1	**Calculate with positive indices**	
a	Work out $(2^3 - 5)^4$	
b	Fred is working out $(10 - 2^4)^2$. He writes $(10 - 2^4)^2$ $= (10 - 16)^2$ $= -6^2$ $= -36$ Fred is wrong. Describe the mistake he has made.	

2	**Calculate with roots**	
a	Evaluate $\sqrt[4]{1.5 \times 4 + 10}$	
b	Fiona is asked to work out $\sqrt[3]{2 \times 5 + 6 \times 9}$. She writes $\sqrt[3]{2 \times 5 + 6 \times 9}$ $= \sqrt[3]{10 + 54}$ $= \sqrt[3]{64}$ $= 8$ Fiona is wrong. Describe the mistake she has made.	

3	**Calculate with negative indices in the context of standard form**	
a	Work out $3 \times 10^{-2} \times 8 \times 10^{-1}$. Give your answer in standard form.	
b	Faisal is working out $9.6 \times 10^{-3} \div 2.4 \times 10^{-7}$. He writes: $9.6 \div 2.4 = 4$ and $10^{-3} \div 10^{-7} = 10^{-10}$ So $9.6 \times 10^{-3} \div 2.4 \times 10^{-7} = 4 \times 10^{-10}$ Do you agree with Faisal? Explain why.	

4	**Use a calculator to evaluate numerical expressions involving powers**	
a	Use your calculator to evaluate $\left(\frac{3 + 2 \times 4.5}{7}\right)^3$ Give your answer as a fraction.	
b	Ffion uses her calculator to work out $(63 - 5.3 \times 2.1^3)^4$. She writes the answer 37509.82701 . Do you agree?	

5	**Use a calculator to evaluate numerical expressions involving roots**	
a	Use your calculator to work out $\sqrt[7]{(1+19)\times 75}$ Give your answer correct to three significant figures.	
b	Frank uses his calculator to work out $\sqrt[3]{4.1+2.3\div 1.15}$. He writes the answer 7.41 to two decimal places. Do you agree?	

6	**Add numbers written in standard form**	
a	Evaluate $2.45\times 10^6+7.3\times 10^5$. Give your answer in standard form.	
b	Fran is working out $1.23\times 10^{-3}+4.5\times 10^{-2}$. She writes: $1.23\times 10^{-3}=0.00123$ and $4.5\times 10^{-2}=0.045$ and $0.00123+0.045=0.00573$ Fran is wrong. Explain why.	

7	**Subtract numbers written in standard form**	
a	Work out $6\times 10^4-4.2\times 10^3$. Give your answer in standard form.	
b	Fabian evaluates $7.3\times 10^7-1.1\times 10^3$ His answer is 6.2×10^4 Do you agree with Fabian? Explain why.	

8	**Multiply numbers written in standard form**	
a	Evaluate $4.8\times 10^4\times 5\times 10^6$. Give your answer as an ordinary number.	
b	Felicity is asked to work out $5\times 10^{-3}\times 4\times 10^{-2}$ and give her answer in standard form. Her answer is 20×10^{-5} . Felicity is wrong. Explain why.	

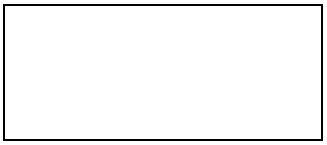
9	**Divide numbers written in standard form**	
a	Work out $3\times 10^{-3}\div 5\times 10^{-5}$. Give your answer as an ordinary number.	
b	Fergus is asked to work out $3\times 10^6\div 6\times 10^4$ and give his answer in standard form. Fergus writes the answer 0.5×10^2 . Do you agree with Fergus? Explain why.	

10	**Use standard form on a scientific calculator including interpreting the standard form display of a scientific calculator**	
a	The volume of the planet Neptune is 6.25×10^{13} km^3. The volume of planet Earth is 57.7 times less than Neptune. Work out the volume of Earth. Write your answer in standard form.	
b	Fenella uses her calculator to work out $3.2 \times 10^{21} \div 8.79 \times 10^{-5}$. She writes down the answer 3.64×10^{25}. Do you agree? Explain why.	

