

**GCSE
MATHEMATICS
8300/2F**

Foundation Tier

Paper 2 Calculator

Shadow paper based on June 2023 paper

Mark scheme

June 2023

Second Half

Version: 1.0

Q	Answer	Mark	Comments
13	Correct method or evaluation for the 15% or the 25% or correct multiplier for the increase or the decrease seen	M1	eg 40×0.15 or 6 or 64×0.25 or 16 or 1.15 or 0.75 oe
	Correct method or evaluation for either calculation	M1dep	eg $40 + 40 \times 0.15$ or 46 or 64×0.75 or 48
	Correct method or evaluation for both calculations	M1dep	
	48 with 46 seen	A1	oe eg 64 decreased by 25% with 48 and 46 seen
	Additional Guidance		
	40×1.15 or 46		M1M1
	64×0.75 or 48		M1M1
	40×1.15 or 46 and 64×0.75 or 48		M1M1M1
	Build-up methods must be correct or show correct method for each step eg 1 $10\% = 4$, $5\% = 2$, $15\% = 6$ eg 2 $10\% = 6.4$, $5\% = 6.4 \div 2 = 3.2$, $25\% = 17.2$ (error in build-up but method shown for that step) eg 3 $10\% = 6.4$, $5\% = 3.6$, $25\% = 17.2$ (error in build-up and method not shown for that step)	M1 M1 M0	
	48 and 46 seen and 48 chosen by eg circling		M3A1
	For 40×0.15 , do not accept $40 \times 15\%$ unless recovered		

Q	Answer	Mark	Comments
14	$7(2x + 3y)$	B1	
	Additional Guidance		
	Condone missing final bracket ie $7(2x + 3y$		B1
	Allow multiplying back out to check their answer		
	Further incorrect work after a correct response is B0 eg $7(2x + 3y) = 35xy$		B0
	$7(x2 + y3)$		B0
	$7 \times (2x + 3y)$		B0

Q	Answer	Mark	Comments
15	$-1, 0, 1, 2, 3$	B2	any order B1 four correct and none incorrect or five correct and one incorrect
	Additional Guidance		
	$-1, 0, 1, 2$		B1
	$-1, 0, 1, 2, 3, 4$		B1
	$-1, 1, 2, 3$		B1
	$-1, 1, 2, 3, 4$		B0

Q	Answer	Mark	Comments
16	$5n + 2$ or $2 + 5n$	B2	oe eg $7 + (5n - 5)$ B1 $5n (+ \dots)$ or $5n (- \dots)$
	Additional Guidance		
	Ignore LHS of formula given eg $T_n = 5n + 2$		B2
	Condone $n = 5n + 2$ or n th term $= 5n + 2$		B2
	Allow a multiplication sign eg $5 \times n + 2$ or $n \times 5 + 2$		B2
	Allow other variables eg $5x + 2$		B2
	$5x$		B1
	$n5 \dots$		B1
	$n5 + 2$		B1
	$5n$ th $+ 2$		B1
	$5n$ th		B0
	$5n + 2n$		B0

Q	Answer	Mark	Comments											
17	35×9 or 315	M1	oe number of 2p coins may be embedded											
	$35 \times 9 \times 2$ or 315×2 or 630 or 6.3(0)	M1dep	oe value of 2p coins implied by 980 or 9.8(0)											
	$14.3(0) - \text{their } 6.3(0) - 35 \times 0.1(0)$ or $1430 - \text{their } 630 - 35 \times 10$ or 4.5(0) or 450	M1dep	oe value of 5p coins implied by 6.3 : 4.5 oe ratio not in simplest form or 4.5 : 6.3 oe ratio											
	7 : 5	A1	accept $1.4 : 1$ or $\frac{7}{5} : 1$ or $1\frac{2}{5} : 1$ or $1 : 0.71(\dots)$ or $1 : \frac{5}{7}$											
	Additional Guidance													
	Up to M3 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts													
	Allow working in pence or pounds throughout													
	Must work consistently in pence or pounds for the third mark (or recover)													
	Ignore units in the ratio eg 7p : 5p or £1.40 : £1		M3A1											
	630 may be seen in a ratio with the value of the 10p coins eg 630 : 350 or 6.3 : 3.5		M2											
	450 may be seen in a ratio with the value of the 10p coins eg 450 : 350 or 4.5 : 3.5		M3											
	For information: <table border="1"> <tr> <td>Coin</td><td>10p</td><td>2p</td><td>5p</td></tr> <tr> <td>Number</td><td>35</td><td>315</td><td>90</td></tr> <tr> <td>Value</td><td>£3.50</td><td>£6.30</td><td>£4.50</td></tr> </table>			Coin	10p	2p	5p	Number	35	315	90	Value	£3.50	£6.30
Coin	10p	2p	5p											
Number	35	315	90											
Value	£3.50	£6.30	£4.50											

