1. **Circle Theorems**
2. ***Angles at the centre and circumference***

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



1. ***Angles in the same segment***

Angles in the same segment are equal.



1. ***Cyclic quadrilateral***

A **cyclic quadrilateral** is a quadrilateral drawn inside a circle. Every vertex of the quadrilateral must touch the circumference of the circle.



The second shape is not a cyclic quadrilateral. One vertex does not touch the circumference.

The opposite angles in a cyclic quadrilateral add up to 180°.







1. ***Angles in a semicircle***

The angle at the circumference in a semicircle is a right angle.



Angle APB = 90°

1. ***The angle between a tangent and a radius is 90°.***



1. ***Tangents which meet at the same point are equal in length.***



1. ***Chords***

The perpendicular from the centre of a circle to a chord bisects the chord.



1. ***The alternate segment theorem***

The angle between a tangent and a chord is equal to the angle in the alternate segment.



1. **Angle Theorems**
2. ***The exterior angle is equal to the sum of the two opposite interior angles. This is true for any triangle.***



d = a + b

1. ***Quadrilaterals***

The angles in a quadrilateral add up to 360º. There are other facts that you will need to know about special types of quadrilaterals. These are shown below:

**Square**



A square is a regular quadrilateral. All of its angles are equal (90°). All of its sides are of equal length. Opposite sides are parallel. The diagonals bisect each other at 90°. The diagonals are equal in length. It has 4 lines of symmetry. Order of rotational symmetry: 4.

**Rhombus**



Diagonally opposite angles are equal. All of its sides are of equal length. Opposite sides are parallel. Diagonals bisect each other at 90°. It has 2 lines of symmetry. Order of rotational symmetry: 2.

**Rectangle**



All angles are equal (90°). Opposite sides are of equal length. Opposite sides are parallel. The diagonals bisect each other. The diagonals are equal in length. It has 2 lines of symmetry. Order of rotational symmetry: 2.

**Parallelogram**



Diagonally opposite angles are equal. Opposite sides are of equal length. Opposite sides are parallel. The diagonals bisect each other. It has no lines of symmetry. Order of rotational symmetry: 2.

**Trapezium**



One pair of opposite sides is parallel. It has no lines of symmetry. It has no rotational symmetry.

**Kite**



Two pairs of sides are of equal length. One pair of diagonally opposite angles is equal. Only one diagonal is bisected by the other. The diagonals cross at 90°. It has 1 line of symmetry. It has no rotational symmetry.

1. ***Angle properties of polygons***

The formula for calculating the sum of the interior angles of a regular polygon is: **(n - 2) × 180°** where **n** is the number of sides of the polygon.

1. ***Interior angle of a regular polygon = sum of interior angles ÷ number of sides***
2. ***Exterior angle***

Exterior angle of a regular hexagon is 

1. ***Vertically opposite angle***

When two lines intersect, the opposite (X) angles are equal:



1. ***Alternate (Z) angle***

On parallel lines, alternate (Z) angles are equal:



1. ***Corresponding (F) angle***

On parallel lines, corresponding (F) angles are equal:



1. ***Interior (C) angle***

On parallel lines, co-interior (C) angles add up to 180°:



1. **Table for Sin, Cos & tan**



1. **Graph for Sin, Cos & tan**





1. **Sine Rule, Cosine Rule & Area of Triangle**
2. ***Sine Rule***

We can use the sine rule to find the size of an angle or length of a side.



The sine rule is:



**OR**



1. ***The cosine rule***

We can use the cosine formula to find the length of a side or size of an angle.



For a triangle with sides a,b and c and angles A, B and C the cosine rule can be written as:

* a2 = b2 + c2 - 2bc cos A

**OR**

* b2 = a2 + c2 - 2ac cos B

**OR**

* c2 = a2 + b2 - 2ab cos C

These formulae can be rearranged to give:







1. ***The area of a triangle***



Area of triangle **ABC** = 1/2ab sin C

or, 1/2ac sin B

or, 1/2bc sin A

1. **Area**
* **Square -------->** Area = Length2
* **Rectangle -------->**  Area = Length \* Width
* **Right-angled Triangle -------->** Area = ½ x Base \* Height
* **Other Triangle -------->** Area = ½ x Base \* Perpendicular Height
* **Circle -------->** Area = π \* r2
* **Trapezium -------->** Area = ½ ( a + b ) \* h

 

* **Parallelogram -------->** Area = base \* height
1. **Surface Area**
* **Curved Surface Area of a Cylinder -------->** Area = 2 \* π \* r \* h



* **Surface area of a Sphere -------->** Area = 4 \* π \* r2



* **Total Surface area of a Cone -------->** π \* r \* l + π \* r2
* **Curved Surface area of a Cone -------->** Area = π \* r \* l



* **Frustum(Truncated Cone) -------->** Area = 



1. **Volume**
* **Cube -------->** Volume = Length3
* **Cuboid -------->** Volume = Length \* Width \* Height
* **Prism -------->** Volume = Area of Cross-section \* Length



* **Cylinder -------->** Volume = π \* r2 \* h



* **Sphere -------->** Volume = 4/3 \* π \* r3



* **Cone -------->** Volume = 1/3 \* π \* r2 \* h



* **Frustum(Truncated Cone) -------->** Volume = πh/3 ( R2 + R\*r+ r2)



1. **Circumference or Perimeter**
* **Circle -------->** Circumference = 2 \* π \* r**OR**π \* D
* **Rectangle -------->** Perimeter = 2 ( Length + Width )
1. **CAST Diagram**



1. **Trigonometric Identities**

These are:



cos2x = 1 - sin2x

sin2x = 1 - cos2x

And:



1. **Differentiation**

The rule for differentiation is





or, using the Leibniz notation



1. **Equation of a circle**

The equation of a circle with radius r and centre (0, 0) is given by the formula





1. **Transformation of Graphs**
2. ***Translations parallel to the y-axis***

 Represents a translation through the vector .

If, then. Here we are adding to the whole function.

The addition of the value represents a vertical translation in the graph. If is positive, the graph translates upwards. If is negative, the graph translates downwards.

**Example 1**







**Example 2**







1. ***Translations parallel to the x-axis***

 Represents a translation through the vector .

If  then .

Here we add to , not to the whole function. This time we will get a horizontal translation. If is positive then the graph will translate to the left. If the value of is negative, then the graph will translate to the right.

**Example 1**







**Example 2**







1. ***Reflections in the x-axis***

If , then .



1. ***Reflections in the y-axis***

If , then .



## Summary

|  |  |
| --- | --- |
| y = f(x) + C | * C > 0 moves it up
* C < 0 moves it down
 |
| y = f(x + C) | * C > 0 moves it left
* C < 0 moves it right
 |
| y = Cf(x) | * C > 1 stretches it in the y-direction
* 0 < C < 1 compresses it
 |
| y = f(Cx) | * C > 1 compresses it in the x-direction
* 0 < C < 1 stretches it
 |
| y = −f(x) | * Reflects it about x-axis
 |
| y = f(−x) | * Reflects it about y-axis
 |