Mark Scheme (Results)

January 2022

Pearson Edexcel Edexcel Award
In Algebra (AAL30)
Paper 01

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NOTES ON MARKING PRINCIPLES

1   Types of mark
M marks: method marks
A marks: accuracy marks
B marks: unconditional accuracy marks (independent of M marks)

2   Abbreviations

cao – correct answer only   ft – follow through
isw – ignore subsequent working   SC: special case
oe – or equivalent (and appropriate)   dep – dependent
indep - independent

3   No working
If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

4   With working
If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

5   **Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

6   **Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

7   **Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

8   **Use of ranges for answers**

If an answer is within a range this is inclusive, unless otherwise stated.

Question		Working	Answer	Mark	Notes
1	(a)		$4c^2 - 9d^2$	2	M1 for expanding bracket to obtain 4 terms with all 4 correct without considering signs or for 3 terms out of 4 correct with correct signs or $(2c)^2 - (3d)^2$ A1 for $4c^2 - 9d^2$
	(b)		y^3	1	B1 cao
	(c)		$27p^3$	2	B2 cao (B1 for $27p^n$, $n \neq 3$ or cp^3, $c \neq 27$ or $(3p)^3$)
	(d)		$\dfrac{2x}{(x+2)^2}$	3	M1 for using a correct common denominator A1 for $\dfrac{x(x+2)-x^2}{(x+2)^2}$ oe A1 for $\dfrac{2x}{(x+2)^2}$
2			Circle centre (0, 0), radius 5 drawn	2	M1 for using (0, 0) as the centre of a circle or a circle of radius 5 drawn A1
3	(a)		$(2w - 5)(t + 3)$	2	M1 for $2w(t + 3)$ and $- 5(t + 3)$ or $t(2w - 5)$ and $3(2w - 5)$ oe A1 for $(2w - 5)(t + 3)$ oe

Question	Working	Answer	Mark	Notes
(b)		$2gh^2(4h - 3g^2)$	2	B2 for correct factorisation (B1 for a partial correct factorisation which shows a product of 3 or 4 factors)
4		Correct region indicated	5	M1 for drawing $x = -1$ and $y = 2$ correctly M1 for drawing $y = x - 3$ correctly M1 for drawing $x + 2y = 4$ correctly A2 for correctly shading required region (A1 for correct shading for 3 inequalities)
5		$x = -8, x = 0$	3	M1 for dealing with fraction, eg $2x(x + 2) = x(x - 4)$ or for $\frac{2}{x-4} = \frac{1}{x+2}$ or for $2(x + 2) = 1(x - 4)$ M1 for writing equation in the form $ax^2 + bx + c\ (= 0)$, eg $x^2 + 8x\ (= 0)$ oe A1 for $x = -8, x = 0$
6 (a)		$-\dfrac{4}{5}$	2	M1 for method to find gradient, eg $\dfrac{5-1}{-2-3}$ A1 oe
(b)		$y = -\dfrac{4}{5}x + \dfrac{17}{5}$	3	M1 for use of gradient $-\dfrac{4}{5}$ in an equation ft (a), eg $y = -\dfrac{4}{5}x + c$ M1 for correct method to find c, ft (a) eg $1 = -\dfrac{4}{5} \times 3 + c$ or $y - 1 = -\dfrac{4}{5}(x - 3)$ A1 for $y = -\dfrac{4}{5}x + \dfrac{17}{5}$

| Question		Working	Answer	Mark	Notes
7	(a)		0	1	B1 cao
	(b)		2	2	M1 for method to find area under graph, eg 6×20 or $6 \times \frac{1}{3}$ A1
	(c)		Correct line drawn	2	M1 for straight line with positive gradient drawn through (0, 0) A1 correct line drawn between (0, 0) and (20, 2) with clear labelling on axis eg 2 and distance
8	(a)		−2, 2	2	B1 for sum $= -2$ B1 for product $= 2$
	(b)		$\dfrac{1}{16}$	2	M1 for $b^2 - 4ac = 0$, may be seen with substituted values A1
9	(a)		$f = \dfrac{5}{d}$	3	M1 $f \propto \dfrac{1}{d}$ or $f = \dfrac{k}{d}$ oe, may be implied by substitution M1 for substitution to find k A1

