Name: _____ Teacher: _____

MATHEMATICS

YEAR 9
HALF YEARLY
2012

SYDNEY TECHNICAL HIGH SCHOOL

Time Allowed	-	70 Minutes
Non Calculator	-	10 Minutes
Calculator	-	60 Minutes

Instructions:

- Approved calculators only may be used.
- All necessary working must be shown in spaced provided. Marks may not be awarded for careless or badly arranged work.
- Marks are shown next to each question.
- Total Marks: 75

Non-Calculator	ALGEBRA	INDICES	SURDS	GEOMETRY	PROBABILITY	Total
/10	/15	/12	/14	/13	/11	/75

ALGEBRA (1 mark each unless shown otherwise)

1. Simplify the following expressions

(a) $6xy - 5x + 4x - 3xy$

(b) $12ab \times -\frac{1}{3}ab$

(c) $-35mn \div 5np$

(d) $\frac{4pq}{21} + \frac{7}{44p^2}$

(e) $\frac{4y}{3x} + \frac{3y}{4x}$ (2 marks)

(a) _____

(b) _____

(c) _____

(d) _____

(e)

_____

_____

_____

2. Expand and simplify (2 marks each)

(a) $4y(2y + 1) - 3(y - 5)$

_____

_____

_____

(b) $(3x - 2)(2x + 3)$

_____

_____

_____

3. If x=3, y=-4 and z=6, find

(a) $\frac{xy}{z}$

_____

_____

(b) $x^2 + 4y^2 + z^2$

_____

_____

(c) $(x + y)^2$

_____

_____

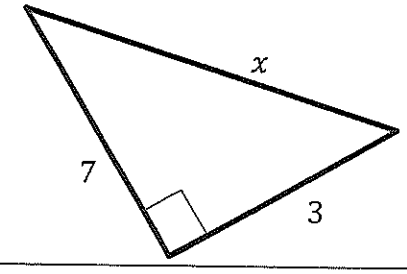
4. (a) Three people have \$$x$, \$$y$ and \$$z$ respectively. What is their average wealth?

(a)

(b) If x apples cost a total of \$$y$, what is the cost of z apples?

(b)

Name: _____ Teacher: _____

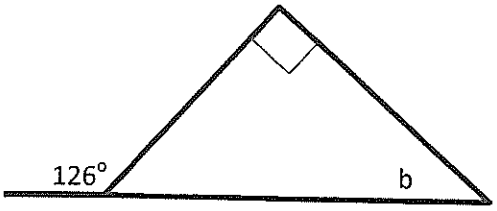
NON-CALCULATOR (1 mark each)		
1.	Write the following numbers correct to 2 significant figures (a) 0.0205 (b) 3498	(a) _____ (b) _____
2.	Express 450 litres in 5 seconds as a rate in its simplest form.	
3.	Write the fraction $2\frac{1}{6}$ as a recurring decimal.	
4.	Convert $0.\dot{2}$ to a fraction.	
5.	Find x as a surd. 	
6.	Write the value of $27^{-2/3}$	
7.	Which ratio is equivalent to 7:2? (A) $\frac{7}{4}:\frac{1}{4}$ (B) 17:5 (C) $\frac{7}{8}:\frac{2}{8}$ (D) 20:6	
8.	Which of the following expression is equal to 80? (A) $5 + 3 \times 10$ (B) $2^2 \times (13 + 7)$ (C) $10 + 15 \times 4$ (D) $60 + 5 \times 20 \div 2$	
9.	The closest estimate of $\frac{46.3 + 89.1}{\sqrt{28.9 + 23.2}}$ is (A) 0.19 (B) 1.8 (C) 19 (D) 15	

INDICES(1 mark each unless shown otherwise)		
1.	Express 0.000583 in scientific notation.	
2.	Simplify the following expressions (a) $12n^{\circ} \times (8m)^{\circ}$ (b) $3^m \times 3^n$ (c) $(2x^2y^4)^3$ (d) $(27f^6g^6)^{\frac{1}{3}}$	(a) _____ (b) _____ (c) _____ (d) _____
3.	Simplify giving your answer without negative indices. $10t^{-6} \div 20t^{-4}$ (2 marks)	
4.	Evaluate the following in scientific notation correct to 2 decimal places.<br$(5.9 \times 10^5) \div (2.3 \times 10^3)$ (2 marks)	
8.	Write $a\sqrt{a}$ in index form.	
6.	If $3^x = 8$, evaluate 3^{x+4}.	
7.	Simplify $8^x \times 2^{4x}$	

