Q	Answer	Mark	Comments
1	$5x^3 + 15x$	B1	

Q	Answer	Mark	Comments
2(a)	$\frac{38}{25}$	B1	

Q	Answer	Mark	Comments
2(b)	300	B1	

Q	Answer	Mark	Comment
3	12.9^2 or 166.41 and 17.2^2 or 295.84	M1	implied by 462.25 or 129.43 or $\sqrt{129.43}$ or 11.37… or 11.38 or 11.4
	$\sqrt{12.9^2 + 17.2^2}$ or $\sqrt{166.41 + 295.84}$ or $\sqrt{462.25}$	M1dep	
	21.5	A1	oe
	Additional Guidance		
	Correct answer with no working		M1M1A1
	21.5 with error seen is A0 eg $\sqrt{12.9^2 + 17.2^2} = \sqrt{461.95}$ Answer 21.5		M1M1A0
	Answer from trigonometry or drawing		M0M0A0

Q	Answer	Mark	Comments
4	230	B1	

	Answer	Mark	Comment
5	**Alternative method 1: price of buying 8 from each shop**		
	2.39 × 8 or 19.12	M1	oe shop A
	3.08 × 4 + 3.08 ÷ 2 × 4 or 18.48	M1	oe shop B
	11.4 ÷ 6 or 1.9(0) or 11.4 × 2 ÷ 6 or 3.8(0)	M1	oe shop C
	11.4 × 2 – their 1.9(0) × 2 or 11.4 × 2 – their 3.8(0) or 19(.00)	M1dep	oe dep on previous mark $11.4 \times \frac{5}{6} \times 2$ oe scores 3rd & 4th marks
	B and 18.48 with 19.12 and 19(.00) seen	A1	
	Alternative method 2: compares price of individual sticks first		
	3.08 × 1.5 ÷ 2 or 2.31	M1	oe shop B
	(11.4 ÷ 4) ÷ 6 or 0.47(5) or 0.48	M1	oe shop C
	11.4 ÷ 4 – their 0.475 or 2.37(5) or 2.38	M1dep	oe dep on previous mark $11.4 \times \frac{5}{6} \div 4$ oe scores 2nd & 3rd marks
	their 2.31 × 8 or 18.48 with M3 awarded	M1dep	oe
	B and 18.48 with 2.31 and 2.37(5) or 2.38 seen	A1	

Mark scheme and Additional Guidance continue on the next page

5 cont	**Alternative method 3: compares the price of 4 sticks first**		
	2.39 × 4 or 9.56 and 3.08 × 1.5 × 2 or 9.24	M1	oe shops A and B
	11.4 ÷ 6 or 1.9(0)	M1	oe shop C
	11.4 – their 1.9(0) or 9.5(0)	M1dep	dep on previous mark $11.4 \times \frac{5}{6}$ oe scores 2nd & 3rd marks
	their 9.24 × 2 or 18.48 with M3 awarded	M1dep	oe
	B and 18.48 with 9.56 and 9.24 and 9.5(0) seen	A1	
	Alternative method 4: compares the price of 2 sticks first		
	2.39 × 2 or 4.78 and 3.08 × 1.5 or 4.62	M1	oe shops A and B
	(11.4 ÷ 2) ÷ 6 or 0.95	M1	oe shop C
	11.4 ÷ 2 – their 0.95 or 4.75	M1dep	dep on previous mark $11.4 \times \frac{5}{6} \div 2$ oe scores 2nd & 3rd marks
	their 4.62 × 4 or 18.48 with M3 awarded	M1dep	oe
	B and 18.48 with 4.78 and 4.62 and 4.75 seen	A1	

Additional Guidance continues on the next page

5 cont

Additional Guidance

Up to M4 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts	
Use the scheme which gives the highest mark	
NB The 4th mark in Alts 2, 3 and 4 does not imply any earlier marks Either the method or values must have been seen and awarded for the first 3 marks in order to give this mark However 18.48 always implies M1 by Alt 1	
If students use different numbers of sticks for different shops do not combine marks from different schemes but note that there are possible valid methods that compare eg 2 sticks from A and B and then 4 sticks from B and C (escalate if seen)	
All schemes can be oe in pence and allow work in a mix of pounds or pence for up to M4	
Allow × 0.16(6…) or × 16(.6…)% or × 0.167 or × 16.7% or × 0.17 or × 17% if seen for method for one sixth for shop C but must recover to given values for A mark	
Allow × 0.83(3…) or × 83(.3…)% if seen for method for five sixths for shop C but must recover to given values for A mark	