Q	Answer	Mark	Comments																											
18(a)	All values correct	B2	B1 1 or 2 rows correct																											
	Additional Guidance																													
	<table><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>5x</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td></tr><tr><td>8x</td><td>8</td><td>16</td><td>24</td><td>32</td><td>40</td><td>48</td></tr><tr><td>x²</td><td>1</td><td>4</td><td>9</td><td>16</td><td>25</td><td>36</td></tr></table>			1	2	3	4	5	6	5x	5	10	15	20	25	30	8x	8	16	24	32	40	48	x ²	1	4	9	16	25	36
	1	2	3	4	5	6																								
5x	5	10	15	20	25	30																								
8x	8	16	24	32	40	48																								
x ²	1	4	9	16	25	36																								

Q	Answer	Mark	Comments
18(b)	$\frac{5}{18}$ or 0.27(7...) or 0.28 or 27(.7...) % or 28%	B1ft	oe fraction, decimal or percentage ft their table with ≥ 12 values must be using 18 for the total number of possible scores
	Additional Guidance		
	Ignore simplification or conversion attempt (not ratio) after correct probability seen		
	Ratio answer eg 5 : 18, even alongside a correct probability is B0		
	ft decimals or percentages must be correct to the same accuracy as in the scheme eg 8 winning values in their table $\frac{8}{18}$ or 0.44(4...) or 44(.4...) %		B1ft

Q	Answer	Mark	Comments
18(c)	$756 \times \text{their } \frac{5}{18}$	M1	oe ft their probability from (b) or if no probability in (b), ft their table with ≥ 12 values where $0 < \text{their probability} < 1$ probabilities, if rounded in (c), must be truncated or rounded to at least 2 sf
	210	A1	
	Additional Guidance		
	Answer 210		M1A1
	$\frac{210}{756}$ on answer line		M1A0
	Condone 210 out of 756		M1A1
	Do not treat estimating by rounding as a misread eg1 800 used instead of 756 eg2 (b) 0.27 (c) 0.3×756 (rounded to 1sf in (c) for the probability) eg3 (b) 0.3 (c) 0.3×756 (follows through their (b))		M0A0 M0A0 M1A0
	Do not allow ft for a ratio from (b) but may ft their (a) instead		
	For 0.27×756 , accept $27\% \times 756$ but do not accept 27% of 756 unless recovered		
	The method mark may be implied by a ft answer (decimal or truncated to the nearest integer or rounded up to the nearest integer) eg1 (b) $\frac{6}{16}$ (c) 283.5 or 283 or 284 (correct ft method implied using (b)) eg2 (a) completed table has 6 winning values (b) no probability shown (c) 252 (correct ft method implied using (a))		M1A0 M1A0

Q	Answer	Mark	Comments
19(a)	360 ÷ 6 or 120 seen	M1	oe eg $60 \times 6 = 360$ or $180 - \frac{(6-2) \times 180}{6}$ may be on diagram
	60	A1	
	Additional Guidance		
	M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	60 seen but not chosen as answer, even if linked to the wrong angle		M1A0
Q	Answer	Mark	Comments
19(b)	It is more than the answer to part (a)	B1	

