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PRACTICE PAPER 06 (2023-24)
CHAPTER 06 TRIANGLES (ANSWERS)

SUBJECT: MATHEMATICS

MAX. MARKS : 40

CLASS : X

DURATION : 1½ hrs

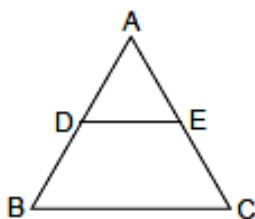
General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 20 questions divided into five Sections A, B, C, D and E.
- (iii). **Section A** comprises of 10 MCQs of 1 mark each. **Section B** comprises of 4 questions of 2 marks each. **Section C** comprises of 3 questions of 3 marks each. **Section D** comprises of 1 question of 5 marks each and **Section E** comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. In the given figure, $\frac{AD}{BD} = \frac{AE}{EC}$ and $\angle ADE = 70^\circ$, $\angle BAC = 50^\circ$, then angle $\angle BCA =$



- (a) 70° (b) 50° (c) 80° (d) 60°

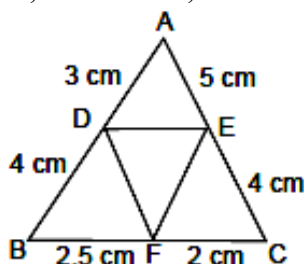
Ans: (d) $\because DE \parallel BC$

$\therefore \angle ADE = \angle ABC = 70^\circ$. (Corresponding angles)

Using angle sum property of triangle $\angle ABC + \angle BCA + \angle BAC = 180^\circ$

$\angle BCA = 60^\circ$.

2. In given figure, $AD = 3$ cm, $AE = 5$ cm, $BD = 4$ cm, $CE = 4$ cm, $CF = 2$ cm, $BF = 2.5$ cm, then



- (a) $DE \parallel BC$ (b) $DF \parallel AC$ (c) $EF \parallel AB$ (d) none of these

Ans: (c) $\frac{CF}{FB} = \frac{CE}{AE} \Rightarrow EF \parallel AB$

3. If $\triangle ABC \sim \triangle EDF$ and $\triangle ABC$ is not similar to $\triangle DEF$, then which of the following is not true?

(a) $BC \cdot EF = AC \cdot FD$

(b) $AB \cdot EF = AC \cdot DE$

(c) $BC \cdot DE = AB \cdot EF$

(d) $BC \cdot DE = AB \cdot FD$

Ans: (c) $\because \triangle ABC \sim \triangle EDF$

Then, $\frac{AB}{ED} = \frac{BC}{DF} = \frac{AC}{EF}$

$\Rightarrow AB \cdot DF = ED \cdot BC$
 or $AB \cdot EF = AC \cdot ED$
 or $BC \cdot EF = DF \cdot AC$
 $\therefore BC \cdot DE \neq AB \cdot EF$

4. If in two triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then
 (a) $\Delta PQR \sim \Delta CAB$ (b) $\Delta PQR \sim \Delta ABC$ (c) $\Delta CBA \sim \Delta PQR$ (d) $\Delta BCA \sim \Delta PQR$
 Ans: (a) $\Delta PQR \sim \Delta CAB$

5. If in triangles ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar, when
 (a) $\angle B = \angle E$ (b) $\angle A = \angle D$ (c) $\angle B = \angle D$ (d) $\angle A = \angle F$
 Ans: (c) $\angle B = \angle D$

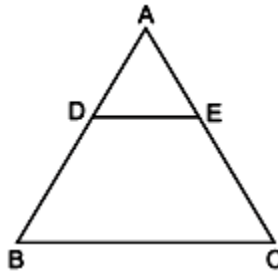
6. The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of first triangle is 9 cm., what is the corresponding side of the other triangle?
 (a) 5.4 (b) 3.5 (c) 5.5 (d) 4.5
 Ans: (a) 5.4

Let corresponding sides of two similar Δ 's are a, b, c and d, e, f respectively, let $a = 9$ cm.
 $\therefore \Delta$'s are similar

$$\frac{a}{d} = \frac{b}{e} = \frac{c}{f} \Rightarrow \frac{a+b+c}{d+e+f} = \frac{a}{d} \text{ (Using property of proportion)}$$

$$\Rightarrow \frac{25}{15} = \frac{9}{d} \Rightarrow d = \frac{9 \times 15}{25} = 5.4 \text{ cm}$$

