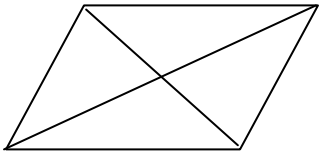
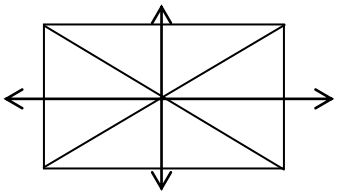
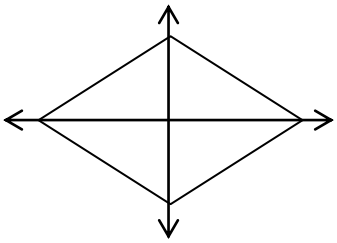
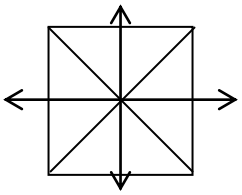
Parallelogram

The quadrilateral is a parallelogram if one of the following cases is identified ..

1- If each two opposite sides are parallel.
2- If each two opposite sides are equal in length.
3- If there are two opposite sides are parallel and equal in length.
4- If each two opposite angles are equal in measure.
5- If the diagonals bisect each other.



The special cases of parallelogram and their properties ..

Rectangle	**Rhombus**	**Square**
		
- Its four angles are right.	- Two adjacent sides are equal in length. (four sides are equal in length)	- Its four angles are right.
- The two diagonals are equal in length but not perpendicular.	- The two diagonals are perpendicular but not equal & each of them bisects the opposite angles	- Two adjacent sides are equal in length.
		- The two diagonals are perpendicular , equal in length & each of them bisects the opposite angles
It has 2 axes of symmetry	It has 2 axes of symmetry	It has 4 axes of symmetry
Per. = 2(L + w)	Per. = 4 × L	Per. = 4 × L

Areas

Remember that ..

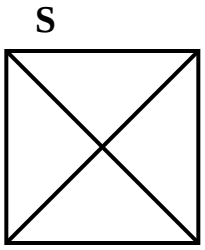
1) **The square:**

Area of a square = side × side = S^2

$= \frac{1}{2}(\text{ diagonal })^2 = \frac{1}{2}d^2$

Side = $\sqrt{\text{Area}}$

Diagonal = $\sqrt{2 \times \text{Area}}$



Perimeter of a square = side × 4.

Side = Perimeter ÷ 4

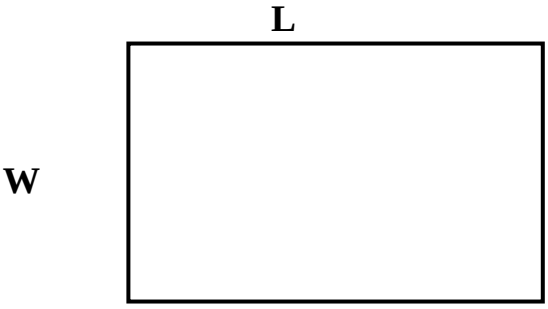
---

2) **The rectangle:**

Area of a rectangle = length × width.

$L = \frac{\text{Area}}{W}$

$W = \frac{\text{Area}}{L}$



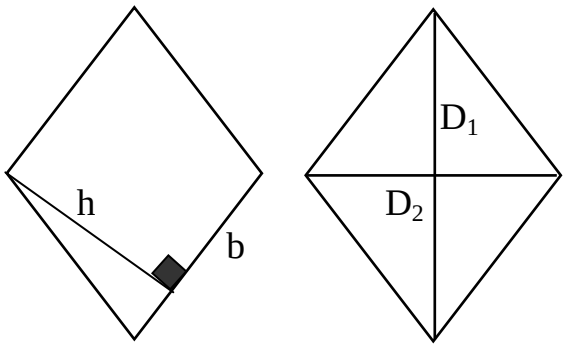
Perimeter of a rectangle = 2(L + W).

The rhombus

A rhombus is a parallelogram with sides equal in length.

