Name:	School:	Target Grade:

PARADIGM

SECONDARY 2 WA2
MOCK EXAM PAPER

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Find a nice comfortable spot without distraction.

2. Be fully focused for the whole duration of the test.

3. Speed is KING. Finish the paper as soon as possible then return-back to Check Your Answers.

4. As you are checking your answers, always find ways to VALIDATE your answer.

5. Avoid looking through line by line as usually you will not be able to see your Blind Spot.

6. If there is no alternative method, cover your answer and REDO the question.

7. Give non-exact answers to 3 significant figures, or 1 decimal place for angles in degree, or 2 decimal place for $$$, unless a different level of accuracy is specified in the question.
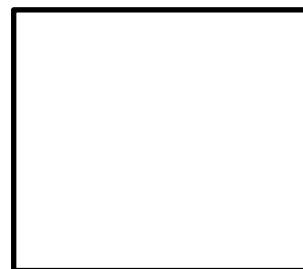
Wish you guys all the best in this test.

You can do it.

I believe in you.

Team Paradigm

If you are struggling in this paper, it's an indication to work harder!
If you need support and personalised guidance, you can find us here
www.mathtutor.com.sg

PARADIGM
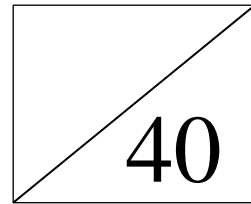
[Turn Over]

Name: _____   Class: _____   Date: _____

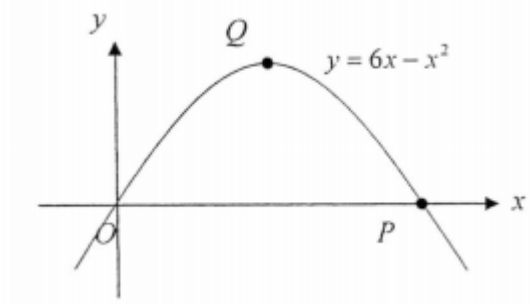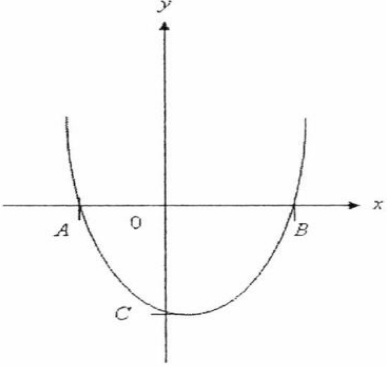**Secondary 2 Mathematics**
WA2 Mock Paper

Topic:

Duration: 1 hour

40

Algebra Expansion and Factorisation

1	(a) Expand and simplify the expression $(2p - 3q^2) - (p + q)^2$.	[2]
	(b) Factorise the expression completely $2x^3 - 50x$.	[2]
	(c) If $4(x - y)^2 = 328$ and $xy = 24$, find the value of $3x^2 + 3y^2$.	[2]
2	(a) Simplify $x^2 - (x - 1)^2 + (x - 2)^2 - (x - 3)^2$.	[2]
	(b) Hence, find the value of $2020^2 - 2019^2 + 2018^2 - 2017^2$.	[2]
3	Factorise each of the following expressions completely.	
	(a) $6x^2 - 9x - 42$	[2]
	(b) $pq - 4p - 12 + 3q$	[2]
4	Factorise the following completely.	
	(a) $4m^2 + 16mn + 16n^2$	[2]
	(b) $4ac - 2bc + 3bd - 6ad$	[2]
5	Solve the following equations	
	(a) $10s^2 + 13s - 3 = 0$	[2]
	(b) $\frac{7p-1}{2} + 1 = \frac{12p+5}{3}$	[2]

Algebraic Fractions

1	Simplify the following algebraic fractions.	
	(a) $\frac{b}{7c^2} \times \frac{2}{bc} \div \frac{1}{c^2}$.	[2]
	(b) $\frac{4x^2-y^2}{2x+y} \times \frac{5}{x^2-6x-7}$	[2]
2	Simplify $\frac{7x}{2} - \frac{3(4-2x)}{5}$.	[2]
3	Express as a single fraction in its simplest form $\frac{3}{(5-x)} - \frac{5}{(x-5)^2}$.	[2]
4	Solve $\frac{3}{x+3} - \frac{2}{x+2} = \frac{1}{12}$.	[2]

Quadratic Equations and Graphs

1	The diagram below shows the graph of $y = 6x - x^2$. The graph passes through the origin and cuts the x-axis again at point P.

