# Sydney Girls' High School

# 2014
# MATHEMATICS

## YEAR 9
## Common Assessment Task 2

**Time Allowed: 70 minutes**

**TOPICS:** Computation & Financial Mathematics, Expressions, equations & inequations, Length, Area, Surface Area & Volume, Indices & Surds, Probability, Linear Relationships, Geometry, Quadratic Expressions, Trigonometry & The Parabola.

**Directions to Candidates**

- There are four (4) questions.
- Attempt ALL questions.
- Questions are of equal value.
- Start each question on a new page.
- Write on one side of the paper only.
- Show all necessary working. Marks will be deducted for careless or badly arranged work.
- Diagrams are NOT drawn to scale.
- Board-approved calculators may be used.

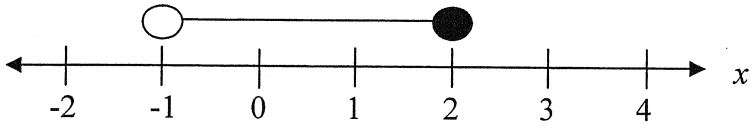
**Total: 80 marks**

## QUESTION 1 (20 marks)

Marks

a) Write 0.0000548 in scientific notation. 1

b) Write the inequality that corresponds to the graph below. 1




c) A man purchases two tickets in a chocolate wheel raffle. There are sixty tickets sold. What is the probability that he wins the prize? 1

d) Fully simplify the following: i) $9\sqrt{8}\times 3\sqrt{12}-\sqrt{27}$ 2

ii) $6^0\times(10^6)^{\frac{1}{2}}\times 4^{\frac{-1}{2}}$ 1

e) If $2x-5y=20$ find $y$ when $x=5$. 1

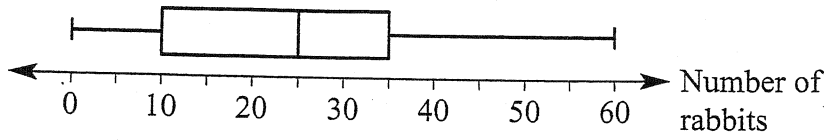
f) Solve $\dfrac{3-x}{5}<2$. 2

g) Find the surface area of a rectangular prism having the dimensions 4cm, 5cm and 8 cm. 2

h) Change the subject of the formula $S=\dfrac{n}{2}(a+L)$ to $L$. 1

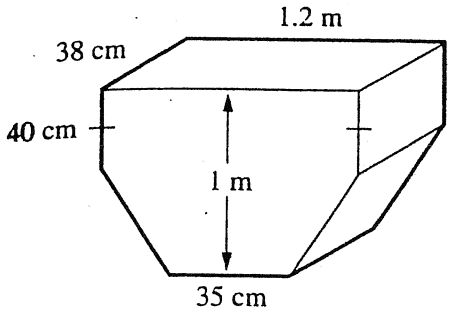
i) A wet suit had a selling price that was marked up by 80% from the cost price of $260. During a sale the selling price of the wetsuit was reduced by 30%. What was the sale price of the wetsuit? 1

j) This box plot summarises the number of rabbits spotted per day in a paddock over a 100-day period.




i) Find the range of the number of rabbits spotted. 1
ii) State the median number of rabbits spotted. 1
iii) Find the interquartile range. 1

k) Find the volume of the solid shown below. 2




l) A computer costs $3750. Kate has $850 and she is going to borrow the remainder. She will pay the loan in 24 monthly repayments of $155.

i) How much interest does she pay? 1
ii) What is the annual rate of interest on her loan? (correct to 2 decimal places) 1

