Year 11 Maths
Knowledge Organiser

GCSE Higher Tier

10 things to learn

Maths Knowledge Organiser GCSE Higher Part 1

1 × **and** ÷ with negatives:

One − ⇒ answer is −

Both − ⇒ answer is +

e.g. $5 \times -3 = -15$

$-5 \times -3 = 15$

$-20 \div 2 = -10$

$-20 \div -2 = 10$

2 **integer** means 'whole number'

3 A **unit fraction power** is a root

e.g. $25^{\frac{1}{2}} = \sqrt{25}$

$7^{\frac{1}{3}} = \sqrt[3]{7}$

4 An **irrational** number is one which can't be written as an integer or fraction.
(This means its decimal form never recurs or terminates.)

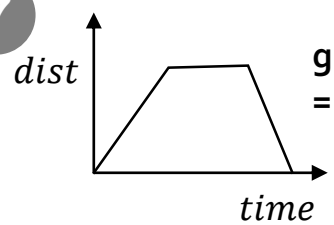
5 **sin, cos & tan**

SOH-CAH-TOA

6 **Quadratic formula**:

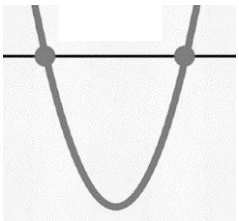
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

7



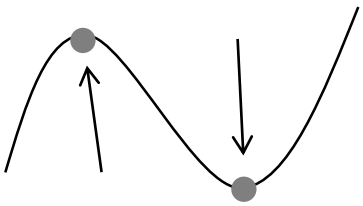
gradient = speed (velocity)

8 **Roots** are the x-values where a graph crosses the x-axis



9 In an **arithmetic sequence** (**linear sequence**) we add or subtract the same each time
e.g. 5, 8, 11, 14, … (add 3)

10 A **turning point** has zero gradient.
It is either a **minimum point** or a **maximum point**.



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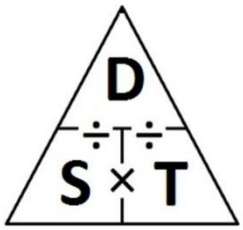
Know

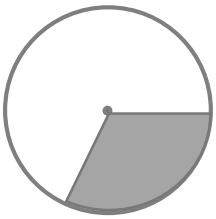
10 things to learn

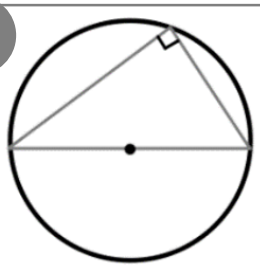
Maths Knowledge Organiser
GCSE Higher Part 2

1. speed
   distance
   time



2. 1 km = 1000 m
   1 kg = 1000 g

3. 
   sector

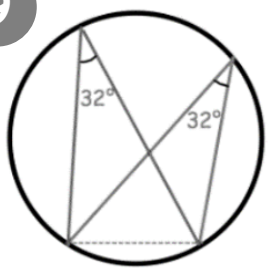
4. 
   The angle in a semi-circle is 90°
   (Learn this wording)

5. An **exact** answer usually contains π or a surd

6. **difference** means subtract
   e.g. the difference between 10 and 6 is 4.

7. A **function** 'does something' to **input** numbers to turn them into **output** numbers.
   e.g. "add 5" is a function

8. **Equation of a line**:
   $$y = mx + c$$
   where m = gradient
   c = y-axis intercept

9. 

   Angles in the same segment are equal
   (Learn this wording)

10. **segment**
    

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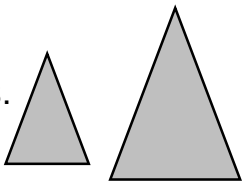
Know

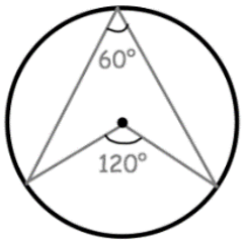
10 things to learn

Maths Knowledge Organiser GCSE Higher Part 3

1. **Similar** shapes have the same angles. One is an enlargement of the other.



