



**BAULKHAM HILLS HIGH SCHOOL
YEAR 11 ASSESSMENT TASK 2 2025
MATHEMATICS ADVANCED**

MARKING COVER SHEET

FINAL MARK

Student Name: _____ **Teacher:** _____

Page	Outcomes			Total
	Functions	Trigonometry	Statistics	
	F1	T1& T2	S1	
Multiple Choice	4 /1	2,3 /2	1,5 /2	/5
Page 7	7 /2	6 /1		/3
Page 8-9			8 /7	/7
Page 10	9 /3			/3
Page 11	10 /5			/5
Page 12	11 /3			/3
Page 13	12 /4			/4
Page 14	13 /2	14 /2		/4
Page 15			15 /3	/3
Page 16	16 /4			/4
Page 17	17 /3			/3
Page 18	18 /3			/3
Page 19		19 /3		/3
Pages 20	20 /3			/3
TOTAL	/33	/8	/12	/53



BAULKHAM HILLS HIGH SCHOOL

YEAR 11 ASSESSMENT TASK 2 2025

Mathematics Advanced

General Instructions

- Reading time – 5 minutes
- Working time – 1 hour
- Write using black pen
- Board-approved calculators may be used
- Show all necessary working in Questions 6 to 20
- Marks may be deducted for careless or badly arranged work
- Reference sheet has been attached

Total marks – 53

Exam consists of 22 pages.

This paper consists of TWO sections.

Section I – (5 marks) Pages (4-5)

Questions 1-5

- Attempt Questions 1-5
- Answer on answer sheet provided
- Allow about 8 minutes for this section

Section II – (47 marks) Pages (6-20)

- Attempt Questions 6 - 20
- Allow about 52 minutes



BAULKHAM HILLS HIGH SCHOOL
YEAR 11 ASSESSMENT TASK 2 2025
MATHEMATICS ADVANCED

Student Name: _____

Teacher: _____

Mathematics

Section I – Multiple Choice

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.

A ☒ B ☒ C ☐ D ☐

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.

A ☒ B ☒ C ☐ D ☐
correct (arrow pointing to B)

- Start Here →
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 ☐
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Section I – 5 marks**Use the multiple choice sheet for questions 1-5****Question 1**

A bag contains 6 red marbles and 4 blue marbles. Two marbles are drawn at random, one after the other without replacement. What is the probability that both marbles are of the same colour?

- (A) $\frac{1}{5}$
- (B) $\frac{7}{15}$
- (C) $\frac{7}{20}$
- (D) $\frac{1}{2}$

Question 2

A ship sails on a course of 045°T for 10 km and then changes its course to 120°T for another 15 km. What is the ship's approximate final distance from the starting point?

- (A) 15.50 km
- (B) 18.30 km
- (C) 20.07 km
- (D) 22.45 km

Question 3

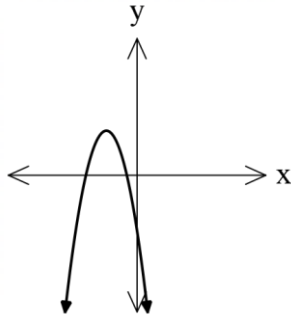
What is the solution to the equation $4\sin\theta = -2$ for $0^\circ \leq \theta \leq 360^\circ$?

- (A) $240^\circ, 300^\circ$
- (B) $120^\circ, 240^\circ$
- (C) $150^\circ, 210^\circ$
- (D) $210^\circ, 330^\circ$

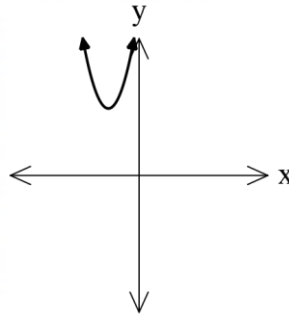
Question 4

Which diagram best shows the graph of the parabola $y = 4 - (x - 3)^2$?

