Mark Scheme (Results)

Summer 2018

Pearson Edexcel Award
In Algebra (AAL30) Level 3

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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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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)		$3x^2$	1	B1 cao
	(b)		a^{10}	1	B1 cao
	(c)		x^6	1	B1 cao
	(d)		$d = 4, f = \frac{3}{2}$	3	M1 a correct first step eg $4q^2$ or $\frac{7}{2} - 2$ oe A1 for $d = 4$ A1 for $f = \frac{3}{2}$ oe
2			Circle centre the origin radius 2 drawn	2	M1 for drawing a circle, centre (0, 0) or circle radius 2 or $x^2 + y^2 = 4$ seen A1 for correct circle
3			$a = 2, b = 4, c = 20$	3	M1 for expanding a bracket to obtain 4 terms correct without considering signs or for 3 terms out of 4 with correct signs M1 (dep M1) for a method to collect like terms, may be implied by one correct value A1 for $a = 2, b = 4, c = 20$

Question		Working	Answer	Mark	Notes
4	(a)	$8 = \frac{k}{5^2}$ $k = 200$	$F = \frac{200}{d^2}$	3	M1 for $F = \frac{k}{d^2}$ or $F \propto \frac{1}{d^2}$ M1 for $8 = \frac{k}{5^2}$ oe A1 cao
	(b)		$\frac{1}{2}$	1	B1 ft from $F = \frac{k}{d^2}$ in (a)
	(c)		Graph sketched	1	B1 correct sketch
5	(a)		$-\frac{4}{3}$	2	M1 rearranging the equation to find the gradient eg $y = -\frac{4}{3}x + c$ A1 for $-\frac{4}{3}$ oe
	(b)		$4y - 3x + 28 = 0$ or $3x - 4y - 28 = 0$	3	M1 for method to use $m_1 m_2 = -1$ in an equation of a straight line in any form, eg $y = \frac{3}{4}x + c, \ 4y = 3x + c$ M1 (dep M1) for substitution of (12, 2) A1 for $4y - 3x + 28 = 0$ or $3x - 4y - 28 = 0$

Question	Working	Answer	Mark	Notes
6		$12x^2 - 5x - 3$	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 A1 for $12x^2 - 5x - 3$
7		Correct region shown	5	M3 for drawing $4x + 3y = 24$, $x = -2$ and $3y = 9 - x$ correctly (M2 for drawing 2 lines correctly M1 for drawing 1 line correctly) A2 for correctly shading required region (A1 for correct shading for 2 inequalities)
8 (a)		$9xd(7x + d)$	2	B2 cao (B1 for a partial correct factorisation which shows a product of at least 3 factors)
(b)		$2(a - 2)(2b + 1)$	3	M1 for start to method of factorisation eg $4b(a - 2)$ and $2(a - 2)$ M1 for factorisation as product of 1 factor in terms of a and 1 factor in terms of b eg $(4b + 2)(a - 2)$ A1 for $2(a - 2)(2b + 1)$
(c)		$(x - 3t)(x + 3t)$	1	B1

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Question	**Working**	**Answer**	**Mark**	**Notes**
9		$-\frac{10}{3}, 2$	2	B1 for sum of roots $= -\frac{10}{3}$ B1 for product of roots $= 2$
10 (a)		192	2	M1 for substitution of 3 and 4 A1 cao
(b)		$a = \frac{b(w+4)}{w-4}$ or $a = \frac{bw+4b}{w-4}$	3	M1 for a correct initial first step eg $w(a - b) = 4(a + b)$ M1 (dep M1) for a correct method to isolate terms in a eg $wa - 4a = 4b + wb$ A1
11		$x = -1, \ y = \frac{5}{2}$ $x = 2, \ y = -\frac{1}{2}$	5	M1 for correct method to eliminate one variable M1 (dep M1) for quadratic $(= 0)$ in one variable M1 (dep M2) for correct method to solve their quadratic, eg correct factorisation or substitution into the formula A1 $x = -1, \ x = 2$ or $y = \frac{5}{2}, \ y = -\frac{1}{2}$ A1 $x = -1, \ y = \frac{5}{2}$ and $x = 2, \ y = -\frac{1}{2}$ (accept coordinate pairs)

