



Powers and roots

Year 7 About 60 minutes No calculator 49 marks

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark]

Work out 14×14 .

A2 Needed today [1 mark]

Work out 0.3×0.3 .

Answer

Answer

- A3** Last lesson [1 mark]

Find the LCM of 9 and 12.

A4 From chapter 1 [1 mark]

Work out $-40 \div 8$.

Answer

Answer

B Example, then your turn

Year 7

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

(a) Write $2 \times 2 \times 2 \times 2 \times 2$ as a power of 2.

(b) Work out 5^4 .

Hint The power tells you how many of the number are multiplied together.

B1 (a) Write $9 \times 9 \times 9 \times 9$ as a power of 9. [3 marks]

(b) Work out 2^8 .

(c) Work out 0.5^2 .

Answer (a) ... (b) ... (c) ...

EXAMPLE 2

Work out

(a) $(-3)^2$ (b) -3^2 (c) $(-2)^5$

Hint A bracket means the whole of -3 is squared. With no bracket, only the 3 is squared.

B2 Work out [3 marks]

(a) $(-5)^3$

(b) -4^2

(c) $(-10)^4$

Answer (a) ... (b) ... (c) ...

EXAMPLE 3(a) Find both values of x when $x^2 = 144$.(b) Work out $\sqrt{0.49}$.**Hint** A square root undoes squaring. A negative number squared is positive too.**B3** (a) Find both values of x when $x^2 = 324$. [2 marks](b) Work out $\sqrt{2.25}$.

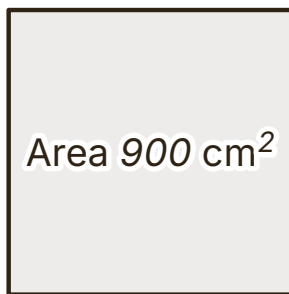
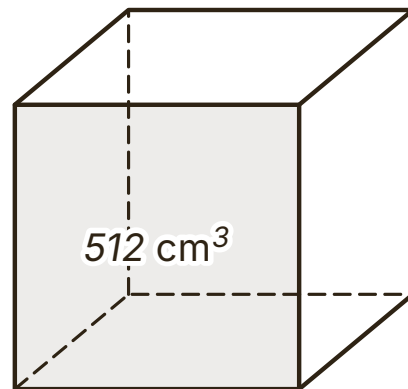
Answer (a) ... (b) ...

EXAMPLE 4

Work out

(a) $\sqrt[3]{8000}$ (b) $\sqrt[3]{-1000}$ **Hint** Find the number that, multiplied by itself three times, gives the number under the root.**B4** Work out [2 marks](a) $\sqrt[3]{27000}$ (b) $\sqrt[3]{-125}$

Answer (a) ... (b) ...

EXAMPLE 5A square has an area of 900 cm^2 . Work out its perimeter.**Hint** The side length is the square root of the area.**B5** A cube has a volume of 512 cm^3 . Work out the area of one face of the cube. [3 marks]

Answer

c Practice

Year 7

C1 Work out $4^3 - 8^2$.

[2 marks]

C2 Which is larger, 2^9 or 9^2 ? Work out the difference between them.

[2 marks]

Answer

Answer larger ... difference ...

C3 Find the value of n when $5^n = 625$. [2 marks]

Answer

C4 $\sqrt{70}$ lies between two whole numbers next to each other. Write down the two whole numbers. [2 marks]

Answer

C5 61 is the sum of two square numbers. Find the two square numbers. [2 marks]

Answer

D Exam-style questions

GCSE Foundation

D1 Work out the value of each of these.

(a) $6^2 + 2^3$ [1 mark]

Answer

(b) $\sqrt{5^2 + 12^2}$ [2 marks]

Answer

(c) $(-2)^3 \times 3^2$ [2 marks]

Answer

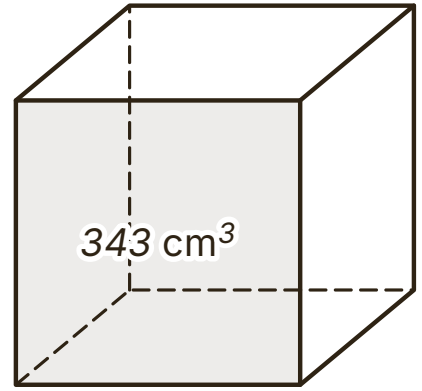
Total for D1: 5 marks

D2 Amy says, " $4^3 = 12$, because $4 \times 3 = 12$." [2 marks]

Amy is wrong. Explain why, and write down the correct value of 4^3 .

- D3** A storage box is a cube. Its volume is 343 cm^3 . Work out the total surface area of the box. [4 marks]

Answer



- D4** A square garden has an area of 196 m^2 . A fence is put all the way round the edge of the garden. The fence costs £12 per metre. Work out the cost of the fence. [4 marks]

Answer



- D5** The number 64 can be written as a power of several different whole numbers.

(a) Write 64 as a power of 2. [1 mark]

Answer

(b) Write 64 as a power of 4. [1 mark]

Answer

(c) Write 64 as a power of 8. [1 mark]

Answer

Total for D5: 3 marks

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 $1^3 + 2^3 + 3^3 + 4^3 = 100$, and 100 is a square number. [4 marks]
 Work out $1^3 + 2^3 + 3^3 + \dots + 10^3$ without adding up the ten cubes.

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Work out 1^3 , then $1^3 + 2^3$, then $1^3 + 2^3 + 3^3$. Each total is a square number. Write down the number that is squared each time.
- Hint 2** The numbers being squared are 1, 3, 6, 10. These are 1, $1 + 2$, $1 + 2 + 3$, $1 + 2 + 3 + 4$.
- Hint 3** So the sum of the first ten cubes is $(1 + 2 + \dots + 10)^2 = 55^2 = 3025$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can work out powers, including powers of negative numbers. ☐ ☐ ☐
- I can find square roots and cube roots without a calculator. ☐ ☐ ☐
- I can find a side length from the area of a square or the volume of a cube. ☐ ☐ ☐