Question	Working	Answer	Mark	Notes
(b)		$u = 2 \pm \sqrt{\dfrac{3}{w}}$	3	M1 for dealing with the fraction , eg $w(2 - u)^2 = 3$ or dealing with the square root, eg $(\pm)\sqrt{w} = (\pm)\sqrt{\dfrac{3}{(2-u)^2}}$ M1 for $2 - u = (\pm)\sqrt{\dfrac{3}{w}}$ A1 for $u = 2 \pm \sqrt{\dfrac{3}{w}}$ oe
10		$-\dfrac{3}{2} < k < \dfrac{2}{3}$	3	M1 for method to solve $6k^2 + 5k - 6 = 0$, eg $(2k + 3)(3k - 2)(= 0)$ M1 for establishing critical values, $\dfrac{2}{3}$ and $-\dfrac{3}{2}$ A1 cao
11 (a)		−202	2	M1 for substitution into $a + (n - 1)d$ eg $-2 + (51 - 1) \times -4$ or substitution into nth term eg $-4 \times 51 + 2$ A1 cao
(b)		−5202	3	M1 for $\dfrac{1}{2}n(2a + (n-1)d)$ or $\dfrac{1}{2}n(a + l)$ M1 for substitution, eg $\dfrac{1}{2} \times 51 \times (2 \times -2 + (51 - 1) \times -4)$ A1 cao

| Question	Working	Answer	Mark	Notes
12 (a)		8, (3.375), 1, 0.125, 0, -0.125, (-1)	2	B2 for all values correct (B1 for 3 or 4 correct values)
(b)		Curve drawn	3	M1 (dep B1) suitable axes drawn and scaled M1 (dep M1) for at least 5 of their points correctly plotted A1 for correct curve
(c)(i)		-0.5 to -0.7	1	B1 for value in range -0.5 to -0.7 or ft cubic graph
(ii)		-1.6 to -1.9	2	M1 for reading from $y = 6$ on graph or for $\left(\frac{2-x}{2}\right)^3 = 6$ A1 for -1.6 to -1.9 or ft cubic graph
13		$x + 4y - 21 = 0$	4	M1 for using relationship between gradient of normal and tangent, eg gradient of normal $= -\frac{1}{4}$ M1 for method to find c, eg $5 = -\frac{1}{4} \times 1 + c$ or $c = \frac{21}{4}$ M1 for equation of line, eg $y = -\frac{1}{4}x + \frac{21}{4}$ A1 for $x + 4y - 21 = 0$ or $21 - x - 4y = 0$
14		11.25	2	M1 for substituting values, eg $(y_0 =)$ 1, $(y_1 =)2$, $(y_2 =)$ 4, $(y_3 =)$ 8, $(y_4 =)16$ and $h = 0.5$ into trapezium rule, eg $\frac{1}{2} \times 0.5\{(1 + 16) + 2(2 + 4 + 8)\}$ A1 for 11.25 oe

Question	Working	Answer	Mark	Notes
15 (a)(i)		$x^2 - 12x + 25 = 0$	2	M1 for correct expansion of $(x-5)^2 = x^2 - 5x - 5x + 25$ A1
(ii)	$\dfrac{--12 \pm \sqrt{(-12)^2 - 4 \times 1 \times 25}}{2 \times 1}$	$6 \pm \sqrt{11}$	3	M1 for stating the quadratic formula or correct substitution into formula ft from (a)(i) or correct completion of the square A1 ft for $\frac{12 \pm \sqrt{44}}{2}$ or $(x-6) = \pm\sqrt{11}$ A1 for $6 \pm \sqrt{11}$
(b)(i)		$(x-3)^2 - 25$	2	M1 for $(x-3)^2$ A1 for $(x-3)^2 - 25$
(ii)		$-2, 8$	2	M1 $(x-3) = (\pm)5$ A1 cao
16		$x = \frac{3}{\sqrt{8}}, y = \frac{1}{\sqrt{8}}$ $x = -\frac{3}{\sqrt{8}}\ y = -\frac{1}{\sqrt{8}}$	4	M1 for substitution of $x = 3y$ or $y = \frac{1}{3}x$ into $x^2 - y^2 = 1$ oe to obtain equation in one variable M1 for simplifying, eg $8y^2 = 1$ A1 for solutions for one variable, eg $y = \pm\frac{1}{\sqrt{8}}$ or one correct pairing A1 for complete solution, $x = \frac{3}{\sqrt{8}}, y = \frac{1}{\sqrt{8}}$ and $x = -\frac{3}{\sqrt{8}}\ y = -\frac{1}{\sqrt{8}}$
17 (a)		$12 + 4\sqrt{3}$	2	M1 for at least one of $(\sqrt{3})^2 = 3$, $(\sqrt{3})^3 = 3\sqrt{3}$, $(\sqrt{3})^4 = 9$ A1 oe

