Question	Answer	Mark	Comments
1	$(27 =) 3^3$	M1	
	$\left((3^2)^7 =\right) 3^{2 \times 7}$ or $\left((3^2)^7 =\right) 3^{14}$	M1	
	3^{17}	A1ft	ft 3^a and 3^b then answer 3^{a+b} with M1M0 or M0M1 scored
	Additional Guidance		
	Answer 3^{17} with no incorrect working		M1M1A1
	3^{17} in working with 17 on the answer line or both 3^{17} and 17 on the answer line		M1M1A1
	$3^3 \times 3^9 = 3^{12}$		M1M0A1ft
	Evaluation of powers of 3 as values only		M0M0A0
	Answer 17 with no valid working		M0M0A0

Question	Answer	Mark	Comments
2	$\dfrac{1}{10}$ or 0.1	B2	B1 $\sqrt{100}^{-1}$ or 10^{-1} or $\left(\dfrac{1}{100}\right)^{\frac{1}{2}}$ or $\dfrac{1}{100^{\frac{1}{2}}}$ or $\dfrac{1}{\sqrt{100}}$ or $\sqrt{\dfrac{1}{100}}$
	Additional Guidance		
	Accept ± or − for B1 only, eg ± 10^{-1} or $-\dfrac{1}{10}$		B1

3	8	B1	
	$\dfrac{1}{0.4}$ or $\dfrac{10}{4}$ or 2.5 or $\dfrac{1}{\frac{2}{5}}$ or $\dfrac{5}{2}$ or $2\dfrac{1}{2}$	M1	8×0.4 or 3.2 implies B1M1 16 : 5 or equivalent ratio implies B1M1
	3.2 : 1 or $\dfrac{16}{5}$: 1 or $3\dfrac{1}{5}$: 1	A1ft	ft B0M1

<table>
<tr><td colspan="3" align="center">Additional Guidance</td></tr>
<tr><td colspan="2">$8^3 = 512$ or $8 \times 8 \times 8 = 512$ alone is not sufficient for B1</td><td></td></tr>
<tr><td colspan="2">ft answers must have n exact or correctly rounded to at least 2 sf

eg $\sqrt{512} = 22.62$ (incorrect and truncated)

2.5

9.05 : 1</td><td>B0

M1

A1ft</td></tr>
<tr><td colspan="2">ft answer exact surd value

eg $\sqrt{512} = 16\sqrt{2}$

2.5

9.05 : 1 or $\dfrac{32}{5}\sqrt{2}$: 1</td><td>B0

M1

A1ft</td></tr>
</table>

Q	Answer	Mark	Comments
4	$b = \sqrt{a} + 3$	B1	

Q	Answer	Mark	Comments
5	Any correct pair of values	B1	eg $a = 9 \ b = \dfrac{1}{2}$ $a = 27 \ b = \dfrac{1}{3}$ $a = 81 \ b = \dfrac{1}{4}$

<table>
<tr><td colspan="3" align="center">Additional Guidance</td></tr>
<tr><td colspan="2">$a = 9 \ b = \dfrac{1}{3}$</td><td>B0</td></tr>
<tr><td colspan="2">$a = 3 \ b = \dfrac{1}{1}$</td><td>B0</td></tr>
<tr><td colspan="2">$a = 3 \ b = 1$</td><td>B0</td></tr>
</table>

Q	Answer	Mark	Comments
6(a)	243	B2	B1 3^{12-7} or 3^5 oe single index or $3 \times 3 \times 3 \times 3 \times 3$ oe multiplication string or 531 441 seen as 3^{12} or as a numerator or 2187 seen as 3^7 or as a denominator or 3^n correctly evaluated, where n is an integer $\geqslant 4$

	Additional Guidance	
	Condone 3^5 and 243 on the answer line, in either order	B2
	3^5 only on the answer line	B1
	Do not allow a misread	
	$12 - 7$ is insufficient for B1 unless 3^{12-7} or 3^5 is also seen	
	Do not award B1 for a correct evaluation of 3^n not ascribed to a particular value of n eg a list 3, 9, 27, 81 … does not score the mark unless 81 is identified as 3^4	