Q	Answer	Mark	Comments
20	$\begin{pmatrix} 5 \\ -4 \end{pmatrix}$	B2	B1 $\begin{pmatrix} 5 \\ \dots \end{pmatrix}$ or $\begin{pmatrix} \dots \\ -4 \end{pmatrix}$ SC1 $\begin{pmatrix} -5 \\ 4 \end{pmatrix}$
	Additional Guidance		
	$(5, -4)$ or $\begin{pmatrix} -4 \\ 5 \end{pmatrix}$		B0
	Ignore words if a vector is also seen eg1 Reflection $\begin{pmatrix} 5 \\ -4 \end{pmatrix}$ eg2 5 right 4 up and $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$ eg3 5 right 4 down eg4 Rotate 5 left and 4 up and $\begin{pmatrix} -5 \\ 4 \end{pmatrix}$		B2 B1 B0 SC1
	Condone any type of brackets		
	Condone missing brackets for B2 or B1 or SC1 but must have two numbers in a column		
	Condone 'fraction line' for B2 or B1 or SC1 but must have two numbers in a column		
	$\begin{pmatrix} 5x \\ -4y \end{pmatrix}$ or $\begin{pmatrix} x5 \\ -y4 \end{pmatrix}$ or $\begin{pmatrix} x+5 \\ y-4 \end{pmatrix}$ or $\begin{pmatrix} 5 \text{ right} \\ 4 \text{ down} \end{pmatrix}$ or $\begin{pmatrix} 5 \text{ r} \\ 4 \text{ d} \end{pmatrix}$ or $\begin{pmatrix} 5 \rightarrow \\ 4 \downarrow \end{pmatrix}$		B0

Q	Answer	Mark	Comments
21	Alternative method 1 Compares 80% of volume of hemisphere with volume of water		
	$\frac{4}{3} \times \pi \times 9^3$ or 972π or [3044, 3054] or $\frac{2}{3} \times \pi \times 9^3$ or 486π or [1522, 1527]	M1	oe eg $\frac{4}{3}\pi \times 729$ allow without any multiplication signs eg $\frac{4}{3}\pi 9^3$
	$0.8 \times \text{their } 486\pi$ or 388.8π or [1217, 1222]	M1dep	oe $0.8 \times \text{their } [1522, 1527]$ or $\frac{1944}{5}\pi$ must be using volume of hemisphere
	185×7 or 1295	M1	oe
	[1217, 1222] and 1295 and Yes	A1	oe
	Alternative method 2 Works out volume of water as proportion of volume of hemisphere		
	$\frac{4}{3} \times \pi \times 9^3$ or 972π or [3044, 3054] or $\frac{2}{3} \times \pi \times 9^3$ or 486π or [1522, 1527]	M1	oe eg $\frac{4}{3}\pi \times 729$ allow without any multiplication signs eg $\frac{4}{3}\pi 9^3$
	185×7 or 1295	M1	Oe
	their $1295 \div \text{their } 486\pi$ or [0.84, 0.86]	M1dep	oe eg their $1295 \div \text{their } [1522, 1527]$ or 85% dep on M2 must be using volume of hemisphere
	[84, 86](%) and Yes	A1	oe eg 0.85 and 0.8 and Yes

Question 21 continues on the next page

21 cont	Alternative method 3 Works out time to fill 80% of volume of hemisphere		
	$\frac{4}{3} \times \pi \times 9^3$ or 972π or [3044, 3054] or $\frac{2}{3} \times \pi \times 9^3$ or 486π or [1522, 1527]	M1	oe eg $\frac{4}{3}\pi \times 729$ allow without any multiplication signs eg $\frac{4}{3}\pi 9^3$
	$0.8 \times \text{their } 486\pi$ or 388.8π or [1217, 1222] or their $486\pi \div 185$ or [8.1, 8.3]	M1dep	oe $0.8 \times \text{their } [1522, 1527]$ or $\frac{1944}{5}\pi$ or their $[1522, 1527] \div 185$ must be using volume of hemisphere
	$0.8 \times \text{their } 486\pi \div 185$ or $0.8 \times \text{their } [1522, 1527] \div 185$ or [6.5, 6.61]	M1dep	oe their $[1217, 1222] \div 185$ or $0.8 \times \text{their } [8.1, 8.3]$
	[6.5, 6.61] and Yes	A1	oe

Question 21 continues on the next page

21 cont	Additional Guidance	
	Up to M3 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts	
	Allow 1.33(...) for $\frac{4}{3}$	
	Allow 0.66(...) or 0.67 for $\frac{2}{3}$	
	π may be seen as [3.14, 3.142] eg Alt 1 $\frac{2}{3} \times 3.14 \times 9^3$	M1
	If a number (or calculation) in terms of π is seen but π is subsequently omitted, treat as a miscopy for M marks eg Alt 1 486 π $0.8 \times 486 = 388.8$ $185 \times 7 = 1295$ Yes	M1 M1dep M1A0
	Yes cannot be implied by inequalities	
	Alts 1 and 2 $185\text{cm}^3 \times 7$ seen is M1 even if evaluated incorrectly $185^3 \times 7$ seen is M0 unless recovered to 1295	
	Do not allow misreads of the given formula unless recovered eg1 using 9^2 instead of 9^3 eg2 using $\frac{3}{4}$ instead of $\frac{4}{3}$	
	For $0.8 \times$ their 486π , do not accept $80\% \times$ their 486π unless recovered	

