Gosford High School

2014
Preliminary
Higher School Certificate

Mathematics

Assessment Task 1

Time Allowed – 60 minutes
(+5 minutes reading time)

SECTION 1 (Multiple Choice)	SECTION 2 (Free Response)			TOTAL
Questions 1 to 5	Question 6 (Basic Arithmetic)	Question 7 (Basic Algebra)	Question 8 (Equations)	
/5	/16	/15	/19	/55

All questions, in each section, are to be attempted.
Remember to start each new question on a new page
Students must answer questions using a blue/black pen and/or a sharpened B or HB pencil.
Approved scientific calculators may be used
Students need to be aware that

* 'bald' answers may not gain full marks.
* untidy and/or poorly organised solutions may not gain full marks.

SECTION 1 (multiple choice – please use the provided answer sheet) 8 marks

Question 1

$1\cdot\dot{3} + 0\cdot 4$ is equal to

A) $1\cdot 4\dot{3}$ B) $1\cdot 7\dot{3}$

C) $1\cdot\dot{7}\dot{3}$ D) $1\cdot\dot{7}$

Question 2

The value of $4a - 2a^2$ when $a = -3$ is

A) -30 B) -48

C) 6 D) 24

Question 3

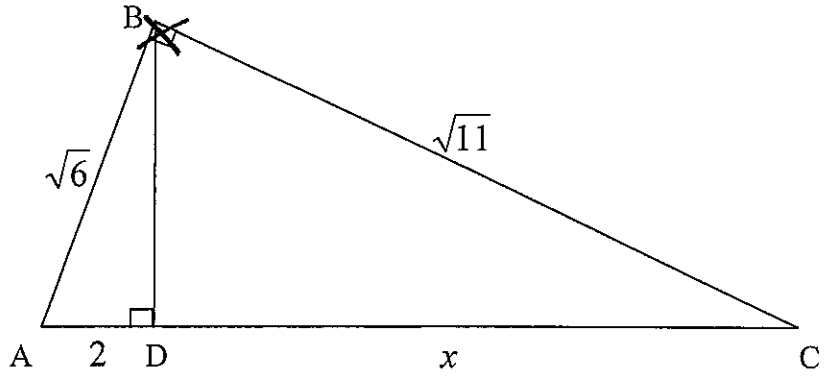
When both sides of the inequality $-2x - 5 > \frac{3}{4}$ are multiplied by -4, the result is

A) $8x + 20 \geq -3$ B) $8x - 20 < -3$

C) $8x + 20 < -3$ D) $8x + 20 < 3$

Question 4

Triangles ABC, ADB and BDC are right angled as shown.



The value of x is

A) 1 B) 3

C) $\sqrt{13}$ D) $\sqrt{21}$

Question 5

Given that $F^{-1} = U^{-1} + W^{-1}$, then $F =$

A) $U + W$

B) $\frac{U + W}{2}$

C) $\frac{UW}{U + W}$

D) $\frac{U + W}{UW}$

SECTION 2 **Free Response – use your own paper**

Question 6 **Basic Arithmetic** **(16 marks)**

a) Write $\frac{7}{90}$ as a decimal correct to 2 significant figures. (1)

b) Write 0.00345 in scientific notation. (1)

c) What is the value of $|-5|-|8|$ (1)

d) Increase \$450 by 65%? (1)

e) Eamon and Lucia paid a total of \$315 for their meals at a restaurant.
This included a $12 \cdot 5\%$ tip.
What was the cost of their meals without the tip? (1)

f) Find the value of $\frac{10 \cdot 46 + 4\pi}{\sqrt[5]{3.6}}$ correct to 3 decimal places (1)

g) Write $0 \cdot 3\dot{5}$ as a proper, simplified fraction. (2)

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

i) Solve $\sqrt{45}+\sqrt{80}=\sqrt{x}$ (2)

j) Find the values of a and b if $\left(\sqrt{3}-\sqrt{2}\right)^{-2} = a + b\sqrt{6}$, given that a and b are integers. (3)

k) Use trial and error and your calculator to find the smallest possible integer n such that $\left(\frac{1}{2}\right)^n < 0 \cdot 001$? (1)

