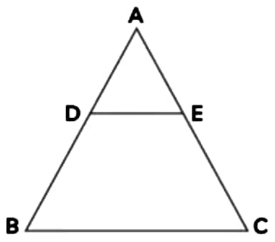
Previous Year Questions 2024

Q1: In ΔABC, DE || BC (as shown in the figure). If AD = 2 cm, BD = 3 cm, BC = 7.5 cm, then the length of DE (in cm) is: (CBSE 2024)



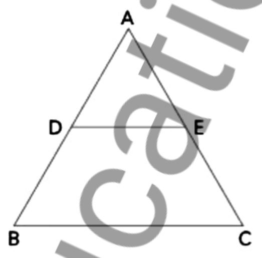
(a) 2.5

(b) 3

(c) 5

(d) 6

Ans: (b)



In ΔABC, DE || BC

AD = 2 cm

BD = 3 cm

∴ AB = AB + BD

= (2 + 3) cm

AB = 5 cm

Now, ∠ADE = ∠ABC, ∠AED = ∠ACB [Corresponding angles]

So by AA prop. ΔADE ~ ΔABC

⇒ AD/AB = DE/BC

⇒ 2/5 = DE/7.5

$$2 \times 7.5 = 5 \times DE$$

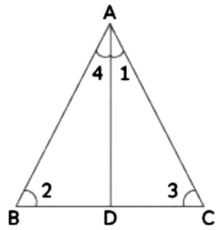
$$15 = 5 \times DE$$

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

DE = 3 cm

Q2: In ΔABC, if AD ⊥ BC and AD^2 = BD × DC, then prove that ∠BAC = 90°. (CBSE 2024)

Ans:



Here,
AD ⊥ BC

and
AD^2 = BD × DC
i.e., AD × AD = BD × DC
AD/DC = BD/AD (transposing)
and ∠ADB = ∠CDA [Each 90°]
⇒ ΔADB ~ ΔCDA
∠1 = ∠2 [By CPST]
∠3 = ∠4 (i)
In ΔAD C,
∠3 + ∠ADC + ∠1 = 180°
∠3 + 90° + ∠1 = 180°
∠1 = 180° – 90° – ∠3
∠1 = 90° – ∠3
∠BAC = ∠1 + ∠4
= 90° – ∠3 + ∠3
[∵∠4 = ∠3 From eqn. (i)]
i.e., ∠BAC = 90°
Hence, Proved

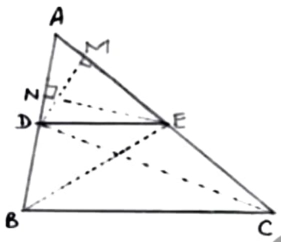
Q3: The greater of two supplementary angles exceeds the smaller by 18°. Find the measures of these two angles. (2024)

Ans:
Let the measures of the two angles be x° and y° (x > y).
Given:
x + y = 180
x - y = 18

Solving the equations, we get:
y = 81 and x = 99.

Q4: If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio. (2024)

Ans:



Given: In ΔABC, DE || BC

To Prove: AD/DB = AE/EC

Construction:

Join BE, DC.

Draw DM ⊥ AC and EN ⊥ AB.

Proof:

ar(ΔADE) = (1/2) × AD × EN

ar(ΔBDE) = (1/2) × DB × EN

⇒ ar(ΔADE)/ar(ΔBDE) = AD/DB ....(i)

Similarly,

ar(ΔADE) = (1/2) × AE × DM

ar(ΔCDE) = (1/2) × EC × DM

⇒ ar(ΔADE)/ar(ΔCDE) = AE/EC ....(ii)

Now,

ΔBDE and ΔCDE are on the same base DE and between the same parallels DE and BC.

∴ ar(ΔBDE) = ar(ΔCDE) ....(iii)

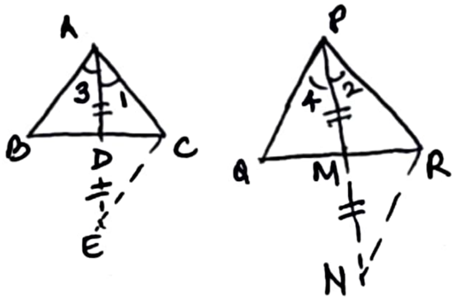
From (i), (ii), and (iii),

AD/DB = AE/EC.