Question		Working	Answer	Mark	Notes
12	(a)		$y < -\frac{1}{5}$	3	M1 a correct first step, eg $8y - (3y - 15) < 14$ M1 (dep M1) for method to isolate terms in y, eg $5y < -1$ oe A1 $y < -\frac{1}{5}$ (SC B1 for $y < \frac{29}{5}$ oe)
	(b)		$1 < x < 2$	2	M1 for critical values of 1 and 2 A1 for $1 < x < 2$
13	(a)	2.75, 2.66, 2.5, 2, 4, 3.5, 3.33, 3.25 Equations of asymptotes $x = 0$ and $y = 3$	Curve drawn	4	M1 for drawing suitable axes on grid M1 for curve of correct shape for values of x from -4 to 4 B1 for one asymptote shown A1 for fully correct graph drawn with both asymptotes shown
	(b)		1.6 to 1.8	1	B1 ft (provided at least 2 marks scored in (a))

Question		Working	Answer	Mark	Notes
14	(a)		$\dfrac{-7 \pm \sqrt{89}}{10}$	2	M1 for correct substitution into the formula A1 for $\dfrac{-7 \pm \sqrt{89}}{10}$
	(b)		No real roots with working	2	M1 for substitution into $b^2 - 4ac$, eg $4^2 - 4 \times 4 \times 9\ (= -128)$ A1 no real roots
15	(a)		$-13,\ 520$	4	M1 for using $t_n = a + (n-1)d$, eg $338 = a + (15-1)d$ or $208 = a + (25-1)d$ M1 for eliminating one variable, eg $10d = -130$ M1 substituting into a correct equation to find the other variable, eg $a + 14 \times -13 = 338$ A1 for $a = 520,\ d = -13$
	(b)		9100	2	M1 for stating $S = \dfrac{n}{2}\{2a + (n-1)d\}$ oe or $S = \dfrac{n}{2}\{a + l\}$, may be implied by substitution A1 for 9100 or ft from (a)

