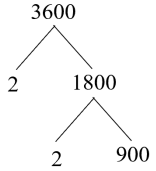
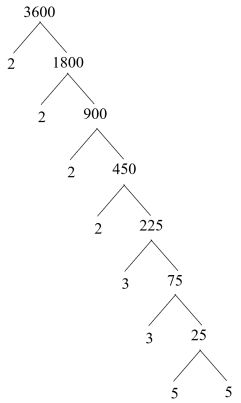
Q	Working	Answer	Mark	Notes
1	$0.0027 = \frac{5.4}{(V)}$ oe		5	M1 for correctly using $\text{density} = \frac{\text{mass}}{\text{volume}}$
	$(V =) \frac{5.4}{0.0027} (= 2000)$			M1 for correctly rearranging for V
	$p \times 10^2 \times h = 2000$ oe			M1ft their 2000 for $p \times 10^2 \times h =$ their V
	$(h =) \frac{2000}{p \times 10^2}$ oe (= 6.3661…)			M1ft their 2000 dep on previous M1 for correctly rearranging for h
	Correct answer scores full marks (unless from obvious incorrect working)	6.4		A1 awrt 6.4
				Total 5 marks

2	12 × 2.45 (= 29.4) **or** 21 ÷ 12 (= 1.75)		3	M1
	$\frac{'29.4' - 21}{21} \times 100$ oe **or** $\frac{2.45 - '1.75'}{'1.75'} \times 100$ oe **or** $(\frac{'29.4' - 21}{12}) \div '1.75' \times 100$ oe **or** $(\frac{2.45}{'1.75'} \times 100) - 100$ oe			M1 or an answer of 140(%)
	Correct answer scores full marks (unless from obvious incorrect working)	40		A1
				Total 3 marks

Q	Working	Answer	Mark	Notes	
3	$\frac{4.5}{100} \times 25\,000\ (=1125)$ **or** $\frac{104.5}{100} \times 25000 (= 26\,125)$ **or** $1150 \times 3\ (= 3450)$ **or** $25\,000 + 1150 \times 3\ (= 28\,450)$ (allow $\frac{3 \times 4.5}{100} \times 25000 (= 3375)$ for this mark)		4	M1 finding 4.5% or 104.5% of 25 000 (allow for $3 \times 0.045 \times 25\,000$ oe) **or** the total interest for T bank **or** the total amount gained for T bank	M2 for $1.045^3 \times 25000 (=28\,529.(15313))$
	$\frac{4.5}{100} \times$ (25 000 + '1125') (= 1175.625 or 1175 or 1176) **and** $\frac{4.5}{100} \times$ (25 000 + '1125' + '1175.625') (= 1228.529) **or** $\frac{104.5}{100} \times 26125 (= 27300.625)$ **and** $\frac{104.5}{100} \times 27300.625 (= 28529.15....)$			M1 completing the interest for C bank **or** completing the total amount for C bank	
	'1125' + '1176' + '1229' (= 3530) **or** '28 529' – 25 000 (=3529) **and** 3 × 1150 (= 3450) **or** '28 529' **and** 25 000 + '3450' (= 28 450)			M1 for total interest for C bank and total interest for T bank **or** total amount for C bank and total amount for T bank	
	Working required	79 or 80		A1 dep on M2 Allow 79 - 80	
					Total 4 marks

Q	Working	Answer	Mark	Notes
4 (a)		$\frac{31}{70}$	1	B1 31/70 Accept 0.44(28571…..) or 44.(2…)%
(b)	4 × 6 + 12 × 14 + 20 × 19 + 28 × 25 + 36 × 6 (= 1488) **or** 24 + 168 + 380 + 700 + 216 (= 1488)		4	M2 for at least **4** correct products added (need not be evaluated) If not M2 then award: (M1 for consistent use of value within interval (including end points) for at least **4** products which must be added or correct midpoints used for at least **4** products and not added)
	$\frac{4 \times 6 + 12 \times 14 + 20 \times 19 + 28 \times 25 + 36 \times 6}{70}$ oe eg '1488' ÷ 70			M1 dep on at least M1 Allow division by their Σf provided addition or total under column seen
	Correct answer scores full marks (unless from obvious incorrect working)	21.26		A1 awrt 21.26 accept 21.3
				Total 5 marks