Q5: Sides AB and BC and median AD of a ΔABC are respectively proportional to sides PQ and PR and median PM of ΔPQR. Show that ΔABC ~ ΔPQR. (2024)

Ans:

Construction: Produce AD to E and PM to N such that AD = DE and PM = MN.



In ΔADB and ΔEDC,
ΔADB ≅ ΔEDC ⇒ AB = CE. Similarly, PQ = RN.

Given,
AB/PQ = AC/PR = AD/PM.
⇒ CE/RN = AC/PR = AE/PN = 2/2
⇒ ΔAEC ~ ΔPNR.

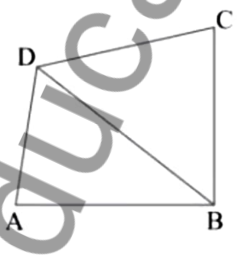
Now,
∠1 = ∠2 and ∠3 = ∠4.
Therefore, ∠1 + ∠3 = ∠2 + ∠4 or ∠BAC = ∠QPR.

Also,
AB/PQ = AC/PR (Given).

Hence, ΔABC ~ ΔPQR.

Q6: In the given figure, ABCD is a quadrilateral. Diagonal BD bisects ∠B and ∠D both. (2024)

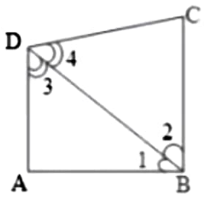
Prove that:
(i) ΔABD ~ ΔCBD
(ii) AB = BC



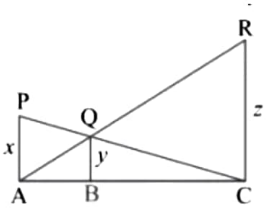
Ans:

(i) In ΔABD and ΔCBD,
∠3 = ∠4 and ∠1 = ∠2.
∴ ΔABD ~ ΔCBD.

(ii) Since ΔABD ≅ ΔCBD,
∴ AB = BC.



Q7: In the given figure, PA, QB, and RC are each perpendicular to AC. If (2024) AP = x, BQ = y, and CR = z, then prove that (1/x) + (1/z) = (1/y).



Ans:

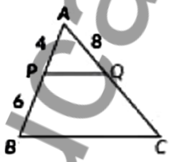
In ΔPAC ~ ΔQBC,
x/y = AC/BC or y/x = BC/AC ...(i)

In ΔRCA ~ ΔQBA,
z/y = AC/AB or y/z = AB/AC ...(ii)

Adding (i) and (ii):
y/x + y/z = (BC + AB)/AC
⇒ (1/x) + (1/z) = (1/y).

Previous Year Questions 2023

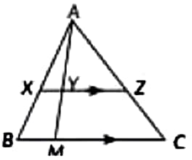
Q8: in ΔABC, PQ || BC If PB = 6 cm, AP = 4 cm, AQ = 8 cm. find the length of AC. (2023)



(a) 12 cm
(b) 20 cm
(c) 6 cm
(d) 14 cm

Ans: (b)
Sol: Since, PQ || BC
$\therefore \frac{AP}{PB} = \frac{AQ}{QC}$
$\Rightarrow \frac{4}{6} = \frac{8}{QC} \Rightarrow QC = \frac{8 \times 6}{4}$
= 12 cm
Now length of AC = AQ+QC = 12+8 = 20 cm

Q9: In the given figure, XZ is parallel to BC. AZ = 3 cm, ZC = 2 cm, BM = 3 cm and MC = 5 cm. Find the length of XY. (2023)



Ans:

Given, AZ = 3 cm, ZC = 2 cm, BM = 3 cm, and MC = 5 cm.

In ΔABC, XZ || BC:

AX/AB = AY/AM = AZ/AC [Thales theorem] ...(i)

Now, AC = AZ + ZC = 3 + 2 = 5 cm,

BC = BM + MC = 3 + 5 = 8 cm.

In ΔAXY and ΔABM,

∠AXY = ∠ABM [Corresponding angles as XZ || BC],

∠XAY = ∠BAM [Common].

∴ ΔAXY ~ ΔABM [By AA similarity criterion]:

AX/AB = XY/BM = AY/AM ...(ii) [Corresponding sides of similar triangles.]

