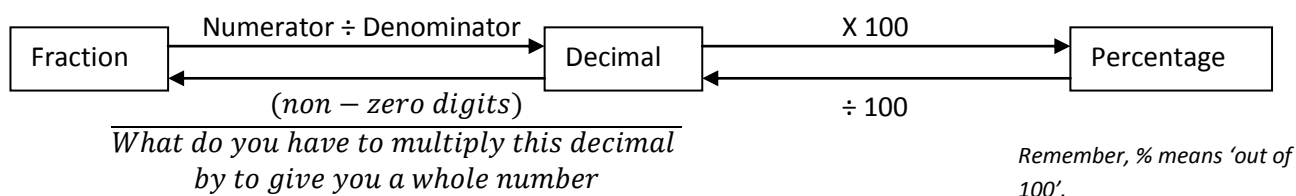


GCSE Edexcel Foundation Key notes

1) Converting from a fraction to a decimals to a percentage (and vice versa)



Example: If the decimal was 0.345. The denominator would be 1000 because you have to multiply 0.345 by 1000 to give you a whole number.

2) Expressing a quantity as a percentage of another:

First express it as a fraction. This is easy just put the smaller quantity over the larger quantity like so:

$$\frac{\text{Smaller quantity}}{\text{Larger quantity}}$$

Now that it's fraction, how do you convert it to a percentage? Use the diagram above.

3) Multiplying by decimal numbers

- ❖ The key is to convert the decimal numbers into whole numbers by multiplying by 10, 100 etc. Then, multiply as normal.
- ❖ Don't forget to divide back at the end.

Example: What is 2.4×3.45 ?

Answer:

- 1) Treat them as whole numbers and multiply $\rightarrow 24 \times 345 = 8,280$
- 2) Then move the decimal by the number of digits after the decimal point. There is 1 after the 2.4 and 2 after 3.45. So there are 3 digits after the decimal point of both numbers. Move the decimal point 3 places to the LEFT!
- 3) $8,280 \rightarrow 8.28$ (note the final zero has been dropped. We don't need it). This seems about right because if we multiply the whole numbers, 2×3 , it equals 6 which is close to 8!

4) Dividing by decimal numbers

- ❖ Easier than multiplication. Multiply both numbers by the SAME number to convert the divisor into a whole number only. This will be your new question. Now solve it.

Example: What is $3.42 \div 0.6$?

1) Multiply both numbers by 10. Why? To make the divisor (0.6) a whole number:

$$3.42 \times 10 = 34.2 \quad 0.6 \times 10 = 6$$

2) Your new question is $34.2 \div 6$? Solve as normal using short division or your calculator.

You should get 5.7 which looks about right.

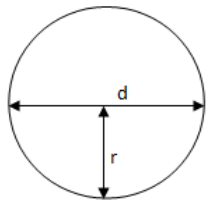
5) All the formulas you need to know for a circle. Remember, these formulas apply to a FULL circle. Learn them:

$$\text{Area} = \pi r^2$$

$$\text{Circumference} = \pi d$$

$$d = 2r$$

(r : radius d : diameter)



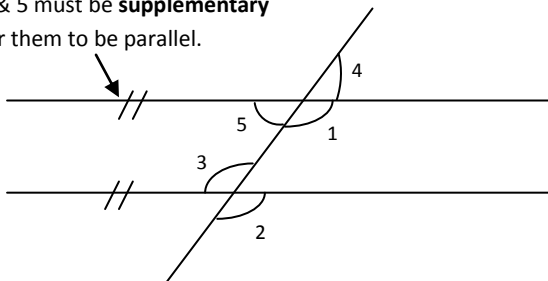
Remember both the r and d pass the CENTRE of the circle.

Don't forget: If it was a semi-circle you have to half these values at the end!

6) Corresponding, alternate and supplementary angles:

Means parallel lines – angles

3 & 5 must be **supplementary** for them to be parallel.



Angles 1 and 2 are the **same** because they **Correspond**

Angles 1 and 3 are the **same** because they **Alternate**.

Angles 1 and 4 are **Supplementary** because they add up to 180° (angles on a straight line). Remember, supplementary angles **do not** have to be next to each other. This means 2 and 4 are supplementary as well. Can you see why?

7) What you have to say to get full marks on transformation questions:

Reflection

- ❖ Reflection
- ❖ Mirror line (what line is it reflected in?)