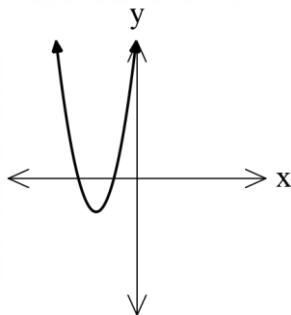
(A)



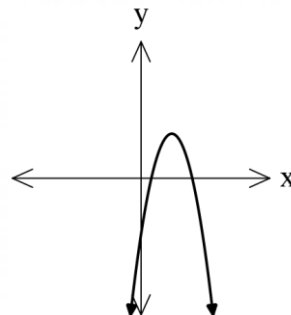
(B)



(C)



(D)



Question 5

Given $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cap B) = 0.3$, which of the following correctly describes the events A and B?

- (A) A and B are mutually exclusive and independent
- (B) A and B are mutually exclusive and non-independent
- (C) A and B are non-mutually exclusive and independent
- (D) A and B are non-mutually exclusive and non-independent

End of Section I

Mathematics Advanced
Section II Answer Booklet

48 marks

Attempt Questions 6-20

Allow about 52 minutes for this section

Instructions:

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
- Your responses should include relevant mathematical reasoning and/or calculations.

Please turn over

Question 6 (1 mark)

Find the exact value of $\cos 210^\circ$.

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Question 7 (2 marks)

How far and in which direction has the hyperbola $y = \frac{1}{x+3}$ been translated to produce the

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hyperbola $y = \frac{1}{x-2}$?

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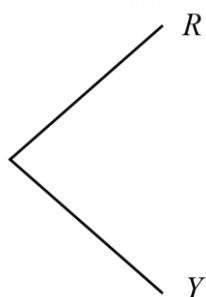
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Question 8 (7 marks)

A box contains 5 red balls (R) and 5 yellow balls (Y). Three balls are drawn in succession. At each draw, if the ball is red, it is replaced, and if it is yellow, it is not replaced.

- a) Complete the probability tree diagram showing the above information.

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- b) Find the probability of drawing no yellow balls.

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c) Find the probability of drawing two yellow balls.

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d) Given that at least one yellow ball has been drawn, what is the probability that exactly two yellow balls were drawn?

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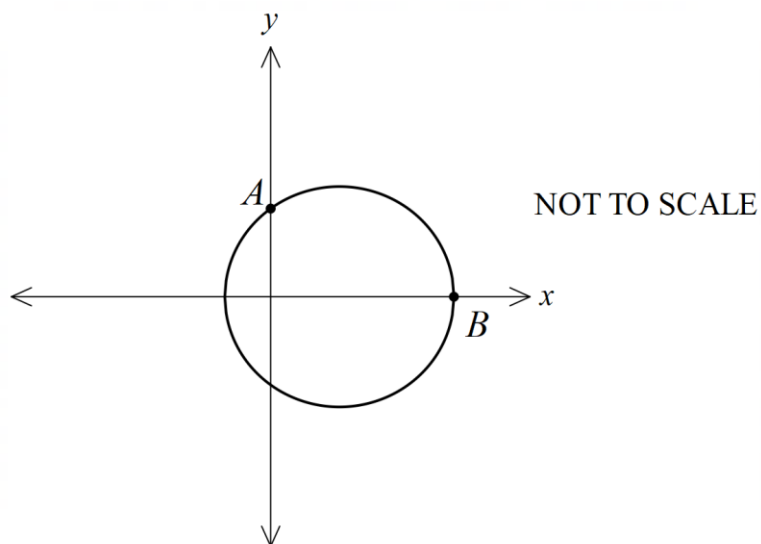
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Question 9 (3 marks)

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The circle $(x-3)^2 + y^2 = 25$ intersects with the positive y - axis and positive x - axis at points A and B respectively. Find the length of AB in exact form.



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Question 10 (5 marks)

a) Given $f(x) = 2x^2 + 3x + 1$ and $g(x) = 2x - 5$, find $f(g(x))$.

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b) What is the domain of $f(g(x))$?

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c) What is the range of $f(g(x))$?