7. In figure $DE \parallel BC$. If $BD = x - 3$, $AB = 2x$. $CE = x - 2$ and $AC = 2x + 3$. Find x .



- (a) 3 (b) 4 (c) 9 (d) none of these

Ans: (c) 9

In ΔABC , $DE \parallel BC$

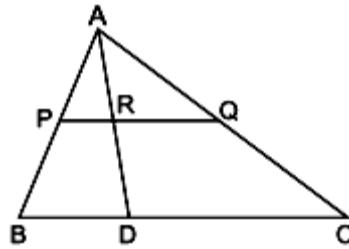
$$\frac{AD}{BD} = \frac{AE}{CE} \Rightarrow \frac{AB - BD}{BD} = \frac{AC - CE}{CE}$$

$$\therefore \frac{2x - (x - 3)}{x - 3} = \frac{2x + 3 - (x - 2)}{x - 2} \Rightarrow \frac{x + 3}{x - 3} = \frac{x + 5}{x - 2}$$

$$\Rightarrow (x - 2)(x + 3) = (x + 5)(x - 3) \Rightarrow x^2 + x - 6 = x^2 + 2x - 15$$

$$\Rightarrow x = 9 \therefore x = 9 \text{ cm}$$

8. In the figure, $AP = 3$ cm, $AR = 4.5$ cm, $AQ = 6$ cm, $AB = 5$ cm and $AC = 10$ cm. Find the length of AD.



- (a) 6.5 (b) 7.5 (c) 5.5 (d) 4.5

Ans: (b) 7.5

In $\triangle ABC$, $\frac{AP}{AB} = \frac{3}{5}$... (i)

$\frac{AQ}{AC} = \frac{6}{10} = \frac{3}{5}$... (ii)

From (i) and (ii),

$\frac{AP}{AB} = \frac{AQ}{AC} \Rightarrow PQ \parallel BC$

(By converse of BPT)

In $\triangle ABD$, $PR \parallel BD$

$\Rightarrow \frac{AP}{AB} = \frac{AR}{AD}$ (By BPT) $\Rightarrow \frac{3}{5} = \frac{4.5}{AD} \Rightarrow AD = 7.5\text{cm}$

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
- (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
- (c) Assertion (A) is true but reason (R) is false.
- (d) Assertion (A) is false but reason (R) is true.

9. Assertion (A): D and E are points on the sides AB and AC respectively of a $\triangle ABC$ such that $DE \parallel BC$ then the value of x is 11, when $AD = 4\text{cm}$, $DB = (x - 4)\text{cm}$, $AE = 8\text{cm}$ and $EC = (3x - 19)\text{cm}$.

Reason (R): If a line divides any two sides of a triangle in the same ratio then it is parallel to the third side.

Ans: (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

10. Assertion (A): D and E are points on the sides AB and AC respectively of a $\triangle ABC$ such that $AD = 5.7\text{cm}$, $DB = 9.5\text{cm}$, $AE = 4.8\text{cm}$ and $EC = 8\text{cm}$ then DE is not parallel to BC .

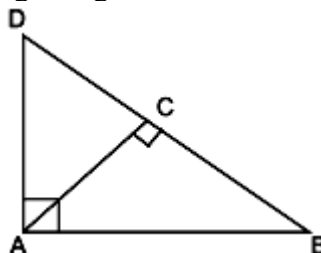
Reason (R): If a line divides any two sides of a triangle in the same ratio then it is parallel to the third side.

Ans: (d) Assertion (A) is false but reason (R) is true.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. In figure, $\triangle ABD$ is a right triangle, right angled at A and $AC \perp BD$. Prove that $AB^2 = BC \cdot BD$.



Ans: In $\triangle DAB$, and $\triangle ACB$

$$\angle DAB = \angle ACB = 90^\circ$$

$$\angle B = \angle B \text{ (common)}$$

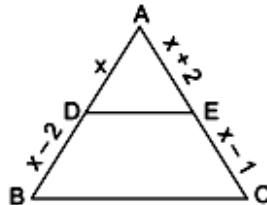
$$\therefore \triangle DAB \sim \triangle ACB$$

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

$$\Rightarrow AB^2 = BC \cdot BD \text{ Hence proved.}$$

12. In $\triangle ABC$, D and E are points on the sides AB and AC respectively, such that $DE \parallel BC$. If $AD = x$, $DB = x - 2$, $AE = x + 2$ and $EC = x - 1$, Find the value of x .