## QUESTION 2 (20 marks)

Marks

a) Find the $x$ and $y$ intercepts of the line $3x+2y-12=0$. 2

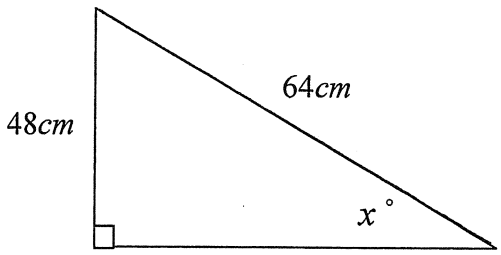
b) Expand and simplify the following:

i) $(2x-1)(1+5x)$ 2

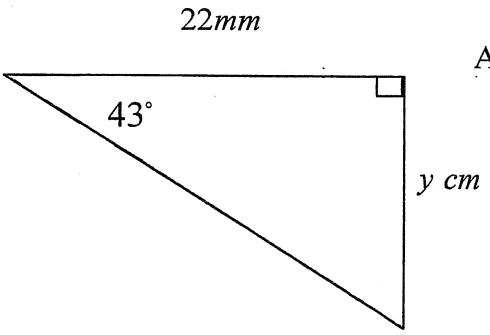
ii) $(2x-3y)^2-(2x^2-y^2)$ 2

c) Find the value of the pronumeral in each of the following figures:

i) Answer to the nearest degree. 2



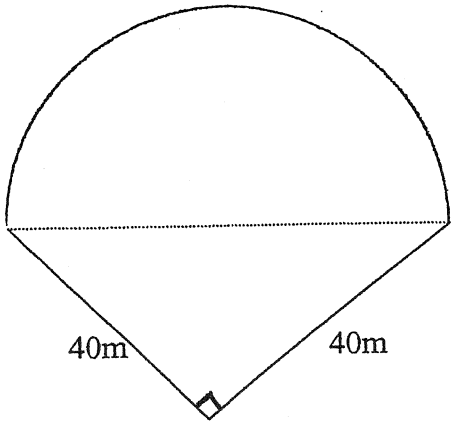

ii) Answer to 1 decimal place. 2




d) A softball field, drawn below consists of a semicircle and a right-angled triangle.

i) Find the entire area of the field correct to 1 decimal place. 2

ii) What is the perimeter of the field? 2
(Correct to 1 decimal place)



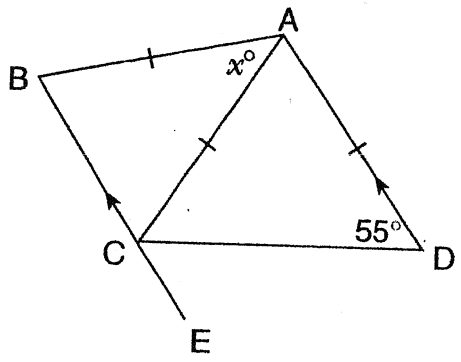
## QUESTION 2-Continued (20 marks)

Marks

e) Solve these two equations simultaneously. 2

$$2a+b=5$$
$$3a+4b=15$$

f) If AB = AC = AD, find the value of $x$, giving reasons. 2




g) Given the equation of a graph is $y=-(x+3)^2+2$.

Find the co-ordinates of the: i) y – intercept 1

ii) vertex. 1

## QUESTION 3 (20 marks)

Marks

a) Factorise fully:

i) $81a^2 - 25b^2$ — 1

ii) $6x^2 - 23x - 4$ — 2

iii) $p^2 + qm + pq + pm$ — 2

iv) $z^2 - (1+w)^2$ — 1

b) Solve the following equations:

i) $5(y+4) - (y-9) = 33$ — 2

ii) $\frac{3}{2x} = 1 - \frac{4}{x}$ — 2

c) Simplify the following:

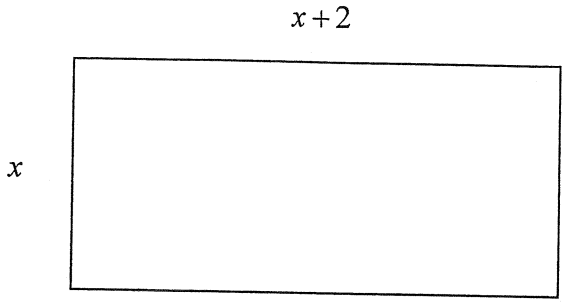
i) $\frac{3y^2 - 3}{3y - 3}$ — 2

ii) $\frac{3}{y^2 + 7y + 12} - \frac{5}{y^2 + 5y + 4}$ — 2

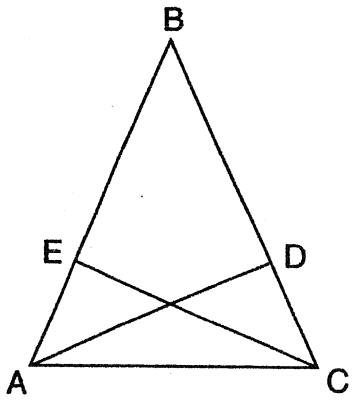
QUESTION 3-Continued (20 marks)

Marks

d) Given the area of the rectangle below is 80 square units, determine the value of $x$. 3




e) In $\Delta ABC$, $AD \perp BC$ and $CE \perp AB$.
If $AD = CE$, prove that $\angle BAC = \angle BCA$ and, hence, that $\Delta ABC$ is isosceles. 3



## QUESTION 4 (20 marks)

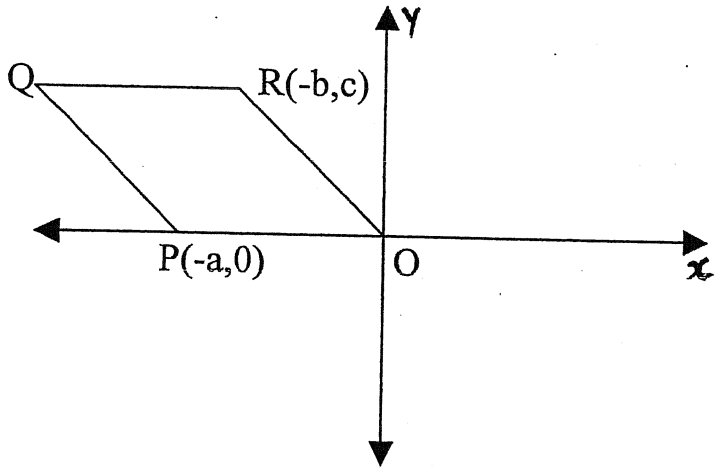
Marks

a) Sketch the following graphs, showing the y-intercept and turning point of each.

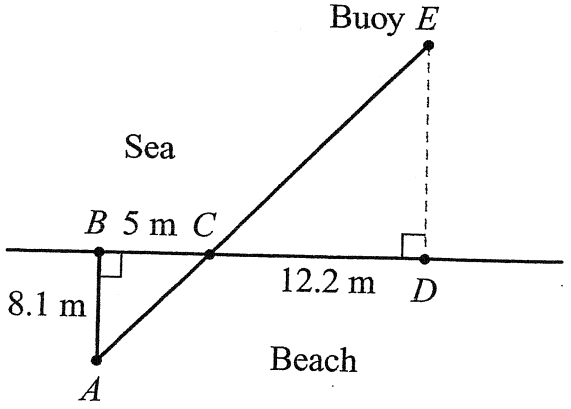
i) $y=-(x+4)^2$ 2

ii) $y=x^2-4x-12$ 3

b) OPQR is a rhombus, Find the coordinates of point Q. 1




c) A buoy (E) is floating in the sea at an unknown distance from the beach as shown. The points A, B, C and D are measured and marked out on the beach as shown.