Shop	Cost for 1	Cost for 2	Cost for 4	Cost for 8
A	2.39	4.78	9.56	19.12
B	2.31	4.62	9.24	18.48
C	2.37(5) or 2.38	4.75	9.5(0)	19(.00)

Q	Answer	Mark	Comment
6(a)	3	B1	

Q	Answer	Mark	Comment
6(b)	No and correct reason	B1	eg no and this gives percentage (not angle) no and it should be (×) 360 (not 100) no and it should be 72
	Additional Guidance		
	Yes indicated		B0
	If neither box is ticked then No may be implied by the reason eg She hasn't used 360° for the circle		B1
	Ignore irrelevant, non-contradictory statements		
	Do not ignore incorrect calculations or evaluations of the angle, or incorrect statements		
	No and this is 20%		B1
	No and she still needs to work out 20% of 360		B1
	No and a circle is 360°		B1
	No and angles in a pie chart are 360		B1
	No and she needs to divide 360 by 5		B1
	No, shouldn't have × by 100		B0
	No, she should have divided 360 / divided by 360		B0
	No and a circle has 360 **not 180**		B0
	No and it's not big enough		B0

Q	Answer	Mark	Comment
7	Correct method or evaluation of the area of any face or correct method or evaluation of the volume of any relevant cuboid of length 6 cm	M1	eg 5×6 or 30 or 2×6 or 12 or 3×6 or 18 or 4×6 or 24 or $2 \times 5 + 2 \times 2$ or $10 + 4$ or 14 or $2 \times 5 \times 6$ or 60 or $2 \times 2 \times 6$ or 24 or $2 \times 3 \times 6$ or 36 or $4 \times 2 \times 6$ or 48 or $5 \times 4 \times 6$ or 120
	Correct method for volume of prism	M1dep	eg $2 \times 5 \times 6 + 2 \times 2 \times 6$ or $60 + 24$ or 14×6
	84	A1	
	Additional Guidance		
	The first M1 may be awarded even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comment
8	3×45 or 135 or 63	M1	may be seen embedded in an expression, equation or calculation eg $3 \times 45 + 31.5x = 198$
	$\frac{198 - 3 \times 45}{31.5}$ or $(198 - 135) \div 31.5$ or $63 \div 31.5$ or 2 (hours)	M1dep	oe eg $31.5 \times 2 = 63$ implied by total of 5 (hours)
	$198 \div (3 + \text{their } 2)$ or $198 \div 5$	M1dep	
	39.6	A1	accept 40 with M3 awarded
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	NB $31.5 \div (45 \div 3) = 2$ (hours)		M0M0

Q	Answer	Mark	Comment
9	$8a + 29$	B1	oe eg $2(4a + 13) + 3$
	$15a + 48$	B1ft	correct or ft B0 only their $8a + 29$ must be in the form $na + c$ where $n \neq 0$ and $c \neq 0$ implied by $3(5a + 16)$
	$3(5a + 16)$ or $15 = 5 \times 3$ and $48 = 16 \times 3$	B1	oe eg $5a + 16$ so it divides by 3
	Additional Guidance		
	Ignore use of substitution as an attempt to show divisibility		
	Ignore further non-contradictory statements		
	Further simplification eg $15a + 48 = 63$ which is 21×3		B1B1B0
	For the 1st B1 accept $8a + 29$ embedded in a calculation for the sum of the first four terms eg $a + 1 + 2a + 5 + 4a + 13 + 8a + 29$		
	For the 2nd B1 accept $15a + 48$ embedded in a calculation to show divisibility eg $\frac{15a + 48}{3} = 5a + 16$		
	For the 3rd B1 accept 15 is a multiple of 3 and 48 is a multiple of 3		
	$8a + 29$ $a + 2a + 4a + 8a = 15a$ $1 + 5 + 13 + 29 = 48$ but $15a + 48$ not seen $15 = 5 \times 3$ and $48 = 16 \times 3$		B1 B0 B1

