LEVEL 3
Mathematical Studies

1350/1 - Paper 1

Mark scheme

1350

June 2018

Version/Stage: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

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Q	Answer	Mark	Comments
	Alternative method 1		
1	$\frac{45}{720}$ (× 100) or 0.0625 or 6.25 or $\frac{50}{810}$ (× 100) or 0.0617(…) or 6.17(..)	M1	oe eg working in pounds
	6.25 and 6.17(…) and Javed or 6.3 and 6.2 and Javed or 0.0625 and 0.0617(…) and Javed	A2	A1 6.25 and 6.17(…) or 6.3 and 6.2 or 0.0625 and 0.0617(…) A1 ft correct conclusion for their values if one answer is correct
	Alternative method 2		
	$\frac{765}{720}$ (× 100) or 1.0625 or 106.25 or $\frac{810}{860}$ (× 100) or 1.0617(..) or 106.17(..)	M1	oe
	1.0625 and 1.0617(…) and Javed or 106.25 and 106.17(…) and Javed	A2	A1 1.0625 and 1.0617(…) or 106.25 and 106.17(…) A1 ft correct conclusion for their values if one answer is correct
	Alternative method 3		
	$\frac{765}{720}$ × 810 or $\frac{860}{810}$ × 720	M1	
	8.606(…) or 8.61 and Javed or 7.64(…) and Javed	A2	A1 8.606(…) or 8.61 or A1 7.64(…) or A1ft correct conclusion for their value

Q	Answer	Mark	Comments
2(a)	**Alternative method 1**		
	Yes and two of it is convenient/easier it is cheaper it is quicker could have a larger sample/all same company or city/all same number of members/ there are 5 distinct clusters	B2	B1 Yes and one statement from the list SC1 its only using one gym
	Alternative method 2		
	No and only views from one gym/the other gyms could be different/you should take a sample from each gym and it's not a random sample	B2	B1 No and one statement from the first list
	Additional Guidance		
	Yes may be implied, eg it is, because… if they say 'it only uses one gym so it is quicker' mark this as B1 not SC1 For 'No' there must be an implication that they know that a cluster sample will only use people from one gym No its not representative of everyone B0 No you should use stratified/random sampling B0		
2(b)	Stratified (sampling)	B1	
	Additional Guidance		
	Do not accept a description of a stratified sampling method		

Q	Answer	Mark	Comments
2(c)	**Alternative method 1**		
	580 ÷ 700 × 175 or 145 or 120 ÷ 700 × 175 or 30	M1	oe
	their 145 – their 30 or their 145 – (175 – their 145) or (175 – their 30) – their 30	M1dep	oe
	115	A1	
	Alternative method 2		
	580 – 120 or 460	M1	
	their 460 ÷ 700 × 175	M1dep	oe
	115	A1	
	Additional Guidance		
	Division and multiplication may be done in one step eg 580 ÷ 4		
	It is possible to use ratio eg 580 : 120 = 4.83(…) : 1 and 175 ÷ (their 4.83…+1) or 30.(17) gains first M1		

Q	Answer	Mark	Comments
3(a)	**Alternative method 1 -** rounding correctly to 2dp or using full answer		
	Month 2 (£)159 219.22	B1	
	Month 3 (£)158 827.66	B1ft	ft their Month 2 value
	Month 4 (£)158 435.31 or (£)158 435.32	B1ft	ft their Month 3 value for use of more than 2dp award maximum 2 marks
	Alternative method 2 - rounding values down to nearest penny		
	Month 2 (£)159 219.22	B1	
	Month 3 (£)158 827.65	B1ft	ft their Month 2 value
	Month 4 (£)158 435.30	B1ft	ft their Month 3 value for use of more than 2dp award maximum 2 marks
	Additional Guidance		
	Using iteration on a calculator gives a final value of 158 435.31 whereas using the rounded up Month 3 value of 158 827.66 gives a final value of 158 435.32 Using rounded down values (as is often done in real life) gives a final answer of 158 435.30 Not using 2 decimal places gains 2 marks maximum **Example** Month 2 (£)159 219.22 Month 3 (£)158 827.6584 Month 4 (£)158 435.3138 Gains B1 B1 B0		
	Use of simple interest of £320 each year gives the missing values as 159220, 158830 and 158440		B0B0B0