Translation

- ❖ Translation
- ❖ A vector (x, y)

(x is left/right. y is up/down)

Rotation

- ❖ Rotation
- ❖ How many degrees? (90° or 180°)
- ❖ Which direction (clockwise/anti-clockwise?) 180° can be either!
- ❖ The point at which it's rotated; The origin (0,0)? Or is it a random point like (2, 3)?

Enlargement

- ❖ Enlargement
- ❖ Scale factor
- ❖ Centre of enlargement (point at which it's enlarged)

You have to use tracing paper for rotation

8) Grouped frequency tables are used for continuous data. The only difference is, you have an extra column: midpoint which is used to calculate the mean:

A year 9 class takes part in a bleep test during a P.E lesson. The results are displayed in a grouped frequency table:

Level	Number of pupils	Midpoint	Midpoint x Frequency
$0 \leq x < 2$	3	1	$(1 \times 3) = 3$
$2 \leq x < 4$	6	3	$(6 \times 3) = 18$
$4 \leq x < 6$	8		
$6 \leq x \leq 8$	5		
$8 \leq x < 10$	2		
$10 \leq x < 12$	1		

The midpoint is simply the middle value of each interval.

To calculate the mean, you do: (4^{th} column total \div 2^{nd} column total)

9) Drawing a frequency polygon:

This is easy just plot the points (midpoint, frequency) and join them up. So, if we were using the grouped frequency table above: (1, 3) (3, 6) and so on. Plot these points and join them up, in a straight line.

10) Sign rules

*Just remember this saying: If the signs are the same, then they turn into a plus. If the signs are different, they turn into a minus.

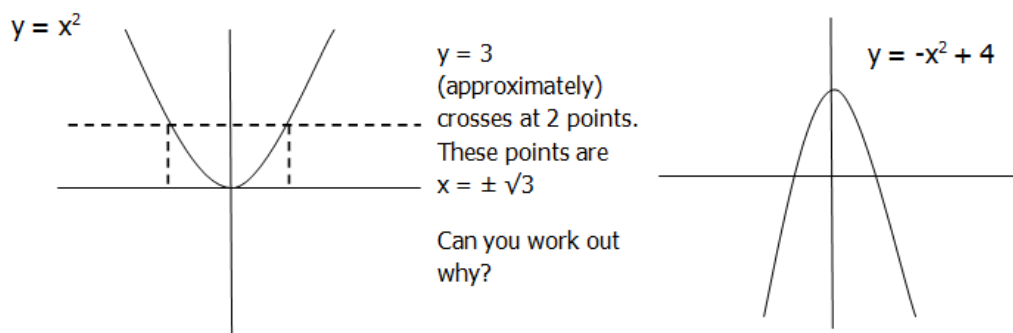
Note: When adding/subtracting, the signs have to be NEXT to each other. When multiplying/dividing, ignore the signs at first and do the calculation. Then, think about the signs afterwards.

11) Quadratic graphs:

Key points: 1) Quadratic graphs contain an x^2 term in it. Example: $y = x^2 + 2$

2) Quadratic graphs are bucket shaped with a positive x^2 .

' $-x^2$ ' graphs are upside down bucket shaped:



3) Using your quadratic graph you can estimate the solution to $y = 3$ for example. Just draw the $y = 3$ line (you should know how to do this) and see where it crosses the quadratic equation. It should be 2 points or 2 solutions rather i.e. $x = \pm \sqrt{3}$.

12) Algebra: When you're doing algebra, think about terms! Circle your terms as well! **Remember a term is just a number, a group of letters and a positive/negative sign at the front.** Try and spot 'like terms'. These are terms which have the same group of letters. You should simplify your terms as much as possible.

13) Solving an algebraic equation: Circle your terms as normal. Then move terms around so you have letters on one side of the equals and numbers on the other! Just remember whenever you move a term across the equals, change the sign! Also, what you do on one side of the equation, you have to do the OPPOSITE on the other. So, if the equation reads: $\frac{y}{5} = 3$ you have to multiply by 5 on the R.H.S as your dividing by 5 on the L.H.S. Then you're final answer is just $y = 15$

14) A quick tip on forming equations: If the question says: Give C in terms of h, then you know your answer should look like: $C = \text{'something h...'}'$

15) Making a letter the subject of the formula: This is similar to point 14) above. Making a letter, for example 's', the subject of the formula just means rearrange the equation so it reads $s = \dots$