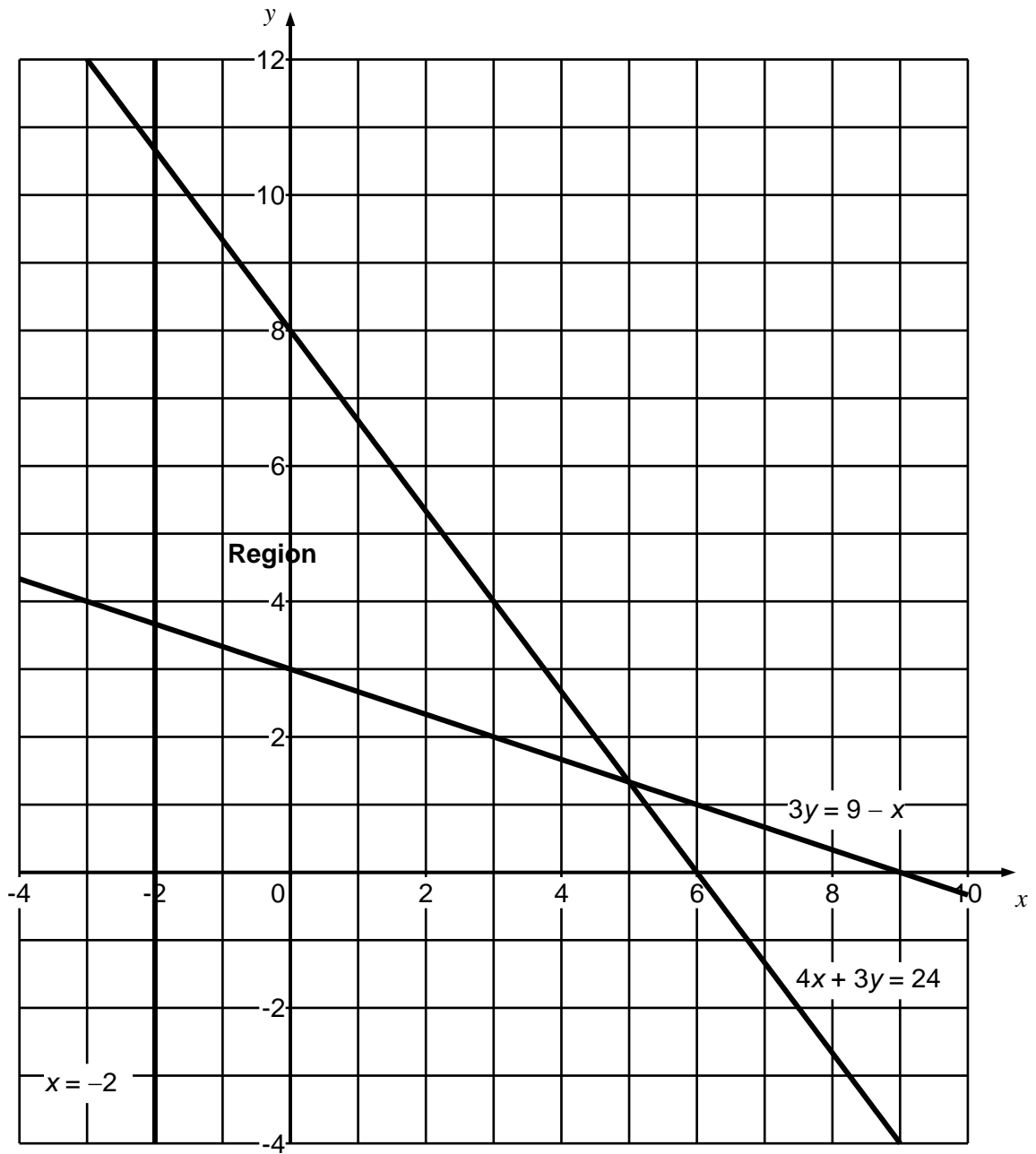| Question	Working	Answer	Mark	Notes
16 (a)		$\dfrac{3x - 8y}{5(x - y)(x + y)}$	4	M1 for correct factorisation of $x^2 - y^2$, eg $(x - y)(x + y)$ M1 for finding a common denominator, eg $5(x - y)(x + y)$ or $(5x + 5y)(x^2 - y^2)$ M1 (dep M1) for correct method to combine fractions A1 for $\dfrac{3x - 8y}{5(x - y)(x + y)}$ or $\dfrac{3x - 8y}{(5x - 5y)(x + y)}$ or $\dfrac{3x - 8y}{(x - y)(5x + 5y)}$ or $\dfrac{3x - 8y}{5(x^2 - y^2)}$ or $\dfrac{3x - 8y}{5x^2 - 5y^2}$
(b)		$\dfrac{3\sqrt{p} - 1}{2}$	3	M1 for correct method to rationalise, eg multiplying by $\dfrac{\sqrt{p}}{\sqrt{p}}$ oe M1 for $3p\sqrt{p} - p$ and $2p$ **or** $6p\sqrt{p} - 2p$ and $4p$ oe A1 $\dfrac{3\sqrt{p} - 1}{2}$ or $\dfrac{3\sqrt{p}}{2} - \dfrac{1}{2}$