Q	Answer	Mark	Comments
3(b)	**Alternative method 1**		
	160 000 – their 158 435.31	M1	ft their Month 4 value implied by their 1564.69
	(710 × 4) – their 1564.69 or 2840 – their 1564.69	M1dep	
	1275.(..) and Yes	A1ft	ft their Month 4 value their correct value with no conclusion or incorrect conclusion implies M2
	Alternative method 2		
	160 000 – (710 × 4) or 160 000 – 2840 or 157 160	M1	
	their 157 160 – their 158 435.31	M1dep	ft their Month 4 value
	1275.(..) and Yes	A1ft	ft their Month 4 value their correct value with no conclusion or incorrect conclusion implies M2
	Alternative method 3		
	Correct method for any month's interest eg Month 1 160 000 – 159 610 = 390 and 710 – their 390 or 320	M1	
	320 + 319.22 + 318.44 + 317.65	M1dep	ft their part (a) 4 months' interest added with at least 3 correct
	1275.(..) and Yes	A1ft	ft their part (a) correct to 2dp their correct value with no conclusion or incorrect conclusion implies M2

	Additional Guidance	
	Example of separate months using 2dp rounded up Month 2 159 610 – their 159 219.22 = 390.78 and 710 – their 390.78 = 319.22 Month 3 their 159 219.22 – their 158 827.66 = 391.56 and 710 – their 391.56 = 318.44 Month 4 their 158 827.66 – their 158 435.31 = 392.35 and 710 – their 392.35 = 317.65 Calculating the interest for 4 years without considering the 710 gains no marks eg 160000 × 1.002^4 = 161283.85 Yes interest is 1283.85	M0M0A0

Q	Answer	Mark	Comments
4	Makes an assumption about number of hours sleep per night for an average person	B1	Allow 6 – 10
	Makes an assumption about life expectancy for average adult	B1	Allow 65 - 90
	Uses 365 or 365.25 days or a combination of 365 and 366 days in the ratio 3 : 1 (for leap years) or uses 52 weeks	B1	Uses a suitable number of days or weeks Allow rounded values if explanation is given eg 52 weeks in a year so that's about 50
	their hours per night × their days per year × their number of years eg 9 × 365 × 75 eg 8 × 7 × 52 × 85	M1	their days per year do not have to be correct
	Accurate answer for their values	A1ft	May be rounded Do not accept decimal answers
	Additional Guidance		
	Allow sensible rounding at any point		
	Examples 1) I assume the number of hours sleep per night is 9 I assume the life span is 80 years 9 × 350 × 80 = 252000 (No evidence of rounding say 52 to 50 to get 350 days so they lose the 3rd B1) 2) Assuming an average person sleeps for 9 hours per night and lives to be 80 52 weeks in a year so approximately 7 × 50 = 350 day per year 9 × 350 × 80 = 252000 (we have seen that 350 comes from rounding 52 to 50 so the 3rd B1 can be awarded)		B1B1B0M1 A1ft B1B1B1M1 A1ft
	If they consider leap years they must divided their lifespan by 4 and round up or down eg using 75 years they should have 18 or 19 years at 366 days and the rest at 365 days		

Q	Answer	Mark	Comments
5(a)	31.3	B1	
	Additional Guidance		
5(b)	11.8	B2	B1 24.6 or 36.4 indicated or used
	Additional Guidance		

