UniSTEP / MLC Seminars:

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www.adelaide.edu.au/mathslearning

Where you'll see maths notation

Maths (duh!)

Statistics

Physics

Chemistry

Economics

Psychology

Almost any discipline at all

Because

- Easier to write maths down
- Easier to be accurate
- Easier to communicate with other languages
- Easier to think

Ask yourself:

How do you it?

What does it ?

What are the for working with it?

How is it to other ideas?

How do you

$\sqrt{25}$

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Example: $\sqrt{}$

What are the for working with it?

distribute it over multiplication and division:

$\sqrt{4 \quad 100} \quad \sqrt{4} \quad \sqrt{100} \qquad \sqrt{\frac{3}{19}} \quad \frac{\sqrt{3}}{\sqrt{19}}$

Can't distribute it over addition and subtraction:

$\sqrt{}$

a number if you bring it inside:

Example: $\sqrt{}$

How is it to other ideas?

- The opposite of squaring
- $\sqrt{x}$ can also be written as $(x)^{\frac{1}{2}}$
- Use it to find distances
- Use it to find the standard deviation
- Used it to solve quadratic equations
- Similar rules to $\sqrt[3]{}, \sqrt[4]{}, \sqrt[5]{}, \ldots$

Listen to your teachers as they write

Look for definitions nearby in the notes/book

Notice the rules in written examples

Ask someone

like the Maths Learning Centre

Level 3 East, Hub Central

10am to 4pm weekdays

Often need to name something you're talking about. For example "Let x be the number we want to find..."

- Greek letters
- Well-known objects
- Vectors
- Subscripts
- Distributions

- alpha
- beta
- gamma
- delta
- epsilon
- zeta
- eta
- theta
- iota
- kappa
- lambda
- mu
- nu
- xi
- omicron
- pi
- rho
- sigma
- tau
- upsilon
- phi
- psi
- chi
- omega

e – e is approximately 2.71828...

– pi is approximately 3.14159...

– infinity

– the empty set

, – the set of natural numbers

, – the set of integers

, – the set of rational numbers

, – the set of real numbers

, – the set of complex numbers

In print, vectors are usually written in :

$$\mathbf{u} \quad 3\mathbf{v} \quad \mathbf{e}$$

In handwriting, they have an extra mark:

$$\bar{v} \quad \vec{v} \quad \tilde{v} \quad \underline{v} \quad \underrightarrow{v} \quad \underset{\sim}{v}$$

Please your vectors:

$$a\underline{v} \quad b\underline{u}$$

$$av \quad bu$$

Subscripts help to give names to related things (don't say it's a subscript when you read it aloud):

$$c_1, c_2, c_3, c_4, c_5 \qquad \mathbf{v} \quad (v_1, v_2, v_3)$$

$$a_0 \quad a_1 x \quad a_2 x^2 \quad a_3 x^3 \quad a_4 x^4 \qquad \mathbf{e}_r, \mathbf{e}_n$$

People use an "i" to refer to all of them at once:

$$c_i \text{ for } i \quad 1, 2, 3, 4, 5$$

The letters tell you which family of distribution and the numbers tell which one in that family.

- Normal distribution with mean 28 and standard deviation 3
- t distribution with 14 degrees of freedom
- chi-squared distribution with 5 degrees of freedom
- F distribution with 2 numerator and 30 denominator degrees of freedom
-

These notations go between bits of maths to make a statement.

Read them aloud differently depending on context:

Let x = 6. Then x = 1+5 = 1+2+3.

“Let x be equal to 6. Then x is equal to 1 plus 5, which is equal to 1 plus 2 plus 3.”

– “is less than or equal to”
– “is less than”
– “is greater than or equal to”
– “is greater than”
– “is equal to”
– “is not equal to”
, – “is approximately equal to”
– “is proportional to”
– “is equivalent to”

for two sets
- "is contained in", "is a subset of"
- "is contained in or equal to"

For example:
- "The set of natural numbers is contained in the set of real numbers"

for an
- "is in", "is an element of"
- "is not in", "is not an element of"

For example:
- "e is not in the set of rational numbers"

for lines { $\perp$ – “is perpendicular to”
$\parallel$ – “is parallel to”

for a random variable { $\sim$ – “has the ___ distribution”

For example:

$X \sim \chi^2_5$ – “X has the chi-squared distribution with 5 degrees of freedom”

for abstract algebraic objects { $\cong$ – “is isomorphic to”

Some notations are for making new objects/numbers from old ones.

