SHIKSHA CLASSES

Subject : Geometry **ANSWERS PAPER** **Total Marks** : 20

Class : X **1. Similarity**

Q. 1 : A) Choose the correct alternative of the following questions. 2

1) If a line divides any two sides of a triangle in the same ratio, then the line is ....

Ans.: b) parallel to third side

2) Areas of triangles with equal heights are proportional to ....

Ans.: a) Their corresponding bases.

B) 1) If $\Delta ABC \sim \Delta PQR$ and $AB : PQ = 2 : 3$ then fill in the blanks. 1

Ans. : $\dfrac{A(\Delta ABC)}{A(\Delta PQR)} = \dfrac{AB^2}{\boxed{PQ^2}} = \dfrac{2^2}{3^2} = \dfrac{\boxed{4}}{\boxed{9}}$

Q. 2 : A) Solve Any ONE of the following. 2

1) $\Delta ABC \sim \Delta PQR, A(\Delta ABC) = 16,$

$A(\Delta PQR) = 25$, then find $\dfrac{AB}{PQ}$

Ans. : Given that,

$\Delta ABC \sim \Delta PQR$

$\therefore$ By theorem of areas of similar triangles.

$$\therefore \frac{A(\Delta ABC)}{A(\Delta PQR)} = \frac{\boxed{AB^2}}{\boxed{PQ^2}}$$

$$\frac{16}{25} = \frac{\boxed{AB^2}}{\boxed{PQ^2}}$$

By taking square root of both sides,

$$\therefore \frac{AB}{PQ} = \frac{\boxed{4}}{\boxed{5}}$$

2) In trapezium ABCD

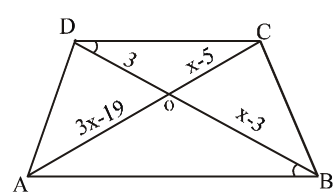
side $AB \parallel PQ \parallel DC$

AP=15, PD =12, QC =14 find BQ

Ans. : Side AB$\parallel$ side PQ $\parallel$ side DC

$\therefore$ By property of three parallel lines and their transversals.

$$\therefore \frac{AP}{PD} = \frac{BQ}{QC}$$



$$\therefore \frac{15}{12} = \frac{BQ}{14}$$

$$\therefore BQ = \frac{\overset{5}{\cancel{15}} \times 14}{\cancel{12}\ 4} = \frac{14 \times 5}{4} = \frac{70}{4}$$

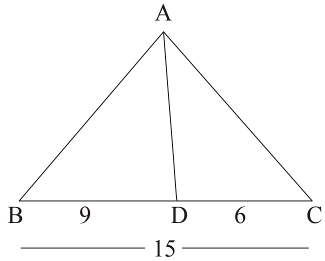
= 17.5 units.

Q. 2 : B) Solve Any ONE of the following. 2

1) In ΔABC point D on side BC is such that DC = 6, BC = 15. Find $A(\Delta ABD) : A(\Delta ABC)$ and

$A(\triangle ABD) : A(\triangle ADC)$.

Ans. : Point A is common vertex of $\triangle ABD$, $\triangle ADC$ and $\triangle ABC$ their bases are collinear.



Hence heights of these three triangles are equal.

BC = 15, DC = 6,

$\therefore$ BD = BC = DC = 15 – 6 = 9

$$\frac{A(\triangle ABD)}{A(\triangle ABC)} = \frac{BD}{BC}$$ ---- heights equal,

hence areas proportional to bases.

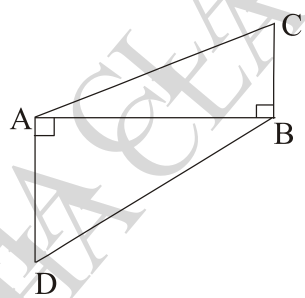
$$= \frac{9}{15} = \frac{3}{5}$$

$$\frac{A(ABD)}{A(ADC)} = \frac{BD}{DC}$$ ---- heights equal

hence areas proportional to bases.

$$= \frac{9}{6} = \frac{3}{2}$$

2) In fig. $BC \perp AB, AD \perp AB$, $BC = 4, AD = 8$ then find $\frac{A(\triangle ABC)}{A(\triangle ADB)}$



Ans. :

$$\frac{A(\triangle ABC)}{A(\triangle ADB)} = \frac{AB \times BC}{AB \times AD}$$

