



Let's do a magic trick!

1. Think of a number
2. Add 4
3. Double the result
4. Add 2
5. Halve the result
6. Take away the number you first thought of

The answer is 5!

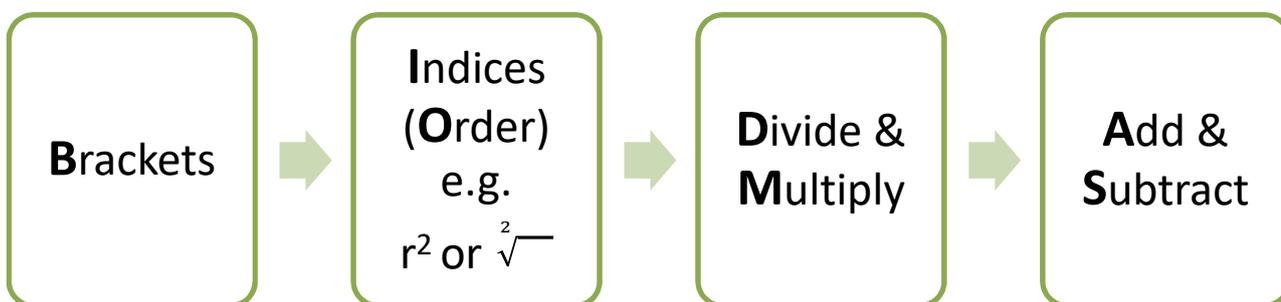
You will often find formulas in L2 Functional Skills (FS) maths exams. Formulas may be given explicitly, or the question may imply a formula. You might see these formulas in a FS exam:

- a) area of circle = πr^2 b) perimeter of rectangle = $2(l+w)$ c) circumference of circle = $2\pi r$
d) area triangle = $\frac{1}{2}bh$ e) volume of cuboid = lwh f) volume cylinder = πr^2h

The main conventions of formulas are:

- The letters (these are called variables) represent numbers.
- Unless there's a mathematical sign, you multiply consecutive letters & numbers.
- Follow the rules of 'order of operations'.

'Order of operations' is nothing to do with hospitals. It's the order that you must do calculations in a formula. The word BIDMAS or BODMAS helps you remember the correct order.



So, using the formulas above, you can follow the conventions to get:

- a) $\pi \times r \times r$ b) $2 \times (l + w)$ c) $2 \times \pi \times r$
d) $\frac{1}{2} \times b \times h$ e) $l \times w \times h$ f) $\pi \times r \times r \times h$

Magic Formulas

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In Functional Skills you will be expected to substitute numbers for the letters in formulas.

Here's an example adapted from a FS L2 maths paper (*Edexcel February 2017*):

You have to use a formula to change a temperature in Celsius (C) to one in Fahrenheit (F).

$$F = 32 + 1.8C$$

This means $F = 32 + 1.8 \times C$

Using the BIDMAS, you must do the 1.8×30 first, then add 32.

So, to convert 30°C to Fahrenheit you do:

1. $1.8 \times 30 = 54$
2. $54 + 32 = 86$

So, the answer is 86°F

To convert -20°C to Fahrenheit you do:

1. $1.8 \times -20 = -36$
2. $-36 + 32 = -4$ (answer of -4°F)



Remember, in the exam, you must always show how you worked something out.

Very often you will be given marks for the method, even if your answer is wrong.

When you complete a calculation involving several different operations BIDMAS helps you remember which order to complete them in:

- Anything in brackets should be done first
- then the indices (orders)
- followed by any division or multiplication
- and finally, addition or subtraction.

Division and multiplication are grouped together with equal priority. This means that in a calculation that involves division and multiplication, you complete each operation as it appears from left to right.

It's the same for add and subtract: you complete them as they appear from left to right.

Here's another example from a Functional Skills exam (Edexcel Nov 2016):

$$\text{Maximum total length of all the fish in a rectangular pond (cm)} = \frac{25\pi LW}{4}$$

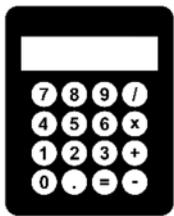
Where L = length of pond (m), W = width of pond (m) and $\pi = 3.14$

So, your calculation will look something like:

$$\frac{25 \times 3.14 \times L \times W}{4}$$

You are given the length (4.2m) and the width (2.4m) of the pond. Substitute these numbers into the formula to get:

$$\frac{25 \times 3.14 \times 4.2 \times 2.4}{4}$$



On a *scientific* calculator, you just type $25 \times 3.14 \times 4.2 \times 2.4 \div 4$
The calculator will do the operations in the correct order.

$$25 \times 3.14 \times 4.2 \times 2.4 \div 4 = 197.82\text{cm}$$

Here's a final worked example from a Functional Skills past paper (Edexcel July 2015):

A person wants to fill a gravel base for a hut to sit on.
The person has bought 5m^3 of gravel. Is that enough?

$$V = A \times d$$

$$V = \text{Volume (m}^3\text{), } A = \text{area (m}^2\text{) and } d = \text{depth (m)}$$

You are given the area as 64.8m^2 and the depth is 0.07m

Put the numbers into the formula:

$$V = 64.8 \times 0.07$$

$$V = 4.536\text{m}^3$$

So the answer is yes, the person has enough gravel.

