

Geometry

Triangles

Tip #1

Triangles with angles $30^\circ - 60^\circ - 90^\circ$ have sides in the ratio $1:\sqrt{3}:2$ (or, $x:\sqrt{3}x:2x$)

Side opposite the smallest angle (30°) is the smallest side = x

Side opposite the 60° angle has length = $\sqrt{3}x$

Side opposite the largest angle (90°) angle has the largest length = $2x$

Similarly for the $45^\circ - 45^\circ - 90^\circ$ triangle has sides in the ratio $1:1:\sqrt{2}$ (or $x:x:\sqrt{2}x$)

Side opposite the equal angles = x

Side opposite the 90° angle = $\sqrt{2}x$

Tip #2

An easy way to remember this $30^\circ - 60^\circ - 90^\circ$ to $1:\sqrt{3}:2$, is to think of it as in the increasing order.

$1, \sqrt{3}$ (or 1.732), 2

In case you forget the combination, remember that the square of the last term is equal to the sum of the two preceding terms.

$x:\sqrt{3}x:2x$

$$(2x)^2 = (\sqrt{3}x)^2 + x^2$$

Tip #3

If the length of two sides 'a' and 'b' of a triangle are given, the length of the third side 'c' would be given by

$$a - b < c < a + b$$

Most students apply only one side of the constraint. Both constraints have to be applied when such a question is asked.

Tip #4

A median divides an equilateral triangle into two equal parts.

Drawing all the medians divides the equilateral triangle into six equal parts.

Tip #5

What is the difference between centroid, circumcenter and incenter of a triangle?

Centroid is the intersection of three medians of a triangle.

Circumcenter is the intersection of three perpendicular bisectors of a triangle.

Incenter is the point of intersection of three angular bisectors.

Circles

Tip #6

What is the difference between circumscribed and inscribed?

A circumscribed circle passes through all the vertices of the plane figure and contains the entire figure within its interior.

An inscribed circle is the largest possible circle that could be drawn within a plane figure.

Tip #7

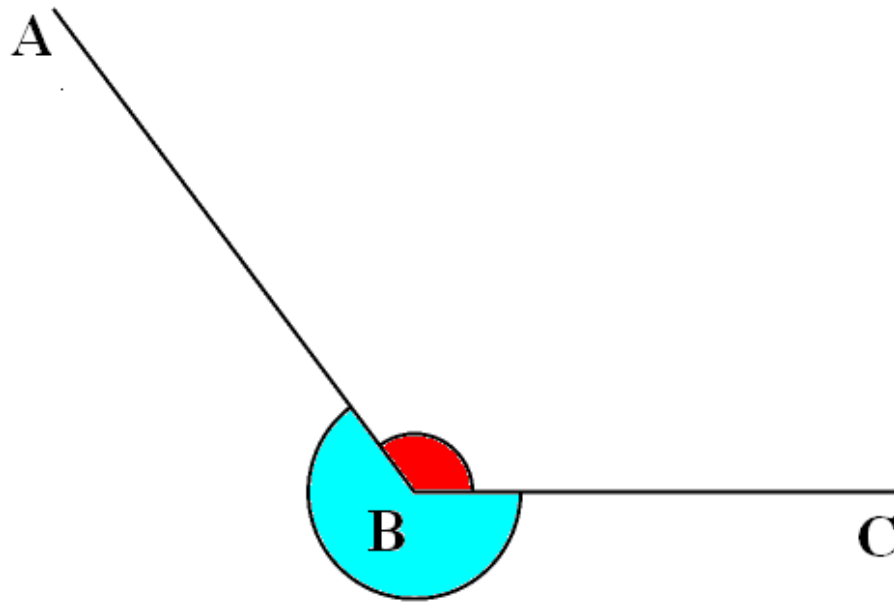
The angle subtended by the end points of the diameter to the circumference of a circle is always 90°

Moreover, if a right triangle is inscribed inside a circle, the hypotenuse of the triangle would be the diameter of the circle.

Tip #8

What is a reflex angle?

The smaller angle between two lines (or radii) is always considered, the larger angle between the lines is called the reflex angle.



For example: When we consider $\angle ABC$, the smaller red shaded portion is considered. The blue shaded angle is the reflex angle of $\angle ABC$.

Polygons

Tip #9

Is the sum of the exterior and interior angle equal to 180° or 360° ?

An exterior angle is the angle between any side of a polygon and the line extended from the adjacent side.

Always, Interior angle + Exterior angle = 180°

Tip #10

What is the difference between a regular polygon and an Irregular polygon?

A polygon is regular, if all the angles are equal in measure and all the sides are equal in length. A polygon which does not follow this rule is called an irregular polygon.

Tip #11

Exterior angle's of regular and irregular polygons?

The sum of all the exterior angles of both regular and irregular polygons is 360°

For *regular* polygons, the measure of each exterior angle is $\frac{360}{n}$, where 'n' is the number of sides of the polygon.

For irregular polygons, the measure of each exterior angle depends on the corresponding interior angle.

Tip #12

Many students assume that angles are always in integer form

This is not true. Angles can be in decimals or fractional values too.

$2\frac{3}{5}^\circ$, 25.6° , 0.24° and $\frac{8}{9}^\circ$ are all examples of angles.

Tip #13

If the perimeter of a rectangle is given, the rectangle with the largest area is a square

For example:

The perimeter of rectangle ABCD is 36, what is the side of the rectangle with the largest area?

