MATHEMATICS · GRADES 7-9

# Fractional exponents introduction

### Difficulty level: Intermediate

### Mathematics: Grades 7-9

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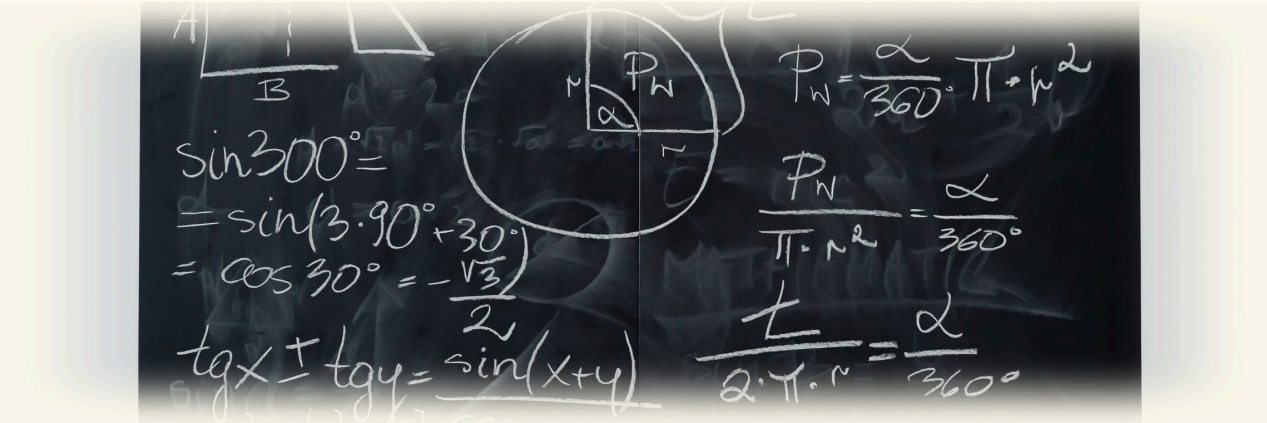
## *Overview of the concept*

This is how you read a power with a fraction in it, which is the shorthand scientists use when a root shows up inside a formula. A fractional power is just a root written in a shorter way, and once you can read it you can follow formulas in science and engineering without getting stuck on the notation. It shows up in growth and decay formulas, in physics, and anywhere a square root or cube root hides inside a bigger calculation.




## *Rule*

**Fractional exponents: a power of $\frac{1}{n}$ means the nth root.**

So $a^{(\frac{1}{2})}$ is $\sqrt{a}$, and $a^{(\frac{1}{3})}$ is $\sqrt[3]{a}$.

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## Worked examples

**EXAMPLE 1**

**Q** Write $16^{\frac{1}{2}}$ as a root and work it out

**SOLUTION**

A fractional exponent $\frac{1}{2}$ means a square root.

$16^{\frac{1}{2}} = \sqrt{16}$

The $\sqrt{16}$ is 4, so $16^{\frac{1}{2}} = 4$

**EXAMPLE 2**

**Q** Write $27^{\frac{1}{3}}$ as a root and work it out

**SOLUTION**

A fractional exponent of $\frac{1}{3}$ asks for a cube root.

$27^{\frac{1}{3}} = \sqrt[3]{27}$

The $\sqrt[3]{27}$ is 3, so $27^{\frac{1}{3}} = 3$

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## Practice questions

1 What is $36\frac{1}{2}$?

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2 What is $125\frac{1}{3}$?

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3 What is $81\frac{1}{4}$?

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**4** What is $64\frac{1}{6}$?

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**5** What is $100\frac{1}{2}$ plus $25\frac{1}{2}$?

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**6** Which power equals 4?

A $16\frac{1}{2}$

B $81\frac{1}{4}$

C $27\frac{1}{3}$

D $16\frac{1}{4}$

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## 7 Why does $49^{\frac{1}{2}}$ equal 7?

**A** The $\frac{1}{2}$ power asks for the number that multiplies by itself to make 49, and $7 \times 7$ is 49.

**B** The $\frac{1}{2}$ power means 49 divided by 2, which is 24.5.

**C** The $\frac{1}{2}$ power asks for the number that adds to itself to make 49, and $7 + 7$ is 14.

**D** $49^{\frac{1}{2}}$ means 49 times $\frac{1}{2}$, which is 24.5.

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## 8 What is $36^{\frac{1}{2}}$ times $36^{\frac{1}{2}}$?

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**9** Which power is NOT 5?

A $25\frac{1}{2}$

B $125\frac{1}{3}$

C $36\frac{1}{2}$

D $625\frac{1}{4}$

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**10** What is $144\frac{1}{2}$ minus $100\frac{1}{2}$?

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## ANSWER KEY

**1.** 6

**2.** 5

**3.** 3

**4.** 2

**5.** 15

**6.** $16\frac{1}{2}$

**7.** The $\frac{1}{2}$ power asks for the number that multiplies by itself to make 49, and $7 \times 7$ is 49.

**8.** 36

**9.** $36\frac{1}{2}$

**10.** 2

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