Q	Answer	Mark	Comments
5(c)	Median from box plot = 34 and Compares average in context **Examples of comparisons** On average the boys from 10A were quicker or the boys from 10A had a better performance or the median was lower for 10A so the students were faster or 10A were faster by 2.7 minutes	B2	ft correct conclusion for their part (a) B1 34 with no comparison or incorrect comparison or B1 correct comparison of average with no value seen eg the median was lower for 10A so the students were faster
	IQR from box plot = 8.5 and Compares spread in context **Examples of comparisons** The IQR was lower for the rest of the year group so the times/results were more consistent or the boys times in 10A were more varied	B2	ft correct conclusion for their part (b) B1 8.5 with no comparison or incorrect comparison or B1 The performance for the rest of the year group was more consistent or B1 the ranges are both 22.5/both the same
	Additional Guidance		
	If students **draw a box plot** for the results for class 10A then they can compare these instead of stating the values eg The box is narrower for the rest of the group so the results were more consistent eg states the median is smaller/lower for 10A		 B2 B1

	Alternative method 1		
6	Payday Help 235×1.008^6 or 246.5(...)	M1	
	See You Through $235 = \frac{A}{(1+11.5)^{\frac{6}{365}}}$	M1	Inserts correct values in formula 1 + 11.5 can be 12.5 Allow 0.016 or better for $\frac{6}{365}$ Implied by correct rearrangement
	$A = 235 \times (1+11.5)^{\frac{6}{365}}$ or 244.9(…)	M1	oe rearranges their equation for *A* their equation must be of the form $235 = \frac{A}{(1+b)^c}$
	246.5(….) and 244.9(…)and See You Through loan company is cheaper	A2	A1 246.5(…) and 244.9(…) or A1 ft correct decision for their values with one value correct For Payday help allow 246 or 247 from correct working seen For SYT allow 244 or 245 from correct working seen
	Alternative method 2		
	1.008^{365} or 18.327(…)	M1	oe
	their 18.327(…) – 1 or 17.327(…)	M1	
	their 17.327(…) × 100 or 1150 ÷ 100	M1	
	1732.(…) and See You Through or 17.32(..) and 11.50 and See You Through	A2	A1 1732.(…) or A1 17.32(..) and 11.50 Or A1 ft correct decision for their value(s) with one value correct

	Additional Guidance	
	Use of 0.016 for 6/365 can gain method marks but not the first accuracy mark. Beware this gives an answer of 244.69 and use of 11.5 instead of 12.5 gives 244.63	

Q	Answer	Mark	Comments
7(a)	One correct frequency density seen or implied	M1	Implied by one correct bar
	Fully correct histogram 150–250 height 0.1 250–300 height 0.3 300–325 height 0.72 325–350 height 0.6 350–400 height 0.04	A2	A1 3 or 4 correct bars All heights ± ½ square
	Additional Guidance		

Q	Answer	Mark	Comments
7(b)	**Alternative method 1**		
	$\left(\frac{10}{25}\times 15\right)+2$ or 6 + 2 or 8	M1	oe number of type A
	10 × 0.8 + 50 × 0.1 or 8 + 5 or 13	M1	number of type B
	$\frac{\text{their}8}{60}$ (× 100) and $\frac{\text{their}13}{80}$ (× 100) or their 8 × 4 ÷ 3 or 10.(6…) or 10.7 or their 13 × 3 ÷ 4 or 9.75	M1	oe eg fractions of the same denominator decimals scaling up to out of 80 scaling down to out of 60
	13.(...)% and 16.(...)% and B or 0.13(…) and 0.16(…) and B or two correct fractions with the same denominator and Type B or 10.(6…) and 13 and B or 10.7 and 13 and B or 8 and 9.75 and B	A2	A1 two correct values with no decision or with incorrect decision or A1ft correct decision for their values with one correct value seen. their values must be proportions not their 8 of Type A and their 13 of Type B