i) Prove $\Delta ABC \;|||\; \Delta EDC$ 2

ii) Find the distance from the buoy to the beach(ED) to 1 decimal place. 2

Marks

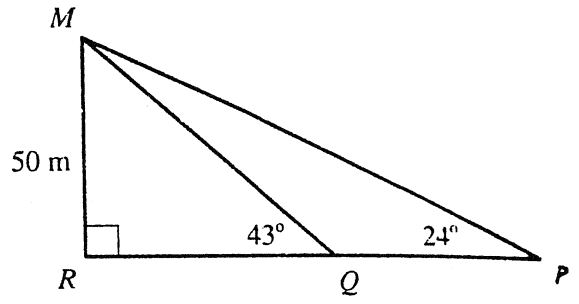
d) A group of students are bushwalking. They walk north from their camp site for 7.5km, then they walk west until their bearing from the camp is 320° T.

i) Draw a neat diagram to show this information. 1

ii) Find how far they are from the camp site, correct to 1 decimal place. 2

iii) What is the bearing of the camp site from the students? 2

e) In the diagram shown below, find the value PQ. (correct to 1 decimal place). 3




f) If $\frac{3a+4b}{2a-2b}=5$, find the value of $\frac{a^2+2b^2}{ab}$. 2

# THE END

Question 1 – Year 9 - yearly 2014 (20 marks)

a) $5.48 \times 10^{-5}$ 1

b) $-1 < x \leq 2$ 1

c) $P(\text{wins}) = \frac{2}{60}$

$= \frac{1}{30}$ 1

d) i) $9\sqrt{8} \times 3\sqrt{12} - \sqrt{27}$

$= 18\sqrt{2} \times 6\sqrt{3} - 3\sqrt{3}$ 2

$= 108\sqrt{6} - 3\sqrt{3}$

ii) $6^0 \times (10^6)^{1/2} \times 4^{-1/2}$

$= 1 \times 10^3 \times \frac{1}{2}$ 1

$= 500$

e) $2x - 5y = 20$

$2(5) - 5y = 20$

$-5y = 10$

$y = -2$ 1

f) $\frac{3-x}{5} < 2$ 2

$3 - x < 10$

$-x < 7$

$x > -7$

g) Surface Area $= 2(4\times5) + 2(5\times8) + 2(4\times8)$

$= 40 + 80 + 64$

$= 184\text{ cm}$ 2

h) $S = \frac{n}{2}(a+L)$

$\frac{2S}{n} = a+L$

$\therefore \frac{2S}{n} - a = L$ 1

i) Mark up $= 260 \times 1.8$

$= \$468$

Selling price $= \$468 \times 0.7$ 1

$= \$327.60$

j) i) Range $= 60 - 0$

$= 60$ 1

ii) Median $= 25$ 1

iii) $IQR = Q_3 - Q_1$

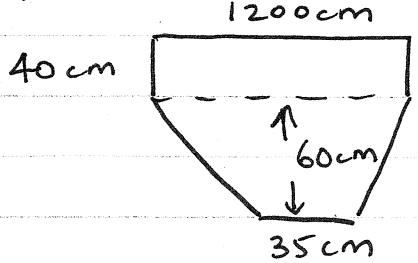
$= 35 - 10$

$= 25$ 1

k) Area of cross-section $= 40 \times 120 + \frac{1}{2}(60)[120+35]$

$= 4800 + 4650$

$= 9450\text{ cm}^2$ 2




Volume $= AH$

$= 9450 \times 38$

$= 359\,100\text{ cm}^3$

OR $= 0.3591\text{ m}^3$

e) i) Interest = $(155 \times 24) - [3750 - 850]$

$= 3720 - 2900$

$= \$820$ 1

ii) Annual interest rate $= \left(\frac{820}{2900} \times \frac{100}{1}\right) \div 2$

$= 14.14\%$ p.a. 1

YR 9 YEARLY 2014

Question 2

a) $3x + 2y - 12 = 0$

Let $x = 0$ to find y-int

$2y = 12$

$y = 6$ (y-int)