Q	Answer	Mark	Comments
10	A'	B1	

Q	Answer	Mark	Comments
11	6	B1	

Q	Answer	Mark	Comments
12	30×1.6 or 48 or 20×2.05 or 41	M1	oe
	$\frac{30 \times 1.6 + 20 \times 2.05}{30 + 20}$ or $\frac{89}{50}$	M1dep	oe
	1.78	A1	allow 1.8 with M2 seen
	Additional Guidance		
	The first M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Answer only 1.8		M0M0A0

Q	Answer	Mark	Comment
13	**Alternative method 1**		
	$\frac{32-14}{12-3}$ or $\frac{18}{9}$ or (m =) 2	M1	oe eg $\frac{14-32}{3-12}$ implied by $y = 2x$ …
	14 = their 2 × 3 + c or 32 = their 2 × 12 + c or (m =) 2 and c = 8 or y – 14 = their 2(x – 3) or y – 32 = their 2(x – 12)	M1dep	oe
	$y = 2x + 8$	A1	
	Alternative method 2		
	14 = 3m + c and 32 = 12m + c and 32 – 14 = 12m – 3m or m = 2 or 56 = 12m + 4c and 32 = 12m + c and 56 – 32 = 4c – c or c = 8	M1	oe correct method to work out m or c using simultaneous equations implied by $y = 2x$ … or $y = mx + 8$
	Correct substitution of their m into one of the original equations or correct substitution of their c into one of the original equations or m = 2 and c = 8	M1dep	
	$y = 2x + 8$	A1	

Q	Answer	Mark	Comments
14	Arc, centre *P*, radius [6.8, 7.2] cm	B1	from use of compasses, mark intention
	Two intersections from arcs with equal radii, centres *P* and *Q*	M1	tolerance 2 mm
	Perpendicular bisector of *PQ* with M1 seen	A1	
	Correct region shown (arcs for bisector not required)	B1	allow any clear indication of region
	Additional Guidance		
	Arc, centre *P*, radius [6.8, 7.2] cm and correct region indicated but arcs for bisector not seen		B1M0A0B1
	For A1 the perpendicular bisector of PQ must be long enough to provide the straight boundary of the correct region		
	Ignore redundant or incorrect lines/arcs		

Q	Answer	Mark	Comments
15(a)	0.4 × 25 or 10 or 0.36 × 50 or 18	M1	oe may be seen by the table
	8	A1	
	Additional Guidance		
	The first M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
15(b)	320	B1	

Q	Answer	Mark	Comments
16	$b^3 < 0$	B1	

Q	Answer	Mark	Comments
17(a)	190 – 64 or 140 – 64 or 184 – 140 or 190 – 184 or 76 or 44 or 6	M1	oe may be seen in table
	126	A1	

Q	Answer	Mark	Comments
17(b)	Valid criticism involving incorrect point	B1	eg (50, 200) should be (50, 190)
	Valid criticism involving vertical axis label	B1	eg frequency should be cumulative frequency
	Additional Guidance		
	Ignore irrelevant additional criticism eg title should include people and (50, 200) should be (50, 190)		B1
	Do not ignore incorrect statements eg (50, 200) should be (50, 190) and they should have plotted at the midpoints		B0
	The point at 190 is not plotted correctly		B1
	A point is plotted incorrectly		B0
	Some points are plotted incorrectly		B0
	Not all points are plotted correctly		B0
	200 should be 190 (could be referring to the vertical axis)		B0
	The graph goes to 200		B0
	Should have used cumulative frequency for the label		B1
	Frequency should be changed to cumulative frequency or number of people		B0
	Has not labelled it correctly		B0
	Should have used cumulative frequency		B0
	Her graph shows only frequency not cumulative frequency		B0

