



Pearson

## **Mark Scheme (Results)**

January 2017

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

isw – ignore subsequent working

oe – or equivalent (and appropriate)

indep - independent

ft – follow through

SC: special case

dep – dependent

### 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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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.

**PAPER: AAL30\_01**

Question	Working	Answer	Mark	Notes
1 (a)		$(d - 4)(d + 3)$	1	B1 for $(d - 4)(d + 3)$ oe
(b)		$(m + 2)(k - 3)$	2	M1 for $m(k - 3)$ and $2(k - 3)$ or $k(m + 2)$ and $-3(m + 2)$ oe A1 for $(m + 2)(k - 3)$ oe
(c)		$2p^2(p - 3)(p + 3)$	2	M1 for correct partial factorisation with at least 2 factors in $p$ A1
2		graph	5	M1 for drawing $y = \frac{1}{4}x$ correctly M1 for drawing $y = 3 - x$ correctly M1 for drawing $x + 3y = 7$ correctly A2 for correctly shading required region (A1 for correct shading for 2 inequalities)
3 (a)		$m^{\frac{5}{4}}$	1	B1
(b)		$n^{-5}$	1	B1 (allow $\frac{1}{n^5}$ )
(c)		$a = 8, n = 9$	2	B1 for $a = 8$ B1 for $n = 9$
(d)		$5 - 21y + 4y^2$	2	M1 for at least 3 correct terms within 4 terms A1
(e)		$\frac{1}{u - 2}$	2	M1 for factorisation of $u^2 - 4u + 4$ A1

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Question	Working	Answer	Mark	Notes
4 (a)	$4x^2 - 12x - 7 = 0$ $(2x - 7)(2x + 1) = 0$	$-\frac{1}{2}, \frac{7}{2}$	3	M1 for writing in the form $ax^2 + bx + c (= 0)$ or correctly completing the square to the form $(dx + e)^2 + f = 7$ M1 (dep) for factorisation or $x = \frac{p \pm \sqrt{q}}{r}$ A1 for $-\frac{1}{2}, \frac{7}{2}$ oe
4 (b)	$a = 3, b = 8, c = -1$ $\frac{-8 \pm \sqrt{8^2 - 4 \times 3 \times -1}}{2 \times 3}$ $= \frac{-8 \pm \sqrt{76}}{6} = \frac{-4 \pm \sqrt{19}}{3}$	$\frac{-4 \pm \sqrt{19}}{3}$	3	M1 for $3x^2 + 8x - 1 (= 0)$ or $-3x^2 - 8x + 1 (= 0)$ or $a = 3, b = 8, c = -1$ or $a = -3, b = -8, c = 1$ M1 for stating the quadratic formula or correct substitution into formula A1 cao
5 (a)		$y = -\frac{5}{3}x + 5$	1	B1 for $y = -\frac{5}{3}x + 5$ oe
5 (b)		$y = \frac{3}{5}x$	2	M1 for method to find gradient of $L_2$ A1ft for $y = \frac{3}{5}x$ oe
5 (c)		$y = -\frac{5}{3}x + 10$	2	M1 for use of correct gradient in the equation of a straight line in any form, eg $y = -\frac{5}{3}x + c, 5x + 3y = c$ A1ft for $y = -\frac{5}{3}x + 10$ oe

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Question	Working	Answer	Mark	Notes
6 (a)(i)  (ii)        (b)(i)  (ii)		5  $t = \pm \sqrt{100(C - 4)}$        $(x + 3)^2 - 4$   $x = -3 \pm \sqrt{y + 4}$	4        4    4	B1 cao  B1 for $100C = 400 + t^2$ or $C - 4 = \frac{t^2}{100}$  B1 for $t^2 = 100(C - 4)$ or $t^2 = 100C - 400$ B1 for $t = \pm \sqrt{100(C - 4)}$ or $t = \pm \sqrt{100C - 400}$ or $t = \pm 10 \sqrt{C - 4}$ SCB2 $\pm 10 \sqrt{C - 4}$ oe  B1 $p = 3$ B1 $q = -4$  M1 for $y - '-4' = (x + '3')^2$ A1 ft from $(x + p)^2 + q$
7 (a)       (b)       (c)		8, 4, 2, 1, 0.5, 0.25, 0.125        Graph        -2.3	2        2        2	B2 for all values correct (B1 for 5 or 6 correct values)        M1 (dep B1) for all their points correctly plotted A1 cao        M1 for $y = 5$ drawn or mark on the graph A1 ft correct curve in the second quadrant