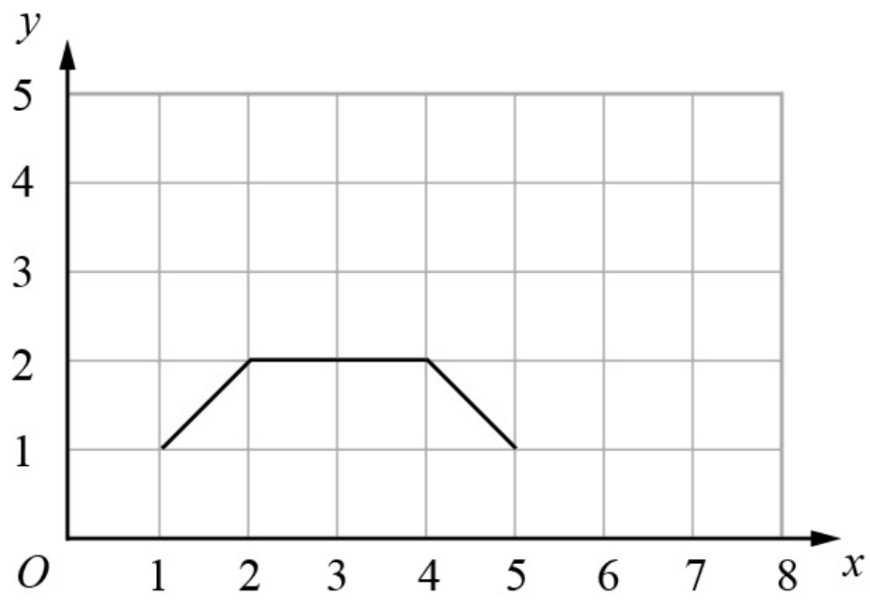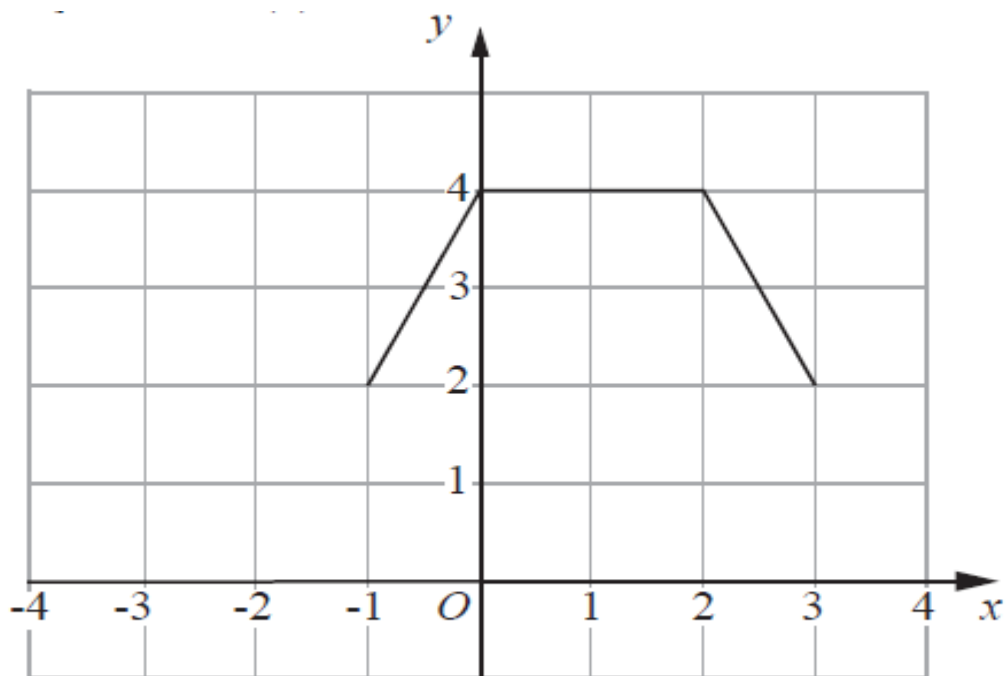| Question	Working	Answer	Mark	Notes
(b)		-4	3	M1 for multiplying $\frac{1}{2-\sqrt{5}}$ by $\frac{2+\sqrt{5}}{2+\sqrt{5}}$ oe or for multiplying $\frac{1}{2+\sqrt{5}}$ by $\frac{2-\sqrt{5}}{2-\sqrt{5}}$ oe or for combining fractions, eg, $\frac{2+\sqrt{5}+2-\sqrt{5}}{(2+\sqrt{5})(2-\sqrt{5})}$ A1 for $-2-\sqrt{5}$ or $-2+\sqrt{5}$ or $\frac{4}{4-5}$ A1 cao
18 (a)		Correct diagram	2	M1 for stretch parallel to y-axis from the x-axis A1 for stretch, factor $\frac{1}{2}$ parallel to y-axis
(b)		Correct diagram	2	M1 for translation parallel to x-axis A1 for translation by $\binom{-2}{0}$
19		Graph sketched	4	B1 for asymptote at $y=-3$ or asymptote at $x=0$ B1 for intercept at $(\frac{1}{3},0)$ M1 for correct shape A1 for fully correct sketch.