2. A pair of **interior** and **exterior** angles adds up to 180°

3. 

The angle at the centre is double the angle at the circumference

4. More complex fraction powers are a power and a root

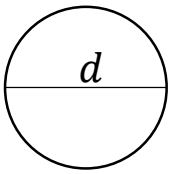
e.g. $8^{\frac{2}{3}} = (\sqrt[3]{8})^2$

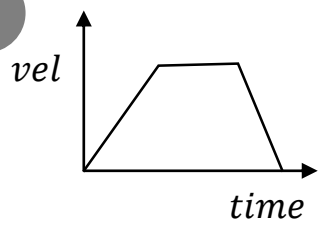
5. **product** means 'multiply'

e.g. the product of 3 and 4 is 12

6. **Circumference** of a circle:

$\boldsymbol{C = \pi \times d}$

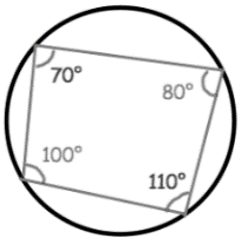


7. 

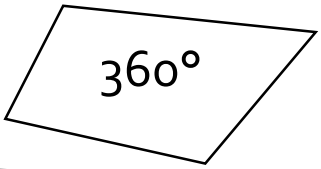
gradient = acceleration

8. When transforming shapes an **invariant point** (or line) stays in the same place

9. **Opposite angles in a cyclic quadrilateral add up to 180°**



10. The **angles** in any **quadrilateral** add up to 360°



Know

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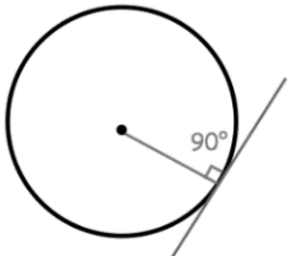
10 things to learn

Maths Knowledge Organiser GCSE Higher Part 4

1. **A radius and a tangent meet at 90°**



2. Anything to power 0 equals 1
e.g. $p^0 = 1, \quad 57^0 = 1$

3. A **prime number** has exactly two factors (1 and itself)
Learn the **primes** less than 20:
2, 3, 5, 7, 11, 13, 17, 19, …

4. For **powers of powers** we multiply the powers
e.g. $(x^5)^3 = x^{15}$

5. **Rotations, reflections** and **translations** produce **congruent** (identical) images.
Enlargements produce a **similar** image.

6. $>$ means 'greater than'
On a number line:

7. 1 litre = 1000 ml

8. $\geq$ means 'greater than or equal to'
On a number line:

9. A **recurring** decimal has a repeating pattern
A dot notation is used to show the pattern
e.g. $0.4\dot{5} = 0.455555\ldots$
$0.\dot{4}\dot{5} = 0.454545\ldots$

10. **reciprocal** means '1 divided by the number'
This inverts fractions
e.g. the reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$

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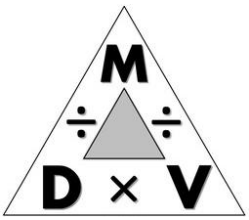
Know

10 things to learn

Maths Knowledge Organiser GCSE Higher Part 5

1

density
mass
volume



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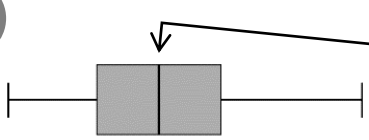


3

Capacity and volume

1 ml = 1 cm^3
1 litre = 1000 cm^3

4

A **quadratic** (x^2) graph makes a U-shape called a **parabola**

5

Area of a sector:

$$\frac{\theta}{360} \times \pi r^2$$

6

Arc length of a sector:

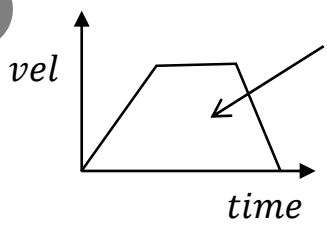
$$\frac{\theta}{360} \times \pi d$$

7

In a **geometric sequence** we multiply or divide by the same amount each time

e.g. 3, 6, 12, 24, … (x 2)

