

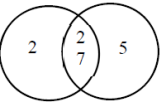
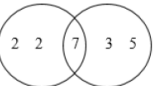
2			3	M1	for continual prime factorisation (at least two consecutive steps correct) or at least two stages of a factor tree, or table, correct.
				M1	for a fully correct factor tree or a list (2,2,2,2,5,11) or $2 \times 2 \times 2 \times 2 \times 5 \times 11$
		$2^4 \times 5 \times 11$		A1	dep M2 for $2^4 \times 5 \times 11$ (with working seen)
					Total 3 marks

3	(a)		2×3^{37}	1	B1
	(b)	$2 \times 3^{43} \times 2^4 \times 3^{37}$ or $2^5 \times 3^p$ ($p \neq 80$) or $2^q \times 3^{80}$ ($q \neq 5$)		2	M1
			$2^5 \times 3^{80}$		A1
					Total 3 marks

4	a		1, 3, 9	1	B1	need all three but ignore any repeats																											
	b	15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, 180, 195, 210 and 70, 140, 210 OR 3×5 and $2 \times 5 \times 7$ OR $2 \times 3 \times 5 \times 7$ (2, 3, 5, 7) oe eg $3 \times 5 \times 14$ (3, 5, 14) <table><tr><td>3</td><td>15</td><td>70</td></tr><tr><td>5</td><td>5</td><td>70</td></tr><tr><td>7</td><td>1</td><td>14</td></tr><tr><td>2</td><td>1</td><td>2</td></tr><tr><td></td><td>1</td><td>1</td></tr></table> <table><tr><td>5</td><td>15</td><td>70</td></tr><tr><td>3</td><td>3</td><td>14</td></tr><tr><td>14</td><td>1</td><td>14</td></tr><tr><td></td><td>1</td><td>1</td></tr></table>	3	15	70	5	5	70	7	1	14	2	1	2		1	1	5	15	70	3	3	14	14	1	14		1	1		2	M1	for listing at least three multiples of 15 and 70 or finding the prime factors of 15 and 70 (could be factors at the ends of branches of factor trees or lists 3, 5 and 2, 5, 7) or a correct calculation or the correct values for the LCM eg 2,3,5,7 or 3,5,14 oe (could be in a table)
3	15	70																															
5	5	70																															
7	1	14																															
2	1	2																															
	1	1																															
5	15	70																															
3	3	14																															
14	1	14																															
	1	1																															
			210		A1																												
						Total 3 marks																											

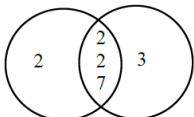
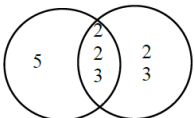
5	(b)		1, 2, 5 or 10	1	B1 Any of these values with no other incorrect value
---	-----	--	---------------	---	--

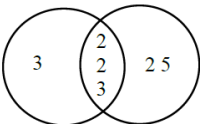
6	(d)		2	M1	A factor tree / division ladder of 3 or more factors ($\neq 1$), multiplying to 800, which must include 2 and 5. Condone 1 error when product $\neq 800$.
		$2 \times 2 \times 2 \times 2 \times 5 \times 5$		A1	Dep on M1 oe eg $2^5 \times 5^2$

7	(a)	<p>1, 2, 4, 7, 14, 28 and 1, 2, 5, 7, 10, 14, 35, 70</p> <p>or</p> <p>$2 \times 2 \times 7$ and $2 \times 5 \times 7$</p> <p>or</p> 		2	<p>M1 for starting to list at least four factors of each number</p> <p>or 2, 2, 7 and 2, 5, 7 seen (may be in a factor tree and ignore 1)</p> <p>or a fully correct Venn diagram</p>
			14		A1 cao
	(b)	<p>28, 56, 84, 112... and 105, 210, 315, 420...</p> <p>or</p> <p>2, 2, 7 and 3, 5, 7</p> <p>or</p>  <p>or $\frac{28 \times 105}{7}$ or 2, 2, 3, 5, 7 oe</p>		2	<p>M1 for any correct valid method e.g.</p> <p>for starting to list at least four multiples of each number</p> <p>or 2, 2, 7 and 3, 5, 7 seen (may be in a factor tree and ignore 1)</p> <p>or a fully correct Venn diagram</p>
			420		A1 cao
Total 4 marks					

