

Question	Marks	Max	Question	Marks	Max
5		6	4	6	9
4		6	3	4	8
3		6	2	4	7
2		6	1	7	6
1		3			

No other items may be taken into the examination room. It is your responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor before reading any further.

Important note to candidates

Special items: nil

To be provided by the candidate Correction fluid/tape, eraser, ruler, highlighters

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,

Formula sheet

This Question/Answer booklet

Materials required/recommended for this section

Working time:

Reading time before commencing work: five minutes

Time allowed for this section

Teacher's Name:

Name: _____ SOLUTIONS

Calculator-free

Section One:

UNIT 1 AND 2

MATHEMATICS METHODS

Question/Answer booklet

Semester Two Examination, 2020

INDEPENDENT PUBLIC SCHOOL

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Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of examination
Section One: Calculator-free	9	9	50	50	34
Section Two: Calculator-assumed	14	14	100	85	66
Total					100

Instructions to candidates

1. The rules for the conduct of the Western Australian Certificate of Education ATAR course examinations are detailed in the *Year 12 Information Handbook 2016*. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer booklet.
3. You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
4. Additional pages for the use of planning your answer to a question or continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number.
5. **Show all your working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.
6. It is recommended that you **do not use pencil**, except in diagrams.
7. The Formula sheet is **not** to be handed in with your Question/Answer booklet.

Question 2 {2.2.5, 2.1.3}

(4 marks)

The fifth term and the ninth term of an arithmetic sequence are 26 and 42 respectively.
Determine the twenty-first term.

$$a + 4d = 26$$

$$a + 8d = 42$$

$$4d = 16$$

$$d = 4$$

$$a = 10$$

$$t_{21} = 10 + 20(4) = 90$$

(1 mark) Sets up two equations for parameters

(1 mark) solves for difference

(1 mark) solves for first term

(1 mark) solves for required term

Question 3 {1.1.24}

(4 marks)

Determine the natural domain and corresponding range for the following:

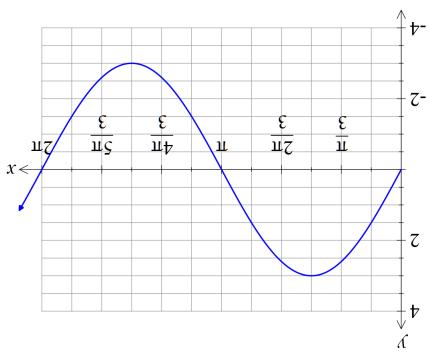
functions	Domain	Range
$f(x) = 5 - x$	\mathbb{R}	\mathbb{R}
$f(x) = -x^2 + 1$	\mathbb{R}	$y \leq 1$
$f(x) = \sqrt{x - 1}$	$x \geq 1$	$y \geq 0$
$f(x) = \frac{1}{x+2} + 3$	$x \neq -2$	$y \neq 3$

(1 mark) two correct domains

(1 mark) four correct domains

Additional working space

Question number: _____



$$y = 3\cos\left(\frac{3}{2}\pi x - \frac{\pi}{6}\right), 0 \leq x \leq 2\pi$$

b) Sketch the graph of the following equation

(1 mark) solves for at least four angles for x

(1 mark) solves for two angles for x

(1 mark) solves for one angle for $3x$

$$x = \frac{\pi}{7}, \frac{9}{13}\pi, \frac{9}{2}, \frac{9}{8}\pi, \frac{9}{14}\pi$$

$$x = \frac{9}{2}\pi + \frac{9}{6}n\pi$$

$$x = \frac{9}{2}\pi + \frac{9}{n}\pi$$

$$3x = \frac{3}{2}\pi + 2n\pi$$

$$3x = \frac{3}{2}\pi + 2n\pi$$

$$\sin(3x) = \frac{\sqrt{3}}{2}, n = 0, \pm 1, \pm 2, \dots$$

$$\sin(3x) = \frac{\sqrt{3}}{2}, 0 \leq x \leq 2\pi$$

a) Solve the following trigonometric equation

(3, 3 = 6 marks)

Question 4 {1.2.8, 1.2.10, 1.2.12, 1.2.13}

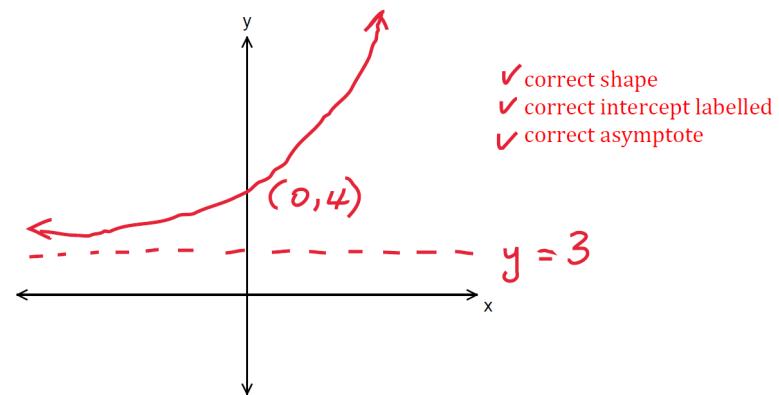
(1 mark) two correct ranges
(1 mark) four correct ranges

- (1 mark) amplitude
(1 mark) all x intercepts
(1 mark) shape AND y intercept

Question 5 {2.1.2, 2.1.7}**(3, 3 = 6 marks)**

On the axes provided, sketch each of the following exponential functions. Remember to label any intercepts or asymptotes.

(a) $y=2^x+3$



(b) $y=0.5 \times 4^x - 1$

$$\begin{aligned}P(-1) &= (-1)^3 - (-1)^2 + 3(-1) + 5 \quad \checkmark \\&= -1 - 1 - 3 + 5 \quad \checkmark \\&= 0\end{aligned}$$

$\therefore (x+1)$ is a factor

$$x^3 - x^2 + 3x + 5 = (x+1)(ax^2 + bx + c) + r$$

$$\begin{aligned}As \quad a &= 1 \quad \checkmark \\-x^2 &= dx^2 + bx^2 \\-1 &= 1 + b \\b &= -2 \quad \checkmark\end{aligned}$$

$$As \quad 3x = bx + cx$$

$$3 = -2 + c$$

$$c = 5 \quad \checkmark$$

$$As \quad 5 = c + r \quad \therefore (x+1)(x^2 - 2x + 5) \quad \checkmark$$

$$r = 0$$

- ✓ Substitutes -1
- ✓ Equates to zero
- ✓ Solves for a
- ✓ Solves for b
- ✓ Solves for c
- ✓ States the factor.

Question 8 {1.3.1, 1.3.5}

(2, 2 = 4 marks)

The first four rows of Pascal's triangle are shown below.

1			
1	1		
1	2	1	
1	3	3	1

Simplify all answers in this question.

a. Expand the expression $(x-2)^5$.

$$\begin{aligned}&x^5(-2)^0 + 5x^4(-2)^1 + 10x^3(-2)^2 + 10x^2(-2)^3 + 5x^1(-2)^4 + 1x^0(-2)^5 \quad \checkmark \\&x^5 - 10x^4 + 40x^3 - 80x^2 + 80x - 32 \quad \checkmark\end{aligned}$$

b. Find the third term of the expansion of $(2x-3y)^4$

$$\begin{aligned}&6(2x)^2(-3y)^2 \quad \checkmark \\&= 6(4x^2)(9y^2) \\&= 216x^2y^2 \quad \checkmark\end{aligned}$$

- ✓ substitutes correct terms
- ✓ correct answer