The rectangle with the largest area is a square of side 6

Tip #14

If the area of a rectangle is given, the rectangle with the shortest perimeter is the square

For example:

The perimeter of rectangle PQRS is 64, what is the side of the rectangle with the smallest perimeter?

The rectangle with the smallest perimeter is a square with side 8

Tip #15

What is the difference between regular trapezoid and isosceles trapezoid?

A trapezoid has a pair of opposite sides parallel.

It's called isosceles trapezoid if the sides that aren't parallel have the same length and both angles coming from the parallel sides are equal.

Coordinate Geometry

Tip #16

Distances in the coordinate system are always positive.

Some students think that the distance between two points or lines could be negative while solving distance equation of two points.

Tip #17

If you are given a point (and conditions) asked to find the equation of a line, you can substitute the point in the options instead of 'x' and 'y' in the equation to check the correct answer.

But, sometimes there might be more than one option which satisfies the point but not the conditions.

For example: What is the equation of the line passing through the point (2, 3) and has slope $-1/2$

Option A $4x - 2y = 24$

$$4(2) - 2(3) = 8 - 6 = 2$$

Not the answer

Option B $6x - 5y = -3$

$$6(2) - 5(3) = -3$$

The equation is satisfied by the point, but it does not have the required slope. So this is a trick option. Students select this option and lose their marks.

Option C $x - y = 8$

$$2 - 3 = -1$$

Not the answer

Option D $x + 2y = 8$

$$2 + 2(3) = 8$$

The equation is satisfied and the slope of this equation is also $= -\frac{1}{2}$

Therefore, this is the correct option.

Tip #18

Many students think that a line can intercept a parabola at only one point. But, a parabola can be intersected by a line at one or two points.

Tip #19

To plot the graph of any function (parabola, circle, line and ellipse) just plug in random values of 'x' and get the corresponding values for 'y'. Two or three such coordinates are enough to plot the graph required.

Tip #20

The inclination of any line is measured with respect to the positive x-axis.

Shaded Area

Tip #21

In some questions drawing a perpendicular or connecting opposite vertices would assist in solving the problem.

If you're stuck – try drawing a perpendicular or connecting the vertices. It might be the key to solving the shaded area problem.

Tip #22

Always remember the difference between “area of sector” and “length of arc”

$$\text{Area of the sector (shaded region - Figure A)} = \frac{\theta}{360} \pi r^2$$

$$\text{Length of the arc (Highlighted – Figure B)} = \frac{\theta}{360} 2 \pi r$$

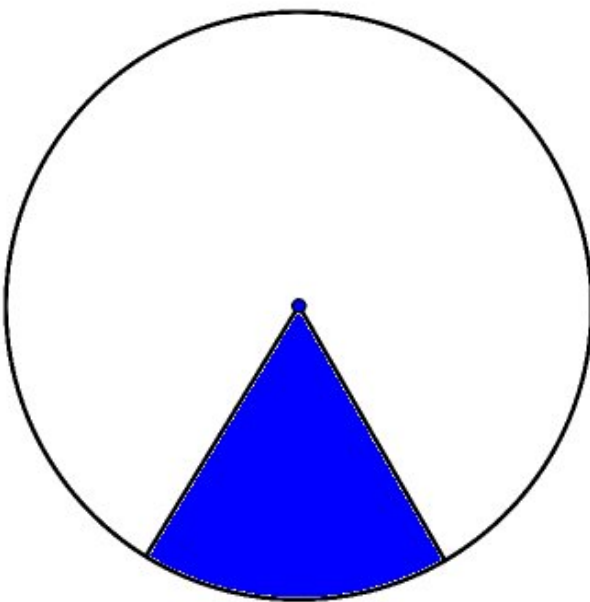


Figure A

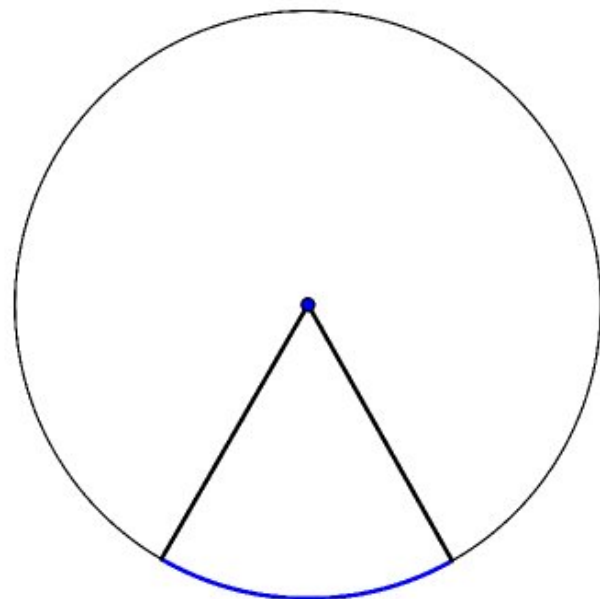


Figure B

Tip #23

Sometimes you would need to find the altitude of an equilateral triangle with the side given

The altitude of the equilateral triangle = $\frac{\sqrt{3}}{2}$ Side

Solid Geometry

Tip #24

In all solid geometry questions draw the diagram. Drawing gives you a basic idea of the figure in question – reducing the amount of mistakes made and increasing the ease with which the problem is solved.

Tip #25

What is the difference between *curved surface area* and *total surface area*?

Curved surface area includes only the areas of the curved surfaces, the areas of the top and bottom bases of the solid figure are not included.

Total surface area includes the areas of all the surfaces in the figure.

Tip #26

If the question asks for the surface area, it refers to the total surface area – not the curved surface area.