<table>
<tr><th>Q</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>5</td><td>E.g.
$2 \times 2 \times 900$ or $2^2 \times 900$ or $2 \times 3 \times 600$ or
$2 \times 5 \times 360$ or $3 \times 3 \times 400$ or $3^2 \times 400$ or
$3 \times 5 \times 240$ or $5 \times 5 \times 144$ or $5^2 \times 144$
E.g.
<table><tr><td>2</td><td>3600</td></tr><tr><td>2</td><td>1800</td></tr><tr><td></td><td>900</td></tr></table>
E.g.
 
</td><td></td><td>3</td><td>M1 for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 900
(see LHS for examples of the amount of work needed for the award of this mark, allow no more than one mistake ft in factor tree or table
(eg one mistake with 2 prime factors ft: $3600 = 1800 \times 20 = 2 \times 900 \times 4 \times 5$ or $360 = 2 \times 2 \times 90$)</td></tr>
<tr><td></td><td>E.g. $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$
E.g.
<table><tr><td>2</td><td>3600</td></tr><tr><td>2</td><td>1800</td></tr><tr><td>2</td><td>900</td></tr><tr><td>2</td><td>450</td></tr><tr><td>3</td><td>225</td></tr><tr><td>3</td><td>75</td></tr><tr><td>5</td><td>25</td></tr><tr><td>5</td><td>5</td></tr><tr><td></td><td>(1)</td></tr></table>
E.g.
 
</td><td></td><td></td><td>M1 for 2, 2, 2, 2, 3, 3, 5, 5 or 2^4 , 3^2 , 5^2 or $2^4 + 3^2 + 5^2$ (ignore 1s) (may be a fully correct factor tree or ladder)</td></tr>
<tr><td></td><td>Working required</td><td>$2^4 \times 3^2 \times 5^2$</td><td></td><td>A1 dep on M2
can be any order (allow $2^4 \,.\, 3^2 \,.\, 5^2$)
(SCB1 for $3.6 \times 2^3 \times 5^3$)</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Total 3 marks</td></tr>
</table>

Q	Working	Answer	Mark	Notes
6	(5 – 2) × 180 – 112 – 102 – 96 (= 230) oe eg $540-112-102-96\ (=230)$ **or** 360 – (180 – 112) – (180 – 102) – (180 – 96) (= 360 – 68 – 78 – 104 = 360 – 230 = 130) oe		5	M1
	$\frac{'540'-112-102-96}{2}$ (= 115) **or** '130' ÷ 2 (= 65)			M1 dep on previous mark
	$\frac{180\times(8-2)}{8}$ (= 135) **or** 180 – (360 ÷ 8) (= 135) **or** $\frac{360}{8}(=45)$ as exterior angle of octagon			M1 indep Withhold the mark for $\frac{360}{8}(=45)$ if shown as an interior angle
	360 – '115' – '135' **or** '65' + '45'			M1
	Working required	110		A1 dep on M1
				Total 5 marks

Q	Working		Answer	Mark	Notes
7	$4 \times (5 - x)$ **or** $5 \times (2x - 1)$ **or** $20 - 4x$ **or** $10x - 5$ oe			4	M1 for setting up a correct algebraic expression for area *A* or area *B* (could be seen as part of an equation) (condone lack of brackets for multiplying if meaning is clear for this mark only)
	one from: $4(5 - x) = 20 - 4x$ or $2 \times 4(5 - x) = 40 - 8x$ or $0.5 \times 4(5 - x) = 10 - 2x$ oe	**and** one from: $5(2x - 1) = 10x - 5$ or $2 \times 5(2x - 1) = 20x - 10$ or $0.5 \times 5(2x - 1) = 5x - 2.5$ oe			M1 for expanding 2 sets of brackets correctly (one for each shape) [allow ×2 or ÷2 for the wrong shape for this mark] Need not be in an equation at this stage.
	eg $10x + 8x = 40 + 5$ **or** $-5 - 40 = -10x - 8x$ **or** $18x = 45$ **or** $-45 = -18x$ **or** $4x + 5x = 20 + 2.5$ oe				M1 for a <u>correct</u> equation with terms in *x* on one side and number terms the other side
	Working required		2.5		A1 oe dep on M1
					Total 4 marks

