Mark Scheme (Results)

January 2016

Pearson Edexcel Level 3 Award
in Algebra (AAL30)

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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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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)		$p^2 - 1$	1	B1 cao
(b)		$4q^2 - 4q + 1$	2	M1 for at least 3 correct terms within 4 terms A1 cao
(c)		$a = \frac{1}{125},\ n = -6$	2	B1 for $a = \frac{1}{125}$ B1 for $n = -6$
(d)		$8z^2$	2	B2 cao (B1 for az^2, $a \neq 8$ or $8z^n$, $n \neq 2$ or $-8z^n$ or $\pm 8z^2$)
(e)		$\dfrac{x - 1}{x + 8}$	2	M1 for $(x-1)(x+8)$ A1 cao

Question	Working	Answer	Mark	Notes
2 (a)	$a = 4, b = -1, c = -2$ $$\frac{--1 \pm \sqrt{(-1)^2 - 4 \times 4 \times -2}}{2 \times 4}$$ $$= \frac{1 \pm \sqrt{1 + 32}}{8}$$ $$= \frac{1 \pm \sqrt{33}}{8}$$	$\frac{1 \pm \sqrt{33}}{8}$	2	M1 for stating the quadratic formula or correct substitution into formula A1 cao
(b)		$\frac{1 \pm \sqrt{33}}{8}$	1	B1 for $\frac{1 \pm \sqrt{33}}{8}$ oe , ft 2 solutions from (a)
3 (a)		$5cd(3c^2 + 7d + 4cd)$	2	B2 cao (B1 for a partial correct factorisation which shows a product of at least 3 factors)
(b)		$(b - 2)(a - 4)$	2	M1 for $b(a - 4)$ and $-2(a - 4)$ **or** $a(b - 2)$ and $-4(b - 2)$ oe A1 for $(b - 2)(a - 4)$ oe
(c)		$3(b - 7)(b + 4)$	2	M1 for correct partial factorisation with 2 linear factors A1 cao

Question	Working	Answer	Mark	Notes
4		graph	4	M2 for drawing $x + y = 6$ and $y = 3x - 3$ correctly (M1 for drawing 1 line correctly) A2 for correctly shading required region (A1 for correct shading for 2 inequalities)
5 (a)		$x - 2y + 10 = 0$	2	M1 for $2y = x + 10$ or $2(y - 5) = x$ or $\frac{1}{2}x + 5 - y = 0$ A1 for $x - 2y + 10 = 0$ or $-x + 2y - 10 = 0$
(b)(i)		$y = \frac{1}{3}x + 4$	4	M1 for use of correct gradient in the equation of a parallel straight line in any form, A1 for $y = \frac{1}{3}x + 4$
(ii)		$y = -3x + 24$		M1 for correct gradient A1 for $y = -3x + 24$ oe
6 (a)		$-4 < x < 4$	1	B1 cao
(b)		$x \leqslant -2, \ x \geq 5$	2	M1 for establishing critical values, 5 and -2 A1 cao

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Question	Working	Answer	Mark	Notes
7 (a)		$\dfrac{10}{3}$	1	B1 for $\dfrac{10}{3}$ oe
(b)	$(\frac{1}{2} \times 3 \times 10) + (7 \times 10)$ $= 15 + 70$	85	3	M1 for a correct method to calculate an area representing a relevant distance M1 for correct and complete method A1 for 85
(c)		line drawn from (10, 10) to (12, 5)	2	M1 for line drawn from (10, 10) with gradient -2.5 A1 cao
8 (a)(i)		156	3	M1 for correct substitution into $b^2 - 4ac$ (accept substitution into $\sqrt{b^2 - 4ac}$) A1 cao
(ii)		2 real distinct roots		B1
(b)		$5, -\dfrac{7}{2}$	2	B1 for sum of roots $= 5$ B1 for product of roots $= -\dfrac{7}{2}$

Question	Working	Answer	Mark	Notes
9 (a)		$\sqrt{\dfrac{1}{5}}$	2	M1 for substitution of $\frac{1}{2}$ A1 for $\sqrt{\dfrac{1}{5}}$ or $\dfrac{1}{\sqrt{5}}$ or $\dfrac{\sqrt{5}}{5}$ oe
(b)	$y^2(x^2+1)=x^2$ $y^2x^2+y^2=x^2$ $y^2x^2-x^2=-y^2$ $x^2(y^2-1)=-y^2$ $x^2=\dfrac{-y^2}{y^2-1}$	$x=\pm\sqrt{\dfrac{y^2}{1-y^2}}$	3	M1 for multiplying by x^2+1 M1 (dep M1) for isolating terms in x^2 on one side of the equation. A1 for $x=\pm\sqrt{\dfrac{y^2}{1-y^2}}$ oe
10		Circle centre the origin radius 4 drawn	2	M1 for drawing a circle, centre (0, 0) or circle radius 4 or $x^2+y^2=16$ seen A1 for correct circle
11 (a)		$(x-5)^2+4$	2	B1 $p=-5$ oe B1 $q=4$ oe
(b)		Graph sketch	3	M1 for a parabola with the correct orientation. M1 "(5, 4)" labelled at minimum point or 29 labelled as y intercept of their parabola A1 fully correct graph drawn with all labels

