FOUNDATION & HIGHER

HIGHER EXTENDS

Name ..... Class .....

N6: Powers and roots

Solve problems involving powers, roots and estimates

20 marks · 25 minutes · Non-calculator

1) A cube of volume 1000 cm^3 is cut into small cubes with sides of 2 cm. How many times greater is the total surface area of the small cubes than the surface area of the large cube?

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[Question 1: 3 marks]

2) Find the smallest whole number n such that $2^n > 1000$

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[Question 2: 2 marks]

3) A square room has an area of $9\,m^2$. It is covered with square tiles of side 30 cm. How many tiles are needed?

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[Question 3: 3 marks]

4) Find two different ways of writing 145 as the sum of two square numbers.

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[Question 4: 3 marks]

5) Use trial and improvement to find $\sqrt[3]{200}$ correct to 1 decimal place. Show your trials.

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[Question 5: 3 marks]

6) Which is larger, 3^{20} or 2^{30}? Show how you decide without working out either number.

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[Question 6: 3 marks]

7) Find the square number between 300 and 400 that is also a multiple of 3

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[Question 7: 2 marks]

8) n is a positive integer and $n^2 - n = 56$. Find n.

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[Question 8: 1 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	5	125 small cubes (P1); $125 \times 24 = 3000$ and 600 (P1); 5 (A1).
2	10	$2^9 = 512$, $2^{10} = 1024$ (P1); A1.
3	100	Side 3 m = 300 cm (P1); 10 tiles per side (P1); 100 (A1).
4	1 + 144 and 64 + 81	Systematic search of squares (P1); one pair (A1); second pair (A1).
5	5.8	$5.8^3 = 195.1$ (P1); $5.9^3 = 205.4$ (P1); $5.85^3 > 200$ or reasoning, 5.8 (A1).
6	3^{20}	$3^{20} = 9^{10}$ (P1); $2^{30} = 8^{10}$ (P1); $9 > 8$ (C1).
7	324	Squares $18^2 = 324$, $19^2 = 361$ (P1); 324 (A1).
8	8	B1.