SURDS (1 mark unless otherwise indicated)		
1.	Write $a^{-5/6}$ in surd form	
2.	Simplify the following surds. (a) $3\sqrt{27}$ (b) $5\sqrt{20} - 2\sqrt{18} - \sqrt{45}$ (2 marks)	(a) _____ (b) _____
3.	Write $4\sqrt{7}$ as an entire surd.	
4.	Expand and simplify. (a) $2\sqrt{6}(7 - 3\sqrt{6})$ _____ (b) $(3\sqrt{2} + 2)(3\sqrt{2} - 2)$ _____ (c) $(\sqrt{6} - 4)^2$ _____ (2 marks each)	(a) _____ (b) _____ (c) _____
5.	Rationalise the denominator of: (a) $\frac{10}{2\sqrt{3}}$ (b) $\frac{4}{\sqrt{5} + 2}$ (2 marks)	(a) _____ (b) _____

GEOMETRY (do not abbreviate reasons)

1.

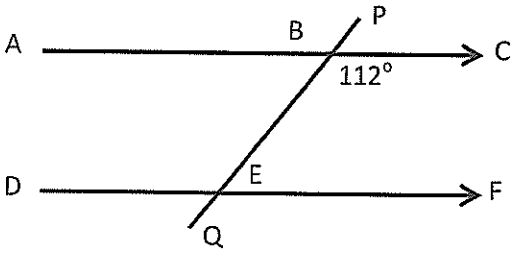


b =

Reason =

(2 marks)

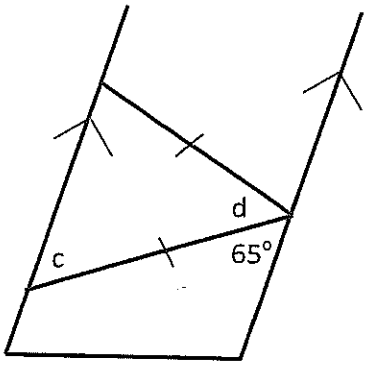
2.



Find ∠DEQ with reasons

(2 marks)

3.



Find c and d (reasons not required)

c =

d =

(2 marks)

4. ABCDEFGH is a regular octagon. Find:

(a) The angle sum of an octagon. (a)

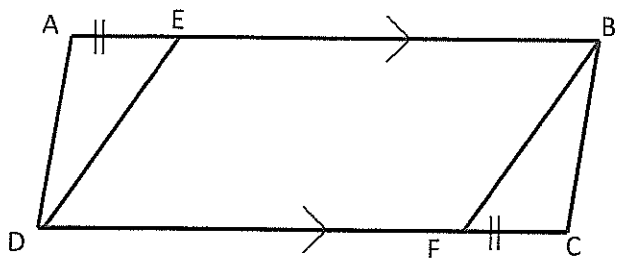
(b) The size of each interior angle. (b)

(c) The size of each exterior angle. (c)

(2 marks)

5. ABCD is a parallelogram with AE = FC

Prove $\Delta AED \equiv \Delta BFC$ and hence that DE = FB. (4 marks)



PROBABILITY (1 mark each)		
1.	A marble is drawn at random from a bag containing 6 red, 4 white, 1 green and 1 black marble. Find the probability that it is: (a) red (b) not white (c) black or green	(a) _____ (b) _____ (c) _____
2.	If 2 dice are thrown, what is the probability of throwing: (a) a total of 5 (b) a total greater than 8 (c) any double	(a) _____ (b) _____ (c) _____
3.	A bag contains 20 chocolates. When a chocolate is drawn at random we know that P (white choc) = 0.5, P (dark choc) = 0.4 and P (caramel) = 0.1. What are the contents of the bag.	
4.	If the probability of an even E is 0.85, what is the probability of the complementary event E'.	
5.	Calculate the expected value of the number of sixes in 200 rolls of a die.	
6.	(a) From a normal deck of 52 playing cards, what is the probability of choosing a KING in one draw? (b) If the person, from above, does draw a KING and does not put it back in the pack, what is their chance now of drawing another KING?	(a) _____ (b) _____

Name: _____ Teacher: MOEFIS SOLN

MATHEMATICS

YEAR 9
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Instructions:

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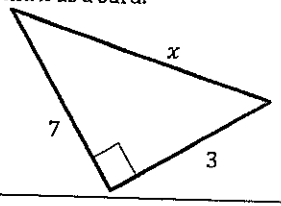
- Total Marks: 75

Non-Calculator	ALGEBRA	INDICES	SURDS	GEOMETRY	PROBABILITY	Total
/10	/15	/12	/14	/13	/11	/75