| Question	Working	Answer	Mark	Notes
12 (a)		$-4n + 104$	2	M1 for $-4n + c$ or $100 + (n-1) \times -4$ A1 for $-4n + 104$ (If M0, SC B1 for $n = -4n + 104$ on answer line)
(b)	$\frac{50}{2}(2 \times a + (50-1) \times 3) = 2500$ $25(2a + 147) = 2500$ $2a + 147 = 100$ $2a = -47$	-23.5	3	M1 for stating $S = \frac{n}{2}\{2a + (n-1)d\}$ oe, may be implied by substitution M1 for $\frac{50}{2}(2 \times a + (50-1) \times 3) = 2500$ oe A1 for -23.5 oe
13 (a)	$-10, (-4.875), -2, -0.625, (0),$ $(0.625), 2, (4.875), 10$	$-10, -2, -0.625, 2, 10$	2	B2 for all values correct (B1 for 2, 3 or 4 correct values)
(b)		Graph	2	M1 (dep B1) for all points correctly plotted A1 cao
(c)		1.2	2	M1 for $y = 3$ used or marked on the graph A1
14		46.5	3	M1 for using values $(y_0 =)$ 32, $(y_1 =)$ 16, $(y_2 =)$ 8, $(y_3 =)$ 4, $(y_4 =)$ 2, $(y_5 =)$ 1 (condone 1 error) M1(dep) for substituting "values" and $h = 1$ into trapezium rule, eg $\frac{1}{2}\times 1\{(32 + 1) + 2(16 + 8 + 4 + 2)\}$ A1 for 46.5

| Question	Working	Answer	Mark	Notes
15	$2x^2 + 2y^2 = 17$ $2x^2 + 2(x+4)^2 = 17$ $4x^2 + 16x + 32 = 17$ $4x^2 + 16x + 15 = 0$ $(2x+3)(2x+5) = 0$ $x = -\frac{3}{2}$, or $-\frac{5}{2}$ $y = \frac{5}{2}, \frac{3}{2}$	$-\frac{3}{2}, \frac{5}{2}$ and $-\frac{5}{2}, \frac{3}{2}$	4	M1 for substitution of $y = x + 4$ or $x = y - 4$ into the quadratic equation M1 for $4x^2 + 16x + 15\ (=0)$ or $4y^2 - 16y + 15\ (=0)$ oe (must be in the form "= 0") A1 $x = -\frac{3}{2}, -\frac{5}{2}$ oe or $y = \frac{3}{2}, \frac{5}{2}$ oe A1 for $x = -\frac{3}{2}, y = \frac{5}{2}$ and $x = -\frac{5}{2}, y = \frac{3}{2}$
16 (i) (ii)		Tangent drawn Normal drawn	2	B1 for tangent drawn and labelled B1 for normal drawn and labelled SCB1 for both lines correct without labels
17		correct graph	4	B1 for asymptote of $x = 4$ B1 for y intercept at $(0, -\frac{1}{4})$ M1 for correct shape A1 for fully correct graph
18 (a) (b)	Translation by +1 unit parallel to the y axis Stretch in direction of x axis, factor $\frac{1}{2}$	Correct graph Correct graph	2 2	M1 for a translation by 1 unit parallel to the y-axis A1 cao M1 for a stretch in direction of x axis A1 cao
19	$48 = k \times 2^3$ $k = 6$	$p = 6d^3$	2	M1 $p = kd^3$ oe, may be implied by substitution A1 cao

