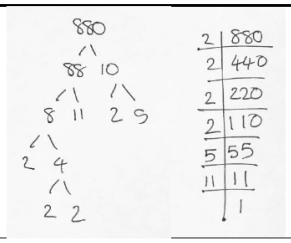
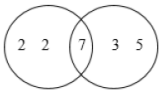
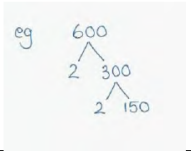
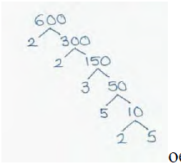
1			3	M1	for continual prime factorisation (at least two correct steps anywhere) or at least two stages of a factor tree, or table, correct. eg if first stage wrong, 800 × 80 then 800 = 80 × 10 and 80 = 40 × 2 would count as 2 correct steps.
				M1	dep M1 for a fully correct factor tree or a list (2,2,2,2,5,11) condone inclusion of 1's on branch ends. **or** 2 × 2 × 2 × 2 × 5 × 11
		$2^4 \times 5 \times 11$		A1	dep M2 for $2^4 \times 5 \times 11$ (with working seen)
					Total 3 marks

2	(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

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

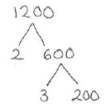
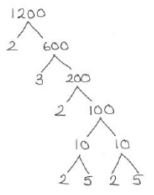
4		28, 56, 84, 112… **and** 105, 210, 315, 420… **or** 2, 2, 7 **and** 3, 5, 7 **or**  **or** $\frac{28 \times 105}{7}$ **or** 2, 2, 3, 5, 7 oe		2	M1for any correct valid method e.g. for starting to list at least **four** multiples of each number **or** 2, 2, 7 **and** 3, 5, 7 seen (may be in a factor tree and ignore 1) **or** a fully correct Venn diagram
			420		A1 cao
					Total 2 marks

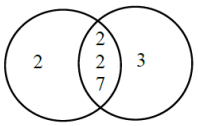
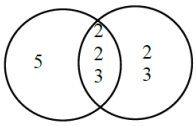
5	eg 2 × 2 × 150 **or** 3 × 5 × 40 **or** 2 × 3 × 100 **or** $5^2 \times 24$ **or**  **or**	2 | 600 2 | 300 | 150	3	M1	for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 150 (see LHS for examples of the amount of work needed for the award of this mark, allow no more than one mistake ft (eg one mistake with 2 prime factors ft: 600 = 200 × 30 = 2 × 100 × 5 × 6))
	eg 2 × 2 × 2 × 3 × 5 × 5  oe	2 | 600 2 | 300 2 | 150 3 | 75 5 | 25 5 | 5 | [1] oe		M1	for 2, 2, 2, 3, 5, 5 (ignore 1s) (may be a fully correct factor tree or ladder)
	Working required and note that the answer must be given as a product of powers of prime factors	$2^3 \times 3 \times 5^2$		A1	dep on M2 can be any order (allow 2^3 . 3 . 5^2)
					Total 3 marks

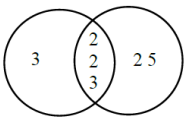
6	a		$2^6 \times 3 \times 11^4$	2	B2	oe, accept 2 811 072
					B1	for $2^a \times 3^b \times 11^c$ oe where two of a, b and c are correct
	b		$2^9 \times 3^5 \times 11^8$	2	B2	cao
					B1	for $2^a \times 3^b \times 11^c$ oe where two of a, b and c are correct **or** $2.666... \times 10^{13}$ **or** an equivalent expression for e.g. $2^2 \times 2^7 \times 3^5 \times 11^3 \times 11^5$
						Total 4 marks

7			$2^4 \times 3^2 \times 5^4 \times 11 \times 13$	2	B2	(B1 for 12 870 000 or correct unsimplified product or $2^m \times 3^n \times 5^p \times 11 \times 13$ with at least 1 of m, n or p correct or for $2^4 \times 3^2 \times 5^4$)
						Total 2 marks