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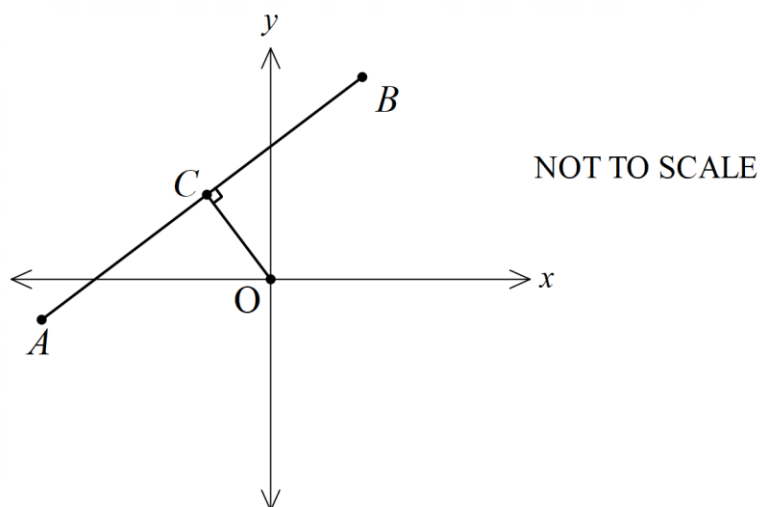
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Question 11 (3 marks)

A line AB passes through the point $C(-2,9)$. If the line drawn from the origin to C is perpendicular to AB , find the equation of AB in general form.

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Question 12 (4 marks)

Justify if the following functions are even, odd or neither.

a) $f(x) = x^2 + 1$

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b) $g(x) = \frac{x^5 - x^3}{x^2 + 1}$

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Question 13 (2 marks)

Given $f(x) = 3x + a$, $g(x) = ax + 4$, and $f(g(x)) = 9x + b$, where a and b are constants, find the value of b .

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Question 14 (2 marks)

If $\tan \theta = \frac{5}{12}$ and $180^\circ < \theta < 270^\circ$, find the exact value of $\operatorname{cosec} \theta$.

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Question 15 (3 marks)

a) A family has two children. What is the probability that they have exactly one boy?

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b) Another family has three children. What is the probability that they have an odd number of boys?

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Question 16 (4 marks)

The straight line l passes through the points $P(2,5)$ and $Q(6,17)$.

- a) Find an equation for l in gradient-intercept form.

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- b) The point D has coordinates $(-4, -11)$. Justify with calculation whether D lies above or below l .

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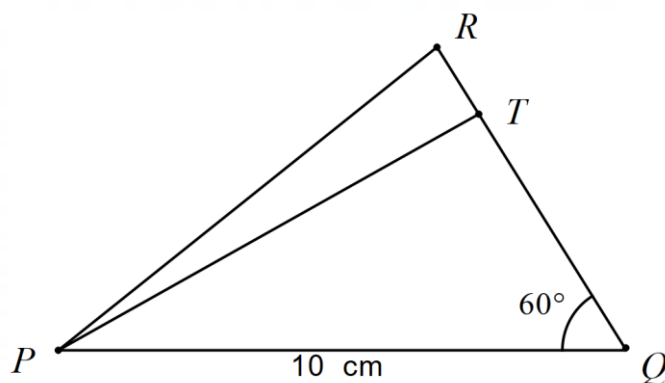
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Question 19 (3 marks)

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In the $\triangle PQR$, $PQ=10\text{cm}$, and $QR=8\text{cm}$. The point T is on QR such that RT is 2cm . Calculate the exact area of $\triangle PTR$.



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Question 20 (3 marks)

For every pair of numbers a and b , the function $g(x)$ satisfies the equation $a^3 g(b) = b^3 g(a)$.

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Find the value of $\frac{g(9) - g(3)}{g(1)}$ given that $g(1) \neq 0$.

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Section II extra writing space

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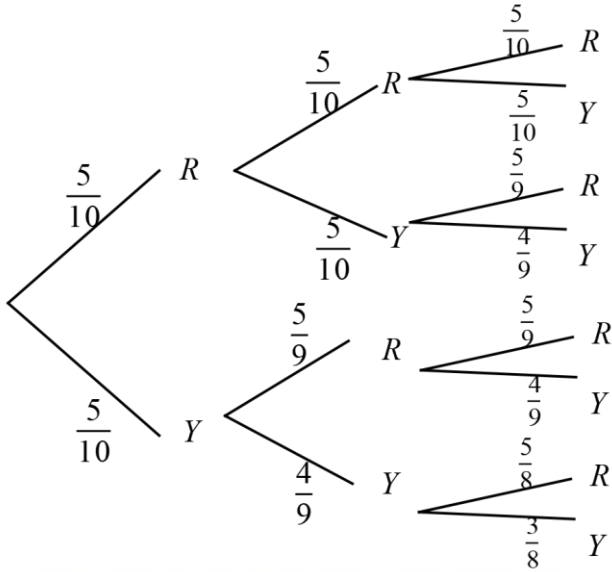
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Section II extra writing space

If you use this space, clearly indicate which question you are answering.