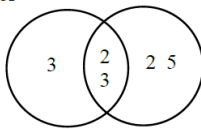
15	<p>eg $2 \times 2 \times 300$ $2 \times 5 \times 120$ $2 \times 3 \times 200$ $3 \times 5 \times 80$ or eg</p> <div><div><div>1200</div><div>2</div><div>600</div><div>3</div><div>200</div></div><div>or</div><table><tr><td>2</td><td>1200</td></tr><tr><td>3</td><td>600</td></tr><tr><td></td><td>200</td></tr></table></div>	2	1200	3	600		200		3	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, 300 (allow no more than one mistake ft (eg <i>one mistake</i> with 2 prime factors ft $1200 = 20 \times 600 = 2 \times 10 \times 3 \times 200$))										
2	1200																				
3	600																				
	200																				
	<p>2, 2, 2, 2, 3, 5, 5 or</p> <div><div><div>1200</div><div>2</div><div>600</div><div>3</div><div>200</div><div>2</div><div>100</div><div>10</div><div>10</div><div>2</div><div>5</div><div>2</div><div>5</div></div><div>oe</div><table><tr><td>2</td><td>1200</td></tr><tr><td>3</td><td>600</td></tr><tr><td>2</td><td>200</td></tr><tr><td>5</td><td>100</td></tr><tr><td>2</td><td>20</td></tr><tr><td>5</td><td>10</td></tr><tr><td>2</td><td>2</td></tr><tr><td></td><td>(1)</td></tr></table></div>	2	1200	3	600	2	200	5	100	2	20	5	10	2	2		(1)			M1	for finding the correct prime factors condone inclusion of 1 (may be seen in a fully correct factor tree or ladder)
2	1200																				
3	600																				
2	200																				
5	100																				
2	20																				
5	10																				
2	2																				
	(1)																				
		$2^4 \times 3 \times 5^2$		A1	(dep on M2 as working requested) Can be in any order (allow $2^4 \cdot 3 \cdot 5^2$) but must be in index form as asked for.																
					Total 3 marks																

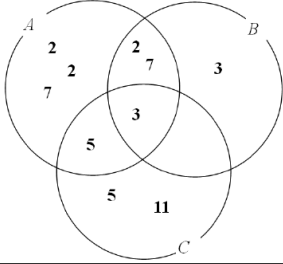
16	(a)(i)		6 or 8	1	B1 allow 6 and 8
	(ii)		27	1	B1 cao
	(iii)		25	1	B1 cao
	(iv)		3 or 7 or 11	1	B1 allow two or more of 3, 7, 11
	(b)	$(2^2 + 5) \times (2 + 3^2) = 99$	Two correct pairs of brackets	1	B1 cao
					Total 5 marks

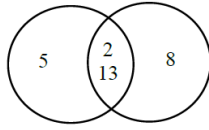
17	(a)	<p>1, 2, 4, 7, 8, 14, 28, 56 and 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84</p> <p>or</p> <p>2 2 2 7 and 2 2 3 7</p> <p>or</p>  <table><tr><td>e.g.</td><td></td><td></td></tr><tr><td>28</td><td>56</td><td>84</td></tr><tr><td></td><td>2</td><td>3</td></tr></table>	e.g.			28	56	84		2	3	2	<p>W1 for any correct valid method and no errors e.g.</p> <p>for starting to list at least four different factors of each number and no errors</p> <p>or</p> <p>2 2 2 7 and 2 2 3 7 seen (may be in a factor tree or a ladder diagram and ignore 1)</p> <p>or a fully correct Venn diagram</p> <p>or other clear method, e.g. table</p>						
e.g.																			
28	56	84																	
	2	3																	
			28																
	(b)	<p>60, 120, 180, 240... and 72, 144, 216, 288...</p> <p>or</p> <p>2 2 3 5 and 2 2 2 3 3</p> <p>or</p>  <table><tr><td>2</td><td>60</td><td>72</td></tr><tr><td>2</td><td>30</td><td>36</td></tr><tr><td>3</td><td>15</td><td>18</td></tr><tr><td>2</td><td>5</td><td>6</td></tr><tr><td></td><td></td><td>3</td></tr></table> <p>or $\frac{60 \times 72}{12}$ or 2, 2, 2, 3, 3, 5 oe</p>	2	60	72	2	30	36	3	15	18	2	5	6			3	2	<p>M1 for any correct valid method and no errors e.g.</p> <p>for starting to list at least four multiples of each number</p> <p>or</p> <p>2 2 3 5 and 2 2 2 3 3 seen (may be in a factor tree or a ladder diagram and ignore 1)</p> <p>or a fully correct Venn diagram</p> <p>or other clear method, e.g. table</p>
2	60	72																	
2	30	36																	
3	15	18																	
2	5	6																	
		3																	
			360																
				<p>A1 dep M1 accept $2^3 \times 3^2 \times 5$ oe</p> <p>Total 4 marks</p>															