From (i) and (ii), we get:

XY/BM = AZ/AC

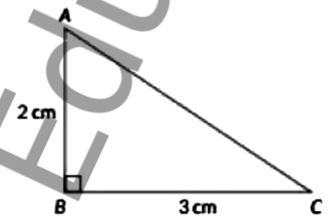
⇒ XY/3 = 3/5

⇒ XY = (3 × 3)/5 = 9/5 = 1.8 cm.

Q10: Assertion (A) : The perimeter of ΔABC is a rational number.

Reason (R) : The sum of the squares of two rational numbers is always rational.

(2023)



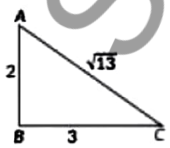
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

Ans: (d)



In ΔABC, $AC^2 = AB^2 + BC^2$

⇒ $AC^2 = 2^2 + 3^2$

$\Rightarrow AC^2 = 4 + 9$

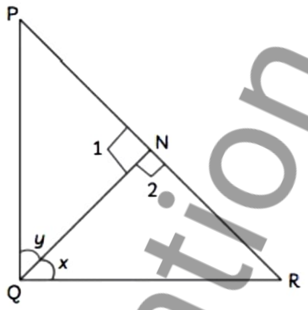
$\Rightarrow AC = \sqrt{13}$ cm

So, perimeter is $(2 + 3 + \sqrt{13})$cm = $(5 + \sqrt{13})$, which is irrational.

Hence, Assertion in false but Reason is true.

Q11: In a ΔPQR, N is a point on PR, such that QN ⊥ PR. If PN × NR = QN^2, prove that ∠PQR = 90°. (CBSE 2023)

Ans: In ΔPQR, QN ⊥ PR and PN × NR = QN^2



In ΔQNP and ΔRNQ,

∠1 = ∠2 = 90°

QN^2 = NR × NP (Given)

QN × QN = NR × NP

QN / NR = NP / QN

∴ **Δ**QNP ~**Δ**RNQ (By SAS similarity criterion)

∠P = ∠RQN = x ...(i)

∠PQN = ∠R = ∠y ...(ii)

In ΔPQR, we have

∠P + ∠PQR + ∠R = 180°

∠x + ∠x + ∠y + ∠y = 180°

2∠x + 2∠y = 180°

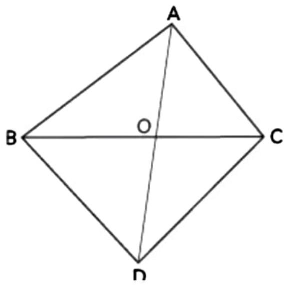
2(∠x + ∠y) = 180°

∠x + ∠y = 90°

∠PQR = 90°,

Hence, proved

Q12: In the given figure, ΔABC and ΔDBC are on the same base BC. If AD intersects BC at O, prove that $\frac{ar(\Delta ABC)}{ar(\Delta DBC)} = \frac{AO}{DO}$. (CBSE 2023)

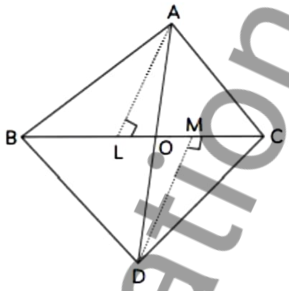


Ans: Given: ΔABC and ΔDBC are on the same base BC. AD and BC intersect at O.

To Prove:

$$\frac{ar(\Delta ABC)}{ar(\Delta DBC)} = \frac{AO}{DO}$$

Construction: Draw $AL \perp BC$ and $DM \perp BC$



Now, in ΔALO and ΔDMO, we have

$\angle ALO = \angle DMO = 90°$

$\angle AOL = \angle DOM$ (Vertically opposite angles)

Therefore, $\Delta ALO \sim \Delta DMO$

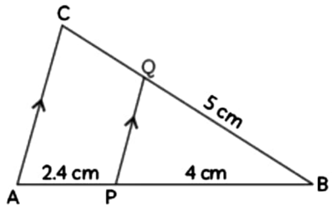
$\therefore \frac{AL}{DM} = \frac{AO}{DO}$ (Corresponding sides of similar triangles are proportional)

$$\frac{ar\ (\Delta ABC)}{ar\ (\Delta DBC)} = \frac{\frac{1}{2} \times BC \times AL}{\frac{1}{2} \times BC \times DM}$$

$$= \frac{AL}{DM} = \frac{AO}{DO}$$

Hence, proved.