	Alternative method 2-working out proportions under 340cm		
	$10 + 15 + 18 + \frac{15}{25} \times 5$ or 52	M1	oe number of type A less than 340cm
	$100 \times 0.02 + 50 \times 0.56 + 25 \times 1 + 15 \times 0.8$ or $2 + 28 + 25 + 12$ or 67	M1	number of type B less than 340cm
	$\frac{\text{their } 52}{60}$ (× 100) and $\frac{\text{their } 67}{80}$ (× 100) or their 52 × 4 ÷ 3 or 69.(3…) or their 67 × 3 ÷ 4 or 50.25	M1	oe eg fractions of the same denominator decimals scaling up to out of 80 scaling down to out of 60
	86.(...)% and 83.(...)% and B or 0.86(…) and 0.83(…) and B or two correct fractions with the same denominator and Type B or 69.(3..) and 67 and B or 52 and 50.25 and B	A2	A1 Two correct values with no decision or with incorrect decision or A1ft correct decision for their values with one correct value seen. their values must be proportions not their 52 of Type A and their 67 of Type B
	Additional Guidance		
	Allow decimal numerators for fractions of the same denominator eg $\frac{2.6}{20}$ and $\frac{3.25}{20}$		

	eg $\frac{10.6}{80}$ and $\frac{13}{80}$ If using alt 2 and working out the number below 340cm they may at some point subtract these values for 1 or from 100 as applicable. This will lead to the values in Alt 1	

Q	Answer	Mark	Comments
	Note that there are five alternative methods for this question and some additional guidance at the end of Alt 5		
8	**Alternative method 1**		
	15 800 – 11 500 or 4300	M1	
	their 4300 × 0.2 or 860	M1	oe Tax to pay
	15 800 – 8164 or 7636	M1	condone use of 8164.01
	their 7636 × 0.12 or 916.32	M1	oe NI to pay
	15 800 – (their 860 + their 916.32) or 15 800 – 1776.32	M1dep	dep on 2nd and 4th M1's awarded
	14 023.68	A1	Net pay per year Implied by correct final answer
	3 × (32 +7) × 48 or 117 × 48 or 5616	M1	oe Annual travel and nursery costs
	(their 14 023.68 – their 5616) ÷ 12 or 8407.68 ÷ 12 or 700.64 or 700 × 12 or 8400	M1	their 5616 must be from a combination of travel and nursery costs and their 14 023.68 must come from subtracting both their tax and their NI
	700.64 and Yes or 8407.68 and 8400 and Yes	A1ft	ft their 14 023.68 if final two method marks are awarded Allow 700.65 or 700.66 if 52 weeks used

8 cont'd	**Alternative method 2**		
	15 800 – 11 500 or 4300	M1	
	their 4300 × 0.2 or 860	M1	oe Tax to pay
	15 800 – 8164 or 7636	M1	condone use of 8164.01
	their 7636 × 0.12 or 916.32	M1	oe NI to pay
	15 800 – (their 860 + their 916.32) or 15 800 – 1776.32	M1dep	dep on 2nd and 4th M1's awarded
	14 023.68	A1	Net pay per year Implied by correct final answer or 8407.88 seen
	(their 14023.68 ÷ 52) – (3 × (32+7)) or 269.69 – 117 or 152.69	M1	Weekly pay after deducting travel and nursery costs their 14 023.68 must come from subtracting both their tax and their NI
	(their 152.69 × 48 + their 269.69 × 4) ÷ 12 or 8407.88 ÷ 12	M1	
	700.65 or 700.66	A1ft	ft their 14 023.68 if final two method marks are awarded

8 cont'd	**Alternative method 3**		
	15 800 – 11 500 or 4300	M1	
	their 4300 × 0.2 or 860	M1	oe Tax to pay
	15 800 – 8164 or 7636	M1	condone use of 8164.01
	their 7636 × 0.12 or 916.32	M1	oe NI to pay
	3 × (32 +7) × 48 or 117 × 48 or 5616	M1	oe Annual travel and nursery costs
	their 860 + their 916.32 + their 5616	M1	Tax + NI + nursery/travel costs
	7392.32	A1	total deductions. Implied by correct final answer or by 8407.68 seen
	(15 800 – their 7392.32) ÷ 12 or 15 800 – their 7392.32 and 700 × 12	M1	their 7392.32 must be from a combination of tax, NI and travel and nursery costs
	700.64 and Yes or 8407.68 and 8400 and Yes	A1ft	ft their 7392.32 if final two method marks are awarded Allow 700.65 or 700.66 if 52 weeks used