8

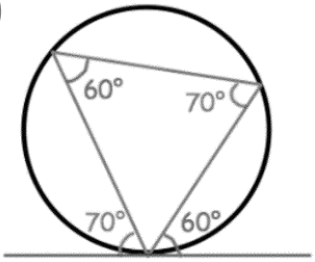


9

A **power of -1** is a reciprocal

e.g. $5^{-1} = \frac{1}{5}$

10



The Alternate Segment Theorem

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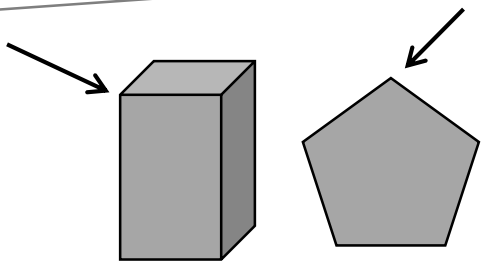
Know

10 things to learn

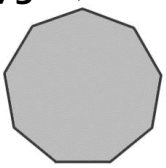
Maths Knowledge Organiser GCSE Higher Part 6

1. In a 2D or 3D shape, a **vertex** is a corner.
(plural: **vertices**)

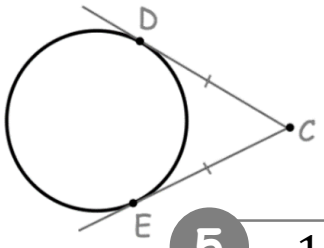


2. The **surface area** of a 3D solid is the areas of all of its faces added together

3. A **regular** shape (**polygon**) has:
- all equal sides
- all equal angles

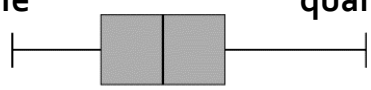


4. **Tangents to a point are the same length**



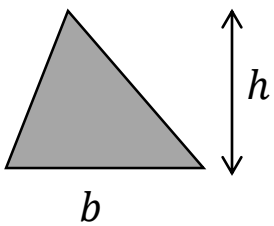
5. $\frac{1}{4} = 0.25 = 25\%$

6. **lower quartile** **upper quartile**

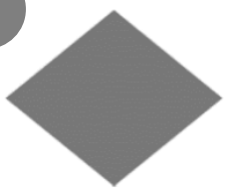


7. **Area of triangle**

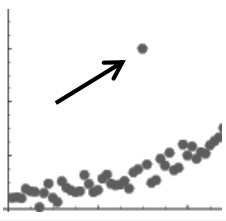
$$\frac{b \times h}{2}$$



8. A **rhombus** has 4 equal sides



9. An **outlier** is a piece of data that doesn't fit the pattern of the rest of the data



10. A **parallelogram** has two pairs of parallel sides

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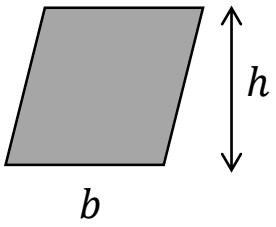
Know

10 things to learn

Maths Knowledge Organiser
GCSE Higher Part 7

1 **Area of parallelogram**

$$b \times h$$



2 We usually **estimate** by rounding each number to 1 significant figure

3 **discrete data** can only have certain values

e.g. number of people
shoe size

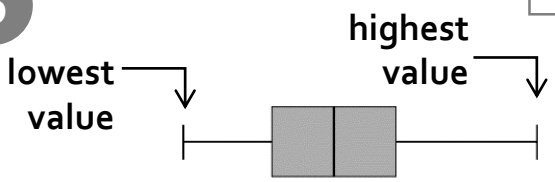
4 **continuous data** can be measured very accurately