- Binary operations
- Symbols that work on one number
- Functions
- Complicated things

$5 \quad 4$ – “5 plus 4”

$5 \quad 4$ – “5 minus 4”

$5 \quad 4$ – “5 times 4”, “5 multiplied by 4”

$5 \; 4$ – “5 times 4”, “5 multiplied by 4”

xy – “x times y”, “xy”

$5 \quad 4$ – “5 divided by 4”

$5/4$ – “5 divided by 4”, “5 over 4”

5^4 – “5 to the power of 4”

5^2 – “5 squared”, “5 to the power of 2”

5^3 – “5 cubed”, “5 to the power of 3”

Operations are done in a certain order:

, , 1. Anything in brackets

x^2 2. Powers

, 3. Division and Multiplication

, 4. Subtraction and Addition

$$4(5 \quad 6) \quad \frac{4 \quad 14}{2 \quad 3} \quad 3 \quad 6 \quad 7 \quad (3 \quad 4[8 \quad 2])$$

$$4(5 \quad 6) \quad \frac{4 \quad 14}{2 \quad 3} \quad 3 \quad 6 \quad 7 \quad (3 \quad 4[8 \quad 2])$$

$$4(5 \quad 6) \quad \frac{4 \quad 14}{2 \quad 3} \quad 3 \quad 6 \quad 7 \quad (3 \quad 4 \quad 6)$$

$$4(5 \quad 6) \quad \frac{4 \quad 14}{2 \quad 3} \quad 3 \quad 6 \quad 7 \quad (3 \quad 24)$$

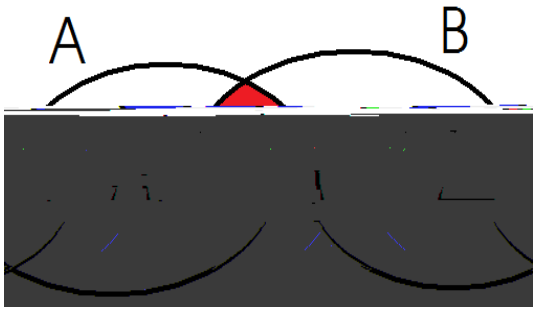
$$4 \quad 11 \quad \frac{18}{6} \quad 3 \quad 6 \quad 7 \quad (27)$$

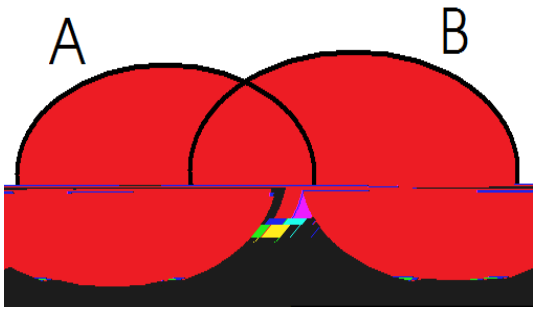
$$4 \quad 11 \quad 3 \quad \tfrac{1}{2} \quad 7 \quad 27$$

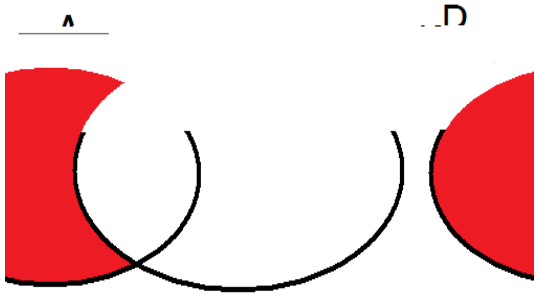
$$44 \quad 3 \quad 3\tfrac{1}{2} \quad 27$$

$$27\tfrac{1}{2}$$

$A \cap B$ – “A intersection B”,
“the intersection of A and B”
– the set of all the things in both A and B
– “A union B”,
“the union of A and B”
– the set of all the things in either A or B
– “A without B”,
“the exclusion of B from A”
– the set of all the things in A but not B







All of these usually refer to the produced by the function, which is a new number.

$f(x)$ – "f of x"

– NOT f multiplied by x!

$\sin x$ – "sine x", "sine of x"

$\cos x$ – "cos x", "cos of x"

$\tan x$ – "tan x", "tan of x"

} trigonometric

All of these usually refer to the produced by the function, which is a new number.

$\ln x$ – "Ell-En x", "Ell-En of x"

- the natural logarithm of x: if you do $e^{\text{this number}}$ you get x as your answer
- some people write this as $\log x$

$\log_{10} x$ – "log base 10 of x", "log 10 of x"

- the base 10 logarithm of x: if you do $10^{\text{this number}}$ you get x as your answer
- some people write this as $\log x$

$\{x \quad | x \quad 1\}$ – "the set of x which are in the real numbers such that x is greater than 1"

$\{a^2 \quad 1 | a \quad \}$ – "the set of numbers a squared plus 1 such that a is in the real numbers."

$1, 3, \quad , \sqrt{2}$ – "the set containing, 1, 3, pi and the square root of 2"

(1,5) – “the set of numbers between 1 (not including 1) and 5 (not including 5)”

(1,5] – “the set of numbers between 1 (not including 1) and 5 (including 5)”

[1,5] – “the set of numbers between 1 (including 1) and 5 (includin Ô M M

- "the integral from 0 to 5 of x squared plus 3 x d x"
- "the sum of i squared plus 2, as i ranges from 1 to 7"
- "dy on dx

Shortcuts for writing things because mathematicians are lazy or want to talk to people in other countries.

$x \to 3$ – “x approaches 3”

$f : \mathbf{R} \to \mathbf{R}$ – “the function f sends the real numbers to the real numbers”

$\Rightarrow$ – “implies that”

$\Leftrightarrow$, iff – “if and only if”

wrt – “with respect to”

st – “such that”

$\forall$ – “for all”, “for every”

$\exists$ – “there exists”

$\exists!$ – “there exists a unique”

Visit us at the Maths Learning Centre:

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10am – 4pm, Mon – Fri

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