(a) Write down the coordinates of P. [1]
(b) Write down the equation of the line of symmetry of the graph. [1]
(c) Find the coordinates of the maximum point Q. [1]
(d) Calculate the area of ΔOPQ. [1]

2 The curve $y = (x - 5)(x + 3)$ cuts the x-axis at A and B, and the y-axis at C.

(a) Write down the coordinates of A and B. [2]
(b) Find the y-intercept. [1]
(c) Find the coordinates of the minimum point. [1]

Quadratic Equations

1	A wine barrel contains 240 litres of wine.	
	A large tap and a small tap are attached to the wine barrel.	
	(a) The small tap pours out x litres of wine per minute.	[1]
	Write down an expression, in terms of x, for the number of minutes it takes	
	to empty the barrel using the small tap.	
	(b) The large tap pours out $(x + 2)$ litres of wine per minute.	[1]
	Write down an expression, in terms of x, for the number of minutes it takes	
	to empty the barrel using the large tap.	
	(c) It takes 10 minutes longer to empty the barrel using the small tap than using	
	the large tap. Write an equation in x, and show that it simplifies	[2]
	to $x^2 + 2x - 48 = 0$	
	(d) Solve the equation $x^2 + 2x - 48 = 0$.	[2]
	(e) From (d), which answer is rejected? Why?	
	(f) Find the time taken, in minutes, to empty the barrel using the small tap.	[1]
		[1]

Answer Key

Algebra Expansion and Factorisation

1	Solutions: (a) $(2p - 3q^2) - (p + q)^2$ $\quad = (2p - 3q^2) - (p^2 + 2pq + q^2)$ $\quad = 2p - 3q^2 - p^2 + 2pq + q^2$ $\quad = 2p - 4q^2 - p^2 - 2pq$ (b) $2x^3 - 50x$ $\quad = 2x(x^2 - 25)$ $\quad = 2x(x + 5)(x - 5)$ (c) $(x - y)^2 = 82$ $\quad x^2 - 2xy + y^2 = 82$ $\quad x^2 - 48 + y^2 = 82$ $\quad x^2 + y^2 = 130$ $\quad 3x^2 + 3y^2 = 390$ Ans: (a) $2p - 4q^2 - p^2 - 2pq$ (b) $2x(x + 5)(x - 5)$ (c) 390
2	Solutions: (a) $x^2 - (x^2 - 2x + 1) + x^2 - 4x + 4 - (x^2 - 6x + 9)$ $\quad = 2x - 1 - 4x + 4 + 6x - 9$ $\quad = 4x - 6$ $\quad$ or $\quad (x - x + 1)(x + x - 1) + (x - 2 - x + 3)(x - 1 + x - 3)$ $\quad = 2x - 1 + 2x - 5$ $\quad = 4x - 6$ (b) $4(2020) - 6 = 8074$ Ans: (a) $4x - 6$ (b) 8074
3	Solutions: (a) $3(2x^2 - 3x - 14)$ $\quad = 3(2x - 7)(x + 2)$ (b) $p(q - 4) + 3(q - 4)$ $\quad = (q - 4)(p + 3)$ Ans: (a) $3(2x - 7)(x + 2)$ (b) $(q - 4)(p + 3)$
4	Solutions: (a) $4(m^2 + 4mn + 4n^2)$ $\quad\quad 4(m + 2n)^2$ (b) $2c(2a - b) + 3d(b - 2a)$ $\quad\quad (2a - b)(2c - 3d)$ Ans: (a) $4(m + 2n)^2$ (b) $(2a - b)(2c - 3d)$

5 | Solutions:

(a) $10s^2 + 13s - 3 = 0$
$(5s - 1)(2s + 3) = 0$
$5s - 1 = 0$ or $2s + 3 = 0$
$s = \frac{1}{5}$ or $s = -\frac{3}{2}$