e.g. height, weight, time

5

$$\frac{3}{4} = 0.75 = 75\%$$

6



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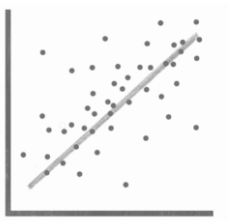
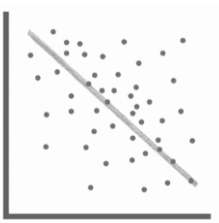


positive correlation

8 **Negative powers**

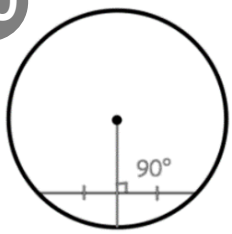
e.g. $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

9



negative correlation

10



The perpendicular bisector of a chord is a radius

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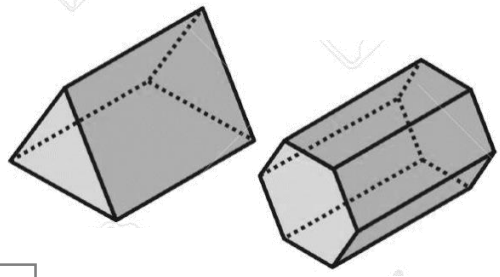
Know

10 things to learn

Maths Knowledge Organiser
GCSE Higher Part 8

1. A **prism** has the same shape running all the way through the middle



2. **Interquartile range**
IQR = UQ – LQ

3. To find the **median** average
- put the numbers in **order**
- select the **middle** number (or in between the two, if there are 2 middle numbers)

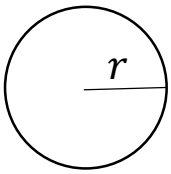
4. A **square number** is made by multiplying a number by itself

Learn the **squares** up to 10 x 10:
1, 4, 9, 16, 25, 36, 49, 64, 81, 100, …

5. $\frac{1}{10} = 0.1 = 10\%$

6. **Area** of a circle:

$\boldsymbol{A = \pi \times r^2}$

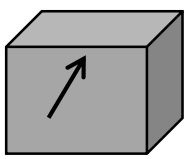


7. **trend** means 'overall pattern'
e.g. The profits went up

8. The **Sine Rule**:

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

9. In a 3D shape, an **edge** is a line connecting two faces.



10. 1 m = 100 cm
1 m^2 = 100^2 cm^2
1 m^3 = 100^3 cm^3

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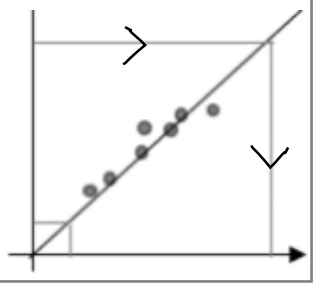
Know

10 things to learn

Maths Knowledge Organiser
GCSE Higher Part 9

1. In a scatter diagram, it is usually unreliable to make predictions **outside the range of the original data**

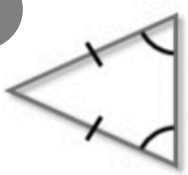


2. **consecutive** numbers are in order
e.g. 5, 6, 7, 8 (or $n, n+1, n+2$)

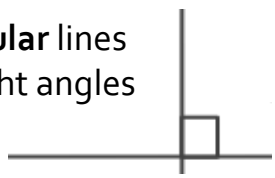
3. 
A **scalene triangle** has no equal sides and no equal angles

4. In **simple random sampling** every person (or object) has the same probability of being in the sample.
e.g. names from a hat

5. $\frac{1}{5} = 0.2 = 20\%$

6. 
The **base angles** of an isosceles triangle are equal

7. **Perpendicular** lines meet at right angles



8. The **mode** is the data value which is the <u>most common</u>.
There can be 2 modes (**bimodal** data) or no mode.

9. **evaluate** means 'work out the **value**' giving your answer as a number

10. A **cube number** is made by multiplying three of the number together (cubing it)
e.g. 2 x 2 x 2 = <u>8</u>
Learn the first five cube numbers: 1, 8, 27, 64, 125, …