Q13: In the given figure, PQ || AC. If BP = 4 cm, AP = 2.4 cm, and BQ = 5 cm, then the length of BC is _____.



(a) 8 cm

(b) 3 cm

(c) 0.3 cm

(d) 25/3 cm (CBSE 2023)

Ans: (a)

As PQ || AC by using basic proportionality theorem

$$\Rightarrow \frac{BP}{PA} = \frac{BQ}{QC}$$

$$\Rightarrow \frac{4}{2.4} = \frac{5}{QC}$$

$$\Rightarrow QC = \frac{5 \times 2.4}{4} = 5 \times 0.6$$

QC = 3 cm

∴ BC = BQ + QC

= 5 + 3

= 8 cm

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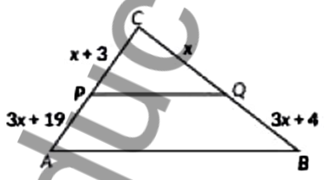
Previous Year Questions 2022

Q14: In the figure given below, what value of x will make PQ || AB? (2022)



(a) 2

(b) 3

(c) 4

(d) 5

Ans: (a)

Sol: Suppose PQ || AB

By Basic Proportionality theorem we have

$$\frac{CP}{PA} = \frac{CQ}{QB} \Rightarrow \frac{x+3}{3x+19} = \frac{x}{3x+4}$$

$$3x^2 + 19x = 3x^2 + 9x + 4x + 12$$

$\Rightarrow$ 6x = 12

$\Rightarrow$ x = 2

So, for x = 2, PQ IIAB

Q15: If Δ ABC and Δ PQR are similar triangles such that ∠A = 31° and ∠R = 69°, then ∠Q is : (2022)

(a) 70°

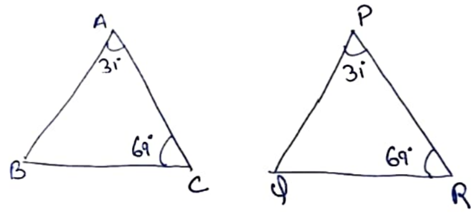
(b) 100°

(c) 90°

(d) 80°

Ans: (d)

Sol: Given Δ ABC and Δ PQR are similar.



Hence, ∠A = ∠P, ∠B = ∠Q and ∠C = ∠R

We know that,

∠P + ∠Q + ∠R = 180°

31° + ∠Q + 69° = 180°

100° + ∠Q = 180°

∠Q = 180° - 100°

∠Q = 80°

Q16: A vertical pole of length 19 m casts a shadow 57 m long on the ground and at the same time a tower casts a shadow 51m long. The height of the tower is (2022)

(a) 171m

(b) 13 m

(c) 17 m

(d) 117 m

Ans: (c)

Sol: Let AB be the pole and PQ be the tower

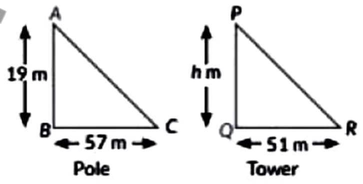
Let height of tower be h m

Now, ΔABC ~ ΔPQR

$\therefore \frac{AB}{PQ} = \frac{BC}{QR}$

$\Rightarrow \frac{19}{h} = \frac{57}{51}$

$\Rightarrow h = \frac{19 \times 51}{57}$



⇒ h = 17m

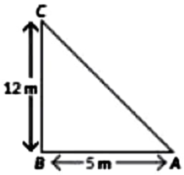
Previous Year Questions 2021

Q17: Aman goes 5 metres due west and then 12 metres due North. How far is he from the starting point? (2021)

Ans: 13 m

Let Aman starts from A point and continues 5 m towards west and readied at B point, from which he goes 12 m towards North reached at C point finally.