Question 7 **Basic Algebra** **(15 marks)**

a) Simplify (i) $\sqrt{81x^{16}}$ (1)

(ii) $\dfrac{3x^{-2}}{6x^{-5}}$ (1)

b) Expand and simplify

(i) $5(1-2x)-(7-3x)$ (1)

(ii) $(3-4x)^2-2(4-x)(4+x)$ (2)

c) Factorise fully

(i) $8x^3-27$ (1)

(ii) $4x^2-13x-12$ (1)

(iii) $a(m-2)-(2-m)$ (1)

d) Simplify $\dfrac{1}{(a-1)(a+1)}+\dfrac{1}{(a+1)^2}$ (2)

e) Simplify $\dfrac{a^3+1}{a^2-4a-5}\times\dfrac{a^2-a}{a^3-a^2+a}$ (3)

f) If $x^2+y^2=7xy$, write $\left(\dfrac{x+y}{3}\right)^2$ in terms of xy (2)

Question 8 **Equations** **(19 marks)**

a) Solve $x^{\frac{3}{4}} = 64$ (1)

b) Solve $3p = \frac{5p}{4} + 2$ (2)

c) Solve the equations $4y = 3x - 4$ and $2y - x = 10$ simultaneously (3)

d) Solve $2x^2 - x - 6 = 0$ (2)

e) Solve the equation $2x^2 + 7x - 3 = 0$, writing your answers in exact surd form (2)

f) Solve $|2x - 5| = 8$ (2)

g) Solve the inequality $6 > |x - 8|$ (2)

h) Solve $2x - 5 = |x + 2|$ (3)

i) Solve $\sqrt{(3x-1)^2} = 4$ (2)

End of Examination

Year 11 Preliminary HSC TASK 1

Student Name _____

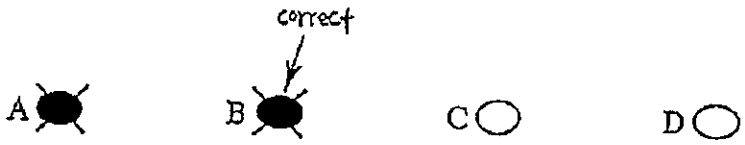
Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9

A ○ B ● C ○ D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word correct and drawing an arrow as follows.



1. A ○ B ○ C ○ D ○
2. A ○ B ○ C ○ D ○
3. A ○ B ○ C ○ D ○
4. A ○ B ○ C ○ D ○
5. A ○ B ○ C ○ D ○

GHS 2014 PRELIMINARY HSC MATHEMATICS
ASSESSMENT TASK 1 SOLUTIONS

SECTION 1 (Multiple Choice)

(1) B (2) A (3) A (4) B (5) C

SECTION 2 (Basic Arithmetic)

QUESTION 6 (Basic Arithmetic)