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Know

10 things to learn

Maths Knowledge Organiser GCSE Higher Part 10

1 In a **quadratic sequence** the coefficient of n^2 is half the 2nd difference

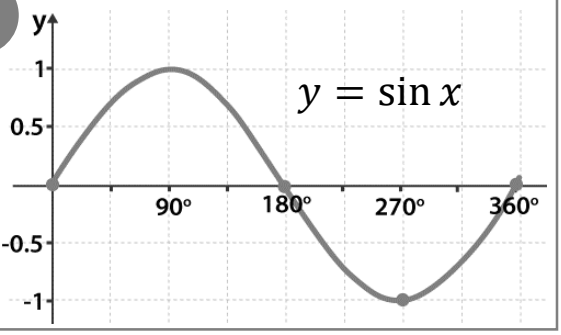
e.g. $2n^2$ ...

$$0,\ \underset{+1}{1},\ \underset{+5}{6},\ \underset{+9}{15}$$

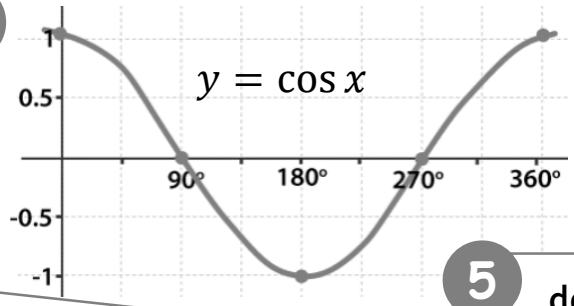
$$\underset{+4}{\quad}\quad\underset{+4}{\quad}$$

2 A **plan** is a view from above

3



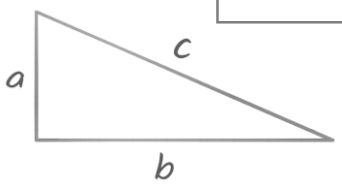
4



5 **depreciate** means 'go down in value' (like a second-hand car)

6 **Pythagoras' theorem:**

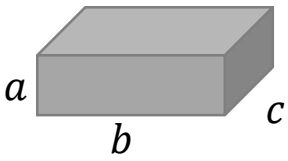
$a^2 + b^2 = c^2$



7 In probability, OR means ADD

8 **Volume of cuboid:**

$a \times b \times c$



9 In probability, AND means MULTIPLY

10 A **recurrence relation** is a sequence where each term is calculated from the previous term(s).

e.g. $x_{n+1} = 2x_n - 3$

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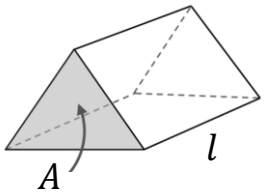
Know

10 things to learn

Maths Knowledge Organiser GCSE Higher Part 11

1 **Volume of prism:**

$$area\ of\ end \times length$$



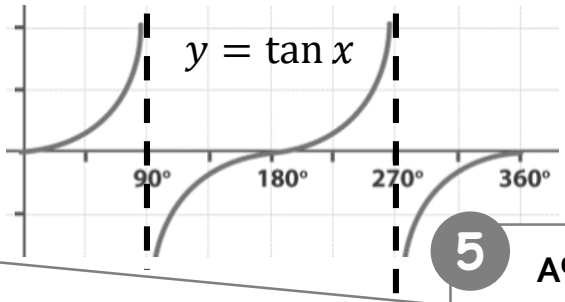
2 The **median** and **interquartile range** are likely to be more reliable than the **mean** and **range,** because they are not affected by outliers

3 A **vector** describes movement

e.g. $\begin{pmatrix}5\\2\end{pmatrix}$ 5 right & 2 up

$\begin{pmatrix}-5\\-2\end{pmatrix}$ 5 left & 2 down

4



5 **A% of B:** A ÷ 100 x B

e.g. 12% of £300: 12 ÷ 100 x 300

6 **iteration** means 'doing the same thing over and over again'