Name: _____ Teacher: _____

NON-CALCULATOR (1 mark each)		
1.	Write the following numbers correct to 2 significant figures (a) 0.0205 (b) 3498	(a) 0.021 (b) 3500
2.	Express 450 litres in 5 seconds as a rate in its simplest form.	90L / sec
3.	Write the fraction $2\frac{1}{6}$ as a recurring decimal.	$2.1\dot{6}$
4.	Convert $0.\dot{2}$ to a fraction.	$\frac{2}{9}$
5.	Find x as a surd. 	$\sqrt{58}$
6.	Write the value of $27^{-2/3}$	$\frac{1}{9}$
7.	Which ratio is equivalent to 7:2? (A) $\frac{7}{4}:\frac{1}{4}$ (B) 17:5 (C) $\frac{7}{8}:\frac{2}{8}$ (D) 20:6	C
8.	Which of the following expression is equal to 80? (A) $5+3\times10$ (B) $2^2\times(13+7)$ (C) $10+15\times4$ (D) $60+5\times20\div2$	B
9.	The closest estimate of $\frac{46.3+89.1}{\sqrt{28.9+23.2}}$ is (A) 0.19 (B) 1.8 (C) 19 (D) 15	C

ALGEBRA (1 mark each unless shown otherwise)

1. Simplify the following expressions

(a) $6xy - 5x + 4x - 3xy$ — $3xy - x$

(b) $12ab \times -\frac{1}{3}ab$ — $-4a^2b^2$

(c) $-35mn \div 5np$ — $\frac{-35mn}{5np} = \frac{-7m}{p}$

(d) $\frac{4pq}{21} \times \frac{7}{44p^2}$ — $\frac{q}{33p}$

(e) $\frac{4y}{3x} + \frac{3y}{4x}$ (2 marks) — $\frac{16y + 9y}{12x} = \frac{25y}{12x}$

2. Expand and simplify (2 marks each).

(a) $4y(2y + 1) - 3(y - 5)$ — $= 8y^2 + 4y - 3y + 15 = 8y^2 + y + 15$

(b) $(3x - 2)(2x + 3)$ — $= 6x^2 + 9x - 4x - 6 = 6x^2 + 5x - 6$

3. If $x=3$, $y=-4$ and $z=6$, find

(a) $\frac{xy}{z} = \frac{-12}{6} = -2$

(b) $x^2 + 4y^2 + z^2 = 9 + 4 \times 16 + 36 = 109$

(c) $(x + y)^2 = (3 + -4)^2 = 1$

4. (a) Three people have $\$x$, $\$y$ and $\$z$ respectively. What is their average wealth? — $\$\left(\frac{x+y+z}{3}\right)$

(b) If x apples cost a total of $\$y$, what is the cost of z apples? — $\$\left(\frac{yz}{x}\right)$

INDICES (1 mark each unless shown otherwise)

1. Express 0.000583 in scientific notation. — 5.83×10^{-4}

2. Simplify the following expressions

(a) $12n^0 \times (8m)^0$ — 12×1 — 12

(b) $3^m \times 3^n$ — 3^{m+n}

(c) $(2x^2y^4)^3$ — $8x^6y^{12}$

(d) $(27f^6g^6)^{\frac{1}{3}}$ — $3f^2g^2$

3. Simplify giving your answer without negative indices.

$10t^{-6} \div 20t^{-4}$ — $\frac{1}{2}t^{-2}$ — $\frac{1}{2t^2}$ (2 marks)

4. Evaluate the following in scientific notation correct to 2 decimal places.

$(5.9 \times 10^5) \div (2.3 \times 10^3)$ — 2.57×10^2 (2 marks)

8. Write $a\sqrt{a}$ in index form. — $a \times a^{\frac{1}{2}}$ — $a^{\frac{3}{2}}$

6. If $3^x = 8$, evaluate 3^{x+4}. — $= 3^x \cdot 3^4 = 8 \times 3^4$ — 648

7. Simplify $8^x \times 2^{4x}$ — $2^{3x} \times 2^{4x}$ — 2^{7x}

SURDS (1 mark unless otherwise indicated)

1. Write $a^{-5/6}$ in surd form

$$\frac{1}{\sqrt[6]{a^5}}$$

2. Simplify the following surds.

(a) $3\sqrt{27}$ $\quad 3 \times 3\sqrt{3}$

$9\sqrt{3}$

(b) $5\sqrt{20} - 2\sqrt{18} - \sqrt{45}$

$10\sqrt{5} - 6\sqrt{2} - 3\sqrt{5}$

$7\sqrt{5} - 6\sqrt{2}$

(2 marks)