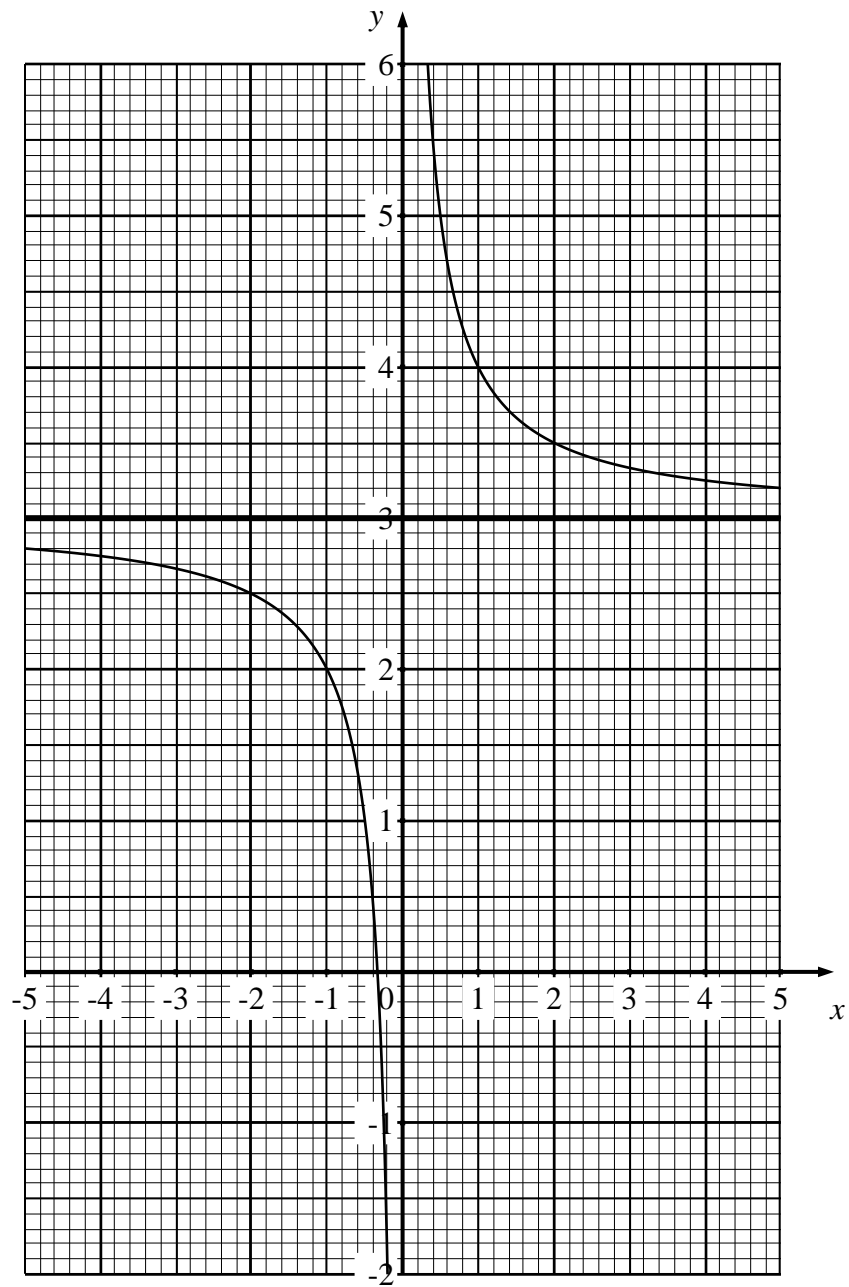| Question	Working	Answer	Mark	Notes
17 (a)		2.5	2	M1 for method to find the gradient eg sight of right angled triangle with their height divided by their base A1 2.5 or $\frac{5}{2}$ or $2\frac{1}{2}$
(b)	$\frac{1}{2} \times 5 \times 12.5$ $+ \frac{1}{2} \times (12.5 + 15) \times 5$ $+ 10 \times 15$ $+ \frac{1}{2} \times 8 \times 15$ $31.25 + 68.75 + 150 + 60$	310	3	M1 for method to work out an area under the graph, eg $\frac{1}{2} \times 5 \times 12.5 \ (= 31.25)$ M1 for a complete method to work out the area under the graph A1 cao
(c)		8	1	B1 cao
18 (a)		graph sketched	2	M1 for a reflection in the x-axis or a stretch by a factor of 2 in the y direction A1 cao
(b)		$(-4, 5)$	2	M1 for method to change x coordinate by 6 units, eg $(-4, y)$ or $(8, y)$ or shows that the y coordinate does not change, eg $(x, 5)$ A1 cao

Question	Working	Answer	Mark	Notes
19 (a)		$9 - (x + 2)^2$	2	M1 for $(x + 2)^2$ or $b = 2$ A1 for $9 - (x + 2)^2$ (accept $a = 9$, $b = 2$)
(b)		$(-2, 9)$	1	B1 ft from answer in correct form in (a)
(c)		B	1	B1 cao
20		77	3	M1 for using values $(y_0 =)$ 2.2, $(y_1 =)$ 3.2, $(y_2 =)$ 4, $(y_3 =)$ 4.6, $(y_4 =)$ 5 (condone 1 error) M1(dep) for substituting values of y and $h = 5$ into trapezium rule, eg $\frac{1}{2} \times 5\{(2.2 + 5) + 2(3.2 + 4 + 4.6)\}$ A1 for 77

Question 7

Region

$3y = 9 - x$

$4x + 3y = 24$

$x = -2$

Question 13(a)

Question 18(a)