a) 0.078

b) 3.45×10^{-3}

c) -3

d) $\$742.50$

e) $\$280$

f) $\$17.82$

g) Let $x = 0.3\dot{5}$

$\therefore 100x = 35.\dot{5}$

By subtraction

$99x = 35.2$

$$x = \frac{35.2}{99}$$

$$x = \frac{352}{990}$$

$$x = \frac{16}{45}$$

$$\therefore 0.3\dot{5} = \frac{16}{45}$$

h) $(2+\sqrt{3})(5-2\sqrt{3}) = 10 - 4\sqrt{3} + 5\sqrt{3} - 6$

$= 4 + \sqrt{3}$

i) $\sqrt{45} + \sqrt{80} = 3\sqrt{5} + 4\sqrt{5}$

$= 7\sqrt{5}$

$= \sqrt{245}$

$\therefore x = 245$

j) $(\sqrt{3}-\sqrt{2})^{-2} = \dfrac{1}{(\sqrt{3}-\sqrt{2})^2}$

$= \dfrac{1}{5-2\sqrt{6}} \times \dfrac{5+2\sqrt{6}}{5+2\sqrt{6}}$

$= \dfrac{5+2\sqrt{6}}{25-24}$

$= 5+2\sqrt{6}$

$\therefore a = 5, \; b = 2$

k) $\left(\frac{1}{2}\right)^{10} = 0.00097\ldots < 0.001$

$\left(\frac{1}{2}\right)^{9} = 0.0019\ldots \not< 0.001$

$\therefore n = 10$

Question 7 Basic Algebra

a) (i) $\sqrt{81x^{16}} = 9x^8$

(ii) $\dfrac{3x^{-2}}{6x^{-5}} = \dfrac{x^3}{2}$ or $\frac{1}{2}x^3$

b) (i) $5(1-2x)-(7-3x) = 5-10x-7+3x$

$= -2-7x$

(ii) $(3-4x)^2 - 2(4-x)(4+x)$

$= 9-24x+16x^2-2(16-x^2)$

$= 9-24x+16x^2-32+2x^2$

$= 18x^2-24x-23$

c) (i) $8x^3 - 27 = (2x-3)(4x^2+6x+9)$

(ii) $4x^2 - 13x - 12 = (4x+3)(x-4)$

(iii) $a(m-2) - (2-m) = a(m-2) + 1(m-2)$

$= (m-2)(a+1)$

d) $\frac{1}{(a-1)(a+1)} + \frac{1}{(a+1)^2} = \frac{1(a+1) + 1(a-1)}{(a-1)(a+1)^2}$

$= \frac{2a}{(a-1)(a+1)^2}$

e) $\frac{a^3+1}{a^2-4a-5} \times \frac{a^2-a}{a^3-a^2+a}$

$= \frac{(a+1)(a^2-a+1)}{(a-5)(a+1)} \times \frac{a(a-1)}{a(a^2-a+1)}$

$= \frac{a-1}{a-5}$

f) $\left(\frac{x+y}{3}\right)^2 = \frac{(x+y)^2}{9}$

$= \frac{x^2+2xy+y^2}{9}$

$= \frac{7xy+2xy}{9}$

$= xy.$

Question 8 Basic Algebra

a) $x^{\frac{3}{4}} = 64$

$x = 64^{\frac{4}{3}}$

$x = 256$

b) $3p = \frac{5p}{4} + 2$

$12p = 5p + 8$

$7p = 8$

$p = \frac{8}{7}$

c) $x = 2y - 10 \longrightarrow 4y = 3(2y - 10) - 4$

$4y = 6y - 30 - 4$

$34 = 2y$

$y = 17$

$x = 2(17) - 10 \longleftarrow$

$x = 24$

d) $2x^2 - x - 6 = 0$

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

$x = -\frac{3}{2}, 2$

e) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$; $a = 2, b = 7, c = -3$

$x = \frac{-7 \pm \sqrt{49 - 4(2)(-3)}}{2 \times (2)}$

$x = \frac{-7 \pm \sqrt{73}}{4}$

f) $|2x-5| = 8$

$2x - 5 = 8$ or $2x - 5 = -8$

$2x = 13$ $\qquad 2x = -3$

$x = 6\frac{1}{2}$ $\qquad x = -\frac{3}{2}$

Both solutions satisfy

$\therefore x = 6\frac{1}{2}, -\frac{3}{2}$

g) $|x-8| < 6$

$\therefore -6 < x-8 < 6$

$2 < x < 14$

h) $2x - 5 = |x+2|$

$\therefore 2x - 5 = x + 2$ or $2x - 5 = -(x+2)$

$x = 7$ $\qquad 2x - 5 = -x - 2$

Solution satisfies. $\qquad 3x = 3$

$(9 = 9)$ $\qquad x = 1$

Solution <u>does not</u> satisfy.

$(-3 \neq 3)$

$\therefore x = 7$ only.

i) $3x - 1 = 4$ or $3x - 1 = -4$

$3x = 5$ $\qquad 3x = -3$

$x = \frac{5}{3}$ $\qquad x = -1$

Which satisfies $\qquad$ Which satisfies

$\therefore x = \frac{5}{3}, -1$