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## Mark Scheme (Results)

January 2020

Pearson Edexcel Level 3 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

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

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Question	Working	Answer	Mark	Notes
1 (a)		$x^2 + xy - 2y^2$	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 A1 for $x^2 + xy - 2y^2$
(b)		$6ut^2(2u + 3t)$	2	B2 for correct factorisation (B1 for a partial correct factorisation which shows a product of 3 or 4 factors)
2 (a)		Correct region indicated	5	M1 for drawing $x = 3$ correctly M1 for drawing $y - x = 5$ correctly M1 for drawing $7x + 5y = 35$ correctly A2 for correctly shading required region (A1 for correct shading for 2 inequalities)
(b)		(2, 5) (2, 6)	1	B1 for both correct and no extras
3		$k \leq -3, k \geq 3$	2	M1 for critical values $\pm 3$ or for $k \leq -3$ or for $k \geq 3$ A1 for $k \leq -3, k \geq 3$
4		Correct statement	1	B1 for statement, eg speed is zero, has stopped running oe

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Question	Working	Answer	Mark	Notes
5 (a)(i)	$a = 3, b = -7, c = 5$	-11	2	M1 for use of $b^2 - 4ac$ A1 cao
(ii)		no real roots	1	B1 (dep M1) consistent with (a)(i)
(b)		$-\frac{1}{2}, -\frac{3}{10}$	3	M1 for sum = $-\frac{b}{a}$ <b>or</b> product = $\frac{c}{a}$ <b>or</b> $10x^2 + 5x - 3 = 0$ <b>or</b> $a = 10, b = 5, c = -3$ A1 for sum = $-\frac{1}{2}$ oe A1 for product = $-\frac{3}{10}$ oe
6		Circle centre (-2, 1), radius 4 cm drawn	2	M1 for using (-2, 1) as the centre of a circle <b>or</b> a circle of radius 4 cm drawn A1
7 (a)		$p^8$	1	B1 cao
(b)		$64t^3$	2	B2 cao (B1 for $64t^n, n \neq 3$ or $ct^3, c \neq 64$ )
(c)		$\frac{1}{x^2 - 9}$	2	M1 for $x^2 - 9 = (x + 3)(x - 3)$ or for $(x - 3)^2(x + 3)^2 = (x^2 - 9)^2$ A1 for $\frac{1}{x^2 - 9}$ or $\frac{1}{(x+3)(x-3)}$

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Question	Working	Answer	Mark	Notes
8 (a)		$x - 2y = 2$	1	B1 for eg $x - 2y = 2$ or $-x + 2y = -2$
		$y = \frac{1}{2}x - 5$	3	M1 for use of gradient of $L_2 = \frac{1}{2}$ , eg $y = \frac{1}{2}x + c$ M1 for a correct method to find $c$ , eg $-6 = \frac{1}{2} \times -2 + c$ A1 for $y = \frac{1}{2}x - 5$
9 (a)		$\frac{1}{8}$	1	B1 for $\frac{1}{8}$ or 0.125
		$2 + \sqrt{5}$	4	M1 for substitution, eg $\frac{\sqrt{5}}{5-2\sqrt{5}}$ M1 for multiplying by $\frac{5+2\sqrt{5}}{5+2\sqrt{5}}$ or a multiple of $\frac{5+2\sqrt{5}}{5+2\sqrt{5}}$ A1 for a single fraction with surds resolved eg $\frac{5\sqrt{5}+10}{25-20}$ or $\frac{5(\sqrt{5}+2)}{5}$ A1 for $2 + \sqrt{5}$
		$n = \frac{5t}{2t+1}$	3	M1 for correct first step, eg $t(5 - 2n) = n$ M1 for isolating terms in $n$ on one side of the equation eg $2nt + n = 5t$ A1 for $n = \frac{5t}{2t+1}$ oe