(b) $\frac{7p-1}{2} + 1 = \frac{12p+5}{3}$
$\frac{7p-1+2}{2} = \frac{12p+5}{3}$
$\frac{7p-1}{2} = \frac{12p+5}{3}$
$3(7p + 1) = 2(12p + 5)$
$21p + 3 = 24p + 10$
$24p - 21p = 3 - 10$
$3p = -7$
$p = -\frac{7}{3}$

Ans: (a) $s = \frac{1}{5}$ or $s = -\frac{3}{2}$ (b) $p = -\frac{7}{3}$

Algebraic Fractions

1 | Solutions:

(a) $\frac{b}{7c^2} \times \frac{2}{bc} \div \frac{1}{c^2}$
$= \frac{b}{7c^2} \times \frac{2}{bc} \times c^2$
$= \frac{2}{7c}$

(b) $\frac{5(2x-y)}{(x+1)(x-7)}$
$\frac{4x^2-y^2}{2x+y} \times \frac{5}{x^2-6x-7}$
$= \frac{(2x+y)(2x-y)}{2x+y} \times \frac{5}{(x+1)(x-7)}$
$= \frac{5(2x-y)}{(x+1)(x-7)}$

Ans: (a) $\frac{2}{7c}$ (b) $\frac{5(2x-y)}{(x+1)(x-7)}$

2 | Solution:

$$\frac{7x}{2} - \frac{3(4-2x)}{5}$$
$$= \frac{7x}{2} \times \frac{5}{5} - \frac{3(4-2x)}{5} \times \frac{2}{2}$$
$$= \frac{35x}{10} - \frac{6(4-2x)}{10}$$
$$= \frac{35x - 6(4-2x)}{10}$$
$$= \frac{35x - 24 + 12x}{10}$$
$$= \frac{47x - 24}{10}$$

Ans: $\frac{47x-24}{10}$

3	Solution:
	$$\frac{3}{(5-x)} - \frac{5}{(x-5)^2}$$ $$= -\frac{3}{x-5} - \frac{5}{(x-5)^2}$$ $$= \frac{-3(x-5)-5}{(x-5)^2}$$ $$= \frac{-3x+15-5}{(x-5)^2}$$ $$= \frac{-3x+10}{(x-5)^2}$$ Ans: $\frac{-3x+10}{(x-5)^2}$
4	Solution: $\frac{3}{x+3} - \frac{2}{x+2} = \frac{1}{12}$ $\frac{3(x+2)-2(x+3)}{(x+3)(x+2)} = \frac{1}{12}$ $12(3x+6-2x-6) = x^2+5x+6$ $x^2-7x+6 = 0$ $(x-6)(x-1) = 0$ $x = 1$ or $x = 6$

Quadratic Equations and Graphs

1	Ans: (a) $6x - x^2 = 0$ $x(6-x) = 0$ $x = 0$ or $x = 6$ $P = (6,0)$ (b) $x = 3$ (c) $y = 6(3) - (3)^2 = 9$ $Q = (3,9)$ (d) $\frac{1}{2}(6)(9)$ $= 27$ units^2
2	Ans: (a) $A(-3,0)$ and $B(5,0)$ (b) $y = (0-5)(0+3)$ -15 (c) $y = (1-5)(1+3)$ since $x = 1$ at min. pt. $(1,-16)$

Quadratic Equations

1	Solutions:

(c) $\dfrac{240}{x} - \dfrac{240}{x+2} = 10$

$\dfrac{240(x+2)-240x}{x(x+2)} = 10$

$\dfrac{240x+480-240x}{x^2+2x} = 10$

$480 = 10(x^2 + 2x)$

$x^2 + 2x = 48$

(d) $x^2 + 2x - 48 = 0$

$$
\begin{array}{ccc|c}
x & & 8 & 8x \\
x & & -6 & -6x \\
\hline
x^2 & & -48 & 2x
\end{array}
$$

$(x + 8)(x - 6) = 0$

Ans: (a) $\dfrac{240}{x}$ (b) $\dfrac{240}{x+2}$ (c) $x^2 + 2x - 48 = 0$ (d) $x = -8$ or $x = 6$

(e) $x = -8$ is rejected. Amount of water cannot be negative.

(f) Time taken(min) to empty barrel $= \dfrac{240}{6}$

$= 40$