circumference, radius, sector, diameter, chord, segment, tangent

Decimal	Percentage	Fraction
0	0%	0
0.1	10%	$\frac{1}{10}$
0.2	20%	$\frac{1}{5}$
0.25	25%	$\frac{1}{4}$
0.3	30%	$\frac{3}{10}$
0.333̇	33.3̇3%	$\frac{1}{3}$
0.5	50%	$\frac{1}{2}$
0.6	60%	$\frac{3}{5}$
0.666̇	66.6̇6%	$\frac{2}{3}$
0.75	75%	$\frac{3}{4}$
1	100%	1

Area of triangle
Area of triangle = $\frac{b \times h}{2}$
$= \frac{8 \times 5}{2}$
$= 20cm^2$

Area of parallelogram
Area of parallelogram = b × h
= 8 × 5
= $40cm^2$

Area of trapezium
Area of trapezium = $\frac{(a + b)}{2} \times h$
$= \frac{(8 + 12)}{2} \times 6$
$= 60cm^2$

Area of circle
Area of circle = π × r × r
= π × r^2
= π × 5^2
= $78.5cm^2$

Circumference of circle
Area of circle = π × d
= π × 8
= 25.1cm

Volume of cuboid
Volume = l × w × h
= 5 × 3 × 2
= $30cm^3$

Surface area of cuboid
Front = 5×3 = 15
Back = 5×3 = 15
Top = 5×2 = 10
Bottom = 5×2 = 10
Side = 3×2 = 6
Side = 3×2 = 6
Total Surface Area = $62cm^2$

Percentages
• To increase £12 by 5%
= 1.05 × £12   (100% + 5% = 105%)
OR
= £12 + 5% of £12
• To decrease £50 by 15%
= 0.85 × £50   (100% - 15% = 85%)
OR
= £50 – 15% of £50

Compound Interest
Invest £250 at 4% for 3 years

Amount = 250 × 1.04^3

Fractions
e.g. $\frac{1}{5} + \frac{7}{10}$ $\frac{4}{5} - \frac{2}{3}$
$= \frac{2}{10} + \frac{7}{10}$ $= \frac{12}{15} - \frac{10}{15}$
$= \frac{9}{10}$ $= \frac{2}{15}$

e.g. $5 \times \frac{2}{3}$ $\frac{4}{5} \times \frac{2}{3}$
$= \frac{5}{1} \times \frac{2}{3}$ $= \frac{8}{15}$
$= \frac{10}{3} = 3\frac{1}{3}$

e.g. $5 \div \frac{2}{3}$ $\frac{4}{5} \div \frac{2}{3}$
$= \frac{5}{1} \times \frac{3}{2}$ $= \frac{4}{5} \times \frac{3}{2}$
$= \frac{15}{2} = 7\frac{1}{2}$ $= \frac{12}{10} = 1\frac{2}{10} = 1\frac{1}{5}$

Angles in Polygons
Sum of interior angles = 180° x (n-2)

Sum of exterior angles = 360°

37°, 37° alternate angles
143°, 143°
143°, 143° corresponding angles
interior angle, exterior angle, 108°, 72°
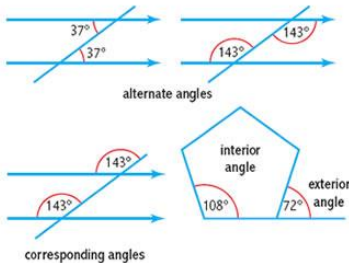
Metric Measures
1 km = 1000 m
1 m = 100 cm or 1000 mm
1 cm = 10 mm
1 litre = 1000 ml or 1000 cm³
1 tonne = 1000 kg
1 kg = 1000 g

Rules of indices
$2^5 \times 2^3 = 2^{5+3} = 2^8$
$7^6 \div 7^2 = 7^{6-2} = 7^4$
$(2^3)^2 = 2^{3 \times 2} = 2^6$
2^{-1} = the reciprocal of 2 (i.e. ½)

Multiples of 12 are: 12, 24, 36, 48 …
Factors of 12 are: 1, 2, 3, 4, 6, 12
Prime numbers are: 2, 3, 5, 7, 11, 13,…
Square numbers are: 1, 4, 9, 16, 25, …
Triangle numbers are: 1, 3, 6, 10, …
Cube numbers are: 1, 8, 27, 64,…

Power of 2	Calculation	Value
2^{-2}	$\frac{1}{2^2}$	¼
2^{-1}		½
2^0		1
2^1	2	2
2^2	2×2	4
2^3	2×2×2	8
2^4	2×2×2×2	16
2^5	2×2×2×2×2	32