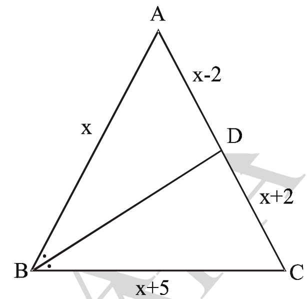
$$= \frac{BC}{AD}$$

$$= \frac{4}{8}$$

$$= \frac{1}{2}$$ (bases at both triangles are equal)

Q. 3 : A) Any ONE of the following. 3

1) In $\triangle ABC$, seg BD bisects $\angle ABC$ If AB=x, BC = x + 5 AD = x - 2, DC = x+ 2 then find the value of x



Ans. : Seg BD bisects $\angle ABC$

AB = $\boxed{x}$, BC = $\boxed{x+5}$

AD = $\boxed{x-2}$, DC = $\boxed{x+2}$

$\therefore$ By Angle bi-sector property.

$$\therefore \frac{AB}{BC} = \frac{AD}{DC}$$

$$\frac{x}{x+5} = \frac{x-2}{x+2}$$

$$\therefore x(x+2) = (x+5)(x-2)$$

$$x^2 + 3x - 10 = x^2 + 2x$$

$$\therefore x = \boxed{10}$$

2) Write the properties of similar traiangles with suitable examples.

Ans. : 1) Reflxivity $\Delta ABC \sim \Delta ABC$

2) Symmetry

If $\Delta ABC \sim \Delta DEF$ then $\Delta DEF \sim \Delta ABC$

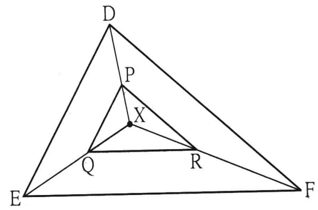
3) Transitivity

If $\Delta ABC \sim \Delta DEF$ and $\Delta DEF \sim \Delta GHI$, then $\Delta ABC \sim \Delta GHI$

Q. 3 : B) Solve Any ONE of the following. 3

1) In the figure X is any point in the interior of triangle. Point X is joined to vertices of

triangle. Seg PQ|| seg DE, seg QR || seg EF. Fill in the blanks to prove that, seg PR|| seg DF.



Ans. : In

$\Delta XDE, PQ \| DE$ .... Given

$\therefore \frac{XP}{PD} = \frac{XQ}{QE}$ ......(I)

Basic Proportionality Theorem

In $\Delta XEF, QR \| EF$ .... Given

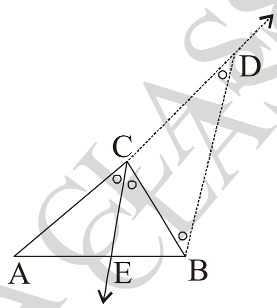
$\therefore \frac{XQ}{EQ} = \frac{XR}{RF}$ .... (II)

Basic Proportionality Theorem

$\therefore \frac{XP}{PD} = \frac{XR}{RF}$ .... from (I) and (II)

$\therefore$ seg PR || seg DF .... (converse of basic proportionality theorem)

2) State and prove Angle bisector theorem.



Ans. : Theorem : The bisector of an angle of a triangle divides the side opposite to the angle in the ratio of remaining sides.

Given : In ΔABC, bisector of $\angle C$ intersects seg AB in point E

To prove : $\frac{AE}{EB} = \frac{CA}{CB}$

Construction : Draw a line parallel to ray CE, passing through the point B Extend AC so as to intersect it at point D.

Proof : Ray CE | | Ray BD and AD is transversal

$\therefore \angle ACE = \angle CDB$ ---- (corresponding angles) ---(i)

Now taking BC as transversal

$\angle ECB = \angle CBD$ ---- (Alternate angles) (ii)

But, $ACE \cong \angle ECB$ ---- [Given]

$\therefore \angle CBD \cong \angle CDB$ [from (i), (ii) & (iii)

In ΔCBD, side $CB \cong$ side CD ----
{sides opposite to congruent angles]

$\therefore$ CB = CD ---(iv)

Now in ΔABD, seg EC || seg BD --- (constructions)

$\therefore \frac{AE}{EB} = \frac{AC}{CD}$ ----[Basic propertionality theorem)

$\therefore \frac{AE}{EB} = \frac{AC}{CB}$ --- [From (iv) & (v)]

Q. 4 : Attempt Any ONE of the following. 4

1) In given figure AB || DC then find the value of x

Ans. : Seg AB || Seg DC

AO = 3x - 19

OC = x- 5

OB = x -3

OD = 3

In ΔAOB and ΔCOD,

$\angle AOB \cong \angle COD \rightarrow$ Opposite angles.

