Turton Mathematics Department: Expected Knowledge Fact Sheet - Foundation

Year group: 10

Direct Proportion

If y is directly proportional to x → $y \propto x$ as one value increase the other increases.

Also written as $y = kx$

k is the constant of proportionality.

Inverse Proportion

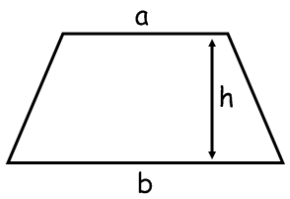
When one value increases as the other decreases.

$y \propto \frac{k}{x}$ $y \propto \frac{1}{x}$ $y = \frac{k}{x}$

Geometry:

Trapezium:

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

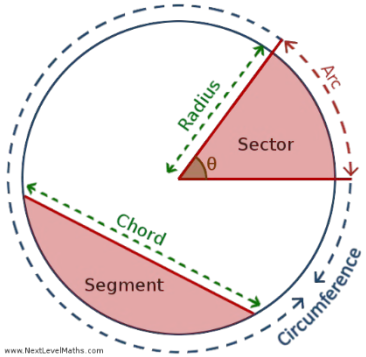


Circle:

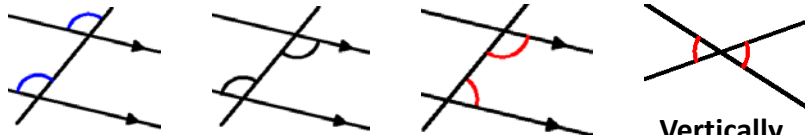
Area = πr^2,

Circumference = $2\pi r$

$\pi = 3.14159265\ldots$



Angles on parallel lines:



Corresponding angles are equal

Alternate angles are equal

Co-interior angles add to 180^0

Vertically opposite angles are equal

Angles in a Polygon:

Number of sides	Sum of interior angles	Shape
3	180°	
4	180° + 180° = 360°	
5	360° + 180° = 540°	
6	540° + 180° = 720°	
8	900° + 180° = 1080°	
10	1260° + 180° = 1440°	

Sum of **Interior** Angles = $(n-2) \times 180°$

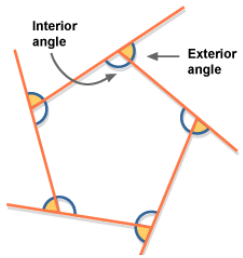
Each Interior Angle (of a Regular Polygon)

$= \frac{(n-2)\times 180°}{n}$

Sum of **Exterior** Angles = 360 °

Each Exterior angle (of a Regular polygon)

$= \frac{360}{n}$

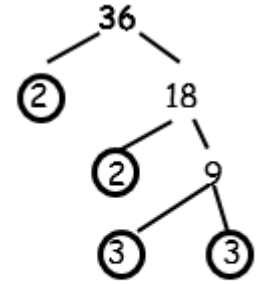


Similarity and Congruence

For any pair of similar **shapes corresponding sides** are in the same ratio and **corresponding** angles are equal. The two shapes need to be the same size to be **congruent**.

Prime Factor Decomposition.

Prime factor decomposition of a number means writing it as a product of **prime factors**. To factorise a number, divide it by the first possible **prime** number.

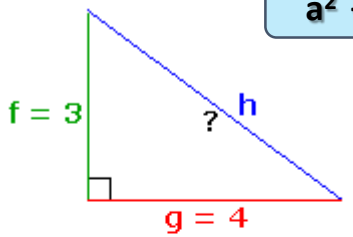


36 = 2x2x3x3

$= 2^2 x 3^2$

Pythagoras' Theorem

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



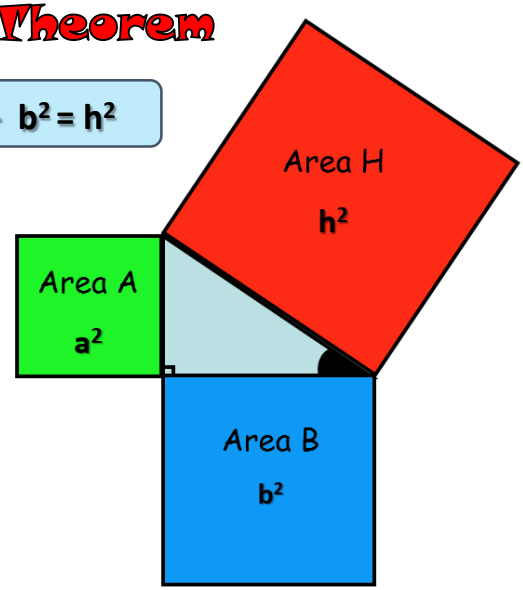
$h^2 = f^2 + g^2$

$h^2 = (3)^2 + (4)^2$

$h^2 = 9 + 16$

$h^2 = 25$

$h = 5$



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Exact Trig Values

Angle (θ) Degrees	0°	30°	45°	60°	90°
$\sin(\theta)$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos(\theta)$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan(\theta)$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not Defined

Solving equations:

To solve means to find the value of the unknown.