3. Write $4\sqrt{7}$ as an entire surd.

$\sqrt{112}$

4. Expand and simplify.

(a) $2\sqrt{6}(7 - 3\sqrt{6})$ $\quad 14\sqrt{6} - 36$

$14\sqrt{6} - 36$

(b) $(3\sqrt{2} + 2)((3\sqrt{2} - 2)$ $\quad = 18 - 4$

$= 14$

14

(c) $(\sqrt{6} - 4)^2$ $\quad 6 - 8\sqrt{6} + 16$

$22 - 8\sqrt{6}$

$22 - 8\sqrt{6}$

(2 marks each)

5. Rationalise the denominator of:

(a) $\frac{10}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{10\sqrt{3}}{6} = \frac{5\sqrt{3}}{3}$

$\frac{5\sqrt{3}}{3}$

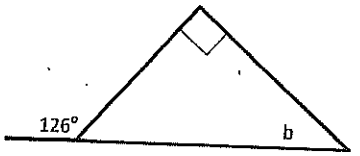
(b) $\frac{4}{\sqrt{5}+2} \times \frac{\sqrt{5}-2}{\sqrt{5}-2} =$ (2 marks)

$4(\sqrt{5} - 2)$

$= 4\sqrt{5} - 8$

GEOMETRY (do not abbreviate reasons)

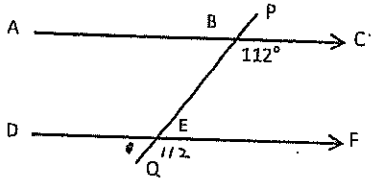
1.



b = 36

Reason = exterior angle of triangle is equal to sum of 2 opposite interior angles

2.



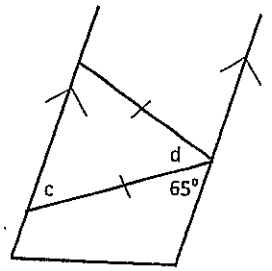
Find ∠DEQ with reasons (2 marks)

∠FEQ = 112° (corresponding angles are equal in parallel lines)

∠DEQ = 68°

(angle sum of straight line)

3.



Find c and d (reasons not required)

c = 65°

d = 50°

4. ABCDEFGH is a regular octagon. Find:

(a) The angle sum of an octagon.

6×180

1080°

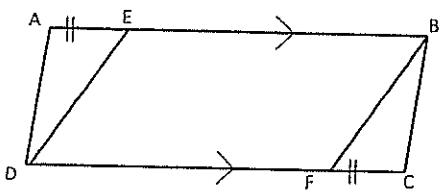
(b) The size of each interior angle.

$1080 \div 8$

135°

(c) The size of each exterior angle.

45°

5.	ABCD is a parallelogram with AE = FC Prove ΔAED ≡ ΔBFC and hence that DE = FB. (4 marks)  In ΔAED and ΔBFC AE = FC (given) AD = BC (opposite sides of parallelogram equal) ∠DAE = ∠BCF (opposite angles of parallelogram equal) ∴ ΔAED ≡ ΔBFC by SAS ∴ DE = FB (corresponding sides of congruent triangles equal)

PROBABILITY (1 mark each)		
1.	A marble is drawn at random from a bag containing 6 red, 4 white, 1 green and 1 black marble. Find the probability that it is: (a) red (b) not white (c) black or green	(a) $P(red) = \frac{6}{12} = \frac{1}{2}$ (b) $P(\text{not white}) = \frac{8}{12} = \frac{2}{3}$ (c) $P(B \text{ or } G) = \frac{2}{12} = \frac{1}{6}$
2.	If 2 dice are thrown, what is the probability of throwing: (a) a total of 5 (b) a total greater than 8 (c) any double	(a) $P(\text{Tot } 5) = \frac{4}{36} = \frac{1}{9}$ (b) $P(>8) = \frac{10}{36} = \frac{5}{18}$ (c) $P(\text{double}) = \frac{6}{36} = \frac{1}{6}$
3.	A bag contains 20 chocolates. When a chocolate is drawn at random we know that P (white choc) = 0.5, P (dark choc) = 0.4 and P (caramel) = 0.1. What are the contents of the bag.	white choc = 10 dark choc = 8 caramel = 2
4.	If the probability of an even E is 0.85, what is the probability of the complementary event E'.	0·15
5.	Calculate the expected value of the number of sixes in 200 rolls of a die.	$33\frac{1}{3}$
6.	(a) From a normal deck of 52 playing cards, what is the probability of choosing a KING in one draw? (b) If the person, from above, does draw a KING and does not put it back in the pack, what is their chance now of drawing another KING?	(a) $P(\text{KING}) = \frac{4}{52} = \frac{1}{13}$ (b) $\frac{3}{51} = \frac{1}{17}$