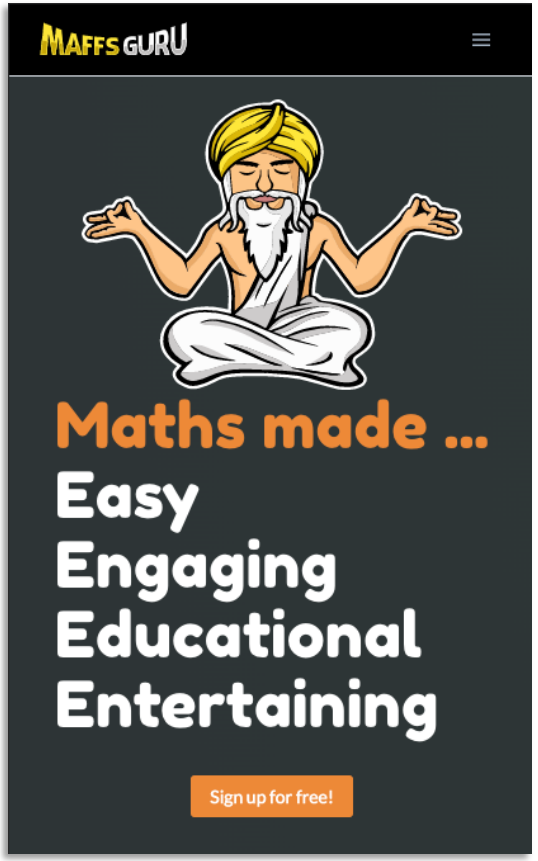


Powers and roots

Year 11 General Maths
Units 1 and 2

www.maffsguru.com

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Learning Objectives

By the end of the lesson I would hope that you have an understanding and be able to apply to questions the following concepts:

- Understand what a power number is
- Understand what a square root is
- Understand what a cube root is
- Understand there are other powers and other roots

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Recap

In the previous lessons we have looked at:

- Order of operation (BIDMAS), and
- Directed Numbers

We met an example of a power in the last question of the last lesson:

Don't get tricked.

Example:

$(-3)^2$

$(-3)^2$

$= -3 \times -3$

$-7^4 = 7 \times 7 \times 7 \times 7$

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Brackets

Indices

Division

Multiplication

Addition

Subtraction

$+ \; and \; + = +$

$- \; and \; - = +$

$+ \; and \; - = -$

$- \; and \; + = -$

What is a square root?

I told you the puns didn't get any better!



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Let's look at powers first …

When we raise a number to a power we are writing something which can be quite long and laborious in a quicker way …

For example:

What is we wanted to write the following number in a simpler way.

$$4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4$$

You might be asking why would I ever want to do that … but I'll explain why later.

4^{16} 4 power of 16

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Powers/Indices/Floaty Numbers Oh My!

As is usual in Mathematics, there are lots of names for the same concepts.

Powers can also be called indices. I call them "floaty numbers".

A power is nothing more than a way of telling you how many times to multiply a number by itself.

"Evaluate"

Examples:

3^2

$3^2 = 3 \times 3 = 9$

4^3

$4^3 = 4 \times 4 \times 4 = 16 \times 4 = 64$

10^5

$10^5 = 10 \times 10 \times 10 \times 10 \times 10 = 100\,000$

$10^6 = 1$ million

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Squares, cubes and more

When we raise something to the power of 2, we call it the **square** of a number.

$9^2 = 9 \times 9 = 81$

$2^3 \neq 2 \times 3$

When we raise something to the power of 3, we call it the **cube** of a number

$2^3 = 2 \times 2 \times 2 = 8$

When we raise something to the power of 4, we call it "to the floaty four" ... OK ... we don't ... but I can't remember the rest. I'm old! We do say, to the power of 4.

This is where Darren goes

Doing things backwards

In Mathematics, we need to learn to do things forwards as well as doing something backwards.

If we can have a cube of a number then we must also have the cube root of a number.

If we can have the square of a number, then we can also have the square root of a number.

We will look at **square roots** first.



$4^2 = 4 \times 4 = 16$

$\sqrt{16} = 4$

$\sqrt{16} = 4$ or -4

$(4)^2 = 4 \times 4 = 16$

$(-4)^2 = -4 \times -4 = 16$

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The square root of a number

There is a special sign which denotes that we are taking the root of a number:

$$\sqrt{}$$

If it doesn't have a floaty number attached, then we know it's the **square root** of the number.

If it does have a number, then we know that it means something different.

The sign simply means, **what number do I multiply by itself twice to get the number under the root sign**?



$\sqrt{100} = 10$

$\sqrt{144} = 12$

$\sqrt{81} = 9$

$\sqrt{64} = 8$

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Examples of finding square roots

Here are some examples.

Remember, he sign simply means, **what number do I multiply by itself twice to get the number under the root sign**?

$\sqrt{4} = 2$

$\sqrt{16} = 4$

$\sqrt{100} = 10$

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Examples of finding cube roots

A cube root means, **what number do I multiply by itself three times to get the number under the root sign**?

$\sqrt[3]{8}$ = 2

$\sqrt[3]{27}$ = 3

$\sqrt[3]{125}$ = 5

$1 \times 1 \times 1 = 1$

$2 \times 2 \times 2 = 8$

$\sqrt[3]{8} = 2$

$3 \times 3 \times 3 = 27$

$9 \times 3 = 27$

$5 \times 5 \times 5$

$= 25 \times 5$

$= 125$

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Other roots

There are lots of other roots we can take.

We need to look at the number which is in front of the root (the floating number) and decide what it is trying to tell us!

Example:

$\sqrt[5]{32} = 2$

$\sqrt[5]{32}$

$1 \times 1 \times 1 \times 1 \times 1 = 1$

$2 \times 2 \times 2 \times 2 \times 2$

$4 \times 4 \times 2$

16×2

32

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Maths is a big fat trick

There are other ways of expressing the root of a number.

As usual, these are there to trick you! Hence, it makes sense to learn them and place them in your summary book (if you're allowed to have one).

Example:

$$\sqrt{4} = 4^{\frac{1}{2}}$$

$$\sqrt[3]{8} = 8^{\frac{1}{3}}$$

$$\sqrt[2]{4} = 4^{\frac{1}{2}} = 2$$

$$\sqrt[3]{8} = 8^{\frac{1}{3}} = 2$$

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Thanks for watching

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