Q	Working	Answer	Mark	Notes
8	$0.22x = 5.48$ oe or (1% =) 5.48 ÷ 22 (= 0.24909…) or 100 ÷ 22 (= 4.54…)			M1
	(x =) 5.48 ÷ 0.22 oe or (100% =) 5.48 ÷ 22 × 100 or "0.24909…" × 100 or 5.48 × "4.54…"			M1
	Correct answer scores full marks (unless from obvious incorrect working)	24.9		A1 awrt 24.9
				Total 3 marks

8 **ALT** **1**	$0.22x = 5\,480\,000$ oe or (1% =) 5 480 000 ÷ 22 (= 249 090.9091…) or 100 ÷ 22 (= 4.54…)			M1
	5 480 000 ÷ "0.22" oe or (100% =) 5 480 000 ÷ 22 × 100 or "249 090.9091…"× 100 or 5 480 000 × "4.54…"			M1
	Correct answer scores full marks (unless from obvious incorrect working)	24 900 000		A1 awrt 24 900 000
				Total 3 marks

Q	Working	Answer	Mark	Notes
9 (a)		$\frac{3}{9}$ $\frac{2}{9}, \frac{4}{9}, \frac{3}{9}$	2	B1 for lower 1st game branch probability B1ft for all values correct on 2nd game branches
(b)	$\frac{2}{9} \times \frac{3}{9}$ or $\frac{4}{9} \times \frac{4}{9}$ or $\frac{3}{9} \times \frac{2}{9}$		3	M1 ft from their tree diagram for one correct product from *WL* or *L W* or *DD* (allow probabilities to 2 dp truncated or rounded)
	$\frac{2}{9} \times \frac{3}{9} + \frac{4}{9} \times \frac{4}{9} + \frac{3}{9} \times \frac{2}{9}$			M1 ft for a fully correct method
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{28}{81}$		A1 Allow 0.345 ... (2 dp truncated or rounded) or 34.5% (2 sf truncated or rounded)
				Total 5 marks

Q	Working	Answer	Mark	Notes
10	$\frac{4}{15}\times\frac{4}{15}$ or $\frac{5}{15}\times\frac{5}{15}$ or $\frac{6}{15}\times\frac{6}{15}$ oe (where 6 = 15 – 4 – 5)		3	M1 oe for one correct product (allow decimals to 2 dp rounded or truncated) $(\frac{4}{15})^2 = (0.26(6...))^2 = 0.07(11...)$ $(\frac{5}{15})^2 = (0.33(3...))^2 = 0.11(1...)$ $(\frac{6}{15})^2 = (0.4)^2 = 0.16$
	$\frac{4}{15}\times\frac{4}{15}+\frac{5}{15}\times\frac{5}{15}+\frac{6}{15}\times\frac{6}{15}$ oe eg $\frac{16}{225}+\frac{1}{9}+\frac{4}{25}$ (where 6 = 15 – 4 – 5)			M1 oe for the sum of all three correct products
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{77}{225}$		A1 oe 0.34(222….) or 34.(222…)% (if no marks awarded, SCB2 for $\frac{31}{105}$ oe from non-replacement, SCB1 for a fully correct method for non-replacement)
				Total 3 marks

Q	Working	Answer	Mark	Notes
11	$(AC^2 =)\ 9^2 + 12^2 - 2 \times 9 \times 12 \times \cos 60\ (= 117)$ or $(AC^2 =)\ 81 + 144 - 108\ (= 117)$ oe		5	M1 oe eg $BM = 9\cos 60 (= 4.5)$ **and** $AM = 9\sin 60 (= \frac{9\sqrt{3}}{2})$ **and** $AC^2 = '(\frac{9\sqrt{3}}{2})'^2 + (12 - '4.5')^2$ (where AM is perpendicular to BC)
	$(AC =)\ \sqrt{117}$ or $3\sqrt{13}$ or 10.8(16653…)			A1 oe
	(area ABC =)0.5 × 9 × 12 × sin 60 $(= 27\sqrt{3}$ or 46.7(653….))			M1 indep or $\frac{1}{2} \times '(\frac{9\sqrt{3}}{2})' \times 12\ (= 27\sqrt{3})$ oe
	(area ACD =)0.5 × 7 × $'\sqrt{117}'$ × sin 84 (=37.6(50896…))			M1 dep on 1st M1
	Working required	84.4		A1 dep on M3 awrt 84.4
				Total 5 marks

