KNOWLEDGE ORGANISER

GCSE MATHS

ALL YEAR

KNOWLEDGE ORGANISERS

At Bottisham Village College, we are striving to create a five-year curriculum plan that builds effective revision strategies into homework and lessons, to ensure that students are able to place powerful knowledge into their long-term memories. Additionally, we hope that this will help build effective learning strategies from early in their time here at the college.

Based on evidence, we know that regular recall activities are the best way of achieving this goal and committing powerful knowledge into the students' memories.

At the start of each term, we shall publish all the knowledge organisers that students will require for their studies in each curriculum area. These will cover a range of aspects: facts, dates, characters, quotes, precise definitions and important vocabulary. We are clear: if this fundamental knowledge is secured, students can then develop their higher-level skills of analysis and critical understanding with greater depth.

They will be given an electronic A4 Knowledge Organiser (KO) booklet for each term containing all of the knowledge required. In lessons, Bottisham staff will be regularly testing this fundamental knowledge, using short-quizzes or even more formal "Faculty Knowledge Tests".

The best way to use these organisers at home, is to follow a simple mantra:

1. Look at a certain aspects of a particular knowledge organiser

2. Cover up part of their knowledge organiser

3. Write it out from memory

4. Check and correct any spelling mistakes, missing bits or mistakes

So simple but so effective.

Basic algebra

a) a+a+a = 3a   b) 2a + a = 3a   c) 4b − b = 3b   d) 2 x 3b = 6b

e) $\frac{6a}{3} = 2a$ f) $\frac{6a}{a} = 6$ g) 4(3x+2) = 12x+8   h) x(3x+2) = 3x² +2x

Perimeter

The distance around the outside of a shape

Area

The space covered by a shape

Pythagoras

a² + b² = c²

Right angled triangles only

Maths Year 10 Up to level 5

Negative Numbers

3 + -5 = 3 − 5

-3 + -5 = -3 − 5

3 - -5 = 3 + 5

-3 - -5 = -3 + 5

3 x 5 = 15

3 x -5 = -15

-3 x 5 = -15

-3 x -5 = 15

15 ÷ 3 = 5

-15 ÷ 3 = -5

15 ÷ -3 = -5

Averages

- Mean – Find the total and divide by the amount of data
- Median – Order the data and find the middle
- Mode – The data with the highest frequency

Trigonometry

SOH CAH TOA

Sin x = $\frac{opp}{hyp}$; Cos x = $\frac{adj}{hyp}$; Tan x = $\frac{opp}{adj}$

Arithmetic with Fractions

a) $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$ b) $\frac{3}{5} - \frac{1}{5} = \frac{2}{5}$ c) $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ d) $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$

e) $\frac{2}{3} \times \frac{3}{5} = \frac{6}{15}$ e) $\frac{1}{3} \div 2 = \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ f) $3 \div \frac{2}{5} = \frac{3}{1} \times \frac{5}{2} = \frac{15}{2}$

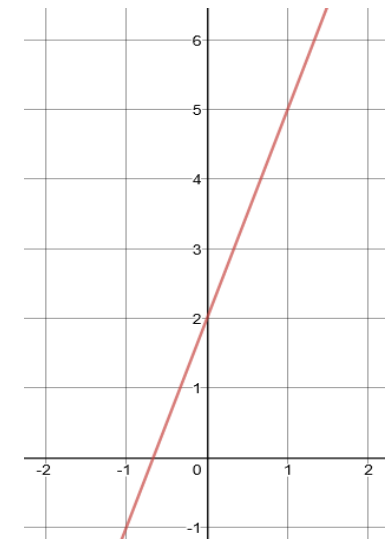g) $\frac{2}{3} \div \frac{4}{5} = \frac{2}{3} \times \frac{5}{4} = \frac{10}{12}$

Linear Graphs

y = mx + c

m is the gradient, c is the y-intercept

Laws of indices and surds

$a^m \times a^n = a^{m+n}$
$a^{-1} = \dfrac{1}{a}$
$(a^m)^n = a^{mn}$
$a^{\frac{1}{2}} = \sqrt{a}$

$a^m \div a^n = a^{m-n}$
$a^{-n} = \dfrac{1}{a^n}$
$a^0 = 1$
$a^{\frac{1}{n}} = \sqrt[n]{a}$