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Question	Solution	Marks
Question 1	B $P(RR) + P(BB) = \frac{6}{10} \times \frac{5}{9} + \frac{4}{10} \times \frac{3}{9}$ $= \frac{7}{15}$	1 – mark
Question 2	C Distance d from the starting position using cosine rule $d^2 = 10^2 + 15^2 - 2(10)(15)\cos 105^\circ$ $d = 20.066$ $d = 20.07 \text{ km}$	1 – mark
Question 3	D $\sin \theta = \frac{-2}{4} = -\frac{1}{2}$ Reference angle : 30° 3rd quadrant : $\theta = 180^\circ + 30^\circ$ $= 210^\circ$ 4th quadrant : $\theta = 360^\circ - 30^\circ$ $= 330^\circ$ $210^\circ, 330^\circ$	1 – mark
Question 4	D The equation is in the form of a vertex form of a parabola, which is $y = a(x - h)^2 + k$ and vertex being (h, k). Vertex is now (3,4), parabola concave downwards as a is negative	1 - mark
Question 5	C A and B are non-mutually exclusive and independent $P(A \cap B) \neq 0, A \text{ and } B \text{ are not mutually exclusive}$ $P(A \cap B) = P(A) \times P(B)$ Therefore independent	1 - mark

Question 6	$\cos 210^\circ$ is in the 3rd quadrant (cosine negative) Reference angle: $210^\circ - 180^\circ = 30^\circ$ $\cos 30^\circ = \frac{\sqrt{3}}{2}$ $\cos 210^\circ = -\frac{\sqrt{3}}{2}$	1 – Correct solution
Question 7	$y = \frac{1}{x}$ has translated 3 units to the left $y = \frac{1}{x}$ has translated 2 units to the right Total translation $(-3) - (-2) = -3 + 2 = -5$ $y = \frac{1}{x+3}$ has translated 5 units to the right	2 – Correct solution 1- Correctly identifies at least one of the horizontal transformations
Question 8	a) 	2 – correct probability tree 1 – correct probability tree for stages one and two
	b) $P(\text{No Yellow}) = P(RRR)$ $= \frac{5}{10} \times \frac{5}{10} \times \frac{5}{10}$ $= \frac{1}{8}$	1 – Correct solution

	$P(\text{two } Y) = P(RYY) + P(YRY) + P(YYR)$ c) $= \left(\frac{5}{10} \times \frac{5}{10} \times \frac{4}{9} \right) + \left(\frac{5}{10} \times \frac{5}{9} \times \frac{4}{9} \right) + \left(\frac{5}{10} \times \frac{4}{9} \times \frac{5}{8} \right)$ $= \frac{121}{324}$	2 – Correct solution 1 – at least one correct case
	d) $P(\text{at least 1 } Y) = 1 - P(\text{zero } Y)$ $= 1 - \frac{1}{8} = \frac{7}{8}$ $P(\text{exactly 2 } Y \mid \text{at least 1 } Y) = \frac{P(\text{exactly 2 yellow})}{P(\text{at least 1 yellow})}$ $= \frac{\frac{121}{324}}{\frac{7}{8}}$ $= \frac{121}{324} \times \frac{8}{7}$ $= \frac{968}{2268}$ $= \frac{242}{567}$	2 – Correct solution 1- correctly finds the probability of at least 1 Yellow as $\frac{7}{8}$
Question 9	This represents a circle with: To find point A, set $x = 0$ $(0 - 3)^2 + y^2 = 25$ $9 + y^2 = 25$ $y^2 = 16$ $y = \pm 4$ Since A is on the positive y-axis, $A = (0, 4)$ To find point B, set $y = 0$ $(x - 3)^2 + 0^2 = 25$ $(x - 3)^2 = 25$ $x - 3 = \pm 5$ Since B is on the positive x-axis, $x = 8$ $B = (8, 0)$ $AB = \sqrt{(8 - 0)^2 + (0 - 4)^2}$ $= \sqrt{8^2 + (-4)^2}$ $= \sqrt{80}$ $= 4\sqrt{5}$	3 – Correct solution (must be exact values) 2 – Correct intercepts for both A and B 1 – One correct intercept point or evidence of distance formula correctly applied