12	(a)	54 ÷ 9 × 4 oe or $\frac{4}{9}$¥ 54 oe		2	M1 Allow 0.44(44…) × 54 or $\frac{24}{54}$
		Correct answer scores full marks (unless from obvious incorrect working	24		A1
	(b)	$\frac{"24" + n}{54 + n} = \frac{1}{2}$ or $\frac{30}{60}$ or 54 – "24" (= 30) and "30" – "24" or 2 × "30" – 54		2	M1 ft if "24" < 27 or $\frac{6}{60}$
		Correct answer scores full marks (unless from obvious incorrect working)	6		A1
					Total 4 marks

Q	Working	Answer	Mark	Notes
13	2×0.75 (= 1.5) oe or $2 \times 0.75 \times 2$ (= 3) oe		5	M1 for area of rectangle
	$\pi \times (0.5 \div 2)^2$ (= 0.1963) or $\frac{1}{2}$ ¥ $\pi \times (0.5 \div 2)^2$ (= 0.09817)			M1 for area of circle **or** area of semicircle
	"1.5" – "0.09817" (= 1.4018…) or "3" – "0.1963" (= 2.8036…)			M1
	"1.4018" × 2 × 250 ÷ 4 (= 175.228…) or "2.8036" × 250 ÷ 4 (= 175.228…) or "1.4018" × 250 ÷ 4 (= 87.6…)			M1or for 87 – 88
	Correct answer scores full marks (unless from obvious incorrect working)	175		A1 Allow 175 – 176
				Total 5 marks

Q	Working	Answer	Mark	Notes
14	$5a + 3p = 1.96$ and $3a + 2p = 1.22$ oe **or** $5a + 3p = 196$ and $3a + 2p = 122$ oe	M2 for an arithmetical method (must see the calculation to find 0.22 or 0.26 or 0.74 and 0.48 oe) E.g. 6.1(0) – 5.88 (= 0.22) oe **or** 3.92 – 3.66 (= 0.26) oe **or** 1.96 – 1.22 (= 0.74) oe and 1.22 – "0.74" (= 0.48)		5	M1 for setting up both equations oe Allow the use of apples and pears oe throughout, e.g. 5 apples + 3 pears = 1.96 and 3 apples + 2 pears = 1.22
	E.g. $15a + 9p = 5.88$ $15a + 10p = 6.1(0)$ Subtracting $(-p = -0.22)$ E.g. $5a + 3p = 1.96$ and $6a + 4p = 2.44$ oe Subtracting	E.g. $10a + 6p = 3.92$ $9a + 6p = 3.66$ Subtracting $(a = 0.26)$			M1 for a correct method to eliminate a or p: coefficients of a or p the same **and** correct operation to eliminate selected variable (condone any one arithmetic error) **or** to find the cost of 1 apple and 1 pear
	E.g. $5a + 3("0.22") = 1.96$ or $3a + 2("0.22") = 1.22$ E.g $a + p = 0.48$ oe	E.g. $5("0.26") + 3p = 196$ or $3("0.26") + 2p = 1.22$ E.g. 3 × 0.22 (= 0.66) 1.96 – "0.66" (= 1.3(0)) "1.3(0)" ÷ 5 (= 0.26) **or** 5 × 0.26 (= 1.3(0)) 1.96 – "1.3(0)" (= 0.66) "0.66" ÷ 3 (= 0.22) **or** Apple and pear is 0.48 oe			M1 (dep on M2) for substituting their value found (must be > 0) of one variable into one of the equations **or** for repeating above method to find second variable **or** for third working column allow $k(a + p) = k(0.48)$ **or** for a complete arithmetical method to find the other value
	$10¥"0.26" + 10¥"0.22"$ or $(a + p =) 0.48¥10$ oe or $[k(a + p) =]k(0.48)¥\frac{10}{k}$				M1 (dep on M3) can be implied by $10(a + p)$ provided a and p must be > 0
	Working required		4.8(0)		A1 dep M2
					Total 5 marks