8 cont'd	**Alternative method 4**			
	15 800 – 11 500 or 4300	M1		
	(their 4300 ÷ 12) × 0.2 or 358.33 × 0.2 or 71.67	M1	Tax to pay per month allow 71.66	
	15 800 – 8164 or 7636	M1	condone 8164.01	
	(their 7636 ÷ 12) × 0.12 or 636.33 × 0.12 or 76.36	M1	NI to pay per month	
	(15 800 ÷ 12) – (their 71.67 + their 76.36) or 1316.67 – 148.03	M1dep	allow 71.66 dep on 2nd and 4th M1's awarded	
	1168.64	A1	Net pay per month Implied by correct final answer	× 48 ÷ 12 can be replaced with × 4
	3 × (32 + 7) × 48 or 117 × 48 or 5616	M1	Annual travel and nursery costs	
	their 1168.64 – (their 5616 ÷ 12) or their 1168.64 – 468 or 700.64	M1	their 5616 must be from a combination of travel and nursery costs and their 1168.64 must come from subtracting both their tax and their NI	
	700.64 and Yes	A1ft	ft their 1168.64 if final two method marks are awarded Allow 700.65 or 700.66 if 52 weeks used	

8 cont'd	**Alternative method 5**		
	15 800 – 11 500 or 4300	M1	
	(their 4300 ÷ 12) × 0.2 or 358.33 × 0.2 or 71.67	M1	Tax to pay per month allow 71.66
	15 800 – 8164 or 7636	M1	condone 8164.01
	(their 7636 ÷ 12) × 0.12 or 636.33 × 0.12 or 76.36	M1	NI to pay per month
	3 × (32 +7) × 48 ÷ 12 or 117 × 48 ÷ 12 or 5616 ÷ 12 or 468	M1	oe Annual travel and nursery costs
	their 71.67 + their 76.36 + their 468	M1	allow 71.66
	616.03 or 616.02	A1	implied by correct final answer
	(15 800 ÷ 12) – their 616.03	M1	their 616.03 must be from a combination of tax, NI and travel and nursery costs
	700.64 and Yes	A1ft	ft their 616.03 if final two method marks are awarded Allow 700.65 or 700.66 if 52 weeks used
	Additional Guidance		
	If they use an incorrect method/ percentage for tax or NI they can gain a maximum of 6 marks If they omit either tax or NI they can gain a maximum of 3 marks		
	Using 52 weeks to calculate weekly tax or weekly NI can lead to slight differences in accuracy values as it does not account for the extra day in the year. Allow these values either correct or ft if the method shows they are working on weekly values (and may then be multiplying back up to annual values)		
	If they use an incorrect time period to work out the nursery and travel costs, eg 52 weeks or 5 days, they can still gain the final method mark Any error in nursery travel costs will mean a maximum of 7 marks being awarded		
	If they round the interim accuracy mark to the nearest pound they may still gain one of the accuracy marks Examples (1) 14023.68 seen then rounded to 14024 gains the first A1. Using the rounded value leads to the answer 700.67 which will be awarded A0 as it does not ft 14023.68 (2) Only 14024 seen and used is first A0. This is then their value to ft so 700.67 will gain A1ft		