11	**Understand the difference between truncating and rounding**	
a	Is the following statement always true, sometimes true, or never true? Justify your decision. *'Truncating a number to one decimal place gives the same result as rounding to one decimal place'*	
b	Fraser writes 2.71828 = 2.71 to three significant figures Fraser is wrong. Explain why.	

12	**Identify the minimum and maximum values of an amount that has been rounded (to nearest x, x d.p., x s.f.)**	
a	The most viewed TV programme on Christmas Day, 2018 was the Queen's Speech. 6.4 million people watched this programme. 6.4 million has been rounded to two significant figures. What is the minimum number of people who could have watched the Queen's speech?	
b	A measurement is given as 152 cm to the nearest centimetre. Faith thinks that the maximum value of the measurement is 152.4 cm. Do you agree with Faith? Explain why.	

13	**Use inequalities to describe the range of values for a rounded value**	
a	The geometry chart for a bike gives the measurement HA = 68° to the nearest whole number. Complete this statement to show the range of possible values for HA. _____ ≤ HA < _____	
b	A sack of compost weighs 20 kg to the nearest kilogram. Fergal writes 19.5 ≤ mass of compost (kg) < 20.499 Fergal is wrong. Explain why.	

14	**Solve problems involving the maximum and minimum values of an amount that has been rounded**	
a	The length and width of a rectangular field have been measured to the nearest metre. Work out the **greatest possible value** of the area of the field. 156 m 68 m 	
b	Two angles in a triangle are measured as 48° and 63°. Both measurements are given to the nearest degree. Freda is asked to work out the **greatest possible value** of the third angle? She writes $180° - 48.5° - 63.5° = 68°$ Freda is wrong. Explain why.	

	Key learning point	☹	😐	😐	☺
1	Calculate with positive indices				
2	Calculate with roots				
3	Calculate with negative indices in the context of standard form				
4	Use a calculator to evaluate numerical expressions involving powers				
5	Use a calculator to evaluate numerical expressions involving roots				
6	Add numbers written in standard form				
7	Subtract numbers written in standard form				
8	Multiply numbers written in standard form				
9	Divide numbers written in standard form				
10	Use standard form on a scientific calculator including interpreting the standard form display of a scientific calculator				
11	Understand the difference between truncating and rounding				
12	Identify the minimum and maximum values of an amount that has been rounded (to nearest x, x d.p., x s.f.)				
13	Use inequalities to describe the range of values for a rounded value				
14	Solve problems involving the maximum and minimum values of an amount that has been rounded				

Top three improvements for me to make

1a	81	
1b	It should be $(-6)^2 = 36$	
2a	2	
2b	She has found the square root of 64. The cube root of 64 is 4.	
3a	2.4×10^{-2}	
3b	No, and reason; e.g. $10^{-3} \div 10^{-7} = 10^4$	
4a	$\frac{1728}{343}$	
4b	Yes	
5a	2.84	
5b	No, it should be 1.827… (Frank has done 3×, instead of the cube root)	
6a	3.18×10^6	
6b	e.g. the answer should be 0.04623	
7a	5.58×10^4	
7b	No, and reason; e.g. the answer is 72 998 900	
8a	2.4×10^{11}	
8b	Not in standard form	
9a	60	
9b	Not in standard form	
10a	1.08×10^{12} (3sf)	
10b	Yes, she has rounded to two decimal places (for example)	
11a	Sometimes true	
11b	He has truncated	
12a	6.35 million	
12b	No, and reason; e.g. 152.43 is bigger	
13a	$67.5° < \text{HA} \leq 68.5°$	
13b	The upper limit should be 12.5	
14a	10720.25 m^2	
14b	She should have worked out 180° – 47.5° – 62.5° = 70°	