Simple revision for Mathematics for first Preparatory

Geometry

The cuboid:

Lateral area = base perimeter x height = (L +W) x 2 x H

Total surface area = lateral area + base area x 2

= (L +W) x 2 x H + L x W x 2

= (LW + WH + LH) x 2

The volume = length x width x height = L x W x H

The cube:

The area of one face = L x L = L^2

The lateral area = face area x 4 = L x L x 4 = $4L^2$

The total area = face area x 6 = L x L x 6 = $6L^2$

The volume = L x L x L = L^3

The circle:

The circumference of the circle = $2\pi r$

The area of the circle = πr^2

The sphere:

The lateral area of a sphere = $4\pi r^2$

The volume of the sphere = $\frac{4}{3}\pi r^3$

The right circular cylinder:

The lateral area of the cylinder = $2\pi r h$

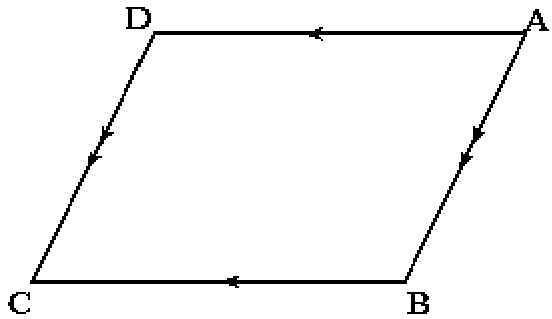
The total area of the cylinder = L.A + B.A x 2 = $2\pi r h + 2\pi r^2$

The volume of the cylinder = B.A x h = $\pi r^2 h$

The Parallelogram

Definition:

A parallelogram is a quadrilateral in which each two opposite sides are parallel



In the opposite figure:

ABCD is a parallelogram that means

AB = DC, AD = BC, $\overline{AB} \parallel \overline{DC}$, $\overline{AD} \parallel \overline{BC}$

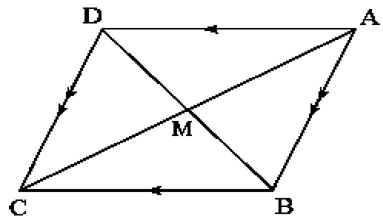
In a parallelogram each two opposite sides are parallel and equal in length

m($\angle$ A) = m($\angle$ C), m($\angle$ B) = m($\angle$ D)

In a parallelogram each two opposite angles are equal in measures

m($\angle$ A) + m($\angle$ B) = 180^0, m($\angle$ C) + m($\angle$ D) = 180^0

In a parallelogram the sum of measures of each two consecutive angles is 180^0



AM = CM, BM = DM

In a parallelogram the two diagonals bisect each other

Properties of a parallelogram

- Each two opposite sides are parallel and equal in length
- Each two opposite angles are equal in measures
- The two diagonals bisect each other
- The sum of measures of each two consecutive angles is 180^0

The special cases of the parallelogram

	Rectangle	A rhombus	A square
Diagonals	Its two diagonals are equal in length	Its two diagonals are perpendicular and not equal	Its two diagonals are perpendicular and equal in length
Angles	One of its angle is right [All angles are equal in measure]		One of its angle is right [All angles are equal in measure]
Sides		Two adjacent sides are equal in length [All sides are equal in length]	Two adjacent sides are equal in length [All sides are equal in length]

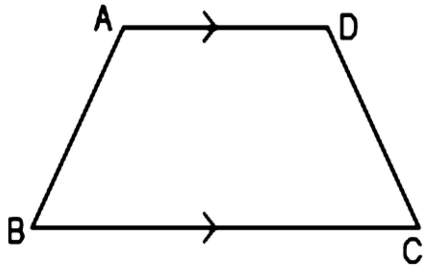
Definition:

A quadrilateral in which only two opposite sides are parallel is called trapezium.

In the opposite figure:

$\overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$

$\therefore$ ABCD is a trapezium



Trapezium

The cases of congruence of two triangles

First case: Two sides and the included angle [S. A. S.]

