SHIKSHA CLASSES

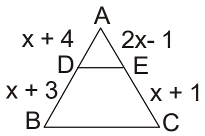
Sub. : Maths | **Answer Paper** | **Total Marks : 30**

Std. X (CBSE) | **6 : Triangles**

Section : A (Each 1 Marks)

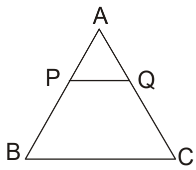
Multiple choice Questions (MCQs).

Q.1 : In fig, DE || BC find the value of x.



Ans : d) $\sqrt{7}$

Q.2 : In fig. PQ ||BC if $\frac{PQ}{BC} = \frac{2}{5}$, then $\frac{AP}{PB}$ is ....

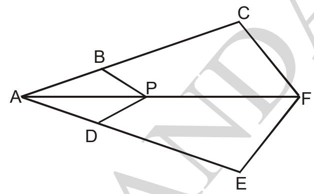


Ans : b) $\frac{2}{3}$

Q.3 : If $\Delta ABC \sim \Delta PQR$, perimeter of ΔABC = 20 cm, perimeter of ΔPQR= 40 cm and PR = 8 cm then AC is

Ans : c) 4 cm

Q.4 : In fig, if PB || FC and DP || EF, AB = 2 cm, AC = 8 cm, then $\frac{AD}{DE}$



Ans : b) $\frac{1}{3}$

Q.5 : A vertical stick 20 m long casts a shadow 10 m long on the ground. At the same time, a tower casts a shadow 50 m long on the ground. The height of the tower is

Ans : a) 100 m

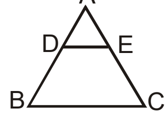
Q.6 : Two poles of height 6 m and 11 m stand vertically upright on a plane ground. If the distance between their foots is 12 m, the distance between their tops is .....

Ans : c) 13 m

Q.7 : If in two triangle ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FE} = \frac{CA}{FD}$, then

Ans : a) $\Delta FDE \sim \Delta CAB$

Q.8 : In fig. DE || BC, AD = 4cm, DB = 6 cm and AE = 5 cm, then EC is



Ans : c) 7.5 cm

Q.9 : Rohit is 6 feet tall at an instant his shadow is 5 feet long. At the same instant, the shadow of a pole is 30 feet long. How tall is the pole?

Ans : d) 36 feet

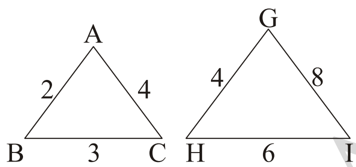
For question number 10 to 11 two statements are given one labeled Assertion and other labeled Reason select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below

Q.10 : Assertion (A): If ΔABC and ΔPQR are congruent triangles, then they are also similar triangles.

Reason (R): All congruent triangles are similar but the similar triangles need not be congruent.

Ans : a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Q.11 : Assertion (A): In the given figures, $\Delta ABC \sim \Delta GHI$.

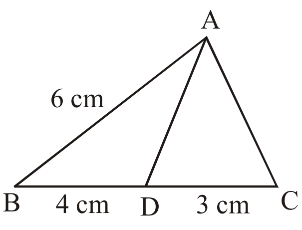


Reason (R): If the corresponding sides of two triangles are proportional, then they are similar.

Ans : a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Section : B (Each 2 Marks)

Q.12 : In fig., AD is the bisector of $\angle A$; If BD = 4 cm, DC = 3 cm and AB = 6 cm determine AC.



Ans : In ΔABC, AD is the bisector of $\angle A$

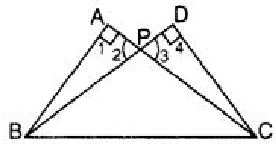
$$\therefore \frac{BD}{DC} = \frac{AB}{AC}$$

$$\Rightarrow \frac{4}{3} = \frac{6}{AC}$$

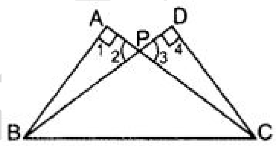
$$\Rightarrow AC = \frac{3 \times 6}{4} = \frac{9}{2} = 4.5 \text{ cm}$$

OR

In the figure ABC and DBC are two right triangles. Prove that AP × PC = BP × PD.