16) Power laws

- Laws:
- 1) Multiplying 2 powers – add them! $2^3 \times 2^4 = 2^7$
 - 2) Dividing 2 powers – subtract them! $\frac{p^5}{p^2} = p^3$
 - 3) Raising one power to another – just multiply them i.e. $(4^3)^4 = 4^{3 \times 4} = 4^{12}$
 - 4) Anything to the power of 1 is just itself i.e. $256^1 = 256$
 - 5) Anything to the power of 0 is just 1 i.e. $97^0 = 1$
 - 6) 1 to the power of anything is just 1 i.e. $1^{56} = 1$

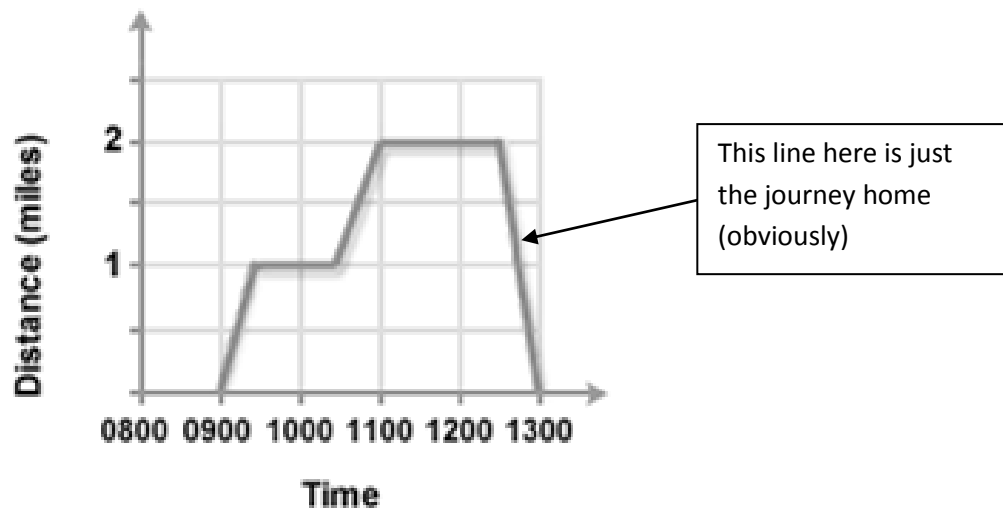
17) Remember the **inverse** of 'squared' is 'square root' and the **inverse** of 'cubed' is 'cube root'. If the equation read: $x^2 = 9$. Then, $x = \sqrt{9}$. So, $x = 3$ OR -3 . **Remember, a square root of a number has a positive solution and a negative solution.** This is due to the sign rules above. $3 \times 3 = 9$ and $(-3) \times (-3) = 9$ as well.

18) Formula for nth term: $a + (n - 1)d$ a = first term d = common difference
just substitute these in and simplify.

Note: d could be negative, if the sequence is going down.

19) Distance-time graph

Sometimes you do not need to use the **speed = distance ÷ time** formula. You can just use the graph. Say, we were given the following graph and we had to work out the average speed on the journey back:



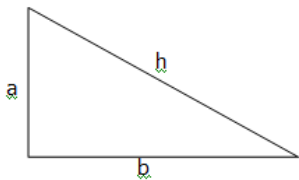
Well, we can clearly see that this person travels 2 miles in 30 minutes or $\frac{1}{2}$ an hour, on the way back. For average speed, we're looking for miles per hour or mph. So, we just double 2 miles. The answer is just 4 mph.

Note: Be careful of the units. You may be asked for km/h or m/s (metres per second).

20) Pythagoras theorem

Formula:

$$a^2 + b^2 = h^2$$



This formula ONLY applies to right-angled triangles. The side labelled 'h' is known as the hypotenuse. It's the longest side of the triangle. If you know any of the two sides, you can find out the remaining one with this formula. Just plug in what you know into the formula and rearrange it as normal to find the unknown.

21) Some conversions you need to know

1.6 km = 1 mile
 1 m = 39.37 inches
 1 foot = 30.5 cm
 1 inch = 2.54 cm
 1 kg = 2.2 lbs
 1 gallon = 4 $\frac{1}{2}$ litres
 1 litre = 1 $\frac{3}{4}$ pints

22) Estimation

Key points:

1) When estimating a calculation, round each number to 1 significant number or 2. Round it so the calculation is easy to do mentally! Don't round to numbers which look dodgy.