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Question	Working	Answer	Mark	Notes
8 (a)	$3^2 - 4 \times 9 \times c = 0$	$\frac{1}{4}$	2	M1 for correct substitution into $b^2 - 4ac$ or $b^2 = 4ac$ (accept substitution into $\sqrt{b^2 - 4ac}$ ) A1
(b)	$x^2 + \frac{7}{4}x - \frac{1}{4} = 0$	$4x^2 + 7x - 1 = 0$	3	M1 for $\frac{-b}{a} = -\frac{7}{4}$ or $\frac{c}{a} = -\frac{1}{4}$ A1 for a correct quadratic equation but not in correct form or $4x^2 + 7x - 1$ A1 for $4x^2 + 7x - 1 = 0$ oe with integer coefficients
9		Outside	2	M1 for drawing an appropriate arc of a circle centre (0, 0), radius 7 A1 for (6, 6) shown on diagram and conclusion OR M1 for substitution of (6, 6) into $x^2 + y^2$ A1 for 72 and conclusion
10 (a)		$3n + 7$	2	M1 for $3n + c$ or $10 + (n - 1)3$ oe A1 for $3n + 7$ (If M0, SC B1 for $n = 3n + 7$ on answer line)
(b)	$\frac{n}{2}(2 \times 4 + (n - 1) \times 8) > 1000$ $n(8 + 8n - 8) > 2000$ $8n^2 > 2000$ $n^2 > 250$	16	3	M1 for $S = \frac{n}{2}\{2a + (n - 1)d\}$ , may be implied by substitution M1 for isolating terms in $n$ to solve $\frac{n}{2}(2 \times 4 + (n - 1) \times 8) =, > 1000$ A1 cao



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Question	Working	Answer	Mark	Notes
11 (a)		Speed	1	B1 for speed (of the particle) oe
(b)		Tangent drawn	1	B1 for tangent drawn at $t = 0.3$
12	$\frac{1}{2} \times 2 \{ (0.5 + 0.1) + 2(0.25 + 0.167 + 0.125) \}$	1.68	3	M1 for stating values ( $y_0 =$ ) 0.5, ( $y_1 =$ ) 0.25 ( $y_2 =$ ) 0.17 (accept 0.16 – 0.17), ( $y_3 =$ ) 0.125 (accept 0.12 – 0.13), ( $y_4 =$ ) 0.1, (condone 1 error) M1(dep) for substituting “values” and $h = 2$ into trapezium rule, eg $\frac{1}{2} \times 2 \left\{ \left( \frac{1}{2} + \frac{1}{10} \right) + 2 \left( \frac{1}{4} + \frac{1}{6} + \frac{1}{8} \right) \right\}$ A1 for 1.66 – 1.70 oe
13 (a)		$x > \frac{12}{7}$	2	M1 for isolating terms in $x$ A1 cao
(b)		$-3 < x < -1$	2	M1 for establishing critical values, $-1$ and $-3$ A1 cao
14		Graph sketch	3	M1 for correct shape M1 for $-2$ labelled as $y$ intercept A1 fully correct graph drawn with labels