Q	Answer	Mark	Comments
	Note that there are 3 alternative methods for this question. **Allow rounding of any of their values**		
9(a)	**Alternative method 1**		
	assumes number of hours production per week eg 8 hours per day and 5 days per week = 40 hours eg 168 hours per week	B1	Total hours per week in range 8 – 168 Must state their assumption. Not just values seen in a calculation
	Vol = $\pi \times 3.5^2 \times 9$ or 346.(…) or 350 or 3 cans per litre	M1	
	works out number of cans per week eg their hours per week × [1900, 2150] ÷ 0.35 or their hours per week × [1900, 2150] × 3 their volume may be rounded	M1	hours × quantity ÷ their volume in litres or hours × quantity × their number of cans per litre Number of cans per litre can be a decimal (Use of 1 can per litre needs stating to accept hours × quantity (×1))
	correct or rounded answer for their total number of cans needed eg 40 × 2000 ÷ 0.33 = 242 424 approx 250 000 cans per week	A1ft	allow decimal answers and/or rounding must have awarded the 2nd M1
	$\pi \times 7 \times 9$ or $2 \times \pi \times 3.5 \times 9$ or [189, 200] **and** $\pi \times 3.5^2$ or [36, 40] or 7 × 7 or 49	M1	allow use of 3 or 3.1 for π calculates estimate of curved surface area and calculates estimate of area of top/base 7 × 7 is putting the circle in a square
	their curved surface area + 2 × their area of top/base eg 198 + 77 (= 275)	M1	total surface area of can (correct answer 275)

	allows for waste eg deducts 10% of area of sheet to give 9000	M1	allow 5% to 25% they must state this is wastage the waste can be deducted at various points eg from sheets area, from number of cylinders or tops/bases per sheet or by increasing their surface areas
	their sheet area ÷ their total surface area or their total surface area × their of cans per week	M1	full cans per sheet must be consistent units their sheet area must be either 10 000 or 10 000 reduced for wastage or from 100 × 100 seen
	their cans per week ÷ their cans per sheet or their total surface area for all cans ÷ their sheet area	M1	This may be multiplied if they work out they need more than one sheet per can
	correct total for their calculation	A1ft	previous M1 must have been awarded answer must be rounded to at least the nearest 10 (may be to less sf)

9(a)	**Alternative method 2**		
	assumes number of hours production per week eg 8 hours per day and 5 days per week = 40 hours eg 168 hours per week	B1	Total hours per week in range 8 – 168 Must state their assumption. Not just values seen in a calculation
	Vol = $\pi \times 3.5^2 \times 9$ or 346.(…) or 350 or 3 cans per litre	M1	
	works out number of cans per week eg their hours per week × [1900, 2150] ÷ 0.35 or their hours per week × [1900, 2150] × 3 their volume may be rounded	M1	hours × quantity ÷ their volume in litres or hours × quantity × their number of cans per litre Number of cans per litre can be a decimal (Use of 1 can per litre needs stating to accept hours × quantity (×1))
	correct or rounded answer for their total number of cans needed eg 40 × 2000 ÷ 0.33 = 242 424 approx 250 000 cans per week	A1ft	allow decimal answers and/or rounding must have awarded the 2nd M1
	$\pi \times 7 \times 9$ or $2 \times \pi \times 3.5 \times 9$ or [189, 200] and $\pi \times 3.5^2$ or [36, 40] or 7 × 7 or 49	M1	allow use of 3 or 3.1 for π calculates estimate of curved surface area and calculates estimate of area of top/base 7 × 7 is putting the circle in a square
	allows for waste eg deducts 10% of area of sheet to give 9000	M1	allow 5% to 25% they must state this is wastage the waste can be deducted at various points eg from sheets area, from number of cylinders or tops/bases per sheet or by increasing their surface areas
	divides their sheet area by their curved surface area to give number of open cylinders per sheet eg 9000 ÷ 200 = 45 or	M1	must be consistent units their sheet area must be either 10 000 or 10 000 reduced for wastage or from 100 × 100 seen