Hint: When answering questions in the exam, it's always best to check your answers by estimation. This is to see if your answer looks about right. For Example, if you worked out 3.7×4.1 as 15.17, you can do a quick check by working out $4 \times 4 = 16$ in your head. The real answer should be close to 16 which it is.

23) Trial and improvement

Trial & improvement has a lot to do with trial and error. It simply means guessing a solution until you find the correct one. Take a look at the following example...

Example: $x^3 - 6x + 1 = 0$ has a solution between 2 and 3. Solve this equation, correct to 1 decimal place.

Answer: First we sub-in $x = 2$ and $x = 3$ to get two extreme values; one too small and one too big.

$$(2)^3 - 6(2) + 1 = 8 - 12 + 1 = -3 \text{ (too small)}$$

$$(3)^3 - 6(3) + 1 = 27 - 18 + 1 = 10 \text{ (too big)}$$

This means the solution must be between 2 and 3. As you can see when we sub-in $x = 2$, we generate an answer of -3 . This is closer to zero than the other extreme value (10), when we sub-in $x = 3$. So it would be wise to choose a value closer to 2 than 3. Let's try $x = 2.3$

$$(2.3)^3 - 6(2.3) + 1 = -0.633 \text{ (too small)}$$

This is again, too small, so this means the solution must be greater than 2.3.

Let's try 2.4:

$$(2.4)^3 - 6(2.4) + 1 = 0.424 \text{ (too big)}$$

This is too big. What does this mean then? The solution must be between 2.3 and 2.4. Can you see how we've narrowed it down? When we get this situation: two

values which is only a decimal place apart, we choose the number right in the middle of them two. In this case, it would be $x = 2.35$

$$(2.35)^3 - 6(2.35) + 1 = -0.122125 \text{ (too small)}$$

This is too small, so the solution must lie between 2.35 and 2.4 but any value between this range, will round up to 2.4 when we round it to one decimal place (think about rounding!).

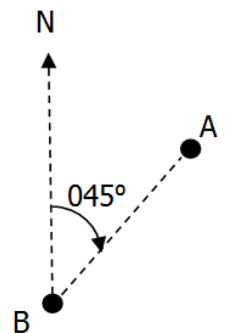
This means the answer is $x = 2.4$ to 1 decimal place.

24) Bearings

There are four things you need to bear in mind when drawing a bearing:

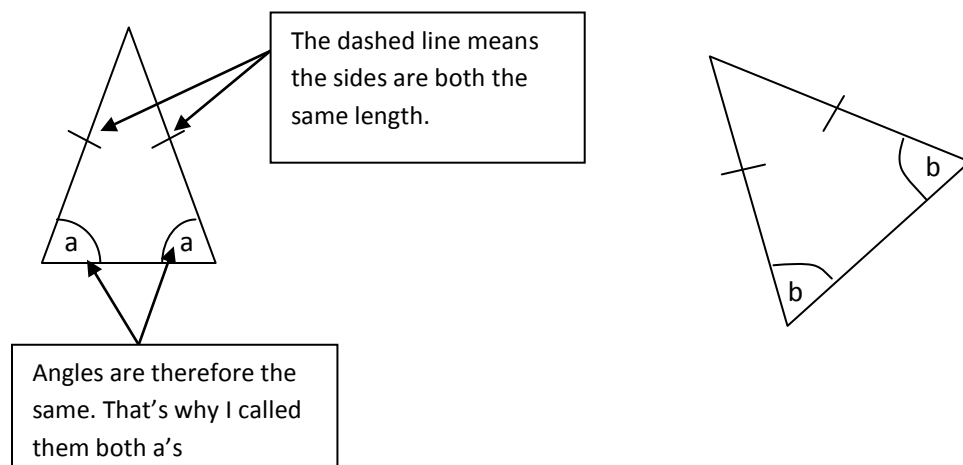
Bearings

- 1) '**A from B**'. The 'from...' is your start point. So in this case, it's B.
- 2) **Northline (N)**. You draw the northline from the start point.
- 3) **Clockwise**. Measure the angle in a clockwise direction.
- 4) **3 figures**. Bearings are expressed in 3 figures i.e. 045°



25) The Isosceles triangle

The Isosceles triangle has two sides that are the same length. This is usually indicated with a dashed line. This means the base angles are going to be the same. See diagrams:



Note: If you know one angle in an isosceles triangle, you can find all the other just by using the fact that all angles in a triangle must add up to 180!