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Question	Working	Answer	Mark	Notes
10 (a)(i)		$6x^2 - 4x - 3 = 0$	1	B1 for correct equation with integer coefficients
(ii)	$\frac{- - 4 \pm \sqrt{(-4)^2 - 4 \times 6 \times -3}}{2 \times 6}$	$\frac{2 \pm \sqrt{22}}{6}$	3	M1 for stating the quadratic formula or correct substitution into formula ft from (a)(i) A1 ft for $\frac{4 \pm \sqrt{88}}{12}$ A1 for $\frac{2 \pm \sqrt{22}}{6}$
(b)		-3, -2	3	M1 for $(x + 3)[(x + 3) - 1] = 0$ M1 for $(x + 3)(x + 2) = 0$ A1 for -3, -2 OR M1 for $x^2 + 6x + 9 - x - 3 = 0$ M1 for $(x + 3)(x + 2) = 0$ <b>or</b> use of the quadratic formula as far as $\frac{-5 \pm \sqrt{1}}{2}$ A1 for -3, -2
(c)		$(x - 4)^2 - 13$	2	M1 $(x - 4)^2$ oe A1 $(x - 4)^2 - 13$



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Question	Working	Answer	Mark	Notes
11 (a)		74 400	2	M1 for substitution into $\frac{1}{2}n(2a + (n-1)d)$ or $\frac{1}{2}n(a + l)$ eg $\frac{1}{2} \times 120(2 \times 25 + (120 - 1) \times 10)$ or $\frac{1}{2} \times 120(25 + 1215)$ A1 cao
(b)		99	3	M1 for setting up an equation or inequality, eg $25 + (n - 1) \times 10 = 1000$ or $10n + 15 = 1000$ M1(dep M1) for $n = 98.5$ A1 cao
12 (a)		$-\frac{4}{3}$	2	M1 for method to find gradient, eg rearrangement to $y = -\frac{4}{3}x - \frac{2}{3}$ A1 for $-\frac{4}{3}$ oe
(b)	$y = \frac{3}{4}x + c$ $-2 = \frac{3}{4} \times 1 + c$ $c = -\frac{11}{4}$ $y = \frac{3}{4}x - \frac{11}{4}$ $3x - 4y - 11 = 0$	$3x - 4y - 11 = 0$	3	M1 for using relationship between gradient of normal and tangent, eg gradient of tangent = $\frac{3}{4}$ <b>or</b> ft from (a) M1(dep M1) for method to find $c$ , eg $-2 = \frac{3}{4} \times 1 + c$ or $c = -\frac{11}{4}$ or $y$ $+ 2 = \frac{3}{4}(x - 1)$ A1ft for $3x - 4y - 11 = 0$ oe provided in correct form

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<b>Question</b>	<b>Working</b>	<b>Answer</b>	<b>Mark</b>	<b>Notes</b>
13 (a)(i)		82.4	3	M1 for using values, eg ( $y_0 =$ ) 0, ( $y_1 =$ ) 1 to 1.2, ( $y_2 =$ ) 3.6, ( $y_3 =$ ) 8, ( $y_4 =$ ) 16 (condone 1 error) M1(dep M1) for substituting “values” and $h = 4$ into trapezium rule, eg $\frac{1}{2} \times 4 \{ (0 + 16) + 2(1 + 3.6 + 8) \}$ A1 for 82.4 to 83.2 oe from correct values
(ii)		distance	1	B1 for distance travelled (between 0 seconds and 16 seconds)
(b)(i)		Tangent drawn	1	B1 professional judgement
(ii)		1.4 – 1.5	2	M1(dep on B1 in (b)(i)) for method to find the gradient eg sight of right angled triangle with their height divided by their base A1 for 1.4 – 1.5 oe or ft
(c)		Acceleration (of the particle at $t = 12$ )	1	B1 oe