Ans: In $\triangle ABC$, $DE \parallel BC$ (Given)



$$\frac{AD}{DB} = \frac{AE}{EC} \text{ (By BPT)}$$

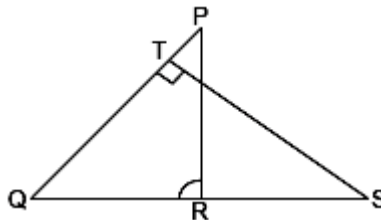
$$\Rightarrow \frac{x}{x-2} = \frac{x+2}{x-1}$$

$$\Rightarrow x(x-1) = (x+2)(x-2)$$

$$\Rightarrow x^2 - x = x^2 - 2^2 \Rightarrow x^2 - x = x^2 - 4$$

$$\Rightarrow x = 4$$

13. In the figure, PQR and QST are two right triangles, right angled at R and T respectively. Prove that $QR \times QS = QP \times QT$



Ans: In $\triangle PRQ$ and $\triangle STQ$

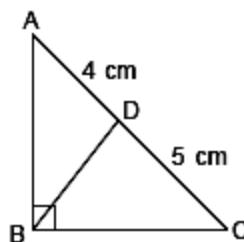
$$\angle Q = \angle Q \text{ (common)}$$

$$\angle R = \angle T \text{ (each } 90^\circ)$$

$$\therefore \triangle PRQ \sim \triangle STQ \text{ (SS similarity corollary)}$$

$$\Rightarrow \frac{QR}{QT} = \frac{QP}{QS} \Rightarrow QR \times QS = QP \times QT$$

14. In the given figure, ABC is a triangle, right angled at B and $BD \perp AC$. If $AD = 4$ cm and $CD = 5$ cm, find BD and AB.



Ans: Here $\triangle ADB \sim \triangle BDC$

$$\therefore \frac{AD}{BD} = \frac{BD}{CD} \Rightarrow AD \times CD = BD \times BD$$

$$\Rightarrow 4 \times 5 = BD^2$$

$$\Rightarrow BD = (2\sqrt{5})^2 \text{ cm}$$

In right $\triangle BDA$

$$AB^2 = BD^2 + AD^2$$

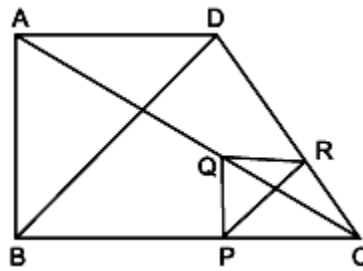
$$\Rightarrow AB^2 = (2\sqrt{5})^2 + 4^2$$

$$\Rightarrow AB^2 = 36 \Rightarrow AB = 6 \text{ cm}$$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. In figure, two triangles ABC and DBC lie on the same side of base BC. P is a point on BC such that $PQ \parallel BA$ and $PR \parallel BD$. Prove that $QR \parallel AD$.



Ans:

Given : In $\triangle ABC$, $PQ \parallel AB$ and $PR \parallel BD$

To prove : $QR \parallel AD$

Proof : By BPT $\frac{CP}{BP} = \frac{CQ}{AQ}$... (i)

Now in $\triangle BCD$, $PR \parallel BD$

\Rightarrow By using BPT $\frac{CP}{BP} = \frac{CR}{RD}$... (ii)

From (i) and (ii), $\frac{CQ}{AQ} = \frac{CR}{RD} \Rightarrow$ By converse of BPT, $QR \parallel AD$

16. P and Q are points on the sides AB and AC respectively of a triangle ABC. If $AP = 2$ cm, $PB = 4$ cm, $AQ = 3$ cm, $QC = 6$ cm, prove that $BC = 3PQ$.

