

Basic terminology:

**Whole Number**, (positive). Examples 1, 4, 11

**Odd number**, (either positive or negative): any number that is not divisible by 2. Examples 3,-5,17

**Even number**, (either positive, zero, or negative): any number that is divisible by 2. Examples -10,0,32

**Prime number**: any whole number greater than one that is only divisible by itself and by 1. Examples 2,3,17

**The  $K$ -th power of a number  $N$** : The notation is  $N^K$ . It is defined as  $N \times N \times N \cdots \times N$ , ( $K$  times).

Some basic terminology of 2-D, (two dimensional), geometric shapes, (or objects):

**A regular polygon**: a 2-D shape whose boundaries are all straight lines, and all the angles between any 2 of these lines are the same.

Examples of regular polygons: equilateral triangle, square, regular pentagon, regular hexagon, regular octagon.

Some definitions of angles: **Acute**:  $0 < \alpha < 90^\circ$ , **Right**:  $\alpha = 90^\circ$ , **Obtuse**:  $90^\circ < \alpha < 180^\circ$ .

Sum of all the angles of a triangle:  $180^\circ$ .

Sum of all the angles of a polygon: any polygon with  $N$  sides can be divided by straight lines into  $N - 2$  triangles. Thus, the sum of all its angles in degrees is:  $(N - 2) \times 180$ .

Triangles:

A triangle is a 2-D shape made up of 3 straight lines.

**Right triangle**: one of the angles is  $90^\circ$ .

**Isosceles triangle**: the length of two of the sides of the triangle is the same.

**Equilateral triangle**: the length of all the sides is the same.

**Obtuse triangle**: one of the angles of the triangle is more than  $90^\circ$ .

**Pythagorean theorem**: every right triangle satisfies  $a^2 + b^2 = c^2$ , where  $a, b, c$  are its sides ( $c$  is the largest side of the triangle).

Some definitions of non-regular polygons with 4-sides:

**Rectangle**: all angles of polygon are right angles.

**Parallelogram**: 2 pairs of parallel sides.

**Rhombus**: the length of all sides is the same.

**A Circle** is defined as a round 2-D shape. The **Radius** of the circle is a straight line connecting its centre with its boundary. The **Diameter** of the circle is a straight line dividing the circle into 2 areas of equal size. Note that this line goes through the centre of the circle and its length is twice as large as the length of the radius.

The **Circumference** of the circle is the length of its rounded boundary. There is a certain constant named  $\pi$  that relates the circumference and the area of a circle to its radius,  $r$ .  $\pi$  is not a rational number, (see below for the definition of a rational number), and its value is approximately  $\pi \approx 3.14 \cdots$ .

Circumference,  $C = 2\pi r$ . Area,  $A = \pi r^2$ .

**A Sector** of a circle is a shape surrounded by 2 radii and portion of boundary of the circle.

Definitions and properties of simple 3-D objects that have 8 **Corners** such as a **Cube** or a **Box**, and whose all angles are right angles:

The 12 **Edges**, (the lines connecting 2 adjacent corners), are straight lines.

The 6 **Faces** are the 2-D shapes enclosed in 4 edges.

If  $x, y, z$  are the edges of a box, its total **Surface area** is  $S = 2(xy + xz + yz)$  and its **Volume** is given by  $V = xyz$ .

A **rational number**, (or otherwise called a fraction) is a number that is either  $\pm \frac{m}{n}$  where  $n$  is a, (positive), whole number and  $m$  is either zero or a, (positive), whole number.

Division of a positive whole number  $p$  by another positive whole number  $q$ , i.e.  $\frac{p}{q}$ , may be a whole number, or may have a **Remainder**,  $0 < r < q$ . Note that  $p$  is called the **Numerator**, and  $q$  is called the **Denominator**. If this division has no remainder, then the value of  $\frac{p}{q}$  is called the **Quotient**.

A **Factor** of a whole number  $n$  is another whole number  $m$  that divides  $n$ .

For any **Fraction** where the numerator and the denominator have no common factor, that fraction is called: “**Fraction lowest terms**.”

A **Random** event is an event with no certainty that it will happen: for example, if tossing a fair coin there is “about” a 50% chance that the toss will be “Head” and “about” 50% chance that the toss will be “Tail”. The terminology used to describe the chances of events to occur is called the **Probability** of these events.

Thus, the probability  $P$  of any event satisfies  $0 \leq P \leq 1$ .

The probability of an event to occur may change if more information is given. The terminology used to define such probability is called: “**Conditional probability**”.

For example: You roll 2 dice, and it is easy to show that the probability that the event “the sum of the 2 numbers showing is less than 5”, (i.e. 2,3, or 4), is  $\frac{5}{36}$ , or to be more specific, 5 rolls, (out of total possible of 36 different rolls), satisfy the condition, namely:  $(1,1), (1,2), (1,3), (2,1), (2,2)$ . If you know that the sum is also less than 12, (the additional information), then the roll of  $(6,6)$  is excluded as a possible roll, so the total number of possible rolls is only 35, and the probability that the sum is less than 5 is now:  $P = \frac{5}{35} = \frac{1}{7}$ .