7 It's easy to **multiply fractions**:

e.g. $\frac{2}{5} \times \frac{3}{7} = \frac{6}{35}$ $\leftarrow 2 \times 3$ $\leftarrow 5 \times 7$

8 $<$ means 'less than'

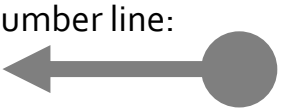
On a number line:

9 The **square root** of a number is what you square to make it

e.g. $\sqrt{16} = 4$ because $4 \times 4 = 16$

10 $\leq$ means 'less than or equal to'

On a number line:



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10 things to learn

Maths Knowledge Organiser
GCSE Higher Part 12

1 **Gradient from 2 points**:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

2 **in terms of π** means
'leave π in your answer' e.g. 6π

3 $$\frac{1}{3} = 0.\dot{3} = 33.\dot{3}\%$$

4 In a **Fibonacci-type sequence**, two terms are added to get the next one
e.g. 1, 1, 2, 3, 5, 8, 13, ...
(1 + 1 = 2, 1 + 2 = 3, etc.)

5 **A out of B as a %** A ÷ B x 100
e.g. 5 out of 17: 5÷ 17 x 100

6 A number in **standard form**:

$$1.3 \times 10^9$$

between 1 & 10 — power of 10

7 **Parallel lines** go in the same direction.
They have the same **gradient**
e.g. $y = 5x + 2$, $y = 5x - 7$

8 $+ \; - =$ **makes** $-$
$- \; - =$ **makes** $+$
e.g. $5 + -3 = 5 - 3 = 2$
$5 - -3 = 5 + 3 = 8$

9 The **cube root** of a number is what you cube to make it
e.g. $\sqrt[3]{8} = 2$ because $2 \times 2 \times 2 = 8$

10 The **Cosine Rule**:

$$a^2 = b^2 + c^2 - 2bc\cos A$$

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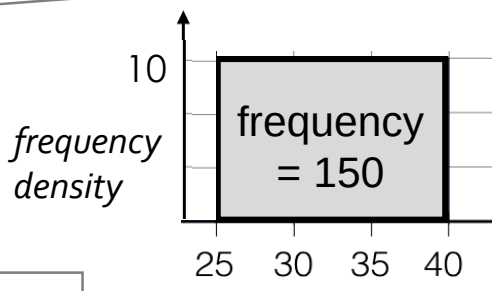
Maths Knowledge Organiser
GCSE Higher Part 13

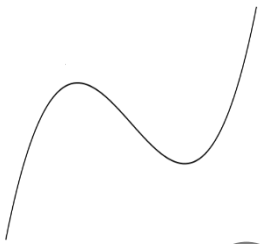
1. In a **histogram,** the <u>area</u> is the frequency



2. **equidistant** means 'equal distances' (from two points)

3. $\sin 30 = \cos 60 = \frac{1}{2}$

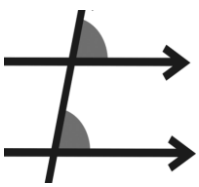
4. A **cubic** (x^3) graph generally has a shape like this:



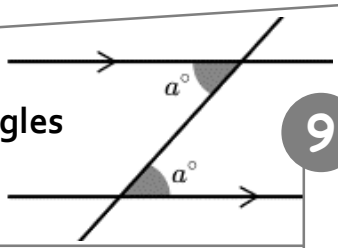
5. **bisect** means 'cut in half'

6. $\sin 60 = \cos 30 = \frac{\sqrt{3}}{2}$

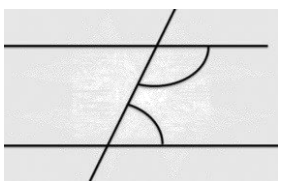
7. **corresponding angles** are equal



8. **alternate angles** are equal



9. **co-interior angles** add up to 180°



10. $\sin 45 = \cos 45 = \frac{\sqrt{2}}{2}$

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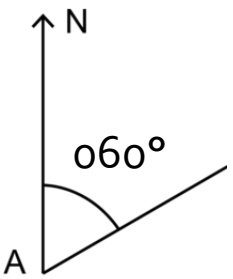
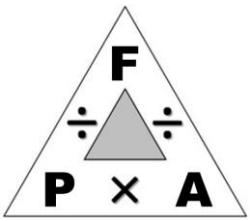
Maths Knowledge Organiser GCSE Higher Part 14