Question 4
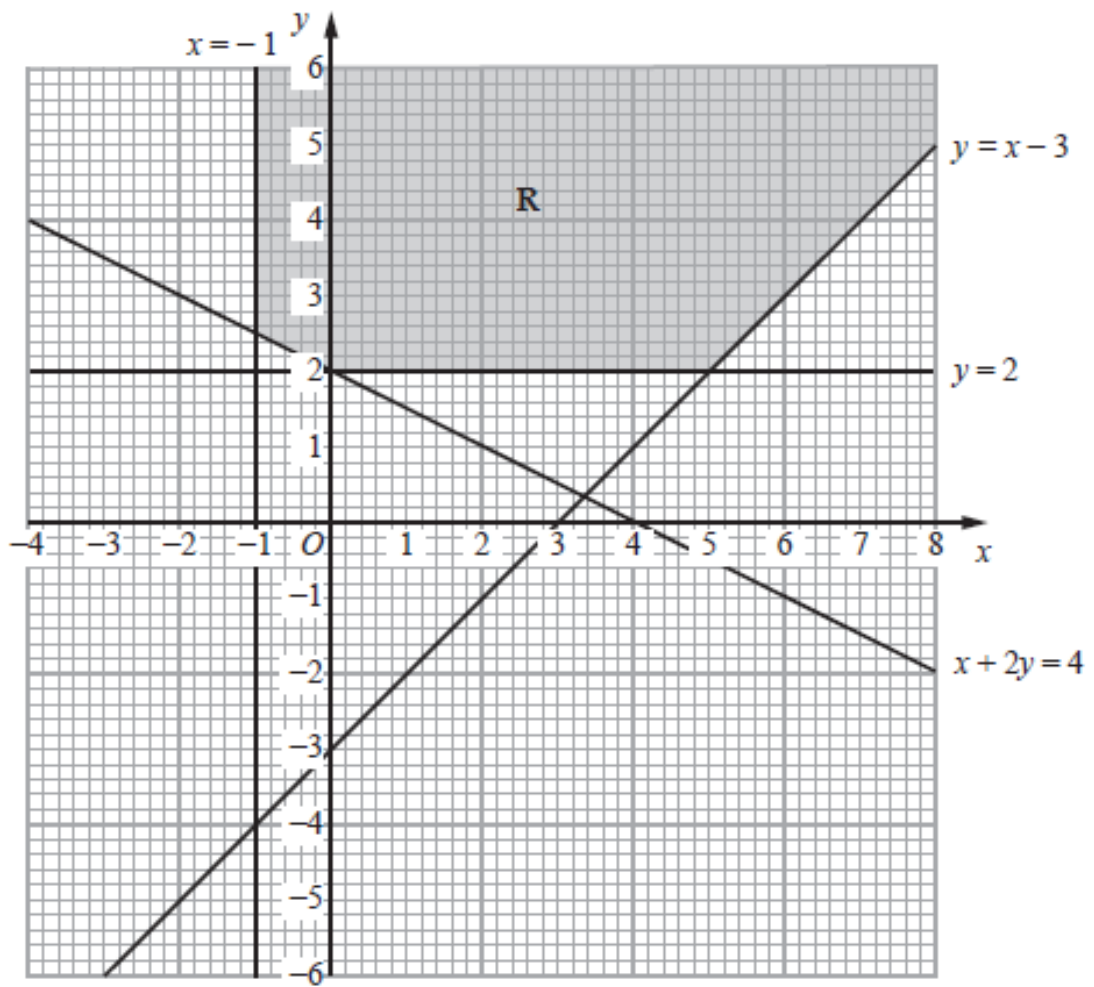
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