You should write the answer in the box provided on the exam paper, remember your units (m^3) and show your workings.



Always substitute values into the formulas in the exam.

You may get marks for it, even if the answer's wrong!

Magic Formulas

Name _____ Date _____

So, let's get back to our original magic trick. Let's write each step as a formula.

We'll call our number x .

1. Think of a number: x
2. Add four: $x + 4$
3. Double the result: $2x + 8$
4. Add 2: $2x + 10$
5. Halve the result: $x + 5$
6. Take away the number you first thought of: 5

And you're left with 5. Always!



Those formulas aren't looking like such scary monsters now – are they?

Exam tips for Functional Skills maths formula questions

- You don't have to memorise formulas for Functional Skills, you'll always be given them if you need them. You do need to remember some in GCSE Maths.
- Read the question! Many people panic because it looks scary.
- When you have a number squared (e.g. r^2) this means you multiply it by itself ($r \times r$). It does not mean you multiply by 2.
So, for $A = \pi r^2$ where $\pi = 3$ and $r = 5$, the calculation you need is 3×5^2 which is 3×25 , giving $A = 75$. (This is the formula for the area of a circle.)
For $C = 2\pi r$ where $\pi = 3$ and $r = 5$, the calculation you need is $2 \times 3 \times 5$, giving $C = 30$. (This is the formula for the circumference of a circle.)

A square root (\sqrt{x}) this is the opposite of x^2 . E.g. $8^2 = 8 \times 8 = 64$. $\sqrt{64} = 8$

You only work out the square root of what is under the line of the square root symbol.

So $\sqrt{10 + 6} + 5$ means 'the square root of 16 then add 7' ($= 4 + 7 = 11$).

On a calculator, you normally press the square root key $\sqrt{\quad}$ and then type in the number.

- Carefully read the question for the units required. Always state units in for your answers. Use units consistently. Often with area and volume problems, you will get parts of the formula in cm, m, m^2 , m^3 , etc. and you need to keep a close eye on what you're doing. For example, in the pond example on page 3, the answer of 197.82 was in cm. If the question had asked for that in metres, you'd have had to divide by 100 (1.9782m).
- **Always show that you can substitute the numbers you're given into the formula. If you get the answer wrong, you may still get marks for the workings.**

GCSE MATHEMATICS: ALGEBRA - notation, vocabulary & manipulation

Weighting percentages for Foundation tier (grades 1-5)

Number (N) 25%, Algebra (A) 20%, Ratio, proportion & rates of change (R) 25%, Geometry & measures (G) 15%, Probability (P) and Statistics (S). P & S have a combined weighting of 15%. Enlarged **bold** font indicates main coverage.

Foundation (grades 1-5)		Additional Foundation and Higher only (grades 4-9)
A1	use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$; coefficients written as fractions rather than decimals; brackets.	
A2	substitute numerical values into formulae and expressions, including scientific formulae	
A3	understand and use the concepts and vocabulary of expressions, equations, formulae, inequalities, terms and factors	to include identities
A4	simplify and manipulate algebraic expressions by: collecting like terms, multiplying a single term over a bracket, taking out common factors, simplifying expressions involving sums, products and powers, including the laws of indices	simplify and manipulate algebraic expressions (including those involving surds) by: expanding products of two binomials factorising quadratic expressions of the form x^2+bx+c , including the difference of two squares
A5	understand and use standard mathematical formulae; rearrange formulae to change the subject	
A6	no Foundation coverage	know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs
A7	where appropriate, interpret simple expressions as functions with inputs and outputs;	interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function'.

FUNCTIONAL MATHEMATICS Coverage and Range statements (indicative only)

Coverage and range statements provide an indication of the type of mathematical content candidates are expected to apply in functional contexts. Relevant content can also be drawn from equivalent National Curriculum levels and the Adult Numeracy standards. ✓ indicates the main coverage and range skills covered in this resource, although these will vary with the student group and how the resource is used by the teacher.

Level 2

a) understand and use positive and negative numbers of any size in practical contexts	g) find area, perimeter and volume of common shapes
b) carry out calculations with numbers of any size in practical contexts, to a given number of decimal places	h) use, convert and calculate using metric and, where appropriate, imperial measures
c) use and calculate ratio and proportion, including problems involving scale	i) collect and represent discrete and continuous data, using information and communication technology (ICT) where appropriate
d) understand and use equivalences between fractions, decimals and percentages	j) use and interpret statistical measures, tables and diagrams, for discrete and continuous data, using ICT where appropriate.
e) understand and use simple formulae and equations involving one or two operations ✓	k) use statistical methods to investigate situations
f) recognise and use 2D representations of 3D objects	l) use probability to assess the likelihood of an outcome

References:

Ofqual (2009), *Functional Skills criteria for Mathematics: Entry 1, Entry 2, Entry 3, level 1 and level 2.*

<https://www.gov.uk/government/publications/functional-skills-criteria-for-mathematics>

DfE (2013), *Mathematics GCSE subject content and assessment objectives.*

<https://www.gov.uk/government/publications/gcse-mathematics-subject-content-and-assessment-objectives>

Also covers many **adult numeracy curriculum** elements.

<http://www.excellencegateway.org.uk/content/etf1075>

Edexcel past papers (Functional Skills Mathematics) <https://qualifications.pearson.com/en/home.html>