AREA

1. Triangles

a. Sum of the angles of a triangle is 180°.

b. The sum of any two sides of a triangle is greater than the third side.

c. Pythagoras Theorem:

In a right-angled triangle, (Hypotenuse) ^{2} = (Base) ^{2} + (Height) ^{2}.

d. The line joining the mid-point of a side of a triangle to the positive vertex is called the median.

e. The point where the three medians of a triangle meet is called centroid. The centroid divided each of the medians in the ratio 2: 1.

f. In an isosceles triangle, the altitude from the vertex bisects the base.

g. The median of a triangle divides it into two triangles of the same area.

h. The area of the triangle formed by joining the mid-points of the sides of a given triangle is one-fourth of the area of the given triangle.

2. Quadrilaterals

a. Diagonals of a parallelogram bisect each other.

b. Each diagonal of a parallelogram divides it into triangles of the same area.

c. Diagonals of a rectangle are equal and bisect each other.

d. Diagonals of a square are equal and bisect each other at right angles.

e. Diagonals of a rhombus are unequal and bisect each other at right angles.

f. A parallelogram and a rectangle on the same base and between the same parallels are equal in area.

g. Parallelogram which is a rectangle has the greatest area.

Important Formulae

1	Area of a rectangle = (Length x Breadth).
2	Perimeter of a rectangle = 2(Length + Breadth). ‘
3	Area of a square = (side) ^{2} = (diagonal) ^{2} /2 .
4	Area of 4 walls of a room = 2 (Length + Breadth) x Height.
5	Area of a triangle = 1/2 x Base x Height.
6	Area of a triangle = s(s-a) (s-b) (s-c) Where a, b, c are the sides of the triangle and s = (a + b + c) /2
7	Area of an equilateral triangle = 3/4 x (side)^2
8	Radius of in circle of an equilateral triangle of side a = a / 23
9	Radius of circumcircle of an equilateral triangle of side a = a / 3
10	Radius of in circle of a triangle of area (Delta) and semi-perimeter r = Delta/ s
11	Area of parallelogram = (Base x Height).
12	Area of a rhombus = Product of diagonals / 2.
13	Area of a trapezium = x (sum of parallel sides x distance between them) / 2.
14	Area of a circle = π R ^{2}, where R is the radius.
15	Circumference of a circle = 2 π R
16	Length of an arc = 2 π θ R/ 360, where θ is the central angle.
17	Area of a sector = 1(arc x R) = π R2 θ/360= R2 θ/2
18	Circumference of a semi-circle = π R.
19	Area of semi-circle = π R^2 / 2.

Problems with solutions

1. The ratio between the perimeter and the breadth of a rectangle is 5 : 1. If the area of the rectangle is 216 sq. cm, what is the length of the rectangle?

Solution

$\frac{2(l + b)}{b} = \frac{5}{1}$

$2l + 2b = 5b$

$3b = 2l$

$b = \frac{2}{3}l$

Then, Area = 216 cm^2

$l \times b = 216$

$l \times \frac{2}{3}l = 216$

$l^2 = 324$

$l = 18$ cm.

2. A towel, when bleached, was found to have lost 20% of its length and 10% of its breadth. The percentage of decrease in area is:

Solution

Let original length = x and original breadth = y.

Decrease in area $= xy - \left(\frac{80}{100}x \times \frac{90}{100}y\right)$

$= \left(xy - \frac{18}{25}xy\right)$

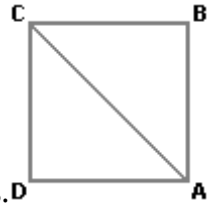
$= \frac{7}{25}xy.$

Decrease % $= \left(\frac{7}{25}xy \times \frac{1}{xy} \times 100\right)\% = 28\%.$

3. A man walked diagonally across a square lot. Approximately, what was the percent saved by not walking along the edges?

Solution

Let the side of the square (ABCD) be x metres.



Then, AB + BC = 2x metres.
AC = 2x = (1.41x) m.
Saving on 2x metres = (0.59x) m.

Saving % = $\left(\frac{0.59x}{2x} \text{ x } 100\right)\%$ = 30% (approx.)

4. What is the least number of squares tiles required to pave the floor of a room 15 m 17 cm long and 9 m 2 cm broad?

Solution

Length of largest tile = H.C.F. of 1517 cm and 902 cm = 41 cm.

Area of each tile = (41 x 41) cm^2.

$\therefore$ Required number of tiles = $\left(\frac{1517 \text{ x } 902}{41 \text{ x } 41}\right)$ = 814.

5. The length of a rectangle is halved, while its breadth is tripled. What is the percentage change in area?

Solution

Let original length = x and original breadth = y.
Original area = xy.

New length = $\frac{x}{2}$.

New breadth = 3y.

New area = $\left(\frac{x}{2} \text{ x } 3y\right) = \frac{3}{2}xy$.

Increase % = $\left(\frac{1}{2}xy \text{ x } \frac{1}{xy} \text{ x } 100\right)\%$ = 50%.