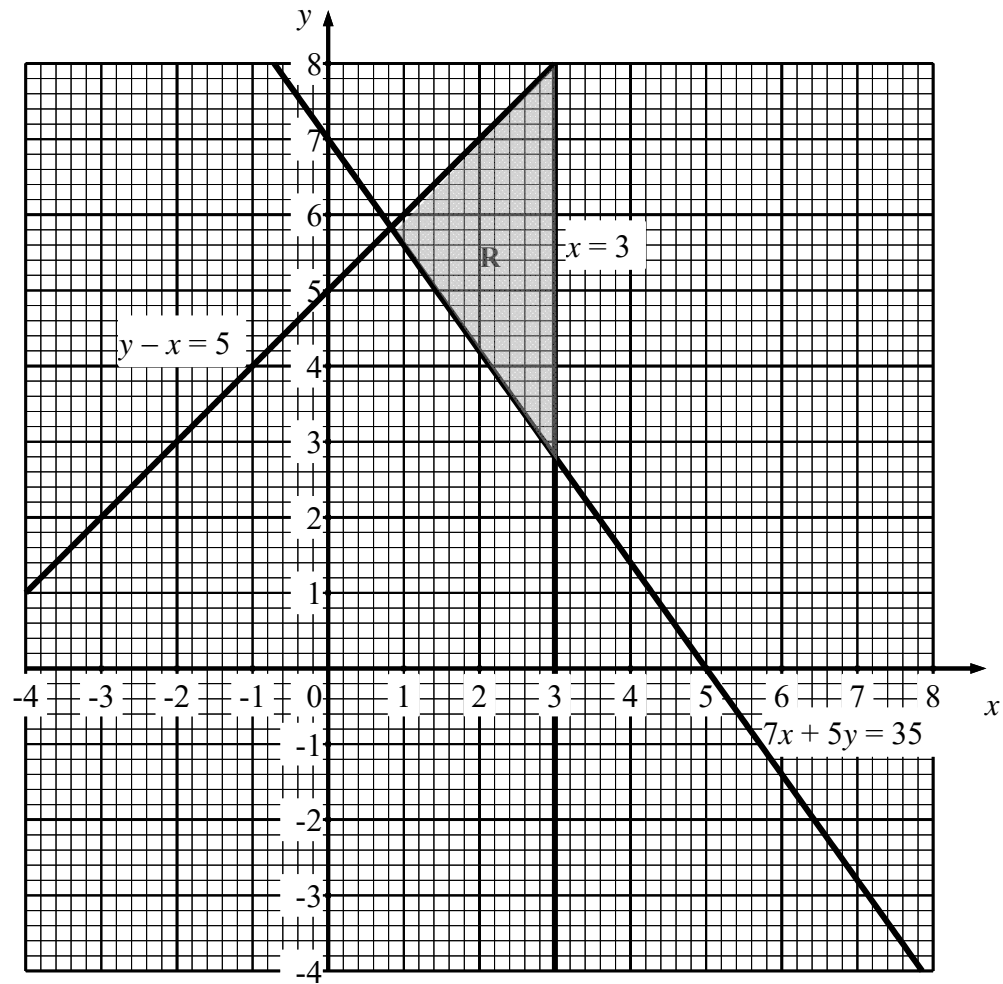
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Question	Working	Answer	Mark	Notes
14 (a)		$\frac{7}{4\sqrt{2}}$	3	M1 for $\frac{1}{(\sqrt{2})^3} = \frac{1}{2\sqrt{2}}$ or $\frac{1}{(\sqrt{2})^5} = \frac{1}{4\sqrt{2}}$ M1 for $\frac{4+2+1}{4\sqrt{2}}$ A1 for $\frac{7}{4\sqrt{2}}$ OR M1 for $\frac{(\sqrt{2})^4 + (\sqrt{2})^2 + 1}{(\sqrt{2})^5}$ or $\frac{\sqrt{16} + \sqrt{4} + \sqrt{1}}{\sqrt{32}}$ M1 for $(\sqrt{2})^4 = 4$ or $(\sqrt{2})^2 = 2$ or $(\sqrt{2})^5 = 4\sqrt{2}$ A1 for $\frac{7}{4\sqrt{2}}$
14 (b)		3	3	M1 for multiplying by $\frac{\sqrt{20}+\sqrt{5}}{\sqrt{20}+\sqrt{5}}$ or a multiple of $\frac{\sqrt{20}+\sqrt{5}}{\sqrt{20}+\sqrt{5}}$ A1 for $\frac{20+10+10+5}{20-5}$ A1 cao OR M1 for $\frac{2\sqrt{5}+\sqrt{5}}{2\sqrt{5}-\sqrt{5}}$ M1 for $\frac{3\sqrt{5}}{\sqrt{5}}$ A1 cao
15 (a)	$15 = k\sqrt[3]{27}$	$r = 5\sqrt[3]{v}$	3	M1 $r \propto \sqrt[3]{v}$ or $r = k\sqrt[3]{v}$ oe, may be implied by substitution M1 for substitution to find $k$ A1
15 (b)		sketch	1	B1 for correct general shape