Ans: $\frac{AP}{PB} = \frac{2}{4} = \frac{1}{2}$... (i) $\frac{AQ}{QC} = \frac{3}{6} = \frac{1}{2}$... (ii)

From (i) and (ii) $\frac{AP}{PB} = \frac{AQ}{QC} \Rightarrow PQ \parallel BC$

In $\triangle ABC$ and $\triangle APQ$.

$$\frac{AB}{AP} = \frac{AC}{AQ} \quad (\because PQ \parallel BC)$$

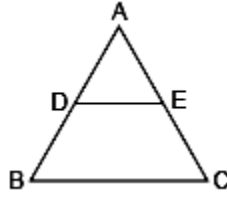
$\angle A = \angle A$ (Common)

$\therefore \triangle ABC \sim \triangle APQ$, (SAS similarity)

$$\Rightarrow \frac{AB}{AP} = \frac{BC}{PQ} \Rightarrow \frac{AP+PB}{AP} = \frac{BC}{PQ}$$

$$\Rightarrow \frac{2+4}{2} = \frac{BC}{PQ} \Rightarrow \frac{6}{2} = \frac{BC}{PQ} = \frac{1}{3} \Rightarrow BC = 3PQ. \text{ Hence proved.}$$

17. In figure, D and E are points on AB and AC respectively, such that $DE \parallel BC$. If $AD = \frac{1}{3} BD$, $AE = 4.5$ cm, find AC.



Ans: Here $AD = \frac{1}{3} BD$,

$AE = 4.5$ cm, $DE \parallel BC$

$\therefore \frac{AD}{BD} = \frac{AE}{EC}$ (using B.P.T.)

$$\Rightarrow \frac{\frac{1}{3}BD}{BD} = \frac{4.5}{EC}$$

$$\Rightarrow \frac{1}{3} = \frac{4.5}{EC}$$

$$\Rightarrow EC = 4.5 \times 3 \text{ cm}$$

$$\Rightarrow EC = 13.5 \text{ cm}$$

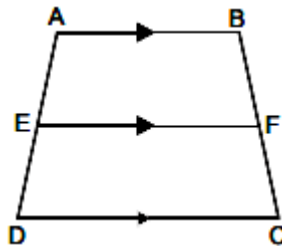
$$\text{Now } AC = AE + EC = 4.5 + 13.5 = 18 \text{ cm}$$

SECTION – D

Questions 18 carry 5 marks.

18. If a line is drawn parallel to one side of a triangle, the other two sides are divided in the same ratio, prove it. Use this result to prove the following :

In the given figure, if ABCD is a trapezium in which $AB \parallel DC \parallel EF$, then $\frac{AE}{ED} = \frac{BF}{FC}$



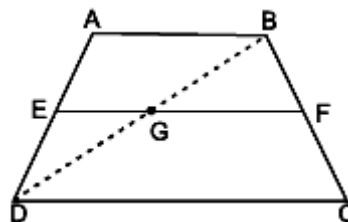
Ans: Given - $\frac{1}{2}$ mark

To prove - $\frac{1}{2}$ mark

Figure - $\frac{1}{2}$ mark

Construction - $\frac{1}{2}$ mark

Proof – 2 marks



Second part - 1 mark

Join BD intersecting EF at G.

In $\triangle DAB$, $EG \parallel AB$

$$\therefore \frac{AE}{ED} = \frac{BG}{GD} \text{ (Using B.P.T.) ... (i)}$$

In $\triangle DBC$, $GF \parallel DC$

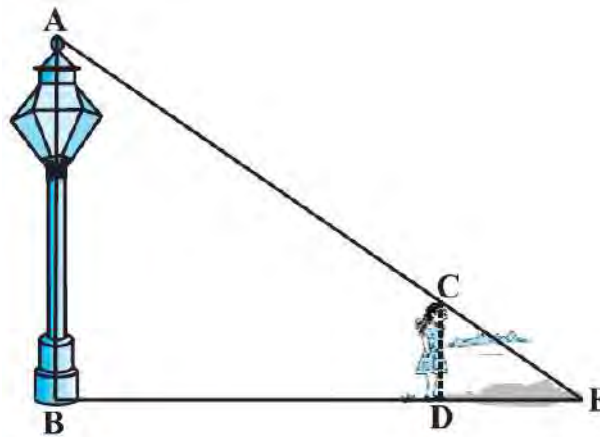
$$\therefore \frac{BG}{GD} = \frac{BF}{FC} \dots(ii)$$

From (i) and (ii) $\frac{AE}{ED} = \frac{BF}{FC}$

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. On one day, a poor girl of height 90 cm is looking for a lamp-post for completing her homework as in her area power is not there and she finds the same at some distance away from her home. After completing the homework, she is walking away from the base of a lamp-post at a speed of 1.2 m/s. The lamp is 3.6 m above the ground (see below figure).



