Name: SOLUTIONS. Teacher: _____

MATHEMATICS

YEAR 9 YEARLY
2012

SYDNEY TECHNICAL HIGH SCHOOL

Time Allowed - 70 Minutes

Instructions:

- Approved calculators only may be used.
- All necessary working must be shown in space provided. Marks may not be awarded for careless or badly arranged work.
- Marks are shown next to each question.
- Total Marks: 80

FACTORISING	MISCELLANEOUS	EQUATIONS, INEQUATIONS FORMULAE	CO-ORDINATE GEOMETRY	MEASUREMENT	TOTAL
/15	/20	/15	/15	/15	/80

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FACTORISING

1. Fully factorise

(a) $px - 2x + ap - 2a$ (2 marks)

$= x(p-2) + a(p-2)$

$= (x+a)(p-2)$

(b) $49y^2 - 100z^2$ (2 marks)

$= (7y-10)(7y+10)$

(c) $x^2 - 6x + 8$ (1 mark)

$= (x-4)(x-2)$

(d) $6a^2 + 5a + 1$ (2 marks)

$= 6a^2 + 3a + 2a + 1$

$= 3a(2a+1) + 1(2a+1)$

$= (3a+1)(2a+1)$

(e) $k^4 - 16$ (2 marks)

$= (k^2-4)(k^2+4)$

$= (k-2)(k+2)(k^2+4)$

2. Simplify

(a) $\frac{6x-4xy}{2x}$ (2 marks)

$= \frac{2x(3-2y)}{2x}$

$= 3-2y$

(b) $\frac{m^2-25}{m^2-5m} \div \frac{m+5}{5m}$ (2 marks)

$= \frac{(m-5)(m+5)}{m(m-5)} \times \frac{5m}{m+5}$

$= 5$

(c) $\frac{3}{2x-1} + \frac{5}{4x+3}$ (2 marks)

$= \frac{3(4x+3)+5(2x-1)}{(2x-1)(4x+3)}$

$= \frac{12x+9+10x-5}{(2x-1)(4x+3)}$

$= \frac{22x+4}{(2x-1)(4x+3)}$

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MISCELLANEOUS

1. Find the value of x and y if $(3+\sqrt{2})(4+2\sqrt{2}) = x+\sqrt{y}$

$= 12 + 6\sqrt{2} + 4\sqrt{2} + 4$

$= 16 + 10\sqrt{2}$ $\therefore x = 16$ $y = 200$

$= 16 + \sqrt{200}$

(2 marks)

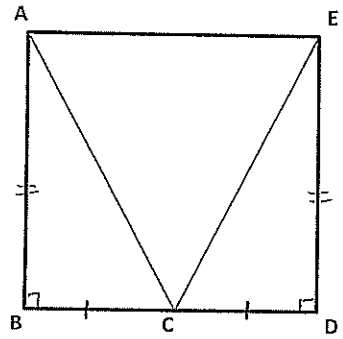
2. Write $(x^2y^{-3})^{-1}$ with positive indices

$= x^{-2}y^{3}$

$= \frac{y^3}{x^2}$

(2 marks)

3.



In this diagram AEDB is a square:
Prove $\Delta ABC \equiv \Delta CDE$

In ΔABC and ΔCDE

1. $AB = ED$ (equal sides of square)

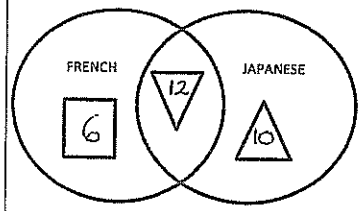
2. $BC = CD$ (given)

3. $\angle ABC = \angle EDC = 90^\circ$ equal 90° angles of square

$\Delta ABC \equiv \Delta CDE$ by SAS

(3 marks)

4. Students studying at least one of the languages, French and Japanese, attend a meeting. Of the 28 students present, 18 study French and 22 study Japanese. Complete the Venn Diagram and two-way table, for this event.



	Japanese	Not Japanese	
French	12	6	18
Not French	10	0	10
	22	6	28

What is the probability that a randomly chosen student

(a) studies French $P(F) = \frac{18}{28} = \frac{9}{14}$

(b) studies Japanese $P(J) = \frac{22}{28} = \frac{11}{14}$

(c) studies both French and Japanese $P(\text{Both}) = \frac{12}{28} = \frac{3}{7}$

(5 marks)

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5. This stem and leaf plot shows the number of cars sold each month by Dodgy Bros Used Cars.