Q	Answer	Mark	Comments
18	$(x + 3)^2$ …	M1	
	$(x + 3)^2 + 4$	A1	
	$(x + 3)^2 + 4$ and valid argument	A1	eg $(x + 3)^2 + 4$ and $(x + 3)^2 \geqslant 0$ and adding 4 or $(x + 3)^2 + 4$ and this is $\geqslant 4$ or correct reference to a minimum point and its position above the x-axis
	Additional Guidance		
	$(x + 3)^2 + 4$ and Even if x is negative it is squared so will be positive so the expression is always positive (no reference to the + 4)		M1A1A0
	$(x + 3)^2 + 4$ and Turning point is (–3, 4) which is positive on the y-axis and as x^2 coefficient it is a U-shape therefore always positive		M1A1A1
	Incorrect work after $(x + 3)^2 + 4$ seen, eg $(x + 3)^2 + 4 = 0$		M1A1A0
	Condone $>$ for $\geqslant$		

Q	Answer	Mark	Comments
19	No and valid reason	B1	eg no and 16 times bigger
	Additional Guidance		
	No and It is to the power 4 not times by 4 (unclear that 'it' is 2)		B0
	No and $2^4 = 16$, $4^4 = 256$, $16 \times 8 = 128$		B1
	No and $2^4 = 16$, $4^4 = 256$ (using B = 2 as an example and does not show that 256 is not 16×8)		B0
	No and $2^4 = 16$ (shows the correct calculation)		B1
	No and $(2B)^4 = 16B^4$		B1

Q	Answer	Mark	Comments
20	$p(1-m) = 2m + 1$	M1	
	$p - pm = 2m + 1$	M1dep	
	$p - 1 = 2m + pm$ or $p - 1 = m(2 + p)$ or $\frac{p-1}{2+p}$	M1dep	oe collection of terms in m eg $-pm - 2m = 1 - p$ oe eg $\frac{1-p}{-p-2}$ or $\frac{p}{2+p} - \frac{1}{2+p}$
	$m = \frac{p-1}{2+p}$ or $\frac{p-1}{2+p} = m$	A1	oe eg $m = \frac{1-p}{-p-2}$ or $m = \frac{p}{2+p} - \frac{1}{2+p}$
	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		
	Condone $m = \frac{p-1}{2+p}$ in working with $\frac{p-1}{2+p}$ on answer line		M1M1M1A1
	$m = \frac{p-1}{2+p}$ followed by incorrect further work		M1M1M1A0
	$p(1-m)^2 = 2m + 1$		M0M0M0A0

Q	Answer	Mark	Comments
21	**Alternative method 1**		
	1225 or 1175 or 145 or 135	M1	
	their 1225 + their 145 or 1370 and 1225 and 145	M1	must add two upper bounds their 1225 must be (1200, 1250] their 145 must be (140, 150]
	1370 and Yes and 1225 and 145	A1	
	Alternative method 2		
	1225 or 1175 or 145 or 135	M1	
	1375 – their 1225 or 1375 – their 145	M1	their 1225 must be (1200, 1250] their 145 must be (140, 150]
	145 and 150 and Yes or 1225 and 1230 and Yes	A1	
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Note that M0M1A0 is possible eg 1224 + 144		M0M1A0
	Accept correct use of decimals eg 1224.9 for 1225		
	Yes may be implied eg The table can be added		

Q	Answer	Mark	Comments
22	$(5a + b)(5a – b)$	B1	brackets in either order
	Additional Guidance		
	Condone missing final bracket eg $(5a + b)(5a – b$		B1
	Condone multiplication sign eg $(5a + b) \times (5a – b)$		B1
	Accept $(–5a + b)(–5a – b)$		B1

Q	Answer	Mark	Comments
23(a)	$\frac{1}{2} \times 10 \times 3.2$ or 16 or $\frac{1}{2} \times (3.2 + 5.8) \times 10$ or 45 or $\frac{1}{2} \times (5.8 + 7.4) \times 10$ or 66 or $\frac{1}{2} \times (7.4 + 6) \times 10$ or 67	M1	oe eg $3.2 \times 10 + \frac{1}{2} \times (5.8 - 3.2) \times 10$
	At least three of $\frac{1}{2} \times 10 \times 3.2$ or 16 and $\frac{1}{2} \times (3.2 + 5.8) \times 10$ or 45 and $\frac{1}{2} \times (5.8 + 7.4) \times 10$ or 66 and $\frac{1}{2} \times (7.4 + 6) \times 10$ or 67	M1dep	oe M2 $\frac{1}{2} \times 10 \{0 + 6 + 2(3.2 + 5.8 + 7.4)\}$ oe
	194	A1	
	Additional Guidance		
	The first M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Values may be seen on the diagram		
	Answer 194 and extra strips used		M1M1A1