- (i) Find her distance from the base of the lamp post. (2)
 (ii) Find the length of her shadow after 4 seconds. (2)

OR

- (ii) Find the ratio AC:CE. (2)

Ans:

(i) Let AB denote the lamp-post and CD the girl after walking for 4 seconds away from the lamp-post. From the figure, DE is the shadow of the girl.

Let DE be x metres.

Now, her distance from the base of the lamp =

$$BD = 1.2 \text{ m} \times 4 = 4.8 \text{ m.}$$

(ii) $\triangle ABE \sim \triangle CDE$

$$\Rightarrow \frac{BE}{DE} = \frac{AB}{CD} \Rightarrow \frac{4.8 + x}{x} = \frac{3.6}{0.9} \Rightarrow 4.8 + x = 4x \Rightarrow 3x = 4.8 \Rightarrow x = 1.6 \text{ m}$$

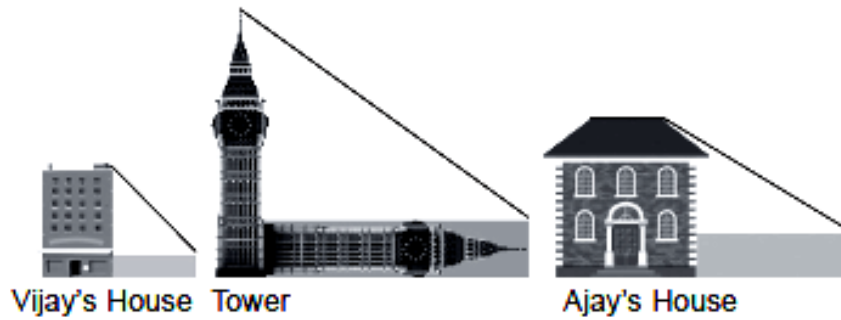
OR

$$\frac{AE}{CE} = \frac{BE}{DE} \Rightarrow \frac{4.8 + 1.6}{1.6} = \frac{6.4}{1.6} = 4$$

$$\Rightarrow AE = 4CE \Rightarrow AC + CE = 4CE \Rightarrow AC = 3CE$$

$$\Rightarrow \frac{AC}{CE} = \frac{3}{1}$$

20. Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Vijay's house is 20 m when Vijay's house casts a shadow 10 m long on the ground. At the same time, the tower casts a shadow 50 m long on the ground and the house of Ajay casts 20 m shadow on the ground.



- (a) What is the height of the tower? (1)
- (b) What is the height of Ajay's house? (1)
- (c) What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12 m? (2)

OR

- (c) When the tower casts a shadow of 40 m, same time what will be the length of the shadow of Ajay's house? (2)

Ans:

(a) When two corresponding angles of two triangles are similar, then ratio of sides are equal.

Height of Vijay's house/Length of Shadow = Height of Tower/Length of Shadow

$$\Rightarrow 20 \text{ m}/10 \text{ m} = \text{Height of Tower}/50 \text{ m}$$

$$\Rightarrow \text{Height of Tower} = 20 \times 50/10 = 100 \text{ m}$$

(b) Height of Vijay's house/Length of Shadow = Height of Ajay's house/Length of Shadow

$$20 \text{ m}/10 \text{ m} = \text{Height of Ajay's house}/20 \text{ m}$$

$$\text{Height of Ajay's house} = 20 \times 20/10 = 400/10 = 40\text{m}$$

(c) The height of Vijay's house is AC = 20m.

The height of the tower is A'C' = 100m.

The length of shadow of Vijay's house is AB = 12cm.

$$\therefore A'B'/AB = A'C'/AC$$

$$\Rightarrow A'B' = AB/AC \times A'C' = 12/20 \times 100 = 12 \times 5 = 60\text{m}$$

OR

(c) The height of tower is A'C' = 100m.

And the height of Ajay's house is PR = 40m

The length of shadow of tower is A'B' = 40m.

The length of shadow of Ajay's house is PQ.

$\therefore \Delta A'B'C'$ and ΔPQR are similar triangles.

$$\therefore PQ/A'B' = PR/A'C'$$

$$\Rightarrow PQ = (PR/A'C') \times A'B' = 40 \times 40 / 100 = 16\text{m}$$