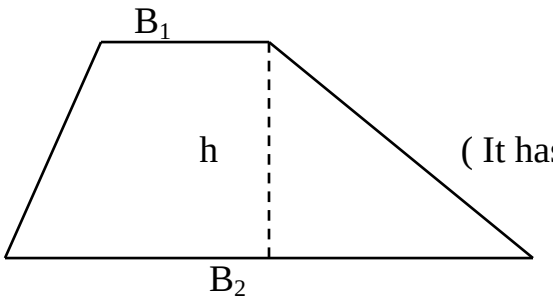
Area of a rhombus = $\frac{1}{2}$ ($D_1 \times D_2$).

or = base × height.



The trapezium

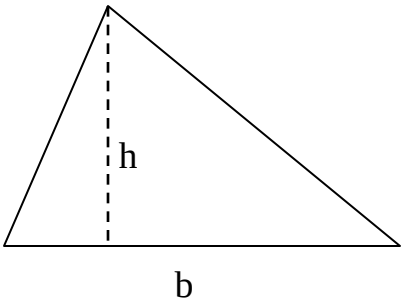
A trapezium is a quadrilateral whose two opposite sides are parallel (but not equal) and called bases and the other two sides are called legs.



(It has only one height)

The triangle

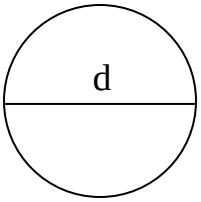
Area of triangle = $\frac{1}{2}$ b × h



The circle

Area of Circle = πr^2

Diameter = 2 × radius



Factorizing By taking H.C.F

$6x^2y^2 - 9x^3y = 3x^2y(2y - 3x)$

That means

a) factorize the numbers to its prime numbers and take the H.C.F of them

b) take the common letter with the smallest power of them

Example

1) $28a^3b^2 + 49a^2b^4 =$

$28 = 2 \times 2 \times 7$, $49 = 7 \times 7$

H.C.F = 7

$28a^3b^2 + 49a^2b^4 = 7a^2b^2(4a + 7b^2)$

2) $2x (m + 3) - 4y (m + 3) =$

H.C.F of 2 & 4 is 2 and (m + 3) is common

$2x (m + 3) - 4y (m + 3) = 2(m + 3) (x - 2y)$

3) $a (a - b) - b (b - a) = a (a - b) + b (a - b) = (a - b) (a + b)$

$(b - a) = -(a - b)$

The Power

1) Multiplication of the same base ⟶ add the power

Ex: a) $2^3 \times 2^2 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5$

$= 2^{3+2}$

b) $2^5 \times 2 = 2^6$

2) Division of the same base ⟶ subtract the power

Ex: $2^5 \div 2^3 = \frac{2 \times 2 \times 2 \times 2 \times 2}{2 \times 2 \times 2} = 2 \times 2 = 2^2$

3) Any base to the power of **ZERO** = 1

Ex: $2^3 \div 2^3 = \frac{2 \times 2 \times 2}{2 \times 2 \times 2} = 1$

$= 2^{3-3} = 2^0 = 1$

Then $5^0 = 1$, $100^0 = 1$, $7^0 = 1$, $a^0 = 1$, $x^0 = 1$

4) **ONE** to any power = **ONE**

Ex: $1^5 = 1 \times 1 \times 1 \times 1 \times 1 = 1$

$1^0 = 1$, $1^{100} = 1 \times \mathbf{1} \times \mathbf{\ldots\ldots\ldots = 1}$

1) When the coefficient is not written, then it is equal to 1, when the power is not written then it is equal to 1.

Ex: $x = x^1$, $y^3 = 1y^3$

6) ZERO to any power = ZERO

Ex: $0^4 = 0$, $0^1 = 0$

$\frac{0}{7} = 0$, but $\frac{7}{0}$ = (has no meaning)

7) Brackets $\longrightarrow$ multiply the power

Ex: $(2^3)^2 = 2^3 \times 2^3 = 2^{3+3} = 2^6$ or $(2^3)^2 = 2^{3x2} = 2^6$

8) Multiplication of the same power $\longrightarrow$ multiply the base

Ex: $2^2 \times 3^2 = 2 \times 2 \times 3 \times 3 = (2 \times 3) \times (2 \times 3) = 6 \times 6 = 6^2$

$= (2 \times 3)^2 = 6^2$

9) Addition & Subtraction has No Rule.

Ex: $2^3 + 2^2 = (2 \times 2 \times 2) + (2 \times 2) = 8 + 4 = 12$

$\neq 2^{3+2}$