Let $y = 0$ to find x-int

$3x = 12$

$x = 4$ (x-int)

b) i) $(2x-1)(1+5x) = 2x + 10x^2 - 1 - 5x$

$= 10x^2 - 3x - 1$

ii) $(2x-3y)^2 - (2x^2 - y^2)$

$= 4x^2 - 12xy + 9y^2 - 2x^2 + y^2$

$= 2x^2 - 12xy + 10y^2$

c) i) $\sin x = 48/64$

$x = 49°$ (nearest degree)

ii) $\tan 43° = y/22$

$y = 22 \cdot \tan 43°$

$= 20.5$ mm

$= 2.1$ cm (1 d.p)

d) i) $x^2 = 40^2 + 40^2$

$x^2 = 1600 + 1600$

$x = \sqrt{3200}$

$x = 40\sqrt{2}$ (diameter)

$\therefore$ radius $= 20\sqrt{2}$

Area $= \frac{\pi r^2}{2} + \frac{1}{2} \times bh = \frac{\pi (20\sqrt{2})^2}{2} + 800$

$= (400\pi + 800)\,m^2$

$\doteq 2056.6\,m^2$ (1 d.p)

ii) Perimeter $= 40 + 40 + \pi r$

$= 80 + \pi \times 20\sqrt{2}$

$= (80 + 20\sqrt{2}\pi)$ m

$\doteq 168.9$ m (1.d.p)

N.B. Leave in exact value until the end to ensure an accurate answer.

e) $2a + b = 5$ (1) $\times 4$

$3a + 4b = 15$ (2)

$8a + 4b = 20$ (3)

(3) − (2) $5a = 5$

$a = 1$ sub in (1)

$2(1) + b = 5$

$b = 3$

f) $\angle ACD = 55°$ ($\Delta ACD$ isosceles)

$\angle CAD = 70°$ (angle sum $\Delta$)

$\angle ACB = 70°$ (alt $\angle$s equal $AD \| BC$)

$\angle ABC = 70°$ ($\Delta ABC$ isosceles)

$\therefore x = 180 - 70 - 70$ (angle sum $\Delta$)

$x = 40°$

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

i) Let $x = 0$ to find y-intercept

$y = -(3)^2 + 2 = -7$

y-int is $-7$

ii) Vertex $(-3, 2)$

4rq

Q3

a) i) $81a^2 - 25b^2$

1 $= (9a + 5b)(9a - 5b)$

ii) $6x^2 - 23x - 4$

2 $= (6x + 1)(x - 4)$ one correct or swapped

iii) $p^2 + qm + pq + pm$

2

$= p^2 + pq + pm + qm$

$= p(p+q) + m(p+q)$

$= (p+q)(p+m)$

iv) $z^2 - (1+w)^2$

1

$= (z + 1+w)(z - (1+w))$

$= (z+w+1)(z-w-1)$

b) i) $5(y+4) - (y-9) = 33$

(2) $5y + 20 - y + 9 = 33$

$4y + 29 = 33$ 1

$4y = 4$

$y = 1$ 1

ii) $\frac{3}{2x} = 1 - \frac{4}{x}$

(2)

$3 = 2x - 8$

$2x = 11$

$x = 5\frac{1}{2}$

c) i) $\frac{3y^2 - 3}{3y - 3}$

(2)

$= \frac{3(y+1)(y-1)}{3(y-1)}$

$= y + 1$

ii) $\frac{3}{(y+3)(y+4)} - \frac{5}{(y+4)(y+1)}$

(2)