Stem	Leaf
2	8 9
3	0 2 5 6 8 8
4	4 7 8
5	1 3

(a) What is the median number of cars sold? 38

(b) What is the range of cars sold?

$53 - 28 = 25$

(c) What is the mode?

38

(3 marks)

6. The data shows the ages of a group of people who participated in a survey.

22 30 36 35 40 41 36 35 30 25
32 34 36 38 37 28 31 44 29 33

(a) Complete this frequency table.

Class	Class Centre (cc)	Tally	Frequency (f)	$f \times cc$
20-24	22	|	1	22
25-29	27	|||	3	81
30-34	32	𝍸 |	6	192
35-39	37	𝍸 ||	7	259
40-44	42	|||	3	126
			$\Sigma f = 20$	$\Sigma(cc) = 680$

(b) Calculate the mean. $\bar{x} = \frac{680}{20} = 34$

(c) What is the modal class. 35-39

(5 marks)

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EQUATIONS, INEQUATIONS AND FORMULAE

1. Solve the following equations:

(a) $3x - 1 = 4 - 2x$

$5x = 5$

$x = 1$

(1 mark)

(b) $5(2x - 4) = 8(3x - 6)$

$10x - 20 = 24x - 48$

$14x = 28$

$x = 2$

(2 marks)

(c) $\frac{x+1}{3} = \frac{4x-2}{5}$

$5x + 5 = 12x - 6$

$7x = 11$

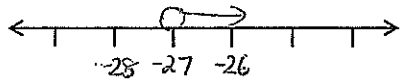
$x = 11/7$

(2 marks)

2. Solve and then graph $-2x < -x + 27$ on a number line.

$-x < 27$

$x > -27$



(3 marks)

3. Use the formula $E = \frac{1}{2}mv^2$ to find E when m = 12.8 and v = 4.5.

$E = \frac{1}{2} \times 12.8 \times 4.5^2$

$E = 129.6$

(1 mark)

4. If $T = \frac{m_1 - m_2}{1 + m_1 m_2}$,

find the value of m_2 when $T = \frac{-1}{5}$ and $m_1 = 3$.

$\frac{-1}{5} = \frac{3 - m_2}{1 + 3m_2}$

$-1 - 3m_2 = 15 - 5m_2$

$2m_2 = 16$

$m_2 = 8$ (2 marks)

5. If m = 2n + 9, find the values of m and n given that m is 4 more than n.

$m - n = 4$

$m = 4 + n$

$4 + n = 2n + 9$

$n = -5$

$\therefore m = -1$ (2 marks)

6. Make G the subject of the formula

$E = 1 - \sqrt{\frac{G}{R}}$

$\sqrt{\frac{G}{R}} = 1 - E$

$\frac{G}{R} = (1 - E)^2$

$G = R(1 - E)^2$ (2 marks)

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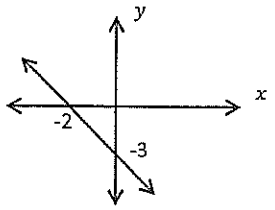
CO-ORDINATE GEOMETRY

1. What is the equation of line l



$b = -3$

$m = -3/2$

$\therefore y = -\frac{3}{2}x - 3.$

(2 marks)

2. Given the points A(-1,3) and B (-2,5)

(a) Find the midpoint of the interval AB

$Mdpt = \left(\frac{-1-2}{2}, \frac{3+5}{2}\right)$

$= \left(\frac{-3}{2}, 4\right)$

(1 mark)

(b) Find the length of the interval AB leaving your answer in surd form

$d = \sqrt{(-1+2)^2 + (3-5)^2}$

$d = \sqrt{1 + 4}$

$d = \sqrt{5}$

(1 marks)

(c) Find the gradient of the interval AB

$m = \frac{5-3}{-2--1} = \frac{2}{-1}$

$m = -2$

(1 marks)

3. Given (2,k) lies on the line $x + 2y = 8$, find the value of k

$2 + 2k = 8$

$2k = 6$

$k = 3$

(1 mark)

4. Find the co-ordinates of the point where the line $2x + y = 6$ cuts the x axis

Cuts x axis when $y = 0$.

$2x = 6$

$x = 3$

Cuts x axis at (3,0)

(2 mark)

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5. Find the equation of the line through $(2,-3)$ parallel to $y = 4 - 7x$. Leave your answer in general form.

