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MATHEMATICS

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Paper 2 (Extended)

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MARK SCHEME

Maximum Mark: 60

Published

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MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

- M Method marks, awarded for a valid method applied to the problem.
- A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.
- B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation ‘**dep**’ is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Part Marks
1(a)	0.15 oe	2	M1 for $0.35 + 0.4 + k + 0.1 = 1$ or better or B1 for 0.85 seen
1(b)	48	1	
2(a)	m^3	1	
2(b)	y^{-8}	1	
2(c)	$\frac{x^5 y^4}{7}$	2	M1 for 2 correct parts and both x and y present ie: $\frac{x^k y^4}{7}$ or $\frac{x^5 y^k}{7}$ or $kx^5 y^4$ ($k \neq 0$)
3	Any irrational number between 6 and 7	1	
4	8.553	2	M1 for 8.55[...] If 0 scored, SC1 for <i>their</i> answer seen and rounded correctly to 3dp
5(a)	13.15, 13.25	2	B1 for each or SC1 for both answers correct but reversed.
5(b)	$2\pi \times 2.1$	M1	
	13.19...	A1	
	<i>their</i> $13.19 > 13.15$ oe	B1	Showing <i>their</i> circumference > 13.15
6(a)	16.8	4	M1 for $8.4 \times 150\,000$ soi and M1 for division by 10^5 oe soi and M1 for $\frac{\textit{their distance}}{45} \times [60]$ oe
6(b)	A valid comment	1	FT from <i>their</i> final speed answer in part (a)

Question	Answer	Marks	Part Marks
7	1936 and 81 or 44^2 and 9^2	2	M1 for 2 correct trials evaluated of form: $a^2 + b^2$ where $a < 10$ and $b > 10$ and a and b are integers or $2017 - a^2 = b^2$ where a is a positive integer with b^2 being tested to see if it is square If 0 scored, SC1 for 44 and 9 seen as a pair
8(a)	95.4 or 95.39 to 95.40	3	M2 for $[LN =] \frac{85}{\cos 27}$ oe or M1 for $\cos 27 = \frac{85}{LN}$ oe
8(b)	38.6 or 38.58 to 38.59	3	M2 for $85 \times \sin 27$ oe or M1 for $\sin 27 = \frac{x}{85}$ oe or M1 for correct line indicated on a diagram
9	40	3	M2 for $\frac{34}{1 - 0.15}$ oe or B1 for 85[%] oe seen
10	16.5	3	M2 for $\sqrt[3]{\frac{2592}{1500}}$ or $\sqrt[3]{\frac{1500}{2592}}$ soi or M1 for $\frac{2592}{1500}$ or $\frac{1500}{2592}$ oe
11	9 nfw	2	M1 for $\frac{54}{308}$ oe
12(a)	3.2	3	M2 for $w = \frac{400}{t^3}$ oe or $50 \times 2^3 = w \times 5^3$ or M1 for $w = \frac{k}{t^3}$ oe or 50×2^3 seen
12(b)	10	1	
13(a)	Complete correct graph drawn	1	
13(b)	$x = 0$ $y = 0$	2	B1 for each

Question	Answer	Marks	Part Marks
14(a)	37	2	M1 for $3(3 \times 5 - 2) - 2$ or $3(3x - 2) - 2$ or $f(5) = 13$ or $f(13)$
14(b)	$\frac{x+2}{3}$ final answer	2	M1 for $[x =]\frac{y+2}{3}$ or $y + 2 = 3x$ or $\frac{y}{3} = x - \frac{2}{3}$ or $x = 3y - 2$ If 0 scored, SC1 for transposing x and y in <i>their</i> equation for x in terms of y
14(c)	x final answer	1	
15	$[y =]3x$	1	
16	22.8 or 22.79 to 22.80	3	M1 for $\frac{1}{2}x^2 \sin 60 = 25$ or better or $\frac{1}{2}x \times \sqrt{x^2 - \left(\frac{x}{2}\right)^2} = 25$ M1 for $x = \sqrt{\frac{25 \times 2}{\sin 60}}$ or $x = \sqrt{\frac{25 \times 4}{\sqrt{3}}}$
17	$-\frac{1}{2}\mathbf{a} + \frac{1}{6}\mathbf{b} + \frac{1}{3}\mathbf{c}$ or $\frac{(-3\mathbf{a} + \mathbf{b} + 2\mathbf{c})}{6}$	4	M1 for $\overline{AB} = -\mathbf{a} + \mathbf{b}$ or $\overline{BC} = -\mathbf{b} + \mathbf{c}$ or $\overline{MN} = \overline{MB} + \overline{BN}$ or any other correct vector expression for \overline{MN} M1FT for $\overline{MB} = \frac{1}{2}\text{their}(-\mathbf{a} + \mathbf{b})$ or $\overline{BN} = \frac{1}{3}\text{their}(-\mathbf{b} + \mathbf{c})$ M1FT for $\overline{MN} = \frac{1}{2}\text{their}(-\mathbf{a} + \mathbf{b}) +$ $\frac{1}{3}\text{their}(-\mathbf{b} + \mathbf{c})$

Question	Answer	Marks	Part Marks
18	$x = k \pm \sqrt{k^2 - kt}$ final answer	4	<p>M1 for $(2x - t)k = x^2$ or $2xk - tk = x^2$ or better</p> <p>M1 for $x^2 - 2kx + kt = 0$ or $x^2 - 2kx = -kt$</p> <p>M1FT for $\frac{2k \pm \sqrt{4k^2 - 4kt}}{2}$ or $(x - k)^2 - k^2 = -kt$</p>