Question 10	a) $f(g(x)) = 2(g(x))^2 + 3(g(x)) + 1$ $= 2(2x - 5)^2 + 3(2x - 5) + 1$ $= 2(4x^2 - 20x + 25) + 3(2x - 5) + 1$ $= 8x^2 - 40x + 50 + 6x - 15 + 1$ $= 8x^2 - 34x + 36$	2 – Correct solution 1- correctly substituting $g(x)$ into $f(x)$
	b) Domain is all Real Numbers or Domain: $x \in \mathbb{R}$ or $x \in (-\infty, \infty)$	1 – Correct solution (must have correct notation)
	c) $f(g(x)) = 8x^2 - 34x + 36$ parabola concave up: minimum value $x = -\frac{(-34)}{2(8)}$ $= \frac{17}{8}$ $f\left(\frac{17}{8}\right) = 8\left(\frac{17}{8}\right)^2 - 34\left(\frac{17}{8}\right) + 36$ $= -\frac{1}{8}$ $\therefore$ Range: $y \in \left[-\frac{1}{8}, \infty\right)$	2 – Correct solution (must have correct notation) 1- for any of the below. - Identify the parabola has a minimum - Correct x and y values
Question 11	Gradient of OC: $m_{OC} = \frac{9-0}{-2-0} = -\frac{9}{2}$ Gradient of AB perpendicular to OC: $m_{AB} = \frac{2}{9}; (m_{OC} m_{AB} = -1)$ Equation of AB : $y - 9 = \frac{2}{9}(x + 2)$ $9y - 81 = 2x + 4$ $2x - 9y + 85 = 0$	3 – correct solution (general form) 2 – finds the gradient of OC + correct perpendicular gradient 1 – correct gradient of OC

Question 12	a) $f(x) = x^2 + 1$ $f(-x) = (-x)^2 + 1 = x^2 + 1 = f(x)$ Even function	2 – correct solution 1 – Finds $f(-x)$
	b) $g(x) = \frac{x^5 - x^3}{x^2 + 1}$ $g(-x) = \frac{(-x)^5 - (-x)^3}{(-x)^2 + 1}$ $= \frac{-x^5 + x^3}{x^2 + 1}$ $= -\left(\frac{x^5 - x^3}{x^2 + 1}\right)$ $= -g(x)$ Odd function	2 – correct solution 1 – Finds $g(-x)$
Question 13	$f(g(x)) = f(ax + 4)$ $f(ax + 4) = 3(ax + 4) + a$ $= 3ax + 12 + a$ $3ax + 12 + a = 9x + b$ compare the coefficients and constant terms $3a = 9$ $a = 3$ $12 + a = b$ $b = 12 + 3$ $= 15$ $\therefore a = 3 \text{ and } b = 15$	2 - Correct solution 1 – Obtains correct equation containing a and b OR correctly finds the value of a or b.
Question 14	The range $180^\circ < \theta < 270^\circ$ falls within the 3rd quadrant. $\tan \theta = \frac{5}{12}$ $\text{hypotenuse} = \sqrt{5^2 + 12^2}$ $= \sqrt{169}$ $= 13$ In the 3rd quadrant: $\sin \theta = -\frac{5}{13}$ $\csc \theta = -\frac{13}{5}$	2 - Correct solution 1 – Finds hypotenuse