Ratio
e.g. Divide £240 between A and B in ratio of 3:5
A : B
3 : 5 = 8 shares
One share = £240 ÷ 8 = £30
A = 3 shares = 3 × £30 = £90
B = 5 shares = 5 × £30 = £150

• Calculate fraction of quantity
To find $\frac{4}{5}$ of a quantity → ÷ 5 × 4

e.g. $\frac{4}{5}$ of £20 = 20 ÷ 5 × 4 = £16

Equations
~Multiply out brackets first
~If there are letters on both sides get rid of the smaller first
~Do the same to both sides
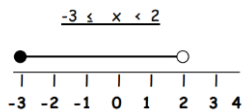e.g.
To solve 5(x – 3) = 3x + 7 (expand bracket)
5x – 15 = 3x + 7 (-3x from both sides)
2x – 15 = + 7 (+15 to each side)
$\frac{2x}{2}$ = $\frac{22}{2}$ (÷2 both sides)
x = 11

Inequalities
-3 ≤ x < 2

-3 -2 -1 0 1 2 3 4

Standard Form
$2.34 \times 10^4 = 23,400$
$1.7 \times 10^{-3} = 0.0017$

Brackets
Other things ² √
Divide
Multiply
Add
Subtract

Simplifying expressions
3x + 4y - 7 + 2y = 3x + 6y - 7
$5p^2 - 2p + p^2 = 6p^2 - 2p$

Expanding brackets
Multiply everything inside the bracket by what is outside
Then collect like terms together

3(x + 2) + 2(x – 5)
= 3x + 6 + 2x – 10
= 5x – 4

Watch for the negative sign in front of the bracket
It changes the sign inside the bracket
3(x + 2) – 2(x – 5)
= 3x + 6 – 2x + 10
= x + 16

Factorise
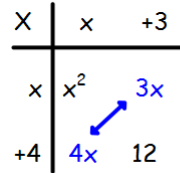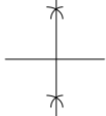3x + 6 = 3(x+2)
$6x^2 - 8x = 2x(3 - 2)$

Expanding Double brackets
$(x+3)(x+4) = x^2 + 7x + 12$

Method:

	x	+3
x	x^2	3x
+4	4x	12

Sequences
If the 1st difference is constant, it is linear
e.g.   3   7   11   15   19   23 ….
     +4 +4 +4 +4 +4

The term to term rule is +4

nth term = 4n –1
The nth term can be used to find the term in any position
e.g. 10th term means n=10
10th term = 4×10 – 1 = 39

LOCUS

LOCUS is the path or region a point covers as it moves according to a rule
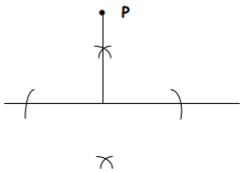
- Fixed distance from a point - **circle**

- Equal distance from two points **perpendicular bisector**

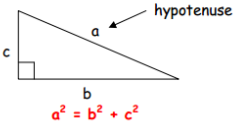- Equal distance from two intersecting lines – **angle bisector**

- Perpendicular from a point to a line

  • P

Pythagoras

For this right angled triangle:

hypotenuse

a

c

b

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

- If finding the hypotenuse
  ADD the squares of the other 2 sides
  Then square root
- If finding a shorter side
  SUBT the squares of the other 2 sides
  Then square root

Trigonometry

O
S H

A
C H

O
T A

SOH CAH TOA

Transformations

You need to know:
- Centre   e.g. (5, 4)
- Scale factor e.g. 2
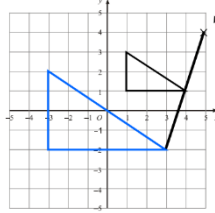
- **Translate a shape**
You need to know:
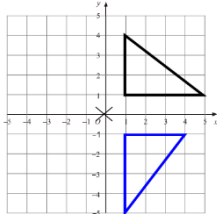- Vector from A to B e.g. $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ Right / Down
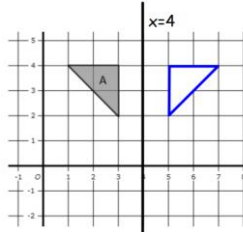
A

B
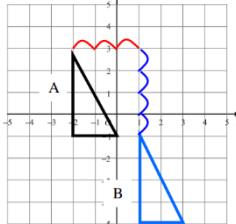
- **Rotate a shape**
You need to know:
- Angle e.g. 90^0
- Direction e.g. clockwise
- Centre of rotation e.g.(0,0)