18	(a)	<p>36, 72, 108, ... and 120, 240, 360, ...</p> <p>or</p> <p>2, 2, 3, 3 and 2, 2, 2, 3, 5</p> <p>or</p> <div><table border="1"><tr><td>2</td><td>36</td><td>120</td></tr><tr><td>2</td><td>18</td><td>60</td></tr><tr><td>3</td><td>9</td><td>30</td></tr><tr><td></td><td>3</td><td>10</td></tr></table></div> <p>or $\frac{36 \times 120}{12}$ or 2, 2, 2, 3, 3, 5 oe</p>	2	36	120	2	18	60	3	9	30		3	10		2	<p>M1 for any correct valid method e.g. for starting to list at least three multiples of each number</p> <p>2, 2, 3, 3 and 2, 2, 2, 3, 5 seen (may be in a factor tree or a ladder diagram and ignore 1) (Allow 2×2 as 4)</p> <p>or a fully correct “Venn” diagram</p>
2	36	120															
2	18	60															
3	9	30															
	3	10															
			360		A1 or $2^3 \times 3^2 \times 5$ oe (allow $2^3 \cdot 3^2 \cdot 5$)												
	(b)		$5^2 \times 7^4 \times 11$	2	<p>B2 for $5^2 \times 7^4 \times 11$ (in any order)</p> <p>(B1 for 660 275 or correct unsimplified product or $5^a \times 7^b \times 11^c$ where 2 of a, b and c are correct)</p>												
Total 4 marks																	

19	$2^2 \times 7$ or $2 \times 3 \times 7$ or $3^2 \times 7$ oe or showing at least 5 correct multiples across at least 2 lists (excluding 28, 42, 63) (28) 56, 84, 112, 140, 168, 196, 224, 252 (42) 84, 126, 168, 210, 252 (63) 126, 189, 252					3	M1 accept prime factors seen in factor tree or correct position in Venn diagram for at least one of the numbers given with no other numbers for that number incorrectly placed		
	$2^2 \times 7$ and $2 \times 3 \times 7$ and $3^2 \times 7$ or showing at least 9 correct multiples across all 3 lists (excluding 28, 42, 63) (28) 56, 84, 112, 140, 168, 196, 224, 252 (42) 84, 126, 168, 210, 252 (63) 126, 189, 252						M1 accept prime factors seen in factor tree or correct position in Venn diagram for all 3 of the numbers given with no other numbers incorrectly placed		
					252		A1 or $2^2 \times 3^2 \times 7$ Dep on M1		
19 alt	7	28	42	63				3	M1 For one correct row in table eg division by 7 gives 4, 6, 9
	2	4	6	9					
	3	2	3	9					
		2	1	3					
	7	28	42	63					
	2	4	6	9					
	3	2	3	9					
	2	2	1	3					
	3	1	1	3					
	(1)	1	1	1					
					252		A1 or $2^2 \times 3^2 \times 7$ Dep on M1		
Total 3 marks									

20	(a)		1, 2, 5, 10	1	B1	in any order												
	(b)	18, 36, ... and 60, 120, ... or 2 3 3 oe or 2 2 3 5 oe or  or <table border="1"><tr><td>2</td><td>18</td><td>60</td></tr><tr><td>3</td><td>9</td><td>30</td></tr><tr><td>5</td><td>3</td><td>10</td></tr><tr><td></td><td></td><td>2</td></tr></table> or 2, 2, 3, 3, 5 oe	2	18	60	3	9	30	5	3	10			2		2	M1	for any correct valid method and no errors e.g. for starting to list at least two multiples of each number or 2 3 3 seen or 2 2 3 5 seen (may be in a factor tree or a ladder diagram and ignore 1) or a fully correct Venn diagram or other clear method, e.g. table, not be written as a product
2	18	60																
3	9	30																
5	3	10																
		2																
		Working required	180		A1	accept $2^2 \times 3^2 \times 5$ oe												
						Total 3 marks												