$= \frac{3(y+1) - 5(y+3)}{(y+1)(y+3)(y+4)}$

$= \frac{3y + 3 - 5y - 15}{(y+1)(y+3)(y+4)}$

$= \frac{-2y - 12}{(y+1)(y+3)(y+4)}$ or $\frac{-2(y+6)}{(y+1)(y+3)(y+4)}$

d) 3

$x(x+2) = 80$

$x^2 + 2x - 80 = 0$ } 1

$(x+10)(x-8) = 0$

$\therefore x = -10$ or $x = 8$ 1

must reject $x = -10$ 1

e) 3

In $\triangle AEC$ and $\triangle ADC$

$\angle AEC = \angle ADC = 90$ data

AC common side

$CE = AD$ data } 2

$\therefore \triangle AEC \equiv \triangle ADC$

$\therefore \angle EAC = \angle DCE$

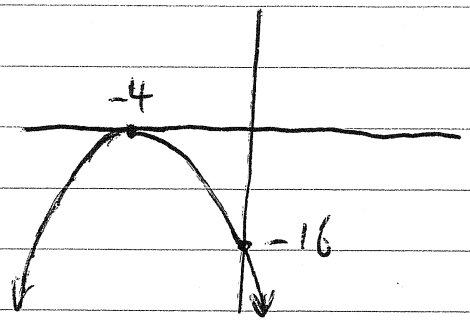
corr. $\angle$ in conjrnt $\triangle$ } 1 all or Nothing

$\therefore \triangle ABC$ is isosceles

YEAR 9 YEARLY QUESTION 4

(a)

(i)



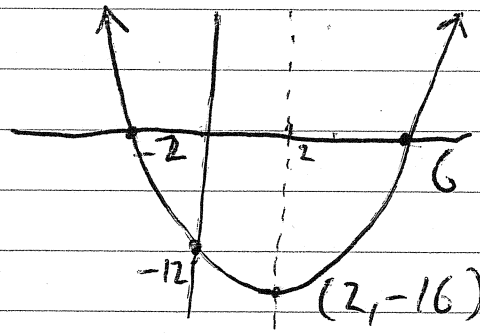

y-intercept ($x=0$)

$y = -(4)^2$

$= -16$

Turning Point $(-4, 0)$

(ii)




$y = x^2 - 4x - 12$

$y = (x-6)(x+2)$

y-int ($x=0$)

$y = -12$.

Turning Point $(2, -16)$.

when $x = 2$

$y = 4 - 8 - 12$

$= -16$

(b) $Q(-b-a, c)$

(c) (i) $\angle ABC = \angle CDE = 90°$

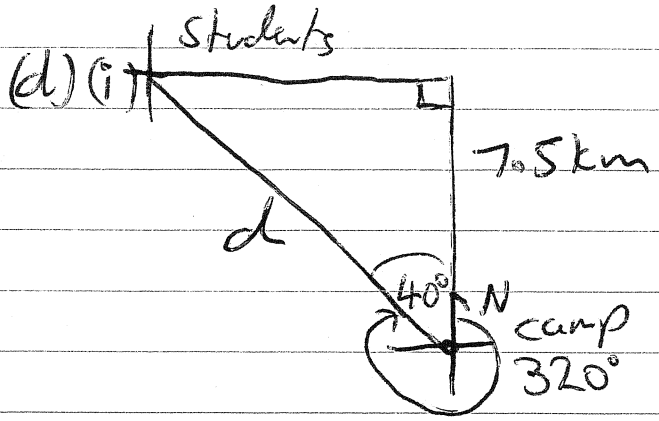
$\angle BCA = \angle DCE$ (vert. opp.).

$\therefore \triangle ABC \parallel\parallel \triangle EDC$ (equiangular).

(ii) $\frac{ED}{8.1} = \frac{12.2}{5}$.

$ED = 19.8$ m.

(d) (i)




(ii) $\cos 40° = \frac{7.5}{d}$

$d = \frac{7.5}{\cos 40°}$

$= 9.8 \text{ km}.$

(iii) $140°$

(e) $\tan 43° = \frac{50}{RQ}$ $\quad \tan 24° = \frac{50}{RP}$

$RQ = \frac{50}{\tan 43°}$ $\quad RP = \frac{50}{\tan 24°}$

$PQ = RP - RQ$

$= 58.7 \text{ m}$

(f) $3a + 4b = 10a - 10b.$

$14b = 7a$

$\therefore a = 2b.$

$$\frac{a^2 + 2b^2}{ab} = \frac{(2b)^2 + 2b^2}{2b^2}$$

$$= \frac{6b^2}{2b^2}$$

$$= 3.$$