Two triangles are congruent if two sides and included angle in one of them are congruent to their corresponding elements in the other

Second case: Two angles and a corresponding side [A. S. A.]

Two triangles are congruent if two angles and the side drawn between their vertices of one of triangle are congruent to their corresponding elements in the other

Third case: Three sides [S. S. S.]

Two triangles are congruent if each side of one of triangle is congruent to their corresponding side in the other

Fourth case: Right angle, hypotenuse and a side [R. H. S.]

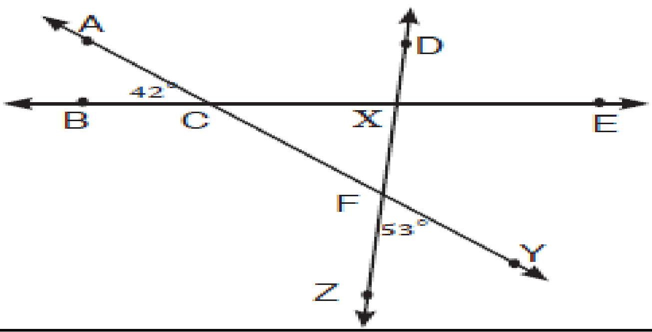
Two right angled triangles are congruent if the hypotenuse and a side of one of triangle are congruent to their corresponding elements in the other

---

(1) In the figure opposite:

Prove that: m($\angle$ DXE) = 85^0

Then **calculate:**



Proof

$\because$ m ($\angle$ ACB) = m ($\angle$ XCF) = 42^0 [V.O.A]

, m ($\angle$ ZFY) = m ($\angle$ CFX) = 53^0 [V.O.A]

$\therefore$ m ($\angle$ CXF) = 1800 – (53^0 + 42^0) = 85^0

$\therefore$ m ($\angle$ CXF) = m ($\angle$ DXE) = 85^0 [V.O.A]

, m (∠ DXC) = $180^0 - 85^0 = 95^0$

∴ m (∠ EXF) = m (∠ CXF) = 95^0 [V.O.A]

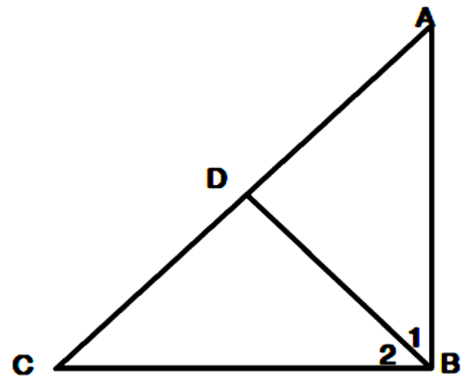
---

(2) **In the figure opposite:**

ABC is a triangle in which:

m (∠ 1) = m (∠ A),

m(∠ 2) = m (∠ C)



Proof

m (∠ 1) = m (∠ A) ==➔ (1)

m(∠ 2) = m (∠ C) ==➔ (2)

by adding (1) and (2):

m (∠ 1) + m(∠ 2) = m (∠ C) + m (∠ A),

m(∠ ABC) = m (∠ A) + m(∠ C)

∴ ∠ ABC is right angle

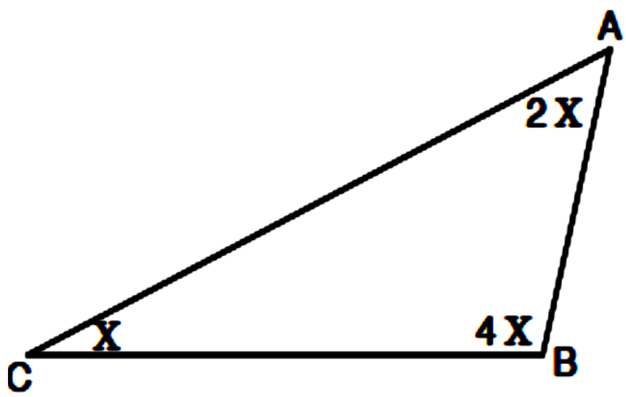
---

(3) **In the figure opposite:**

ABC is a triangle in which:

m (∠ A) = 2 m (∠ C),

m(∠ B) = 4 m (∠ C)