$\angle ABO \cong \angle CDO \rightarrow$ Alternate angles

$\therefore$ AB|| DC

$\therefore \Delta AOB \sim \Delta COD \rightarrow$ A - A test

$\therefore \frac{AO}{CO}=\frac{OB}{OD} \rightarrow$ c.s.c.t

$\therefore \frac{3x-19}{x-5}=\frac{x-3}{3}$

$\therefore 3(3x-19)=(x-3)(x-5)$

$\therefore 9x-57=x(x-5)-3(x-5)$

$\therefore 9x-57=x^2-5x-3x+15$

$\therefore 9x-57=x^2-8x+15$

$\therefore x^2-8x-9x+15+57=0$

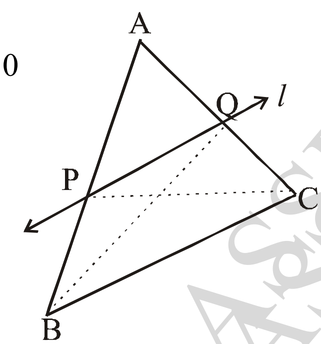
$\therefore x^2-17x+72=0$

$\therefore x^2-9x-8x+72=0$

$\therefore x(x-9)-8(x-9)=0$

$\therefore (x-9)=0(x-8)=0$

$\therefore x=9$ or $x=8$



2) Prove that, If a line parallel to a side of a triangle intersects the remaining sides in two distinct points then the line divides the sides in the same proportion.

Ans. : Given : In ΔABC line $\ell \parallel$ line BC

and line ℓ intersets AB and AC in

P and Q respectivey.

To prove :

$\frac{AP}{PB}=\frac{AQ}{QC}$

Construction : Draw seg PC and seg BQ

Proof :

ΔAPQ and ΔPBQ have equal heights

$\therefore \frac{A(\Delta APQ)}{A(\Delta PQB)}=\frac{AP}{PB}$ _____ I

and $\therefore \frac{A(\Delta APQ)}{A(\Delta PQC)}=\frac{AQ}{QC}$ _____ II

seg PQ is common base of

ΔPQB and ΔPQC seg. PQ || sg BC

Hence ΔPQB and ΔPQC have equal heights.

$A(\Delta PQB)=A(\Delta PQC)$ ____ III

From eq^n (I), (II) and (III)

$\frac{A(\Delta APQ)}{A(\Delta PQB)}=\frac{A(\Delta APQ)}{A(\Delta PQC)}$

$\therefore \frac{AP}{PB}=\frac{AQ}{QC}$

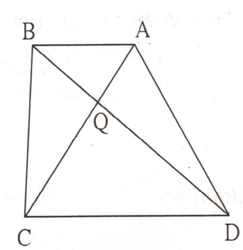
Q. 5 : Solve Any ONE of the following. 3

1) In trapezium ABCD side AB || side CD diagonal AC and BD interset each other at pt P. Then prove that

$\frac{A(\Delta ABP)}{A(\Delta CPD)}=\frac{AB^2}{CD^2}$

Ans. : In trapezium ABCD,

side AB || side CD



In

ΔAPB and ΔCPD

$\angle PAB \cong \angle PCD \rightarrow$ Alternate angles.

$\angle APB \cong \angle CPD \rightarrow$ Opposite angles

$\therefore \Delta APB \sim \Delta CPD \rightarrow A - A - test$

$\therefore \frac{A(\Delta APB)}{A(\Delta CPD)} = \frac{AB^2}{CD^2} \rightarrow$ By theorem of areas of similar traingles.

2) Diagonal of quadrilateral ABCD intersect in point Q.

If 2QA = QC, 2QB = QD,

then prove that DC = 2AB.

Ans. : Given : 2QA = QC

2QB = QD

To prove : CD = 2AB

Proof : 2QA = QC

$\therefore \frac{QA}{QC} = \frac{1}{2}$ ______ (1)

2 QB = QD $\therefore \frac{QB}{QD} = \frac{1}{2}$ ______ (2)

$\therefore \frac{QA}{QC} = \frac{QB}{QD}$ ______ From (1) and (2)

In ΔAQB and ΔCQD,

$\frac{QA}{QC} = \frac{QB}{QD}$ ______ Proved

$\angle AQB \cong \angle DQC$ ....(Opposite angles)

$\therefore \Delta AQB \sim \Delta CQD$....(SAS test of similarity)

$\therefore \frac{AQ}{CQ} = \frac{QB}{QD} = \frac{AB}{CD}$....(Corresponding sides are proportional)

But $\frac{AQ}{CQ} = \frac{1}{2}$ $\therefore \frac{AB}{CD} = \frac{1}{2}$

$\therefore 2AB = CD$

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