1 **bearings** are measured <u>clockwise from north</u> and written with 3 digits



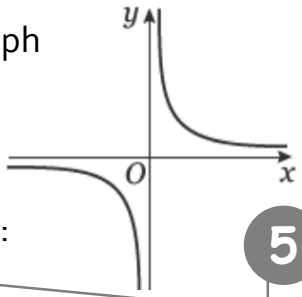
2 **inverse** means 'opposite'
e.g. + and − are inverse operations

3



pressure
force
area

4 A **reciprocal** graph such as $y = \frac{1}{x}$ looks like this:



5 With **simple interest,** the interest is the same amount every time

6 $\tan 30 = \frac{\sqrt{3}}{3}$

7 To **divide by a fraction,** multiply by its reciprocal

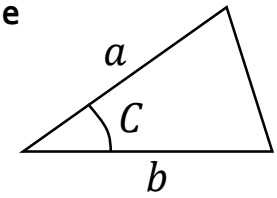
e.g. $\frac{2}{5} \div \frac{3}{7} = \frac{2}{5} \times \frac{7}{3} = \frac{14}{15}$

KFC

8 $\tan 60 = \sqrt{3}$

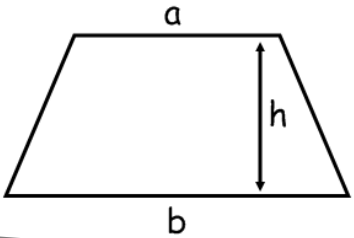
9 **Area of a triangle**

$\frac{1}{2}ab \sin C$



10 **Area of a trapezium**

$\frac{1}{2}(a + b)\, h$



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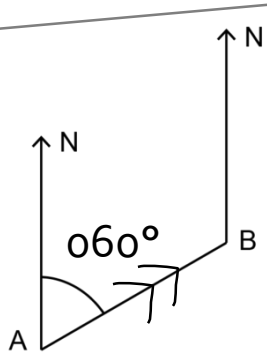
GCSE Higher Part 15

1

The bearing of **B <u>from A</u>** is the direction to travel to get to B <u>from A</u>.



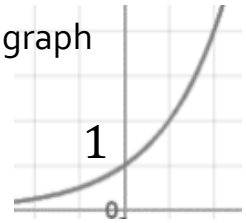
2

Direct proportion: $y = kx$

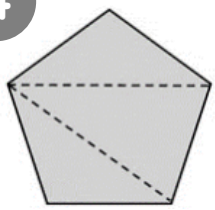
3

An **exponential** graph looks like this:

e.g. $y = 2^x$



4



For an n-sided polygon, **sum of interior angles**

$(n-2) \times 180$

5

Equation of a circle:
(centred at the origin)

$x^2 + y^2 = r^2$

6

Inverse proportion: $y = \frac{k}{x}$

7

Gradients of perpendicular lines are a 'negative reciprocal'

e.g. $\frac{2}{3}$ and $-\frac{3}{2}$

8

The conditions for triangles to be congruent are:

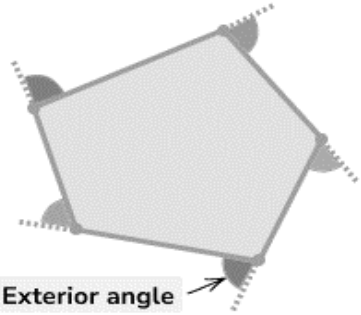
SSS, SAS, ASA, RHS

9

$\tan 45 = 1$

10

The **exterior angles** of any polygon add up to 360°



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