26) Expanding out two brackets using the FOIL method:

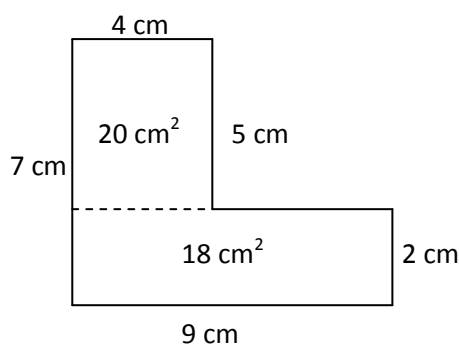
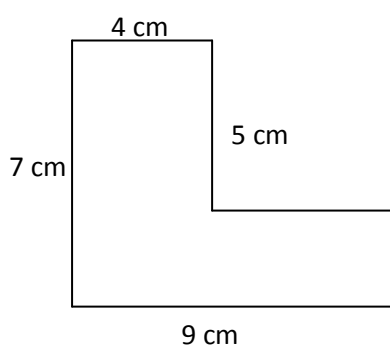
FOIL

F – Firsts
O – Outsides
I – Insides
L – Lasts

The 'foil' abbreviation helps you to remember what terms to multiply out and in which order!

$$\begin{aligned} (x+2)(x-1) &= x^2 - x + 2x - 2 \\ &= x^2 + x - 2 \end{aligned}$$

27) Area of compound Shapes: Compound shapes are common shapes (like rectangles, triangles etc.) joined together. It is easy to find the areas of these. First split the shape into these common shapes. Fill in the unknown measurements (you can always work out these) and then work out the area of each shape. Then, lastly sum them at the end...



Total area: $20 \text{ cm}^2 + 18 \text{ cm}^2 = \underline{38 \text{ cm}^2}$

Can you split the rectangle up in a different way? Your final result should be the same.

28) Density = Mass ÷ Volume

29) Angle rules involve regular polygons

Key formulas: 1) Exterior angle = $360^\circ / n$

(exterior is outside the shape when a side is extended in a straight line.)

2) Interior angle = $180^\circ - \text{exterior angle from above}$

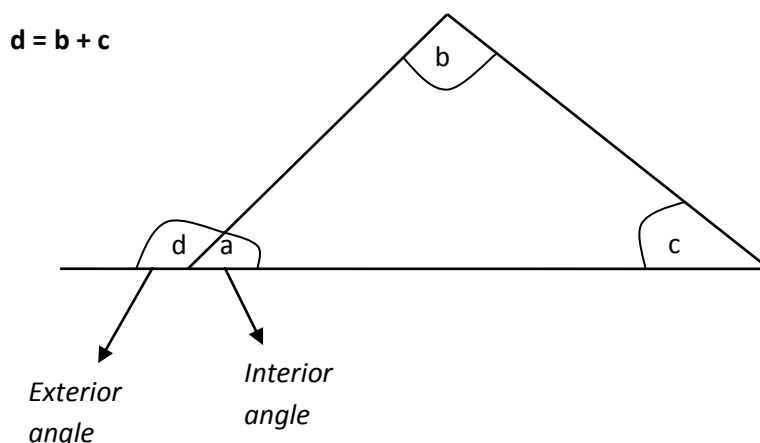
3) Sum of exterior angles = 360°

4) Sum of interior angles = $(n - 2) \times 180^\circ$

Remember 'n' stands for the number of sides in that shape

Note the last 2 formulas apply to any polygons and not just regular ones.

30) Exterior Angle of a triangle = Sum of Opposite Angles To The Interior Angle



31) In pie chart questions, remember, total frequency = 360°

Exam-Style Question:

Below is a frequency table of how children travel to school. Draw a pie chart to represent the data. One is given to you:

Transport	Walk	Car	Bus	Bike
Frequency	80	84	68	8
Degrees		126		

Answer:

- 1) In this case, the distribution is how children travel to school
- 2) The total frequency is 240 ($80 + 84 + 68 + 8$) i.e. number of children
- 3) The total pie chart represents 360° so divide this by the total frequency (240).
 $360 \div 240 = 1.5$. This means 1 child represents 1.5° on the pie chart.
- 4) Lastly, multiply each frequency by 1.5° and draw it on the pie chart using a protractor.

Note: You could also do $126 \div 84$ as you already know that 84 children represents 126° for car, so divide by 84 to get how much degrees a child represents. Again its 1.5°

Transport	Walk	Car	Bus	Bike
Frequency	80	84	68	8
Degrees	120	126	102	12