Q	Answer	Mark	Comments
6(b)	2^{13}	B2	B1 2^{3+6+4} or $(8 =) 2 \times 2 \times 2$ or 2^3 or $(2^6 \times 2^4 =) 2^{6+4}$ or $(2^6 \times 2^4 =) 2^{10}$ or $2^9 (\times 2^4)$ or $2^7 (\times 2^6)$ or 8192

Additional Guidance		
8192 and 2^{13} on answer line, in either order		B2
8192 only on the answer line		B1
Correctly combined powers can be implied eg $8 = 2^4$ with answer 2^{14} implies $2^6 \times 2^4 = 2^{10}$		B1
Evaluations other than 8192 do not score eg 8×1024 without seeing 8×2^{10} eg $8 \times 64 \times 16$		B0 B0
Do not award B1 for 8192 if it is in a list of powers of 2 unless it is indicated or it is the highest power evaluated		
Changing terms to numbers with a base of 8 scores zero unless converted to a number with a base of 2		

Q	Answer	Mark	Comments
7	$2\dfrac{1}{4}$	B1	oe mixed number

Additional Guidance		
$\dfrac{9}{4} = 2\dfrac{1}{4}$ or $2.25 = 2\dfrac{1}{4}$ on answer line		B1
$2\dfrac{1}{4} = \dfrac{9}{4}$ or $2\dfrac{1}{4} = 2.25$ on answer line		B0
Otherwise, $2\dfrac{1}{4}$ and $\dfrac{9}{4}$ or $2\dfrac{1}{4}$ and 2.25 on answer line in either order (or in working with answer line blank and answer unclear)		B0
$1\dfrac{5}{4}$		B0
$2\left(\dfrac{1}{4}\right)$ or $2 + \dfrac{1}{4}$		B0

Q	Answer	Mark	Comments
8	**Alternative method 1 – evaluation and division**		
	$(5^2 =) 25$ or $(3 \times 5^2 =) 75$ or $600 \div 3$ or 200 or $600 \div 5^2$ or 24	M1	oe oe eg $3 \times 200 = 600$ oe eg $25 \times 24 = 600$
	$600 \div 3 \div 5^2$ or 8	M1dep	oe eg $8 \times 75 = 600$
	3 with M1 awarded and not from incorrect working	A1	
	Alternative method 2 – product of prime factors		
	600 written as a product of factors where at least one factor is prime	M1	eg 2 and 300 or 5 and 120 or 2 and 2 and 150 may be seen on a factor tree or in repeated division allow one strand to be incorrect if a previous value completes the product eg 20×30 followed by $2 \times 10 \times 5 \times 8$ implies $2 \times 10 \times 30$ for M1
	2 and 2 and 2 and 3 and 5 and 5	M1dep	may be seen on a factor tree or in repeated division
	3 with M1 awarded and not from incorrect working	A1	

Additional Guidance

$8 \times 3 \times 25 = 600$ and answer 3	M1M1A1
2^3 on answer line with M2 awarded	M1M1A0
Answer 3 on answer line with no working	M0M0A0
Do not allow $600 \div 3 \times 5^2$ for M2 in alt 1 unless recovered, but do allow $\dfrac{600}{3 \times 5^2}$ or $600 \div (3 \times 5^2)$	

Q	Answer	Mark	Comment
9	36	B1	

Q	Answer	Mark	Comment
10	−20.425	B1	

Q	Answer	Mark	Comment
11	9.61×10^{18}	B1	

Q	Answer	Mark	Comments
	Correct evaluation of the cube root of an integer [40, 50] or correct evaluation of the cube of a decimal or fraction (3, 3.5]	M1	eg $\sqrt[3]{40} = 3.4$ or $40 \to 3.4$ eg $3.5^3 = 42.8$ or $3.5 \to 42.8$
	42	A1	SC1 answer given as $\sqrt[3]{42}$