Question 15	a) Possible outcomes Boy, Boy (BB) Boy, Girl (BG) Girl, Boy (GB) Girl, Girl (GG) $P(\text{exactly one boy}) = \frac{\text{favorable outcomes}}{\text{Total outcomes}} = \frac{2}{4} = \frac{1}{2}$	1 – Correct solution
	b) 8 possible outcomes BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG Outcomes with 1 boy: BGG,GBG,GGB Outcomes with 3 boys: BBB $P(\text{odd number of boys}) = \frac{4}{8} = \frac{1}{2}$	2 – Correct solution 1 – correctly identifies all outcomes
Question 16	a) $y - 5 = \frac{17-5}{6-2}(x-2)$ $y - 5 = 3(x-2)$ $y = 3x - 1$	2 - correct solution (in gradient intercept form) 1 – correct gradient
	b) y – value of the line l at $x = -4$ $y_l = 3 \times (-4) - 1 = -13$ Compare the coordinate of D: $y_D = -11$ $y_l = -13$ Since $-11 > -13$, point $D(-4, -11)$ lies above the line l.	2 – correct solution 1- Substitute $x = -4$ and finds correct y_l value -13

Question 17	$3x - 5y + 2 = 0$ $5y = 3x + 2$ $y = \frac{3}{5}x + \frac{2}{5}$ The gradient m_1 of this line is $\frac{3}{5}$. Gradient joining points $(0, 3)$ and $(a, a + 4)$ is $m_2 = \frac{(a + 4) - 3}{a - 0} = \frac{a + 1}{a}$ Parallel lines have the same slope. $\frac{a + 1}{a} = \frac{3}{5}$ $5(a + 1) = 3a$ $2a = -5$ $a = -\frac{5}{2}$	3 – correct solution 2 – Finds the gradient $\frac{3}{5}$ and use the two given points to find the gradient $\frac{a+1}{a}$ 1 - rearrange the equation $3x - 5y + 2 = 0$ into gradient-intercept form to find the gradient $\frac{3}{5}$
Question 18	$x + y = 5 \quad (1)$ $2x + ky = 7 \quad (2)$ $3x - y = 3 \quad (3)$ Find intersection point : solve (1) and (3) $3x - (5 - x) = 3$ $3x - 5 + x = 3$ $x = 2$ Substitute back to find y: $y = 5 - 2$ $= 3$ intersect at $(2, 3)$ Substitute Intersection Point into Second Line $2x + ky = 7$ $2(2) + k(3) = 7$ $3k = 3$ $k = 1$ For $k = 1$, all the three lines meet at a single point	3 – correct solution 2 – obtains correct intersection $(2, 3)$ 1 – correctly finds either x or y.

Question 19	Area of $\Delta PQR = \frac{1}{2} \times 10 \times 8 \sin 60^\circ$ $= 40 \times \frac{\sqrt{3}}{2}$ $= 20\sqrt{3} \text{ cm}^2$ ΔPQR and ΔPTR have the same perpendicular height when their bases are RT and RQ respectively. $\therefore$ area $\Delta PQR : \Delta PTR = RT : RQ = 1 : 4$ $\therefore$ area $\Delta PTR = \frac{1}{4} \times$ area of ΔPQR $= \frac{1}{4} \times 20\sqrt{3}$ $= 5\sqrt{3} \text{ cm}^2$ <u>Alternate solution:</u> Area of $\Delta PTQ = \frac{1}{2} \times 10 \times 6 \sin 60^\circ$ $= 15\sqrt{3} \text{ cm}^2$ Area of $\Delta PRT = 20\sqrt{3} - 15\sqrt{3}$ $= 5\sqrt{3} \text{ cm}^2$	1 mark – Finds exact area of PQR 2 marks – correct solution 1 mark- Substantial progress (e.g. finds the area of PQT)
Question 20	$a^3 g(b) = b^3 g(a)$ $\frac{g(a)}{g(b)} = \frac{a^3}{b^3}$ $\frac{g(9)}{g(1)} - \frac{g(3)}{g(1)} = \frac{9^3}{1^3} - \frac{3^3}{1^3} = 702$	3 - Correct solution 2 - Successfully apply the derived expression to at least one specific value pair (either $\frac{g(9)}{g(1)}$ or $\frac{g(3)}{g(1)}$) 1 – derives the ratio $\frac{g(a)}{g(b)} = \frac{a^3}{b^3}$ or use this understanding correctly to set up the problem Note: Simplifying $g(x) = x^2$ did not qualify for any marks.