



Negative and fractional powers

About 45 minutes No calculator 41 marks

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] Find the value of n when $\frac{3^n}{3^7} = 81^2$.
- A2** Last lesson [2 marks] Write $0.5\dot{3}$ as a fraction in its simplest form.

Answer _____

- A3** From chapter 6 [2 marks] Each interior angle of a regular polygon is 8 times its exterior angle. How many sides does the polygon have?

Answer _____

Answer _____

- A4** Key Stage 3 [2 marks] A trapezium has parallel sides of 4 cm and 18 cm. Its area is 99 cm². Find its height.

Answer _____

B Example, then your turn

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

EXAMPLE 1

Work out $49^{-\frac{3}{2}}$.**Hint** The bottom of the fraction is the root, the top is the power, and the minus sign turns it over.

- B1** Work out $400^{-\frac{3}{2}}$. [2 marks]

Answer _____

EXAMPLE 2

Work out $\left(\frac{4}{9}\right)^{-\frac{1}{2}}$.**Hint** Turn the fraction over first, then take the square root of the top and of the bottom.

- B2** Work out $\left(\frac{8}{125}\right)^{-\frac{2}{3}}$. [3 marks]

Answer _____

C Practice

C1 Between which two consecutive whole numbers does $\sqrt{300}$ lie? [2 marks]

Answer and

C3 Work out $625^{\frac{3}{4}}$. [2 marks]

Answer

C5 Write $\frac{1}{\sqrt[3]{x^2}}$ in the form x^n . [2 marks]

Answer

C7 Write $\frac{1}{32}$ as a power of 8. [2 marks]

Answer 8.....

C2 Work out 6^{-2} . Give your answer as a fraction. [1 mark]

Answer

C4 Find the value of n when $2^n = \frac{1}{64}$. [2 marks]

Answer $n = \dots\dots$

C6 Simplify $(64x^9)^{\frac{2}{3}}$. [2 marks]

Answer

C8 Work out $5^0 + 4^{-\frac{1}{2}}$. [2 marks]

Answer

D Exam-style questions

D1 Leo says, " $8^{\frac{4}{3}} = \frac{32}{3}$, because $8 \times \frac{4}{3} = \frac{32}{3}$." [2 marks]

Explain why Leo is wrong, and work out the correct value of $8^{\frac{4}{3}}$.

D2 $p = 243^{\frac{2}{5}}$ and $q = 243^{-\frac{3}{5}}$.

(a) Work out the value of p . [2 marks]

Answer

(b) Work out the value of q . Give your answer as a fraction. [2 marks]

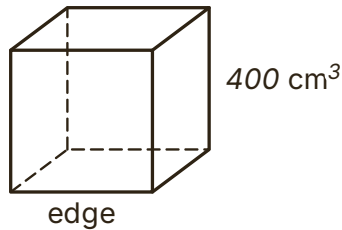
Answer

(c) Write $p \div q$ as a power of 3. [2 marks]

Answer

Total for D2: 6 marks

- D3** A cube has a volume of 400 cm^3 . Without a calculator, show that the length of an edge of the cube is between 7 cm and 8 cm. [2 marks]



E Extension

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

- E1** Find the value of x when $\left(\frac{1}{8}\right)^x = 32\sqrt{2}$. [3 marks]

Answer $x = \dots\dots$

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Write both sides as a power of 2.
Hint 2 $\frac{1}{8} = 2^{-3}$ and $32\sqrt{2} = 2^5 \times 2^{\frac{1}{2}} = 2^{\frac{11}{2}}$.
Hint 3 So $2^{-3x} = 2^{\frac{11}{2}}$, giving $-3x = \frac{11}{2}$ and $x = -\frac{11}{6}$.

How did it go?

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

I can find the two whole numbers a root lies between. ☐ ☐ ☐

I can work out a negative power as a reciprocal. ☐ ☐ ☐

I can work out a fractional power as a root and a power, with numbers or letters. ☐ ☐ ☐