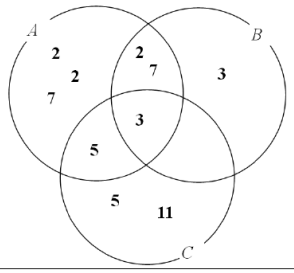
8	(a)		$3^2 \times 5 \times 7$	1	B1	accept $3 \times 3 \times 5 \times 7$ oe or 315

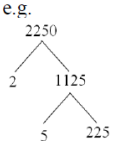
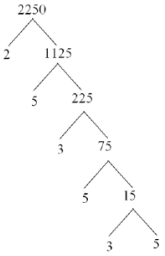
9	eg $2 \times 2 \times 300$ $2 \times 5 \times 120$ $2 \times 3 \times 200$ $3 \times 5 \times 80$ or eg  or 2 | 1200 3 | 600 | 200			3	M1	for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 300 (allow no more than one mistake ft (eg *one mistake* with 2 prime factors ft $1200 = 20 \times 600 = 2 \times 10 \times 3 \times 200$))
	2, 2, 2, 2, 3, 5, 5 or  oe 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)
			$2^4 \times 3 \times 5^2$		A1	(dep on M2 as working requested) Can be in any order (allow $2^4 . 3 . 5^2$) but must be in index form as asked for.
						Total 3 marks

10	(a)	1, 2, 4, 7, 8, 14, 28, 56 **and** 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84 **or** 2 2 2 7 **and** 2 2 3 7 **or**  e.g. **28** 56 84 **2** **3**		2	M1 for any correct valid method and no errors e.g. for starting to list at least **four** different factors of each number and no errors **or** 2 2 2 7 **and** 2 2 3 7 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
			28		A1 dep M1 accept $2^2 \times 7$ oe
	(b)	60, 120, 180, 240… **and** 72, 144, 216, 288… **or** 2 2 3 5 **and** 2 2 2 3 3 **or**  **or** $\frac{60\times72}{12}$ **or** 2, 2, 2, 3, 3, 5 oe **2** 60 72 **2** 30 36 **3** 15 18 **2** **5** 6 **3**		2	M1 for any correct valid method and no errors e.g. for starting to list at least **four** multiples of each number **or** 2 2 3 5 **and** 2 2 2 3 3 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
			360		A1 dep M1 accept $2^3 \times 3^2 \times 5$ oe
					Total 4 marks

11	(a)	36, 72, 108, ... **and** 120, 240, 360, ... **or** 2, 2, 3, 3 **and** 2, 2, 2, 3, 5 **or**  **or** $\frac{36\times120}{12}$ **or** 2, 2, 2, 3, 3, 5 oe **2** 36 120 **2** 18 60 **3** 9 30 **3** **10**		2	M1for any correct valid method e.g. for starting to list at least **three** multiples of each number 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) **or** a fully correct "Venn" diagram
			360		A1 or $2^3 \times 3^2 \times 5$ oe (allow $2^3 \,.\, 3^2 \,.\, 5$)
	(b)		$5^2 \times 7^4 \times 11$	2	B2 for $5^2 \times 7^4 \times 11$ (in any order) (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)
					Total 4 marks

12		$2\times2\times7$ or $2\times3\times7$ or $3^2\times7$ oe condone 1's in factor tree **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.
		$2\times2\times7$ **and** $2\times3\times7$ **and** $3\times3\times7$ **or** showing at least 9 correct multiples across all 3 lists (excluding 28, 42, 63)			M1 accept prime factors seen in factor tree **or** correct position in Venn diagram for all 3 of the numbers given.
			252		A1 or $2^2 \times 3^2 \times 7$ oe Dep on M1
12	**alt**	7 28 42 63 2 **4** **6** **9** 3 **2** **3** **9** 2 1 3 oe or 7 28 42 63 2 4 6 9 3 2 3 9 2 2 1 3 3 1 1 3 (1) 1 1 1		3	M1 For one correct row in table eg division by 7 gives 4, 6, 9 M1 Fully correct table – need only go as far as top table – we want to see prime factors along the side or prime factors along the sides and bottom (condone 1's)
			252		A1 or $2^2 \times 3^2 \times 7$ oe Dep on M1
					Total 3 marks