Q	Working	Answer	Mark	Notes
15 (a)	0.8, 2.6, 1.9, 1.6, 0.3	Correct histogram	3	B3 fully correct histogram (B2 for at least 3 correct frequency densities or at least 3 correct bars **or** all five bars of correct width with heights in the correct ratio B1 for 2 correct frequency densities or 2 correct bars – but these bars must be of different widths, ie not 1st and 3rd) **or** three bars of correct width with heights in the correct ratio)
(b)			2	M1 for $\frac{n}{40}$ where $n < 40$ or for $\frac{4}{m}$ where $m > 4$
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{4}{40}$		A1 for $\frac{4}{40}$ oe If M0 then SCB1 for $\frac{2}{35}$ (or 0.057…)
				Total 5 marks

Q	Working	Answer	Mark	Notes
16 (a)	$1.75 \times 10^6 \div 2.4 \times 10^7$ or 1 750 000 ÷ 24 000 000 oe eg $\frac{1.75}{24}$		3	M1
	0.0729(16…) or 0.072 or 0.073 or for $\frac{7}{96}$ or 7.29(16…)% or 7.2% or 7.3%			A1
	Correct answer scores full marks (unless from obvious incorrect working)	7.3×10^{-2}		A1 accept 7.3×10^{-2} or better ($7.29(16….) \times 10^{-2}$)
(b)	$2.4 \times 10^7 \times 5.01 \times 10^{21} \div 3$ oe		2	M1
	Correct answer scores full marks (unless from obvious incorrect working)	4×10^{28}		A1 accept 4×10^{28} , 4.0×10^{28} , 4.01×10^{28} , 4.008×10^{28}
				Total 5 marks

Q	Working	Answer	Mark	Notes
17	LW = 180 oe (9LW = 1620) or 4L × (L + W) = 1620 oe or 5W × (L + W) = 1620 oe or 4L = 5W oe ($L = \frac{5}{4}W$ oe or $W = \frac{4}{5}L$ oe)		5	M2 for any two correct equations from (i) LW = 180 oe (9LW = 1620) (ii) 4L × (L + W) = 1620 oe (iii) 5W × (L + W) = 1620 oe (iv) 4L = 5W oe ($L = \frac{5}{4}W$ oe or $W = \frac{4}{5}L$ oe) (M1 for one correct equation or 1620 ÷ 9 (= 180))
	$L = "\frac{4}{5}L" = "180"$ oe or $W = "\frac{5}{4}W" = "180"$ oe or $4L = \left(\frac{4}{5}L + \frac{4}{5}L\right) = 1620$ oe or $5W = \left(\frac{5}{4}W + W\right) = 1620$ oe or $9L = \left(\frac{4}{5}L + L\right) = 1620$ oe or $9\left(\frac{5}{4}W + W\right) = 1620$ oe or $4\left(\frac{180}{W}\right)^2 + 4("180") = 1620$ oe or $5("180") + 5\left(\frac{180}{L}\right)^2 = 1620$ oe			M1 for a correct equation in terms of one variable only
	Correct answer scores full marks (unless from obvious incorrect working)	L = 15 and W = 12		A2 for both correct (A1 for one correct) Award 4 marks for L = 12 and W = 15 dep on M3
				Total 5 marks