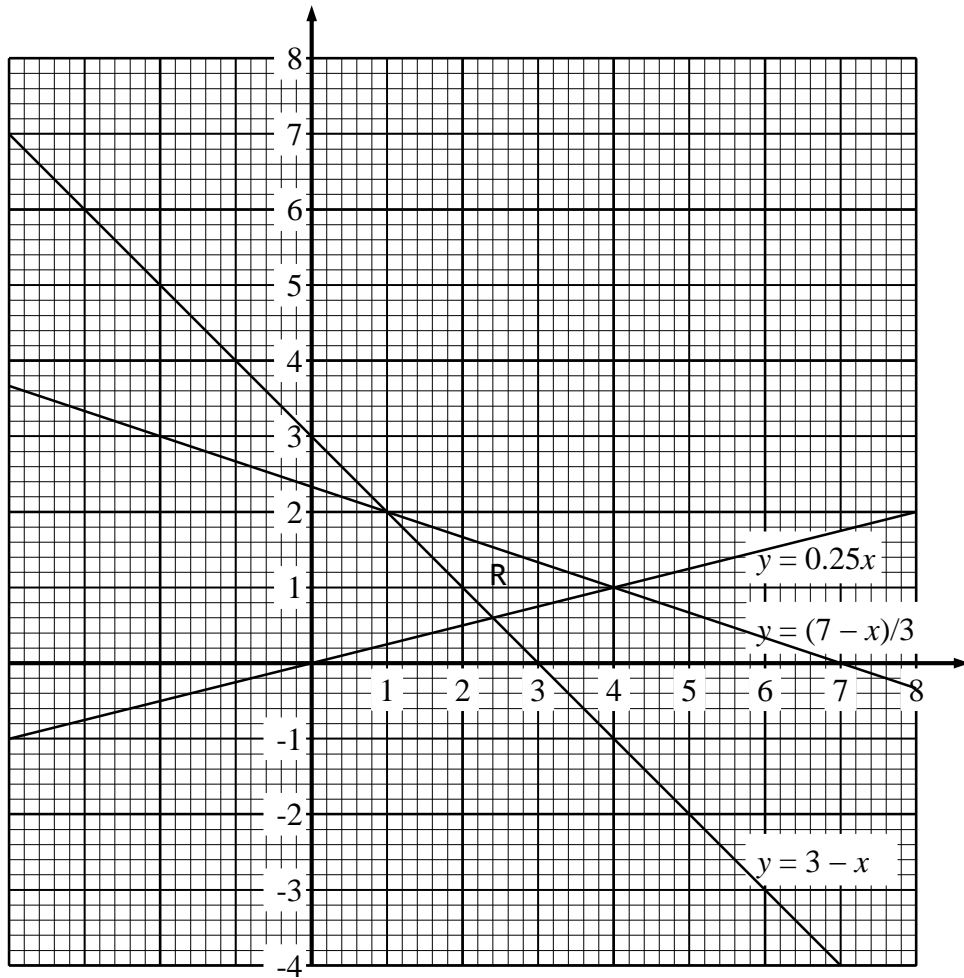
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Question	Working	Answer	Mark	Notes
15 (a)		$\frac{3 - \sqrt{7}}{2}$	2	M1 for multiplying by $\frac{3-\sqrt{7}}{3-\sqrt{7}}$ oe A1 for $\frac{3-\sqrt{7}}{2}$
		$4\sqrt{10}$	4	M1 for correct expansion of $(\sqrt{5} + \sqrt{2})^2$ or $(\sqrt{5} - \sqrt{2})^2$ or $\{(\sqrt{5} + \sqrt{2}) - (\sqrt{5} - \sqrt{2})\}\{(\sqrt{5} + \sqrt{2}) + (\sqrt{5} - \sqrt{2})\}$ A1 for $(5 + 2\sqrt{2}\sqrt{5} + 2) - (5 - 2\sqrt{2}\sqrt{5} + 2)$ oe or $2\sqrt{2} \times 2\sqrt{5}$ A1
		160		B1 ft in $a\sqrt{b}$
16 (a)		Graph drawn	4	B1 for appropriate scaling and labelling of graph M1 for line drawn with gradient 2 or a line drawn with gradient -4 M1 for line from "(4, 8)" showing constant speed for 5 seconds A1 for fully correct and complete graph
	$(\frac{1}{2} \times 3 \times 6)$	9m	2	M1 for a correct method to calculate area A1 (accept 9)