	$5x - 3 = 17$	
+3	$5x = 20$	+3
÷5	$x = 4$	÷5

When expanding double brackets there are a few methods you can use. Choose the one that suits you

Smiley Face

$(x+3)(x+4)$

$= x^2 + 12 + 3x + 4x$

$= x^2 + 7x + 12$

Grid Method

$(x+5)(x+7)$

	x	$+5$
x	x^2	$+5x$
$+7$	$+7x$	$+35$

$= x^2 + 12x + 35$

Double Claw / FOIL

F - Firsts
O - Outers
I - Inners
L - Lasts

$(x+2)(x+3)$

$= x^2 + 3x + 2x + 6$

$= x^2 + 5x + 6$

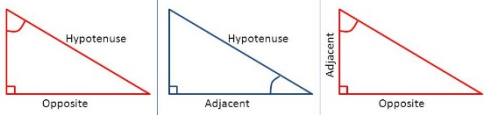
Trigonometry

Trigonometry Ratios

Sine Ratio: $\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$

Cosine Ratio: $\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$

Tangent Ratio: $\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$



SOH CAH TOA

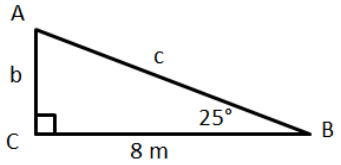
To find side b:

$\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$

$\tan 25 = \frac{b}{8}$

$8 \times \tan 25 = b$

$b = 3.73$ (2d.p.)



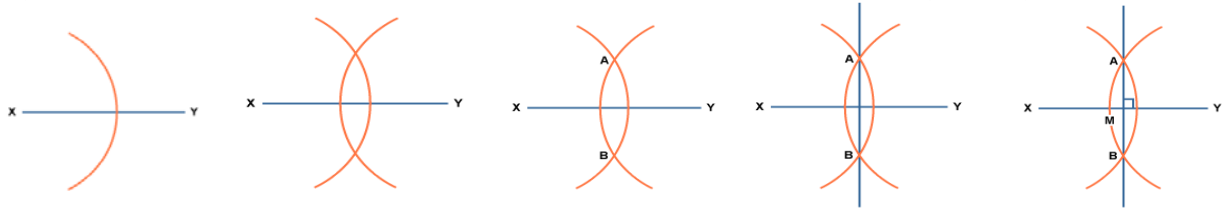
Index Laws

Rule	Example
$a^m \times a^n = a^{m+n}$	$2^5 \times 2^3 = 2^8$
$a^m \div a^n = a^{m-n}$	$5^7 \div 5^3 = 5^4$
$(a^m)^n = a^{m \times n}$	$(10^3)^7 = 10^{21}$
$a^1 = a$	$17^1 = 17$
$a^0 = 1$	$34^0 = 1$

Construction

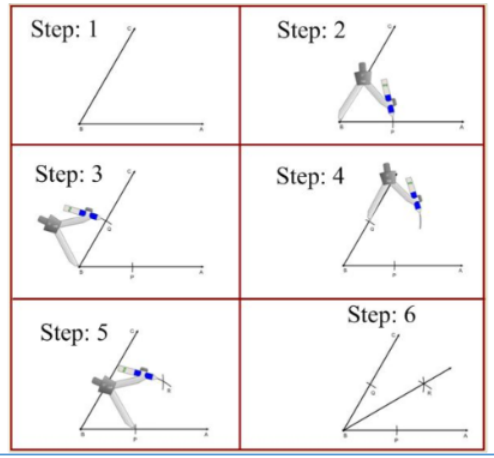
Perpendicular: two lines drawn at right angles to each other

Perpendicular Bisector: line that intersects another to form a right angle (COMPASS)

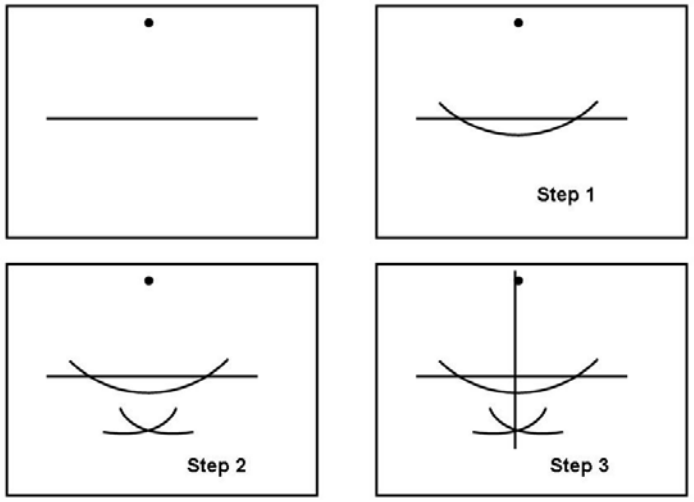


Angle Bisector:

Line drawn to cut another angle in half (COMPASS)



Perpendicular from a point to a line (COMPASS)



Locus

The *locus* of a point moves so that it is always a set distance (x) from a fixed point (O)