-6x=-7$
$x=\frac{7}{6}$
$=1\frac{1}{6}$ ✓ 2

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

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

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

$2(2a+1)-3(a+4)=36$
$4a+2-3a-12=36$
$a-10=36$
$a=46$ ✓ 3

10/10

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

$ay = b - mx$

$y = \frac{b - mx}{a}$ ✓ 2

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

a) the value of C when $a = 7.8$ 1

$C = 7.8^2 - 4$

$= 60.84 - 4$ ✓

$= 56.84$

b) the value of a when $C = 10.5161$ 2

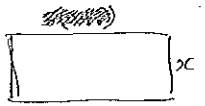
$a^2 - 4 = 10.5161$

$a^2 = 14.5161$

$a = \pm\sqrt{14.5161}$ ✓ 2

$= \pm 3.81$

4. The length of a rectangle is three more than three times its width. 3
The perimeter of the rectangle is 54cm.
Form an equation and solve it to find the dimensions of the rectangle.



$2(3x+3) + 2x = 54$

$6x + 6 + 2x = 54$

$8x = 54 - 6$

$8x = 48$

$x = 6$

∴ the length is 21 cm and the width is 6 cm ✓ 3

10/10

5. Solve by factorising:

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

$x(x+6) = 0$ ✓

$\therefore x = 0$ or $x = -6$ ✓

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

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

$2x(x-3) - (x-3) = 0$ ✓

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

$\therefore x = 3$ 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

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

$x = \frac{-1 \pm \sqrt{(-1)^2 - (4 \times 2 \times -4)}}{2 \times 2}$ ✓

$= \frac{-1 \pm \sqrt{1 - (-32)}}{4}$ ✓

$= \frac{-1 \pm \sqrt{33}}{4}$ ✓

6. Solve the following:

a) 2

$2x+y=7 \quad \cdots ①$

$x-y=2 \quad \cdots ②$

$x=2+y \quad \cdots ③$

Substitute ③ into ①	Substitute $y=1$ into ①
$2(2+y)+y=7$	$2x+1=7$
$4+2y+y=7$	$2x=6$
$3y=3 \rightarrow y=1$	$x=3$
	$\therefore x=3$ and $y=1$

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

$y=2x+3 \quad \cdots ①$

$x+y=12 \quad \cdots ②$

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

c) 3

$3a-b=11 \quad \cdots ①$ $\quad 9a-3b=33 \quad \cdots ③$

$2a-3b=12 \quad \cdots ②$ $\quad 2a-3b=12 \quad \cdots ②$

① − ②	
$7a=21$	$-b=11-9$
$a=3$	$-b=2$
$3\times3-b=11$	$b=-2$
$9-b=11$	$\therefore a=3, b=-2$

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

$5a+4c=105 \quad \cdots ①$

$3a+6c=90 \quad \cdots ②$

$3a+6c=90$

$3a=90-6c$

$a=\frac{90-6c}{3} \quad \cdots ③$

Substitute ③ into ①

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

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

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

$450-30c+12c=315$

$-18c=315-450$

$-18c=-135$

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

$c=7.5$

Substitute $c=7.5$ into ②

$3a+6\times7.5=90$

$3a+45=90$

$3a=45$

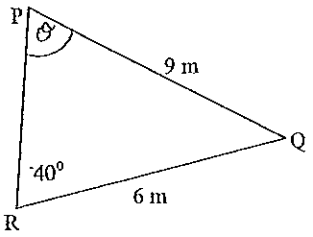
$a=15$

$\therefore$ adult tickets cost \$15

child ticket costs \$7.50 each.

Section 2 Trigonometry

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



$\frac{\sin\theta}{6}=\frac{\sin40^\circ}{9}$

$\sin\theta=\frac{6\sin40^\circ}{9}$

$=0.428525\ldots$

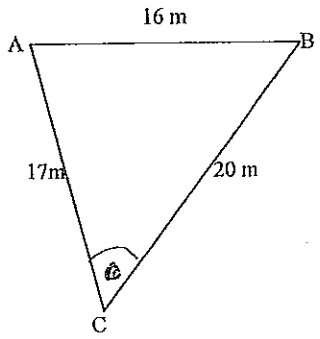
$\theta=\sin^{-1}(0.428525)$

$=25^\circ$ (nearest degree)

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

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

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



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

$=\frac{20^2+17^2-16^2}{2\times20\times17}$

$=\frac{433}{680}$

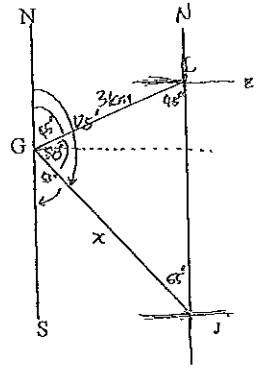
$C=\cos^{-1}\left(\frac{433}{680}\right)$

$=50.44900\ldots$

$=50^\circ27'$ (nearest minute)

6/6

3.



Not to Scale

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

since $\angle NGL = 45^\circ$ (given)

$\therefore \angle GLJ = 45^\circ$ (alt $\angle$s, NS $\parallel$ LJ)

$\therefore \angle LGJ = \angle NGJ - \angle NGL$

$= 125^\circ - 45$ (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) 3

$\frac{x}{\sin 45^\circ} = \frac{3}{\sin 55}$

$x = \frac{3 \sin 45}{\sin 55}$ ✓

$= 2.5596\ldots$

$= 2.6$ km (1 d.p)

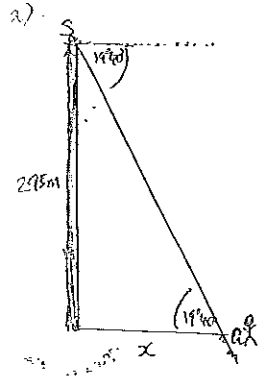
4.

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. 3
(answer to the nearest metre)

a)



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

$x = \frac{295}{\tan 19^\circ 40'}$ ✓

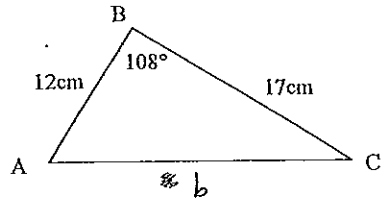
$= 825.4158\ldots$

$= 825$ m (nearest metre)

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

9/9

5. For the figure below find a) the length AC to the nearest mm 3
b) the area of Δ ABC to nearest cm^2 3



a) $b^2 = 12^2 + 17^2 - 2 \times 12 \times 17 \times \cos 108^\circ$

$= 559.0789837\ldots$

$b = 23.6485\ldots$

∴ Length of AC = 236 mm (nearest mm) ✓

b) Area $= \frac{1}{2} ab \sin C$

$= \frac{1}{2} \times 12 \times 17 \times \sin 108$

$= 102 \times \sin 108^\circ$

$= 97.00776\ldots$

$= 97\ cm^2$ (nearest cm^2) ✓

6/6