Ans :



In ΔAPB and ΔDPC,

$\angle 1 = \angle 4$ ...[Each $= 90^0$

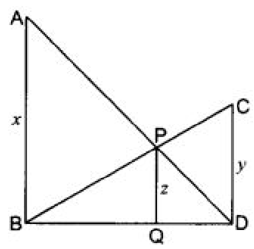
$\angle 2 = \angle 3$ ...[Vertically opp. $\angle$s

$\therefore \Delta APB \sim \Delta DPC$ ...[AA corollary

$\Rightarrow \frac{BP}{PC} = \frac{AP}{PD}$ ...[Sides are proportional

$\therefore AP \times PC = BP \times PD$.

Q.13 : In Fig. AB || PQ || CD , AB = x units, CD = y units and PQ = z units. Prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$.



Ans : In ΔADB and ΔPDQ,

Since AB || PQ

$\angle ABQ = \angle PQD$ (Corresponding $\angle$'s)

$\angle ADB = \angle PDQ$ (Common)

By AA-Similarity

$\Delta ADB \sim \Delta PDQ$

$$\therefore \frac{DQ}{DB} = \frac{PQ}{AB} \Rightarrow \frac{DQ}{DB} = \frac{z}{x}$$

Similarly, $\Delta PBQ \sim \Delta CBD$

and $\frac{BQ}{DB} = \frac{z}{y}$

Adding (i) and (ii), we get

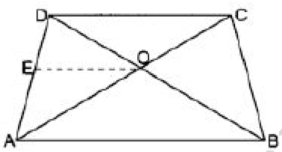
$$\frac{z}{x} + \frac{z}{y} = \frac{DQ + BQ}{DB} = \frac{BD}{BD}$$

$$\frac{z}{x} + \frac{z}{y} = 1 \quad \Rightarrow \quad \frac{1}{x} + \frac{1}{y} = \frac{1}{z}.$$

Section : C (Each 3 Marks)

Q.14 : If the diagonals of a quadrilateral divide each other proportionally, prove that it is a trapezium.

Ans : In □ABCD, Diagonals AC and BD intersect at 'O'



and $\frac{AO}{BO} = \frac{CO}{DO}$ ---- (given)

$$\Rightarrow \frac{AO}{CO} = \frac{BO}{DO} \quad ...(i)$$

In ΔABD, EO || AB (Construction)

$$\therefore \frac{AE}{ED} = \frac{BO}{DO} \quad \text{(By BPT)} \quad ...(ii)$$

From equations (i) and (ii)

$$\frac{AE}{ED} = \frac{AO}{CO} \Rightarrow EO \,||\, DC$$

(Converse of BPT)

But EO || AB constraction

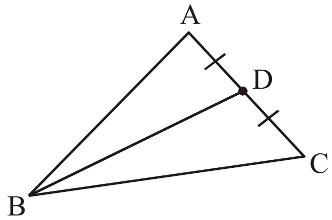
AB || DC

$\Rightarrow$ In quad ABCD, AB || DC

$\Rightarrow$ ABCD is a trapezium.

OR

In ΔABC, AB = AC and D is midpoint of on side AC such that $BC^2 = AC \times CD$, Prove that BD = BC.