$m = -7$

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

$y + 3 = -7x + 14$

$7x + y - 11 = 0$

(2 marks)

6. The equation of the line BD is $3x - y - 13 = 0$. Find the gradient of a line perpendicular to BD

$y = 3x - 3$

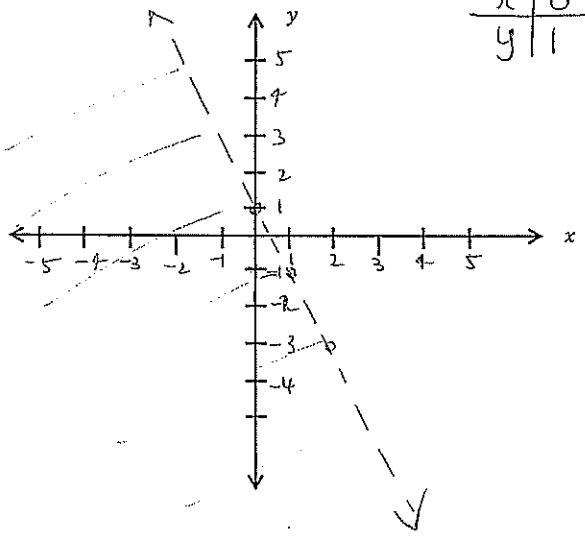
$m = 3$.

$\therefore$ line $\perp$ to BD has gradient $-\frac{1}{3}$

(2 marks)

7. Graph $2x + y < 1$ on the number plane below

x	0	1	2
y	1	-1	-3



(3 marks)

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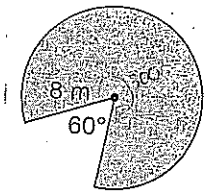
MEASUREMENT

1. For the following figure, find correct to 2 decimal places



(a) Its perimeter

$P = 8 + 8 + 2\pi \times 8 \times \frac{300}{360}$

$P = 57.89$ m

(b) its area

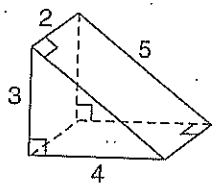
$A = \pi \times 8^2 \times \frac{300}{360}$

$A = 167.55\ m^2$

(4 marks)

2. Find the volume of each prism

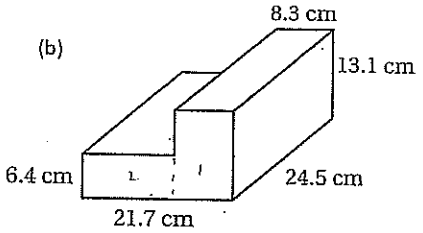
(a)



$V = \frac{1}{2} \times 4 \times 3 \times 2$

$V = 12\ u^3$

(b)



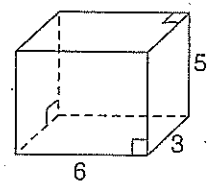
$A = (13.1 \times 8.3) + (6.4 \times 13.4) = 194.4$

$V = 194.49 \times 24.5 = 4765.005\ cm^3$

(2 marks)

3. Find the surface area of each prism

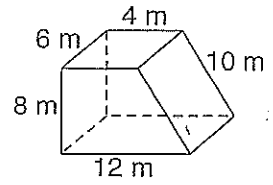
(a)



$SA = 6 \times 5 \times 2 + 5 \times 3 \times 2 + 6 \times 3 \times 2$

$SA = 126\ u^2$

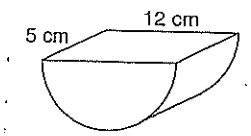
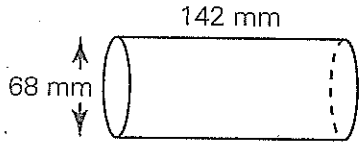
(b)



$SA = \frac{1}{2} 8(4+12) \times 2 + 10 \times 6 + 4 \times 6 + 6 \times 8 + 12 \times 6$

$SA = 332\ m^2$

(4 marks)

4.	Find the surface area of this half-cylinder, correct to 1 decimal place.  $SA = (5 \times 12) + \pi \times 6^2 + \frac{2\pi \times 6 \times 5}{2}$ $SA = 267.3 cm^2$ (2 marks)
5.	Find the side length of a cube whose surface area is $1176cm^2$. Each face $= 1176 \div 6 = 196 cm^2$ $\therefore$ side length $= \sqrt{196} = 14cm$ (1 marks)
6.	Find the volume of the cylinder.  $V = \pi \times 34^2 \times 142$ $V = 515698.7 mm^3$ (2 marks)