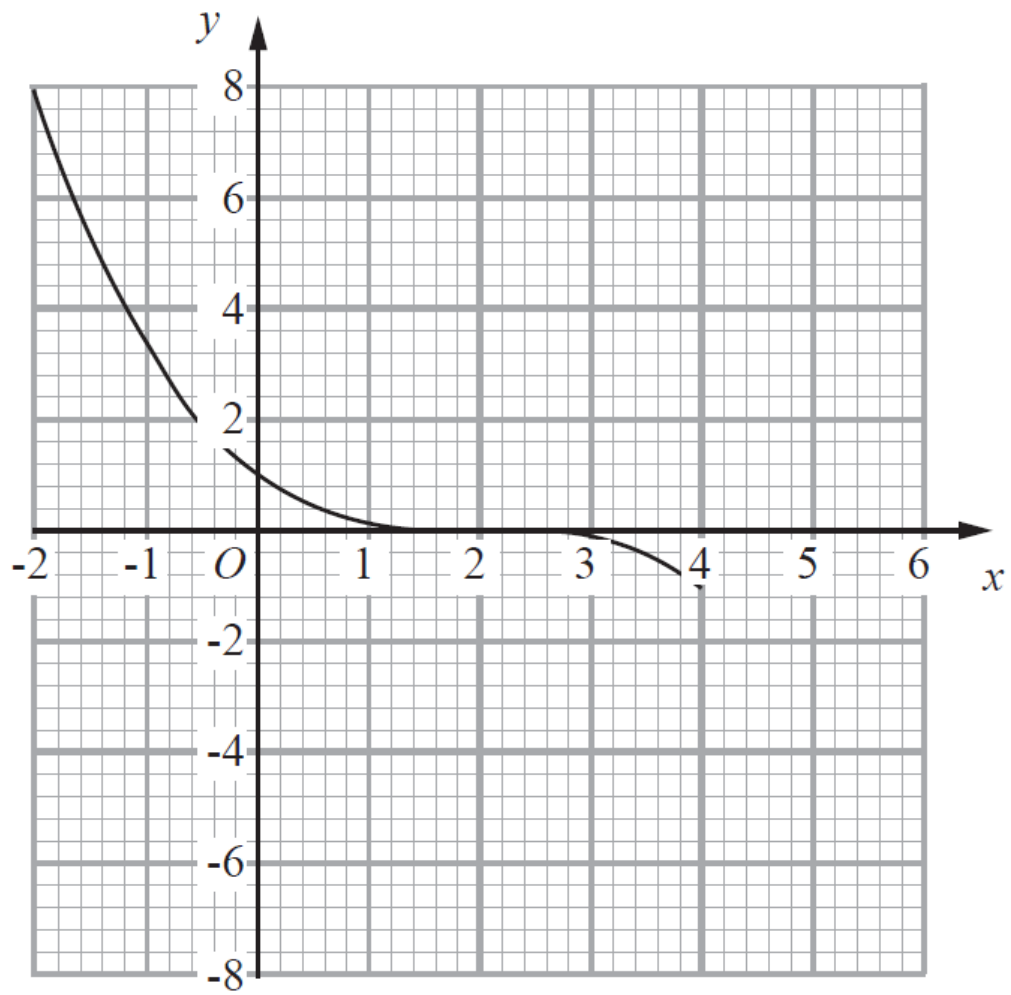
Question 18 (a)

Question 18 (b)

Question 19