Additional Guidance		
Up to M1 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts		
Condone eg $40 = 3.4$ or $\sqrt{40} = 3.4$ to mean $\sqrt[3]{40} = 3.4$		
Answer only 42		M1A1
Must select 42 as final answer for M1A1 ie 42 as the last in a list with a blank answer line is not enough for A1 unless 42 selected		
If $\sqrt[3]{42}$ or 3.5^3 is evaluated then it must be correct to award the A1 for 42		
NB 42 only from incorrect method eg listing multiples of 3 or $42 \div 3$ seen or 42 is divisible by 3 as the working		M0A0

12(a)

Acceptable values for cube roots of integers in range

40	3.4(19…) or 3.42(0)		46	3.5(83…) or 3.6
41	3.4(48…) or 3.45		47	3.6(08…) or 3.609 or 3.61
42	3.4(76…) or 3.48 or 3.5		48	3.6(34…)
43	3.5(03…)		49	3.6(59…) or 3.66 or 3.7
44	3.5(30…)		50	3.6(84…) or 3.7
45	3.5(56…) or 3.557 or 3.56 or 3.6			

Examples of cubes of numbers in range with their acceptable values

3.1	29(.791) or 29.8 or 30		3.4	39(.304)
3.2	32(.768) or 32.77 or 32.8 or 33		3.5 or $3.4\dot{9}$	42(.875) or 42.88 or 42.9 or 43
3.3	35(.937) or 35.94 or 36			

Q	Answer	Mark	Comments
	Valid response that indicates there is one (negative) answer missing	B1	eg −10 (is also an answer) or there is a negative value as well or square roots have two answers or answer is 10 and −10

Additional Guidance		
−10 × −10 (= 100)		B1
Another number can square to make 100 (implies exactly two)		B1
She has forgotten the other value (implies exactly two)		B1
There is another value it could be (implies exactly two)		B1
It could be a different number (implies exactly two)		B1
It could be negative (bod means 10 could be −10)		B1
-10^2 (= 100) (condone missing brackets around −10)		B1
$\pm \sqrt{100}$		B1
Indication that there might be **more** than two possible values for x eg There are other possible numbers eg There could be other values eg Other numbers square to make 100 eg She hasn't included negatives		B0 B0 B0 B0
Repeating the question eg There is more than 1 possible value eg 10 is not the only possible value eg More than 1 number works		B0 B0 B0
A partially correct statement eg x could be negative or decimal eg −10 × −10 = −100 eg $x^2 = -10$		B0 B0 B0

(Q cell on left: **12(b)**)

Q	Answer	Mark	Comment
13	5	B1	

Q	Answer	Mark	Comments
14	$(12^2 =)$ 144 or $(\sqrt{36} =)$ 6 or $(\frac{1}{3} \times \sqrt{36} =) 2$	M1	implied by correct answer accept $(\sqrt{36} =) \pm 6$ or $(\frac{1}{3} \times \sqrt{36} =) \pm 2$
	$(12^2 =)$ 144 and $(\frac{1}{3} \times \sqrt{36} =) 2$	M1dep	implied by correct answer $144 \times \frac{1}{2}$ or $\frac{432}{6}$ oe fraction implies M1M1 accept $(\frac{1}{3} \times \sqrt{36} =) \pm 2$
	72	A1	accept ± 72 SC2 288

Additional Guidance

-72 only	M1M1A0
Condone missing brackets if recovered eg $12^2 \div \frac{1}{3} \times 6$ with answer 72	M1M1A1
$\dfrac{144}{\frac{1}{3} \times 6}$ with no further correct work	M1M0A0
Using a decimal for $\frac{1}{3}$ must be recovered	

Q	Answer	Mark	Comments
15(a)	14 and 15	B1	either order

Additional Guidance

Ignore incorrect calculations	
Answer 14^2 and 15^2	B0