Q	Working	Answer	Mark	Notes
18	eg $\frac{4}{3}\pi r^3 = 288\pi$ oe $\frac{4}{3}p\hat{E}x\hat{}^3 = 288p$ oe		6	M1 for using the formula for the volume of a sphere correctly and equating it to 288π
	$x = 12$			A1
	$\sqrt{(5\times'12')^2+(0.5\times'12')^2}(=6\sqrt{101}=60.299...)$ oe **or** $(OC=)0.5\sqrt{'24'^2+'12'^2}(=6\sqrt{5})$ **and** $AC=\sqrt{'(6\sqrt{5})'^2+'60'^2}(=6\sqrt{105})$ **and** $\sqrt{'(6\sqrt{105})'^2-'12'^2}(=6\sqrt{101})$ oe			M1 (dep on first M1 and using their value for x) for using Pythagoras to find the perp height of faces *CAD* or *BAE* or a correct method to find angle *CAD* or *BAE*
	$\sqrt{(5\times'12')^2+(1\times'12')^2})(=12\sqrt{26}=61.188...))$oe **or** $(OC=)0.5\sqrt{'24'^2+'12'^2}(=6\sqrt{5})$ **and** $AC=\sqrt{'(6\sqrt{5})'^2+'60'^2}(=6\sqrt{105})$ **and** $\sqrt{'(6\sqrt{105})'^2-'6'^2}(=12\sqrt{26})$ oe			M1 (dep on first M1 and using their value for x) for using Pythagoras to find the perp height of faces *ABC* or *AED* or a correct method to find angle *BAC* or *DAE*
	(‘12’ × 2(‘12’)) + 2(0.5 × ‘12’ × ‘$12\sqrt{26}$’) +2(0.5 × 2‘12’ × ‘$6\sqrt{101}$’) oe eg $'288'+2\times'72\sqrt{26}'+2\times'72\sqrt{101}'$ or ‘288’ + 2 × ‘367.129’…+ 2 × ‘723.59…’ oe			M1 (dep on first M1 using their value for x and correct working for heights of each triangle)for working out the total surface area of the pyramid
	Correct answer scores full marks (unless from obvious incorrect working)	2469		A1 2469 - 2470
				Total 6 marks

Q	Working	Answer	Mark	Notes

				Edexcel averages: scores of candidates who achieved grade:								
Qn	Mean score	Max score	Mean %	ALL	9	8	7	6	5	4	3	U
1	3.42	5	68	3.42	4.93	4.61	4.07	2.99	1.83	0.63	0.21	0.13
2	2.30	3	77	2.30	2.92	2.70	2.41	2.27	1.79	1.34	0.94	0.53
3	2.95	4	74	2.95	3.88	3.54	3.09	2.73	2.42	1.63	0.67	0.22
4	3.53	5	71	3.53	4.83	4.37	3.85	3.26	2.54	1.41	0.65	0.04
5	2.01	3	67	2.01	2.73	2.51	2.13	1.79	1.56	0.92	0.34	0.11
6	3.20	5	64	3.20	4.88	4.43	3.45	2.61	1.62	0.60	0.14	0.00
7	2.65	4	66	2.65	3.84	3.46	2.73	2.30	1.62	0.87	0.54	0.29
8	1.90	3	63	1.90	2.89	2.33	1.86	1.54	1.17	0.75	0.51	0.04
9	3.01	5	60	3.01	4.61	3.93	2.98	2.32	1.63	1.06	0.65	3.01
10	1.68	3	56	1.68	2.84	2.54	1.86	1.02	0.32	0.15	0.02	0.00
11	2.63	5	53	2.63	4.60	3.74	2.78	1.49	0.66	0.22	0.08	0.02
12	2.62	4	66	2.62	3.53	3.01	2.46	2.36	2.07	1.71	1.08	0.62
13	2.53	5	51	2.53	3.86	3.25	2.77	1.97	1.34	0.73	0.24	0.26
14	2.72	5	54	2.72	4.66	3.83	2.67	1.64	1.06	0.37	0.10	0.02
15	2.50	5	50	2.50	4.42	3.25	2.26	1.72	0.99	0.46	0.15	0.06
16	1.64	5	33	1.64	3.03	2.03	1.49	1.00	0.61	0.34	0.19	0.00
17	1.90	5	38	1.90	3.75	2.01	1.25	1.12	0.91	0.68	0.35	0.28
18	1.45	6	24	1.45	3.20	1.66	1.12	0.57	0.23	0.12	0.02	0.00
	44.64	**80**	**56**	**44.64**	**69.40**	**57.20**	**45.23**	**34.70**	**24.37**	**13.99**	**6.88**	**5.63**

Suggested grade boundaries

Grade	9	8	7	6	5	4	3
Mark	63	51	43	30	19	11	4