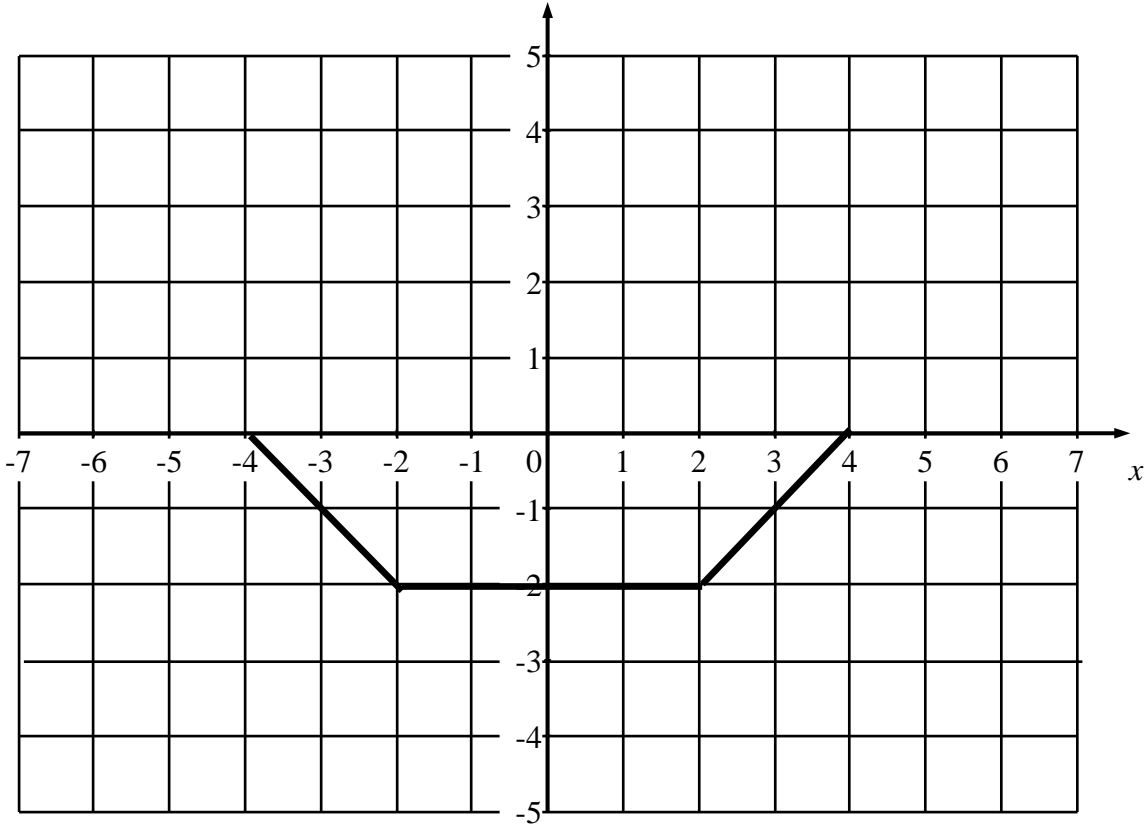| Question	Working	Answer	Mark	Notes
20 (a)		$\dfrac{\sqrt{3}}{15}$	2	M1 for correct method to rationalise, eg multiplying by $\dfrac{\sqrt{3}}{\sqrt{3}}$ oe A1 $\dfrac{\sqrt{3}}{15}$ oe
(b)(i)		$3\sqrt{2}$	4	B1 cao
(ii)	$\dfrac{1}{2\sqrt{2}} + \dfrac{1}{3\sqrt{2}}$ $\dfrac{3+2}{6\sqrt{2}}$	$\dfrac{5}{6\sqrt{2}}$		M1 for $\dfrac{1}{2\sqrt{2}} + \dfrac{1}{3\sqrt{2}}$ or $\dfrac{\sqrt{8}}{8} + \dfrac{\sqrt{18}}{18}$ M1 for use of a correct common denominator, eg $6\sqrt{2}$, 72 A1 for $\dfrac{5}{6\sqrt{2}}$ or equivalent answer in correct form. SC B2 for equivalent rationalised answer.

Question 4

$y = 3x - 3$

$y = 6 - x$

R

Question 7

Speed (m/s)