Proof

Let : m (∠ C) = X , m (∠ B) = 4X , m (∠ A) = 2X

m (∠ A) + m (∠ C) = 2X + X = 3X

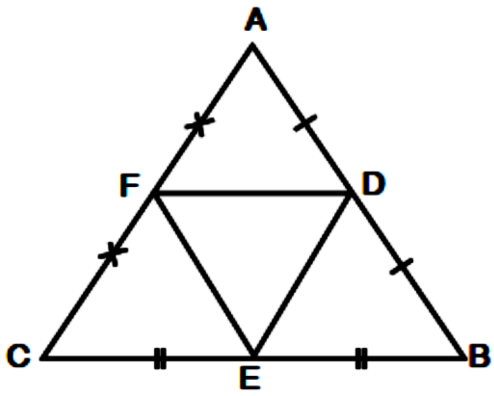
m (∠ B) = 4X

$$m(\angle B) > m(\angle A) + m(\angle C)$$

$$\therefore \angle B \text{ is obtuse}$$

---

(4) **In the figure opposite:**



AB = 5 cm, BC = 8 cm, CA = 7 cm.

D, E and F are the midpoints of AB, BC, CA respectively.

Proof

D, F are the midpoints of AB, AC respectively

$$DF \parallel BC \text{ , } DF = \frac{1}{2} BC = 4 \text{ cm}$$

D, E are the midpoints of AB, BC respectively

$$DE \parallel AC \text{ , } DE = \frac{1}{2} AC = 3.5 \text{ cm}$$

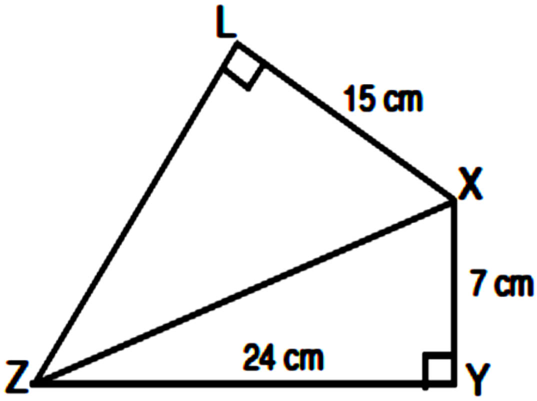
E, F are the midpoints of BC, AC respectively

$$EF \parallel AB \text{ , } EF = \frac{1}{2} AB = 2.5 \text{ cm}$$

Perimeter of Δ DEF = 4 + 3.5 + 2.5 = 10 cm

---

(5) **In the opposite figure:**



XYZL is quadrilateral in which

$m(\angle Y) = m(\angle L) = 90°$, XY = 7 cm

YZ = 24 cm, XL = 15 cm.

Proof

In Δ XYZ, m ($\angle$ XYZ) = 90^0

$(XZ)^2 = (XY)^2 + (YZ)^2$

$= (7)^2 + (24)^2 = 625$

$XZ = \sqrt{625} = 25$ cm

Area of Δ XYZ = $\frac{1}{2}$ X B.L X H = $\frac{1}{2}$ X 24 X 7 = 84 Cm^2

In Δ XLZ, m ($\angle$ XLZ) = 90^0

$(LZ)^2 = (XZ)^2 - (XL)^2$

$= (25)^2 - (15)^2 = 400$

$LZ = \sqrt{400} = 20$ cm

Area of Δ ABC = $\frac{1}{2}$ X B.L X H = $\frac{1}{2}$ X 15 X 20 = 150 Cm^2

Area of the figure XYZL = 84 + 150 = 234 Cm^2