- **Reflect a shape**
You need to:
- give the equation of the line

x=4

A

Graphs

You need to know:
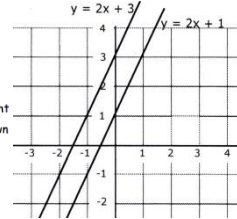
~Substitute values of x into the equation
~Plot the points in pencil
~Join the points with a ruler and pencil
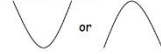~They should be in a straight line

e.g. **y = 3x – 1**

x	-2	-1	0	1	2
y	-7	-4	-1	2	5

y = 2x + 3

y = 2x + 1

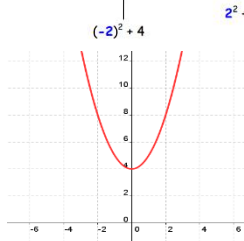Parallel lines have the same gradient

Quadratic Graphs

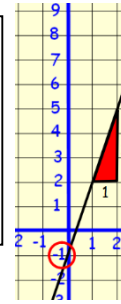- Graphs of quadratic equations have x^2 in and look like this:

  or

- To draw the graph of $y = x^2 + 4$

- Fill the table by following the rule
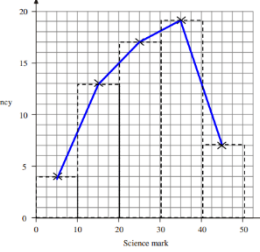- Then join the points with a smooth curve

x	-3	-2	-1	0	1	2	3
y	13	8	5	4	5	8	13

$2^2 + 4$

$(-2)^2 + 4$

The Range is the difference between the smallest and the largest values

Tree Diagrams

First pen

Second pen

5/7   Blue

5/7   Blue   2/7   Red $BB: \frac{5}{7} \times \frac{5}{7} = \frac{25}{49}$

$BR: \frac{10}{49}$

2/7   Red   5/7   Blue $RB: \frac{10}{49}$

2/7   Red $RR: \frac{4}{49}$

Construct a frequency polygon
(points plotted at the midpoint of the bars)

Frequency

Science mark

Probability from a table

Colour	Red	Green	Blue	Yellow
Probability	0.2	x	0.3	0.15

$0.2 + x + 0.3 + 0.15 = 1$ so $x = 0.35$

If there are 200 counters how many will be blue?
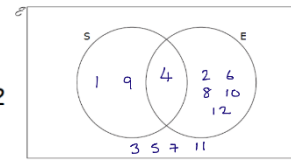
Blue = 0.3 x 200 = 60

Venn Diagrams
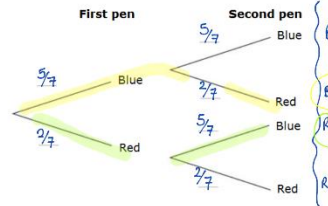
ξ = {1,2,3,4,5,6,7,8,9,10,11,12}
S= square numbers
E = even numbers

S

1 9   4   2 6
8 10
12

3 5 7 11

E

S ∪ E= 1,9,4,2,6,8,10,12

S ∩ E = 4

Frequency trees

1

Boys 20   Left 5
Right 15

40

Girls 20   Left 12
Right 8

Scatter Graphs

Scatter diagrams – used to investigate correlation

e.g. Positive Correlation

Strong positive   **Weak positive**

If it shows correlation , draw a line of best fit on it
Points which do not fit the trend are called OUTLIERS and should be ignored
The line can be used to predict data

Line of best fit

Negative   No correlation
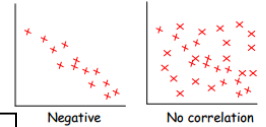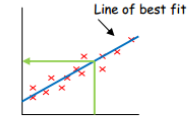
Mean from a table

Time (t sec)	x	f	fx
60 < t ≤ 70	65	12	780
70 < t ≤ 80	75	22	1650
80 < t ≤ 90	85	23	1955
90 < t ≤ 100	95	24	2280
100 < t ≤ 110	105	19	1995

$\Sigma f = 100$ $\Sigma fx = 8660$

Mean = $\frac{\Sigma fx}{\Sigma f} = \frac{8660}{100}$ = **86.6sec**

Modal class = **90 < t ≤ 100**
(because this class interval has the largest frequency i.e. 24)
Median = $\frac{1}{2}$ (100 + 1) th = 50.5th
= **80 < t ≤ 90**

Mean

Always write down the total!

To find the Mean you have to add all the numbers together and divide that total by how many numbers there are.

Median

You MUST put the numbers in ORDER first

The Median is the middle number of some data.

Mode

Notice that MOde and MOst start with my name

The MOde is the MOst common number.