21	(a)	$2 \times 2 \times 2 \times 5 \times 5$ or 2, 2, 2, 5, 5 or $2 \times 2 \times 3 \times 5 \times 7$ or 2, 2, 3, 5, 7 or eg <table border="1"><tr><td>2</td><td>200</td><td>420</td></tr><tr><td>2</td><td>100</td><td>210</td></tr><tr><td>5</td><td>50</td><td>105</td></tr><tr><td></td><td>10</td><td>21</td></tr></table>	2	200	420	2	100	210	5	50	105		10	21		2	M1 for one number written as a product of prime factors or prime factors listed – numbers may be at end of factor trees or on ‘ladder diagrams’ or in a table or in a Venn diagram or at least two factors for each (excluding 1, 200, 420)
	2	200	420														
2	100	210															
5	50	105															
	10	21															
		<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	20		A1 or $2^2 \times 5$ oe												
	(b)			2	M1 for $2^m \times 3^n \times 5^p \times 7^q \times 11^r$ with at least three of $m = 3, n = 2, p = 2, q = 2, r = 1$ (all 5 terms should be seen) or omission of one term with others fully correct OR prime factors seen in a Venn diagram – if so must be fully correct												
		<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$2^3 \times 3^2 \times 5^2 \times 7^2 \times 11$		A1 allow 970 200 oe												
Total 4 marks																	

22	(b)	<p>2, 5, 10, 13, 26, 65 and 2, 4, 8, 16, 26, 52, 104 or 2, 5, 13 and 2, 2, 2, 2, 13 oe</p>  <p>or</p> <table border="1"><tr><td colspan="3">e.g.</td></tr><tr><td>26</td><td>130</td><td>208</td></tr><tr><td></td><td>5</td><td>8</td></tr></table> <table border="1"><tr><td colspan="3">e.g.</td></tr><tr><td>2</td><td>130</td><td>208</td></tr><tr><td>13</td><td>65</td><td>104</td></tr><tr><td></td><td>5</td><td>8</td></tr></table>	e.g.			26	130	208		5	8	e.g.			2	130	208	13	65	104		5	8		2	<p>M1 for starting to list at least two factors of each number excluding 1 and <i>n</i> (Two factors may be written as, for e.g., $130 \div 26 = 5$ and $208 \div 26 = 8$ oe or $130 \div 13 = 10$ and $208 \div 13 = 16$ etc) or 2, 5, 13 and 2, 2, 2, 2, 13 seen (may be in a factor tree or a ladder diagram and ignore 1) or a fully correct Venn diagram oe or other clear method, e.g. table</p>
e.g.																										
26	130	208																								
	5	8																								
e.g.																										
2	130	208																								
13	65	104																								
	5	8																								
		<i>Working required</i>	26		A1 dep on M1																					

23	(a)		97	1	B1
-----------	-----	--	----	---	----

24	<p>e.g. $2 \times 5 \times 225$ or $5 \times 5 \times 90$ or $5^2 \times 90$ $3 \times 5 \times 150$ or $3 \times 3 \times 250$ or $3^2 \times 250$</p> <p>e.g.</p> <table border="1"><tr><td>2</td><td>2250</td></tr><tr><td>5</td><td>1125</td></tr><tr><td></td><td>225</td></tr></table> <p>e.g.</p> <pre> 2250 / \ 2 1125 / \ 5 225</pre>	2	2250	5	1125		225		3	M1	<p>for 2 correct stages in prime factorisation with 0 incorrect stages or at least 3 stages in prime factorisation with no more than 1 incorrect stage. Each stage gives 2 factors – may be in a factor tree or a table or listed eg 2, 2, 225 (see LHS for examples of the amount of work needed for the award of this mark). Example of 3 stages with 1 incorrect stage: $2250 = 225 \times 100 = 3 \times 5 \times 15 \times 100$ or $225 = 3 \times 5 \times 15$</p>								
2	2250																		
5	1125																		
	225																		
	<p>e.g. $2 \times 3 \times 3 \times 5 \times 5 \times 5$</p> <p>e.g.</p> <table border="1"><tr><td>2</td><td>2250</td></tr><tr><td>5</td><td>1125</td></tr><tr><td>3</td><td>225</td></tr><tr><td>5</td><td>75</td></tr><tr><td>3</td><td>15</td></tr><tr><td>5</td><td>5</td></tr><tr><td></td><td>(1)</td></tr></table> <p>e.g.</p> <pre> 2250 / \ 2 1125 / \ 5 225 / \ 3 75 / \ 5 15 / \ 3 5</pre>	2	2250	5	1125	3	225	5	75	3	15	5	5		(1)			M1	<p>for 2, 3, 3, 5, 5, 5 or $2 \times 3 \times 3 \times 5 \times 5 \times 5$ or $2, 3^2, 5^3$ oe or $2 + 3^2 + 5^3$</p> <p>(ignore 1s)</p> <p>(may be a fully correct factor tree or ladder)</p>
2	2250																		
5	1125																		
3	225																		
5	75																		
3	15																		
5	5																		
	(1)																		
	Working required	$2 \times 3^2 \times 5^3$		A1	<p>dep on M2 can be any order (allow $2 \cdot 3^2 \cdot 5^3$)</p>														
Total 3 marks																			