13 (a)	$2\times2\times2\times5\times5$ **or** 2, 2, 2, 5, 5 **or** $2\times2\times3\times5\times7$ **or** 2, 2, 3, 5, 7 **or** eg 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)
	Correct answer scores full marks (unless from obvious incorrect working)	20		A1	or $2^2\times5$ oe
(b)			2	M1	for $2^m\times3^n\times5^p\times7^q\times11^r$ 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
	Correct answer scores full marks (unless from obvious incorrect working)	$2^3\times3^2\times5^2\times7^2\times11$		A1	allow 970 200 oe
					Total 4 marks

14	e.g. $2\times5\times225$ or $5\times5\times90$ or $5^2\times90$ $3\times5\times150$ or $3\times3\times250$ or $3^2\times250$		3	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, 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: $2250 = 225\times100 = 3\times5\times15\times100$ or $225 = 3\times5\times15$
	e.g. 2 | 2250 5 | 1125 | 225 e.g. 				
	e.g. $2\times3\times3\times5\times5\times5$ e.g. 2 | 2250 5 | 1125 3 | 225 5 | 75 3 | 15 5 | 5 | (1) e.g. 			M1	for 2, 3, 3, 5, 5, 5 or $2\times3\times3\times5\times5\times5$ or $2, 3^2, 5^3$ oe or $2+3^2+5^3$ (ignore 1s) (may be a fully correct factor tree or ladder)
	Working required	$2\times3^2\times5^3$		A1	dep on M2 can be any order (allow $2\,.\,3^2\,.\,5^3$)

<table>
<tr><td>15</td><td>9, 18, 27, 36 and 12, 24, 36
or 36
or a multiple of 36
or
(9 × 12 =) 108
or
$3^2 \times 4$ (= 36) (from Venn diagram or table)</td><td></td><td>4</td><td>M1 for at least two multiples of 9 and 12
or
36
or
a multiple of 36</td></tr>
<tr><td></td><td>“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)</td><td></td><td></td><td>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</td></tr>
<tr><td></td><td>“4” × 7.6(0) + “3” × 4.8(0)
or
“30.4” + “14.4”
or
“4n” × 7.6(0) + “3n” × 4.8(0)</td><td></td><td></td><td>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></td></tr>
<tr><td></td><td>Correct answer scores full marks (unless from obvious incorrect working)</td><td>44.8(0)</td><td></td><td>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))</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Total 4 marks</td></tr>
</table>

<table>
<tr><td>16 (a)</td><td>eg 2 × 2 × 75
or 3 × 5 × 20
or 2 × 3 × 50
or $5^2 \times 12$
or
<table>
<tr><td>2</td><td>300</td></tr>
<tr><td>2</td><td>150</td></tr>
<tr><td></td><td>75</td></tr>
</table></td><td></td><td>2</td><td>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 × 30 = 2 × 50 × 5 × 6</td></tr>
<tr><td></td><td>Working required</td><td>2 × 2 × 3 × 5 × 5</td><td></td><td>A1 dep on M1, oe eg $2^2 \times 3 \times 5^2$</td></tr>
<tr><td>(b)</td><td>(5A =) 2 × 2 × 2 × 3 × 3 × 5 × 5 oe (= 1800)
or
(5A =) $2^3 \times 3^2 \times 5^2$ (= 1800)
or
(7B =) 2 × 2 × 3 × 3 × 3 × 5 × 7 oe (= 3780)
or
(7B =) $2^2 \times 3^3 \times 5 \times 7$ (= 3780)</td><td></td><td>2</td><td>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, 11 340...

or for an answer of 1080 oe eg $2^3 \times 3^3 \times 5$</td></tr>
<tr><td></td><td>Working required</td><td>37 800</td><td></td><td>A1 dep on M1, oe eg $2^3 \times 3^3 \times 5^2 \times 7$</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Total 4 marks</td></tr>
</table>