12

8

4

0

2   4   6   8   10   12

Time (s)
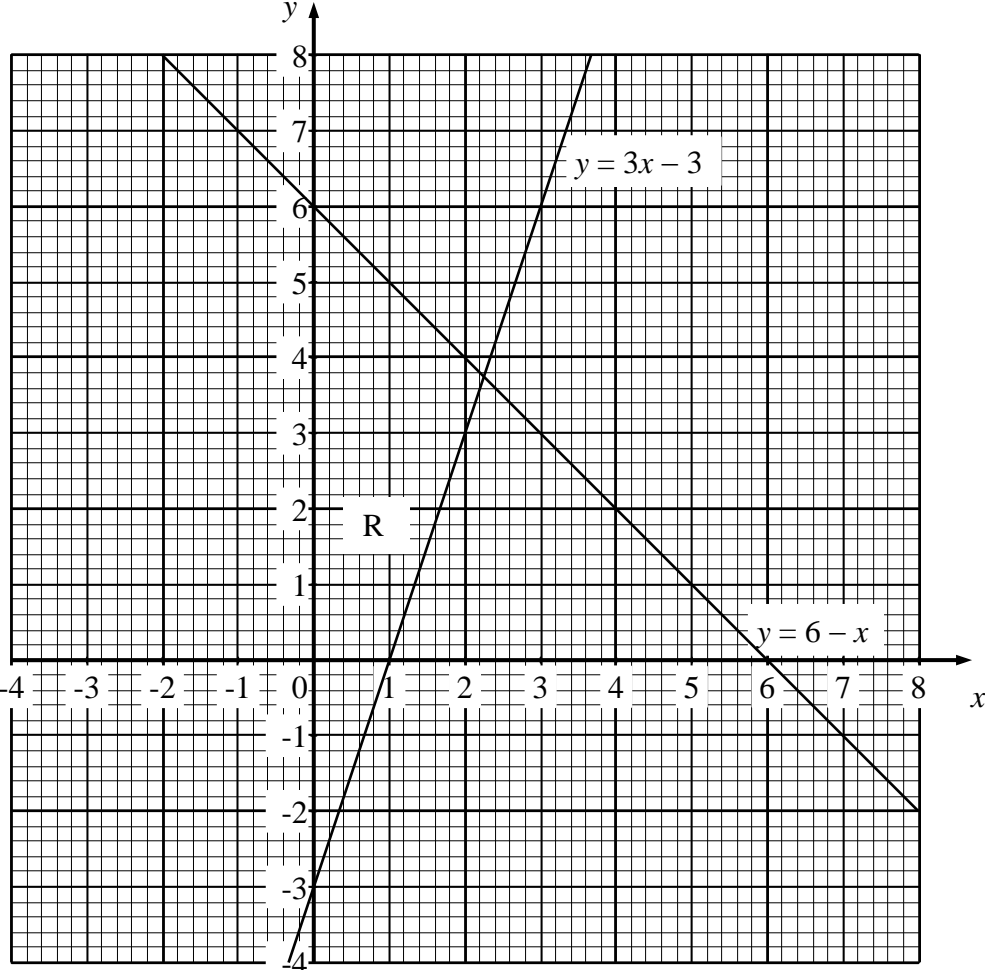