25	9, 18, 27, 36 and 12, 24, 36 or 36 or a multiple of 36 or (9 × 12 =) 108 or 3 ² × 4 (= 36) (from Venn diagram or table)		4	M1 for at least two multiples of 9 and 12 or 36 or a multiple of 36																					
	“4” × 7.6(0) or “3” × 4.8(0) or “30.4” or “14.4” or “4n” × 7.6(0) or “3n” × 4.8(0)			M1 for a correct method to find the cost of 4 or 8 or 12 etc of packets of pens or 3 or 6 or 9 etc packets of pencils																					
	“4” × 7.6(0) + “3” × 4.8(0) or “30.4” + “14.4” or “4n” × 7.6(0) + “3n” × 4.8(0)			M1 for a correct combination of number of packets of pens × 7.6(0) + number of packets of pencils × 4.8(0) with an intention to add, eg <table><tr><td>pens</td><td>pencils</td><td></td></tr><tr><td>4 × 7.60 +</td><td>3 × 4.8 =</td><td>44.8(0)</td></tr><tr><td>8 × 7.60 +</td><td>6 × 4.8 =</td><td>89.6(0)</td></tr><tr><td>12 × 7.60 +</td><td>9 × 4.8 =</td><td>134.4(0)</td></tr><tr><td>16 × 7.60 +</td><td>12 × 4.8 =</td><td>179.2(0)</td></tr><tr><td>36 × 7.60 +</td><td>27 × 4.8 =</td><td>403.2(0)</td></tr><tr><td>48 × 7.60 +</td><td>36 × 4.8 =</td><td>537.6(0)</td></tr></table>	pens	pencils		4 × 7.60 +	3 × 4.8 =	44.8(0)	8 × 7.60 +	6 × 4.8 =	89.6(0)	12 × 7.60 +	9 × 4.8 =	134.4(0)	16 × 7.60 +	12 × 4.8 =	179.2(0)	36 × 7.60 +	27 × 4.8 =	403.2(0)	48 × 7.60 +	36 × 4.8 =	537.6(0)
pens	pencils																								
4 × 7.60 +	3 × 4.8 =	44.8(0)																							
8 × 7.60 +	6 × 4.8 =	89.6(0)																							
12 × 7.60 +	9 × 4.8 =	134.4(0)																							
16 × 7.60 +	12 × 4.8 =	179.2(0)																							
36 × 7.60 +	27 × 4.8 =	403.2(0)																							
48 × 7.60 +	36 × 4.8 =	537.6(0)																							
	Correct answer scores full marks (unless from obvious incorrect working)	44.8(0)		A1 allow 45 if 44.8(0) seen allow 4480 p or pence if £ sign crossed out M3A0 for 44.8n where n is an integer (eg 134.4(0))																					
				Total 4 marks																					

26	(a)	eg $2 \times 2 \times 75$ or $3 \times 5 \times 20$ or $2 \times 3 \times 50$ or $5^2 \times 12$ or <table border="1"><tr><td>2</td><td>300</td></tr><tr><td>2</td><td>150</td></tr><tr><td></td><td>75</td></tr></table>	2	300	2	150		75		2	M1 for 2 correct stages in prime factorisation with 0 incorrect stages or at least 3 stages in prime factorisation with no more than 1 incorrect stage. Each stage gives 2 factors – may be in a factor tree or a table or listed eg 2, 2, 75 (see LHS for examples of the amount of work needed for the award of this mark). Example of 3 stages with 1 incorrect stage: $300 = 100 \times 30 = 2 \times 50 \times 5 \times 6$
	2	300									
	2	150									
	75										
		Working required	$2 \times 2 \times 3 \times 5 \times 5$	A1	dep on M1, oe eg $2^2 \times 3 \times 5^2$						
	(b)	(5A $\Rightarrow 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$ oe (= 1800)) or (5A $\Rightarrow 2^3 \times 3^2 \times 5^2$ (= 1800)) or (7B $\Rightarrow 2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 7$ oe (= 3780)) or (7B $\Rightarrow 2^2 \times 3^3 \times 5 \times 7$ (= 3780))		2	M1 for method to find 5A or 7B as prime factors (may be seen in factor tree, table or Venn diagram) or as an integer or for listing at least 3 multiples of each number eg 1800, 3600, 5400... and 3780, 7560, 11340... or for an answer of 1080 oe eg $2^3 \times 3^3 \times 5$						
		Working required	37800	A1	dep on M1, oe eg $2^3 \times 3^3 \times 5^2 \times 7$						
Total 4 marks											