Q	Answer	Mark	Comments
22	$9 \div 4$ or $13.5 \div 6$ or $\frac{9}{4}$ or $\frac{13.5}{6}$ or 2.25 or $6 \div 4$ or $13.5 \div 9$ or $\frac{6}{4}$ or $\frac{13.5}{9}$ or 1.5	M1	oe use of a valid pair of sides to make an appropriate calculation or value eg $4 \div 9$ or 0.44(...) or $4 \div 6$ or 0.66(...)
	$9 \div 4 = 13.5 \div 6$ or $\frac{9}{4} = \frac{13.5}{6}$ or $6 \div 4 = 13.5 \div 9$ or $\frac{6}{4} = \frac{13.5}{9}$	A1	oe showing sides are in proportion eg $4 \div 9 = 6 \div 13.5$ or $\frac{4}{6} = \frac{9}{13.5}$
	Additional Guidance		
	For A1 equating may be implied by two calculations or two fractions with correct evaluation eg $9 \div 4 = 13.5 \div 6$ is implied by $9 = 4 \times 2.25$ and $13.5 = 6 \times 2.25$		M1A1
	For A1 equating may be implied by calculations eg1 $9 \div 4 = 13.5 \div 6$ is implied by $9 \div 4 = 2.25$ and $6 \times 2.25 = 13.5$ eg2 $9 \div 4 = 13.5 \div 6$ is implied by $\frac{9}{4} \times 6 = 13.5$		M1A1 M1A1
	$4 \times 13.5 = 9 \times 6$		M1A1
	$4 \times 13.5 = 54$ and $9 \times 6 = 54$		M1A1
	Non-contradictory working can be ignored eg correct response along with area calculations		M1A1
	Ignore words eg references to scale factors, enlargement, angles		
	Working on diagrams may be seen eg1 Arrows or lines from 4 to 9 and 6 to 13.5 with $\times 2.25$ on them eg2 Arrows or lines from 4 to 9 and 6 to 13.5 with 2.25 on them Arrows or lines must unambiguously link relevant numbers		M1A1 M1A0
	For $9 \div 4$ or $\frac{9}{4}$ allow $9 : 4$ etc		

Q	Answer	Mark	Comments
23	$100 \times x$ or $100x$ or $x \times 100$ or $x100$ or $x \div 60$ or $\frac{x}{60}$ or $\frac{1}{60}x$ or $x\frac{1}{60}$ or $100 \div 60$ or $\frac{100}{60}$	M1	plasters per hour boxes per minute
	$\frac{100x}{60} \left(= \frac{5x}{3} \right)$ or $100 \div 60 \times x \left(= \frac{5x}{3} \right)$	A1	oe showing 100 and 60 and x eg $\frac{100 \times x}{60} \left(= \frac{5x}{3} \right)$ or $x\frac{100}{60} \left(= \frac{5x}{3} \right)$ or $\frac{100}{60} \times x \left(= \frac{5x}{3} \right)$ or $100x \div 60 \left(= \frac{5x}{3} \right)$
	Additional Guidance		
	M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Do not allow M1 if only seen embedded in an incorrect expression or calculation eg $100x \times 5 = 500x$		M0
	$60 \times \frac{5x}{3} = 100x$ (M1 allowed as $100x$ is not embedded in an incorrect expression or calculation, A0 because using the given answer)		M1A0
	Condone $x = 100 \div 60$		M1A0
	$\frac{100x}{60} \left(= \frac{5x}{3} \right)$		M1A1
	$\frac{100}{60} = \frac{5}{3}$ and $\frac{5}{3} \times x \left(= \frac{5x}{3} \right)$ $\frac{100}{60} = \frac{5}{3}$ and $\frac{5x}{3}$		M1A1 M1A0

Additional guidance for Question 23 continues on the next page

Q	Additional Guidance (continued)	
23	No equivalents allowed for M1	
	Ignore units	
	Condone 1.66(...) for $\frac{5}{3}$	
	Ignore non-contradictory working after M1A1 seen	