Ans : We have,

$BC^2 = AC \times CD$ and AB = AC

$\Rightarrow BC \times BC = AC \times CD$ and $\angle B = \angle C$

$$\Rightarrow \frac{BC}{AC} = \frac{CD}{BC} \text{ and } \angle B = \angle C$$

So, By SAS - criterion of similarity, we have $\Delta BCA \sim \Delta DCB$

$$\Rightarrow \frac{BC}{DC} = \frac{CA}{CB} = \frac{BA}{DB} \quad \text{(CPST)}$$

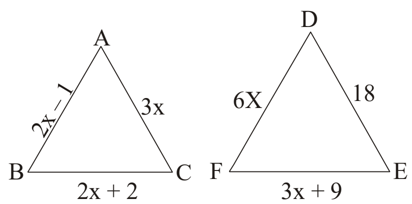
$$\Rightarrow \frac{CA}{CB} = \frac{BA}{DB}$$

$$\Rightarrow \frac{AC}{BC} = \frac{AB}{BD}$$

$$\Rightarrow \frac{AB}{BC} = \frac{AB}{BD} \quad (\because AB = AC)$$

$\Rightarrow$ BD = BC

Q.15 : In Fig, if $\Delta ABC \sim \Delta DEF$ and their sides are of lengths (in cm) as marked along with them, then find the lengths of the sides of each triangle.



Ans : $\Delta ABC \sim \Delta DEF$ (Given)

$$\text{thereore, } \frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$$

So, $\frac{2x-1}{18}=\frac{2x+2}{3x+9}=\frac{3x}{6x}$

Now, taking $\frac{2x-1}{18}=\frac{3x}{6x}$, we have

$$\frac{2x-1}{18}=\frac{1}{2}$$

$\Rightarrow \quad 4x-2=18$

$\Rightarrow \quad x=5$

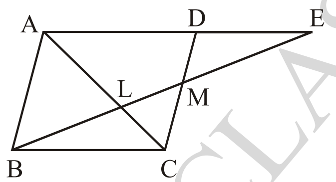
$\therefore$ AB = 2 × 5 – 1 = 9, BC = 2 × 5 + 2 = 12
CA = 3 × 5 = 15, DE = 18, EF = 3 × 5 + 9 = 24 and FD = 6 × 5 = 30

Hence, AB = 9 cm, BC = 12 cm, CA = 15 cm
DE = 18 cm, EF = 24 cm, FD = 30 cm.

Section - D(Each 5 Marks)

Q.16 : Through the mid point M of the side CD of a parellelogram ABCD, the line BM is drawn intersecting AC in L and AD produced in E prove that EL = 2BL.

Ans :



In ΔBMC and ΔEMD, we have
MC = MD (∵ M is the mid point of CD) ∠CMB = ∠EMD .....(Vertically opp. angles) and ∠MBC = ∠MED .... (Alternate angles)
So, by AAS - criteria of congruency,
We have
$\therefore$ ΔBMC ≅ ΔEMD
$\Rightarrow$ BC = DE .... (i)
Also AD = BC .... (ii)
...... (∵ ABCD is a parallelogram)
AD + DE = BC + BC ..... From (i) & (ii)
$\Rightarrow$ AE = 2BC .... (iii)
Now, in ΔAEL and ΔCBL, we have
∠ALE = ∠CLB .... (Vertically oppo. angles)
∠EAL = ∠BCL ..... Alternate angles
So, By AA-criterion of similarity of triangles, we have
ΔAEL ~ ΔCBL

$\Rightarrow \frac{EL}{BL}=\frac{AE}{CB}$ .. Corresponding sides of simillar triangle

$\Rightarrow \frac{EL}{BL}=\frac{2BC}{BC}$ using equation (iii)

$\Rightarrow \frac{EL}{BL}=2$

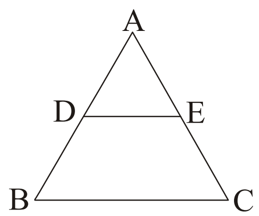
$\Rightarrow$ EL = 2 BL

OR

Prove that, if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Using the above result, do the following:

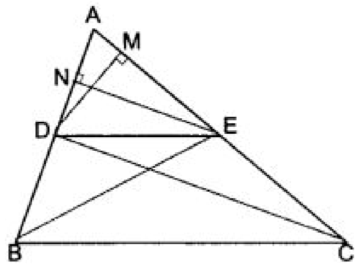
In Fig. DE || BC and BD = CE. Prove that "ABC is an isosceles triangle.