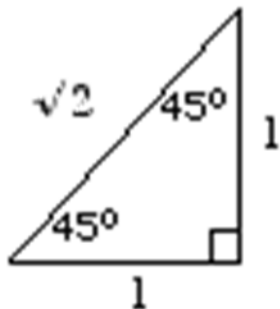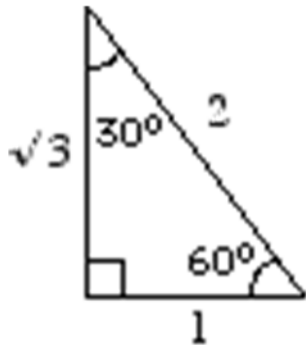| |
|---|
| $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ |
| $\dfrac{\sqrt{a}}{\sqrt{b}} = \sqrt{\dfrac{a}{b}}$ |
| $\sqrt{a}^2 = a$ |

Linear Graphs

$y = mx + c$

m is the gradient

c is the y-intercept

$y = 3x + 2$

Trigonometric Identities

Transformations

- Translation – moves the object without changing any of its properties or orientation. Uses a vector to describe the movement
- Rotation – Done from a centre and described using an angle and direction
- Reflection – Object is flipped in a line. The line is described using linear graphing convention
- Enlargement – Done from a centre with a scale factor. The scale factor can be positive or negative and an integer or fraction
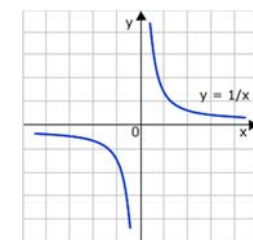
Types of graph
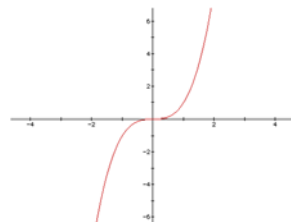
Reciprocal graph
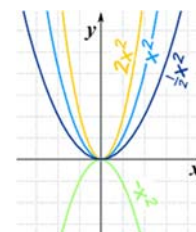
Quadratic graphs

$y = 1/x$
Cubic graph

Compound measures

$$speed = \frac{distance}{time}$$

$$density = \frac{mass}{volume}$$

$$pressure = \frac{mass}{area}$$

Percentage Multipliers

- Find 23% of an amount: x 0.23
- Decrease by 23%: x 0.77
- Increase by 23%: x 1.23
- Compound interest of 5% pa for 3 years: x 1.05^5

Vectors

Vectors describe a movement. The top number is left/right and the bottom number is up/down.

$\binom{3}{-1}$ = 3 right, 1 down; $\binom{-3}{1}$ = 3 left, 1 up

Indices

a^m x a^n	a^{m+n}
$a^m \div a^n$	a^{m-n}
$(a^m)^n$	a^{mn}
a^0	1

Congruent

Shapes are congruent if the sides and angles are all the same size.

Circles

Diameter = radius x 2 (2r)
Circumference = π x diameter (dπ)
Area = π x radius x radius ($πr^2$)

Similar Shapes

When a shape is enlarged:
The sides change length
Angles stay the same
The ratio of the sides stay the same

Standard Form

First significant figure must always be in the ones column.

1,200,000 = 1.2 x 10^6

0.0034 = 3.4 x 10^{-3}

Prime Numbers

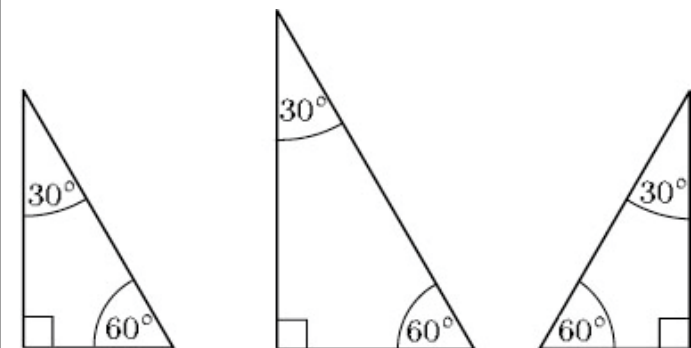Numbers with only themselves and 1 as a factor:

2, 3, 5, 7, 11, 13, 17, 19, …

Factorising Quadratics

x^2 + 8x + 15, fill in the grid. What multiplies to make 15 and adds to make 8? 3 and 5.