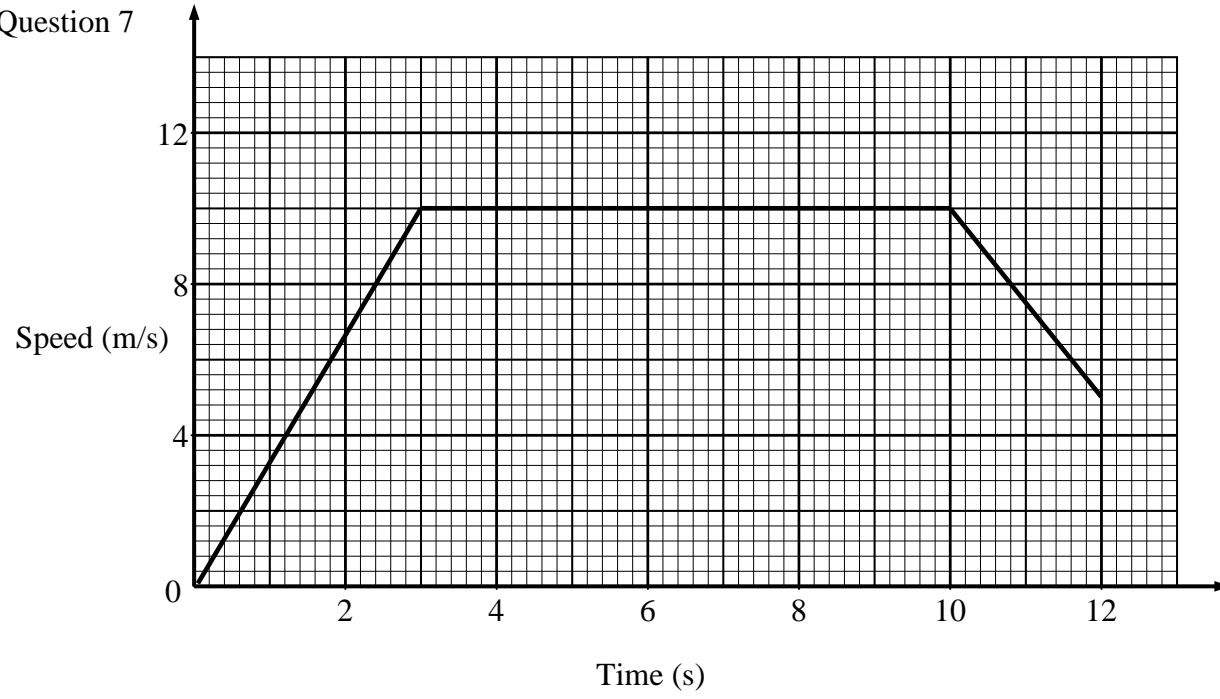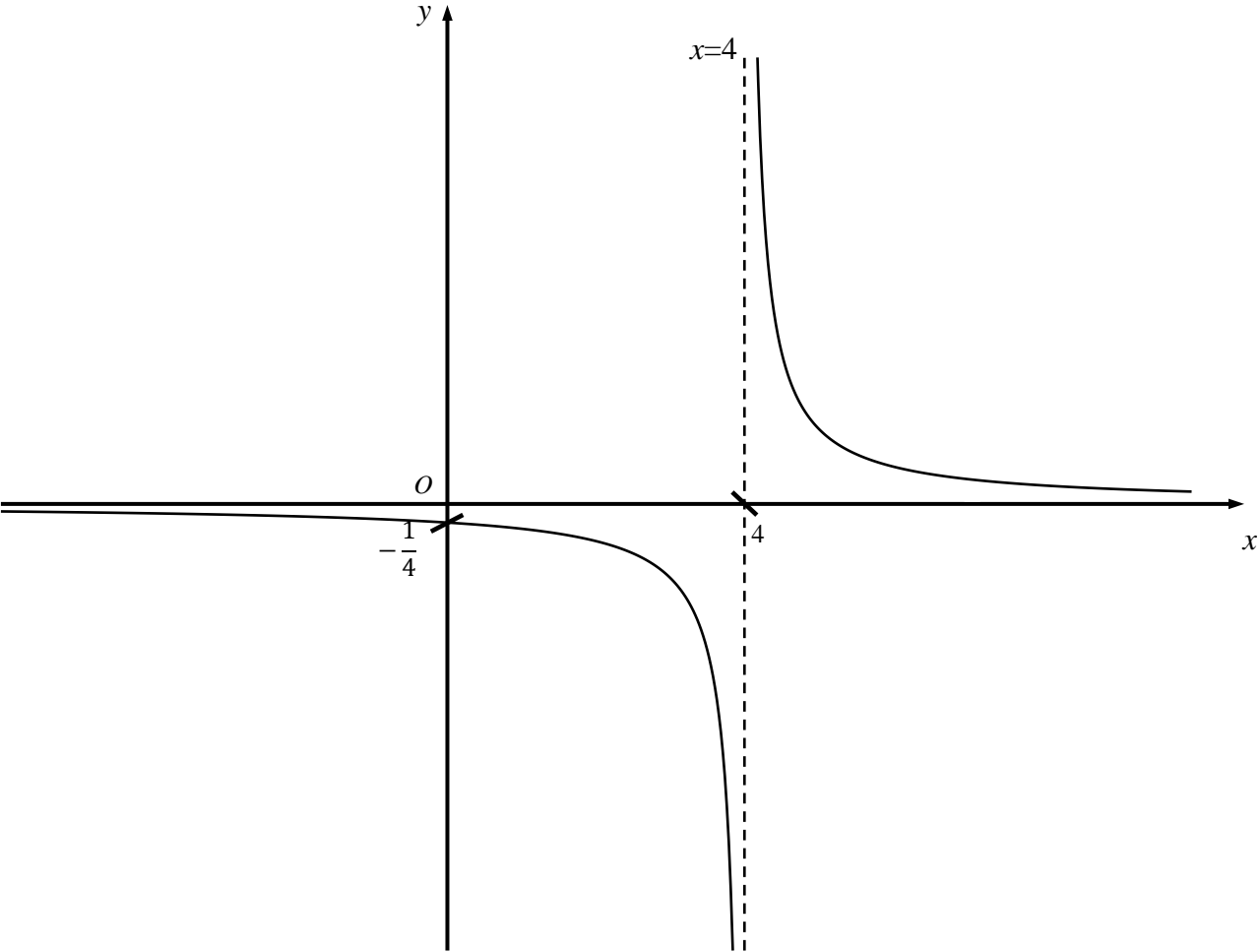
Question 17

Question 18(a)

Question 18(b)