Ans : Given : A triangle ABC in which a line parallel to side BC intersects other two sides AB and AC at D and E respectively.

To Prove : $\frac{AD}{DB}=\frac{AE}{EC}$.

Construction : Join BE and CD and then draw DM ⊥ AC and EN ⊥ AB.



Proof : Area of $\Delta ADE = \left(\frac{1}{2}\text{base} \times \text{height}\right)$.

So, $ar(\Delta ADE) = \frac{1}{2}(AD \times EN)$

and $ar(\Delta BDE) = \frac{1}{2}(DB \times EN)$

Similary, $ar(\Delta ADE) = \frac{1}{2}(AE \times DM)$

and $ar(\Delta DEC) = \frac{1}{2}(EC \times DM)$

Therefore,

$$\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2}AD \times EN}{\frac{1}{2}DB \times EN} = \frac{AD}{DB} \quad ...(i)$$

and

$$\frac{ar(\Delta ADE)}{ar(\Delta DEC)} = \frac{\frac{1}{2}AE \times DM}{\frac{1}{2}EC \times DM} = \frac{AE}{EC} \quad ...(ii)$$

Now, ΔBDE and ΔDEC are on the same base DE and between the same parallel lines BC and DE.

So, $ar(\Delta BDE) = ar(\Delta DEC)$ ---(iii)

Therefore, from (i), (ii) and (iii) we have,

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Second Part

As DE || BC

$$\therefore \frac{AD}{DB} = \frac{AE}{EC} \Rightarrow \frac{AD}{DB} + 1 = \frac{AE}{EC} + 1$$

$$\Rightarrow \frac{AD + DB}{DB} = \frac{AE + EC}{EC}$$

$$\Rightarrow \frac{AB}{DB} = \frac{AC}{EC}$$

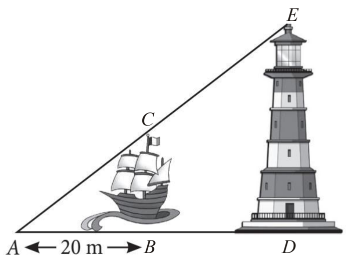
$$\Rightarrow AB = AC \text{ (As } DB = EC)$$

$\therefore$ ΔABC is an isosceles triangle.

Section : E

Q.17 : **Case study :**

Shweta went to a beach with her uncle. From a point A where Shweta was standing, a ship and light house come in a straight line as shown in the figure.



i) **Which similarity criteria can be seen in this case, if ship and lighthouse are considered as straight lines?** 1

Ans : According to given figure criteria of similarity is 'AA'.

ii) **The distance between Shweta and the ship is twice as much as the height of the ship.**

What is the height of the ship? 1

Ans : The distance between Sweta and the ship = 20m

So, the height of the ship $= \frac{20}{2}$

$= 10$ m.

iii) If the distance of Shweta from the lighthouse is twelve times the height of the ship, then find the ratio of the heights of ship and lighthouse. 2

Ans : The height of ship = 10m

The distance between sweta and light house = 12 × 10 = 120m

Now $\Delta ABC \sim \Delta ADE$ (from (i))

So, $\frac{AB}{AD} = \frac{BC}{DE}$ (C.P.S.T)

$\Rightarrow \frac{20}{120} = \frac{10}{DE}$

$\Rightarrow DE = \frac{\overset{60}{\cancel{120}} \times \cancel{10}}{\cancel{20}} = 60$

The ratio of the height of ship and light house

$= \frac{10}{60}$

$= \frac{1}{6} = 1:6$.

OR

What is the height of the lighthouse?

Ans : The height of the ship = 10m ie BC = 10 m

The distance between sweta and lighthouse

= 12 × 10 = 120m

ie AD = 120m

$\because \Delta ABC \sim \Delta ADE$

So, $\frac{AB}{AD} = \frac{BC}{DE}$

$\Rightarrow \frac{20}{120} = \frac{10}{DE}$

$\Rightarrow DE = \frac{10 \times 120}{20} = 60$

Hence, the height of the lighthouse = 60 m.

* * *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