Q	Answer	Mark	Comments
23(b)	$\frac{6}{40}$ or $\frac{3}{20}$ or 0.15	B1	
	m/s^2 or m/s/s or ms^{-2}	B1	oe eg metres per second per second
	Additional Guidance		
	Ignore incorrect simplification or conversion after correct answer seen		

Q	Answer	Mark	Comments
24	**Alternative method 1**		
	$4(2x^2 + 1)$ or $7(2x^2 + 1)$ or $\frac{8x^2+4}{5} \times \frac{3}{14x^2+7}$	M1	
	$\frac{4\left(2x^2+1\right)}{5x} \times \frac{3x}{7\left(2x^2+1\right)}$ or $\frac{4(2x^2+1)}{5} \times \frac{3}{7(2x^2+1)}$ or $\frac{4}{5x} \times \frac{3x}{7}$	M1dep	$\frac{4}{5x} \times \frac{3x}{7}$ must follow $4(2x^2 + 1)$ and $7(2x^2 + 1)$
	$\frac{12}{35}$ with M2 seen	A1	
	Alternative method 2		
	$\frac{24x^3+12x}{70x^3+35x}$ or $\frac{x(24x^2+12)}{x(70x^2+35)}$ or $\frac{24x^2+12}{70x^2+35}$	M1	
	$\frac{12x(2x^2+1)}{35x(2x^2+1)}$ or $\frac{12(2x^3+x)}{35(2x^3+x)}$ or $\frac{12(2x^2+1)}{35(2x^2+1)}$	M1dep	
	$\frac{12}{35}$ with M2 seen	A1	
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
25	$\frac{25}{20}$ or $\frac{5}{4}$ or 1.25 or $\frac{20}{25}$ or $\frac{4}{5}$ or 0.8 or (ratio of lengths is) 20 : 25	M1	oe
	$\left(\frac{25}{20}\right)^3$ or $\left(\frac{5}{4}\right)^3$ or 1.25^3 or $\left(\frac{20}{25}\right)^3$ or $\left(\frac{4}{5}\right)^3$ or 0.8^3 or (ratio of volumes is) $20^3 : 25^3$	M1dep	oe eg $\frac{125}{64}$ or 1.953125 or $\frac{64}{125}$ or 0.512 oe eg $4^3 : 5^3$
	$17.5(0) \div 1.25^3$ or $17.5(0) \times 0.8^3$	M1dep	oe
	8.96	A1	SC2 34.18
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	$17.5(0) \times 1.25^3$ or $17.5(0) \div 0.8^3$		M1M1M0A0
	1.25^2 or 0.8^2		M1M0M0A0

Q	Answer	Mark	Comments
26	1.02 × 1500 – 100 or 1430	M1	oe
	1.02 × their 1430 – 100 or 1358.6	M1dep	oe
	1358.60	A1	SC2 1285.77(2)
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Further work after 1358.6(0) seen		M1M1A0

Q	Answer	Mark	Comments
27	$8 = a \times b^0$ or $a = 8$	M1	oe
	343 = their $8 \times b^3$	M1dep	oe
	$\sqrt[3]{\frac{343}{\text{their } 8}}$ or $b = \frac{7}{2}$	M1dep	oe
	28	A1	
	Additional Guidance		
	The first M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
28	$\cos 72 = \frac{9}{x}$	M1	oe eg $\frac{x}{\sin 72} = \frac{18}{\sin 36}$ x can be any letter or *VB* or *VA* or *VC* or *VD*
	$\frac{9}{\cos 72}$	M1dep	oe eg $\frac{18 \times \sin 72}{\sin 36}$
	29.1(2…)	A1	accept 29 with M1 scored
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
29	**Alternative method 1**		
	5 × 5 × 5 or 125 or 5 (× 1) × 4 or 20	M1	oe
	105	A1	
	Alternative method 2		
	5 (× 1 × 1) or 5 and 5 × 4 (× 1) or 20 and 5 × 4 × 3 or 60	M1	oe 5 × 4 (× 1) or 20 may appear twice
	105	A1	
	Additional Guidance		
	The first M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	5 × 4 (× 1) or 20		M1