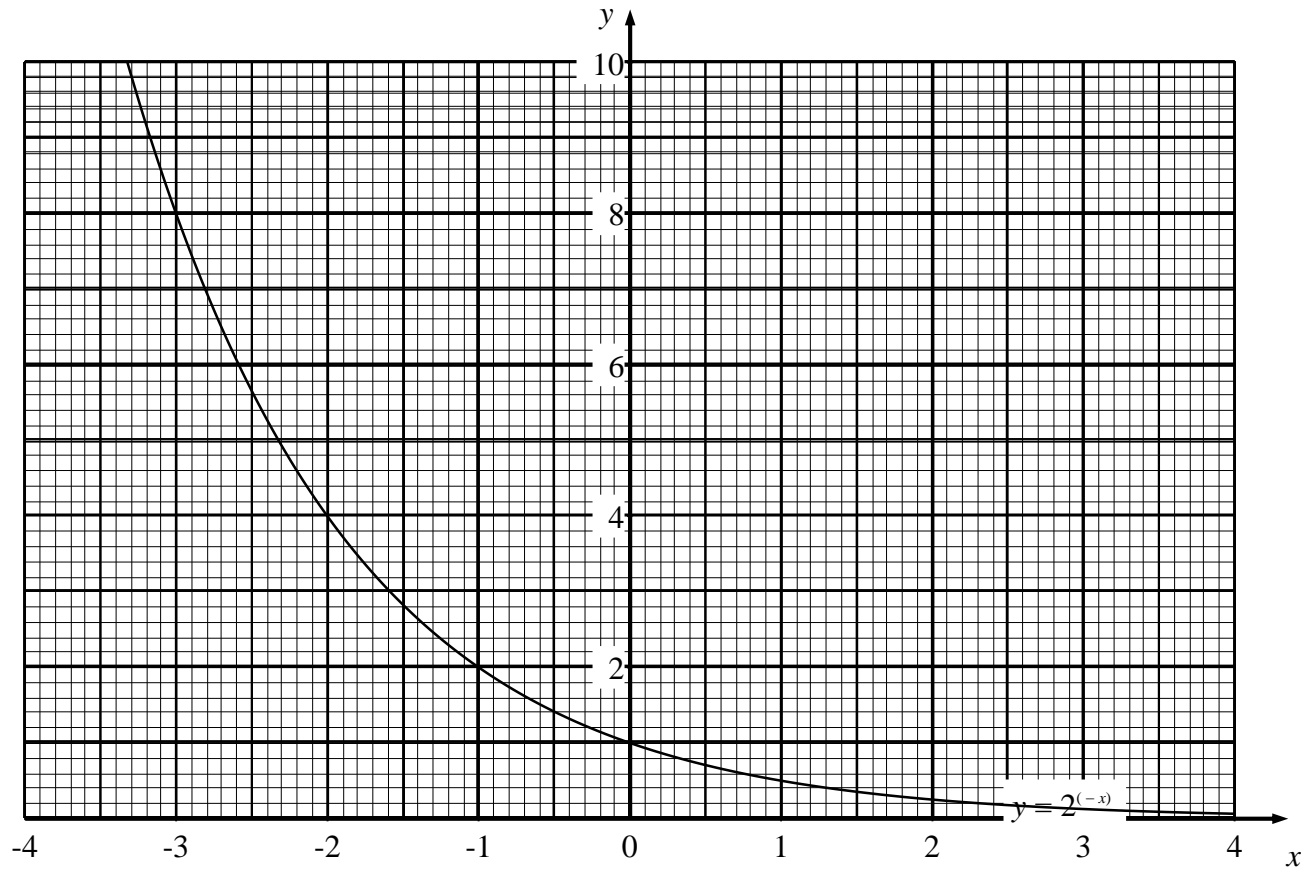
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Question	Working	Answer	Mark	Notes
17 (a)	$5 = \frac{k}{\sqrt{36}}$	$p = \frac{30}{\sqrt{n}}$	3	M1 $p = \frac{k}{\sqrt{n}}$ oe, may be implied by substitution M1 for substitution to find $k$ A1 cao
17 (b)		Sketch	1	B1 for sketch
18	Stretch in direction of y-axis factor $\frac{1}{2}$	Correct graph	2	M1 for a stretch in direction of y-axis A1 for correct curve drawn through $(-3, -1)$ , $(3, -1)$ and $(0, 1)$
19	$4x^2 - (-3 - x)^2 = 36$ $4x^2 - (9 + 6x + x^2) = 36$ $3x^2 - 6x - 45 = 0$ $x^2 - 2x - 15 = 0$ $(x + 3)(x - 5) = 0$ $x = -3, 5$ $y = 0, -8$	$-3, 0$ and $5, -8$	5	M1 for substitution of $y = -3 - x$ into the quadratic equation M1 (dep on M1) for correct expansion of brackets within the equation M1 (dep on M2) for equation of the form $ax^2 + bx + c = 0$ A1 $x = -3, 5$ oe or $y = 0, -8$ oe A1 for $x = -3, y = 0$ and $x = 5, y = -8$

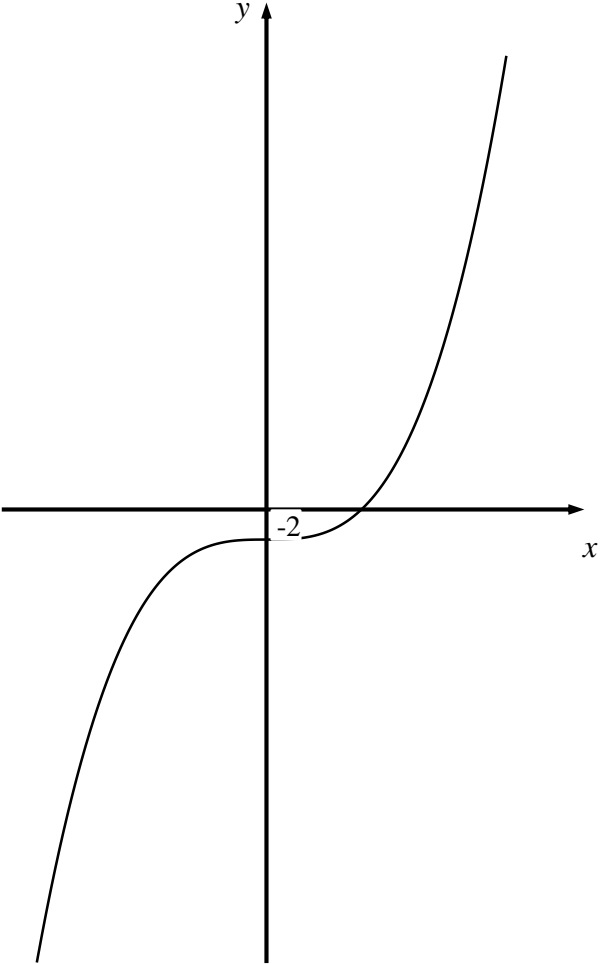
Question 2



Question 7



Question 14



Q16