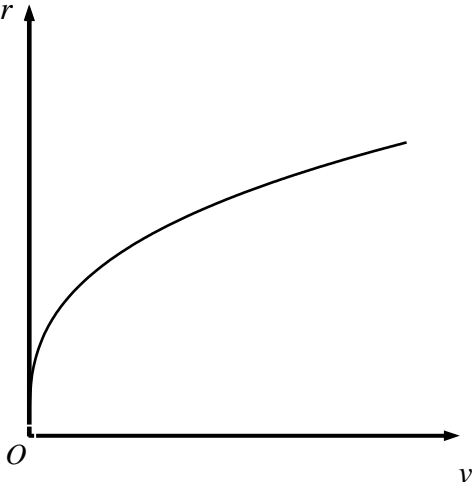
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Question	Working	Answer	Mark	Notes
16 (a)		24, 156	2	M1 for $\sin x^\circ = \frac{2}{5}$ <b>or</b> $y = \frac{2}{5}$ shown on graph <b>or</b> 1 correct solution A1 for 21 to 24 and 156 to 159
16 (b)		22 – 28 and 112 – 118	2	M1 for $x + 20 = 42$ to 48 <b>or</b> $x + 20 = 132$ to 138 <b>or</b> 1 correct solution <b>or</b> sketches graph of $y = \sin(x + 20)^\circ$ A1 for 22 – 28 and 112 – 118
16 (c)		Sketch graph	2	M1 for stretch parallel to $x$ -axis A1 for stretch, factor 2 parallel to $x$ -axis
17		$x = 5, y = \frac{5}{2}$ $x = -\frac{5}{2}, y = -5$	5	M1 for substitution of $2y = 2x - 5$ or $y = x - \frac{5}{2}$ into $4x^2 + 4y^2 = 125$ oe to obtain equation in one variable M1 for writing equation in the form $ax^2 + bx + c (= 0)$ eg $8x^2 - 20x - 100 (= 0)$ oe M1 for method to solve the equation, eg $(2x + 5)(x - 5) (= 0)$ A1 $x = -\frac{5}{2}, x = 5$ OR $y = \frac{5}{2}, y = -5$ OR $x = -\frac{5}{2}, y = -5$ OR $x = 5, y = \frac{5}{2}$ A1 for $x = 5, y = \frac{5}{2}$ and $x = -\frac{5}{2}, y = -5$
18		Graph sketched	4	B1 for asymptote of $x = 2$ B1 for intercept at $(0, \frac{1}{2})$ M1 for correct shape A1 for fully correct sketch.

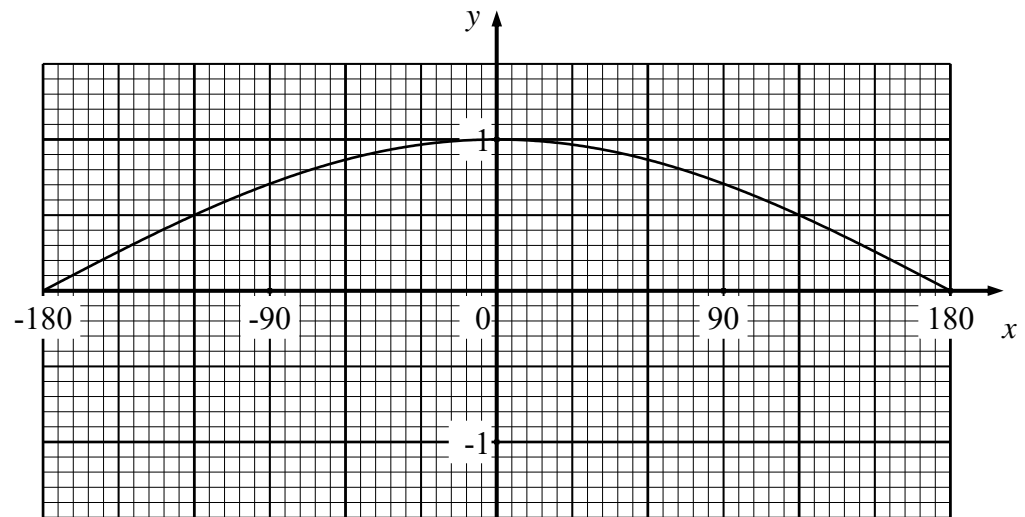
Question 2



Question 15(b)



Question 16(c)



Question 18