	x	
x	x^2	
		15

(x+3)(x+5)

Maths
Year 11
Up to level 5

30° 30° 30° 60° 60° 60°

Maths – Year 11 5+

Equation of a circle

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

$$x^2 + y^2 = 25$$

Circle with centre (0,0) and radius 5

Trigonometric Rules

Sine rule: $\dfrac{a}{sinA} = \dfrac{b}{sinB} = \dfrac{c}{sinC}$

Cosine rule: $c^2 = a^2 + b^2 - 2abcosC$

Area of triangle: $\frac{1}{2}absinC$

Solving Quadratics 1

$$x^2 + 8x + 15 = 0$$
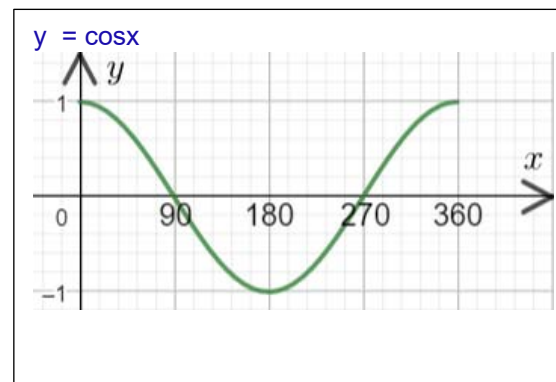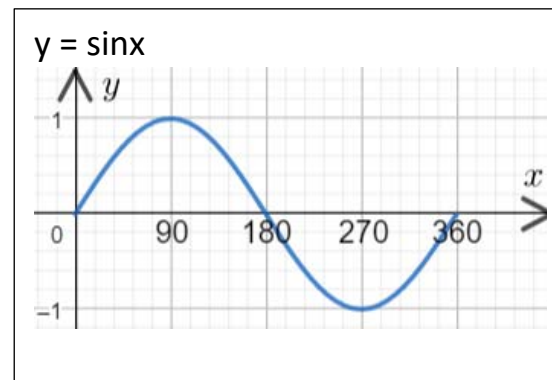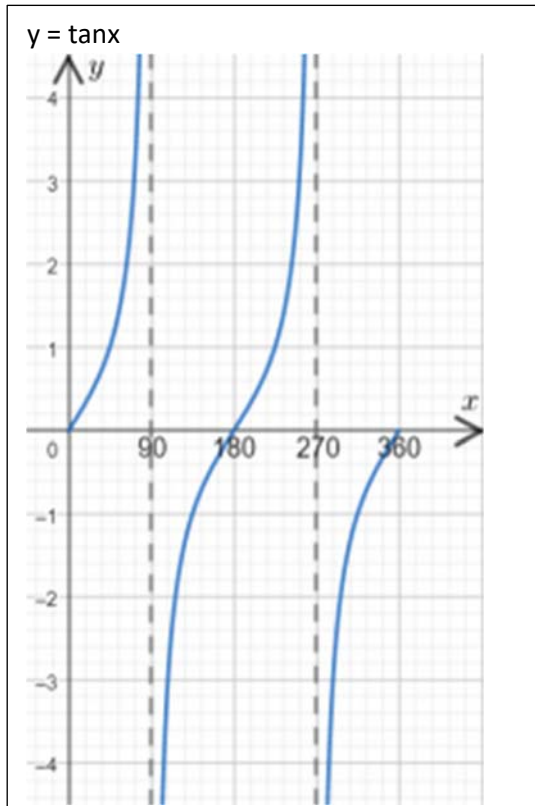
Factorise to (x+5)(x+3) = 0

Either x+3 = 0 or x+5 = 0, so x =-3 or -5

Solving Quadratics 2

$$x^2 + 8x + 7 = 0$$

Complete the square:

$(x+4)^2 - 9 = 0$

$(x+4)^2 = 9$

x+ 4 = ±3

x = -1 or x = -7

Solving Quadratics 3

$$x^2 + 8x + 7 = 0$$

Use the formula:

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

$$x = \frac{-8 \pm \sqrt{8^2 - 4x1x7}}{2}$$

$$x = \frac{-8 \pm \sqrt{36}}{2} = -1 \; or -7$$

Trigonometric Graphs

y = tanx

y = sinx

y = cosx