	0.9 ÷ 0.02 = 45		
	divides their sheet area by their area of top/base to give number of tops/bases per sheet eg 10 000 ÷ 40 = 250	M1	Do not penalise incorrect sheet area here if already penalised
	their cans per week ÷ their open cylinders per sheet eg 250 000 ÷ 45 and their cans per week ÷ their tops/ bases per sheet eg 250 000 ÷ 250	M1	
	correct total for their calculation eg 5550 +1000 +1000 = 7550 must be sheets for cylinders + sheets for tops + sheets for bases	A1ft	previous M1 must have been awarded the number of tops and bases may have been summed earlier answer must be rounded to at least the nearest 10 (may be to less sf)

9(a)	**Alternative method 3**		
	assumes number of hours production per week eg 8 hours per day and 5 days per week = 40 hours eg 168 hours per week	B1	Total hours per week in range 8 – 168 Must state their assumption. Not just values seen in a calculation
	Vol = $\pi \times 3.5^2 \times 9$ or 346.(…) or 350 or 3 cans per litre	M1	
	works out number of cans per week eg their hours per week × [1900, 2150] ÷ 0.35 or their hours per week × [1900, 2150] × 3 their volume may be rounded	M1	hours × quantity ÷ their volume in litres or hours × quantity × their number of cans per litre Number of cans per litre can be a decimal (Use of 1 can per litre needs stating to accept hours × quantity (×1))
	correct or rounded answer for their total number of cans needed eg 40 × 2000 ÷ 0.33 = 242 424 approx 250 000 cans per week	A1ft	allow decimal answers and/or rounding must have awarded the 2nd M1
	2 × π × 3.5 or 22	M1	allow use of 3 or 3.1 for π calculates length of rectangle
	100 ÷ their 22 or 4(.5…) and 100 ÷ 9 or 11(.1…)	M1	fitting maximum per width allow work in metres eg 1 ÷ 0.09
	their 11 × their 4 or 44	M1	must be integers rounded down number of rectangles per sheet
	(100 ÷ 7) × (100 ÷ 7) or 14 × 14 or 196 or 200	M1	number of circular tops/bases per sheet must be integer value but may be rounded
	their cans per week ÷ their rectangles per sheet eg 250 000 ÷ 44 and their cans per week ÷ their tops/ bases per sheet eg 250 000 ÷ 200	M1	

	correct total for their calculation eg 5680 + 1250 + 1250 = 8180 must be sheets for cylinders + sheets for tops + sheets for bases	A1	previous M1 must have been awarded answer must be rounded to at least the nearest 10 (may be to less sf)	
	Additional Guidance			
	Values for days and weeks cannot just appear without any explanation so 1950 × 7 × 24 with no indication of days/weeks They must at least state either their days per week **or** hours per day used: **Examples** gaining B1 Assume a week's production is 2000 (litres per hour) × 24 × 7 or 2100 × 7 hours per day =14 700 so 14700 × 7 is 102 900 per week or 2000 × 8 = 16000 per day so 112000 per week (condone as clearly used 7 days) or One week is 168 hours or A working week is 40 hours			B0
	Using both 1900 and 2150 and averaging later is acceptable			
	If they calculate the volume but then use something completely different to work out number of cans per sheet they lose 1st M1 but can gain 2nd M1 in order to access the A1 **Example** Assume 40 hours per week volume of a can = 346.6cm^3 a can holds 250ml 40 × 2000 ÷ 0.25 = 320 000			B1 M0 M1 A1ft
	If they calculate the circumference (21.9 or 22) then go on to use this to find the curved surface area mark this on alt1 or 2 (ie do not give M1 for 21.9 and M1 for [189,200])			
	Some find the correct total surface area of 275 (approx.) but then think that they need 3 sheets per can (dividing by 100) This can gain the final M1 (and A1 if correctly worked out and rounded) for multiplying their number of cans by 3			

Q	Answer	Mark	Comments
9(b)	Number of hours per week may be lower so number of sheets/cans would decrease or if amount of wastage was higher they would need more sheets or may produce more/less than 2000 litres per hour so number of sheets would increase or decrease or cans may not be completely full so more sheets/cans would be needed	B1	oe Must state **how** their answer would change