In ΔABC, we have



$AC^2 = AB^2 + BC^2$ [By Pythagoras theorem]

$AC^2 = 5^2 + 12^2$

$AC^2 = 25 + 144 = 169$

AC = 13m

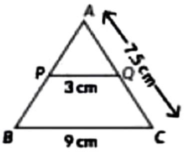
So, Aman is 13 m away from his starting point.

Previous Year Questions 2020

Q18: All concentric circles are _________ to each other. (2020)

Ans: All concentric circles arc **<u>similar</u>** to each other.

Q19: In figure, PQ || BC, PQ = 3 cm, BC = 9 cm and AC = 7.5 cm. Find the length of AQ. (2020)



Ans: Given, PQIIBC

PQ = 3 cm, BC = 9 cm and AC = 7.5 cm

Since. PQ || BC

∴ ∠APQ = ∠ABC (Corresponding angles are equal)

Now, in ΔAPQ and ΔABC

Now, in ΔAPQ and ΔABC

$\angle APQ = \angle ABC$ (Corresponding angles are equal)

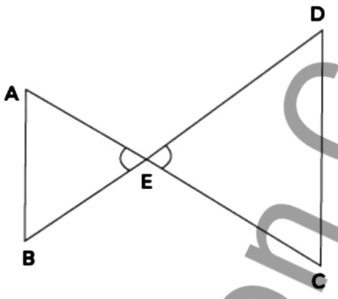
$\angle A = \angle A$ (Common)

$\Delta APQ \sim \Delta ABC$ (AA similarity)

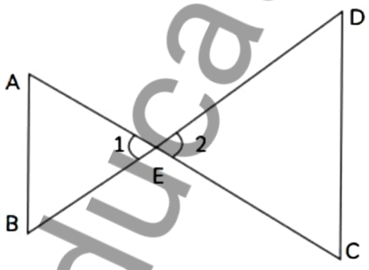
$\therefore \frac{AP}{AB} = \frac{AQ}{AC} = \frac{PQ}{BC}$

$\therefore \frac{AQ}{AC} = \frac{3}{9} \Rightarrow \frac{AQ}{7.5} = \frac{1}{3} \Rightarrow AQ = \frac{7.5}{3} = 2.5\text{ cm}$

Q20: In the given figure, EA/EC = EB/ED , prove that ΔEAB ~ ΔECD. (CBSE 2020)



Ans: In ΔEAB and ΔECD



Since, $EA / EC = EB / ED$

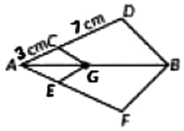
$\angle 1 = \angle 2$ [Vertically opposite angles]

So, by SAS similarity rule $\Delta EAB \sim \Delta ECD$

Hence, proved.

Previous Year Questions 2019

Q21: In the figure, GC||BD and GE||BF. If AC = 3cm and CD = 7 cm, then find the value of AE / AF. (2019)



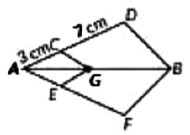
Ans: 3/10

Here in the given figure.

GC || BD and GE || BF

AC = 3 cm and CD = 7 cm

By Basic Proportionality theorem.



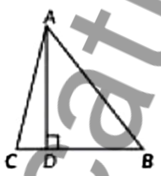
We get, $\frac{AC}{CD} = \frac{AE}{EF}$

$\therefore \quad \frac{AE}{EF} = \frac{3}{7} \Rightarrow \frac{AF}{AE} = \frac{7}{3} \Rightarrow \frac{AE+EF}{AE} = \frac{3+7}{3}$

$\Rightarrow \quad \frac{AF}{AE} = \frac{10}{3}$

$\therefore \quad \frac{AE}{AF} = \frac{3}{10}$

Q22: The perpendicular from A on the side BC of a ΔABC intersects BC at D, such that DB = 3CD. Prove that $2AB^2 = 2AC^2 + BC^2$. (2019)



Ans:

In ΔABC, AD ⊥ BC and BD = 3CD

BD + CD = BC

3CD + CD = BC

4CD = BC

CD = (1/4) BC ...... (1)

and, BD = (3/4) BC ...... (2)

In ΔADC, ∠ADC = 90°

$AC^2 = AD^2 + CD^2$ [Using Pythagoras theorem]

$AD^2 = AC^2 - CD^2$ ..... (3)

In ΔADB, ∠ADB = 90°

$AB^2 = AD^2 + BD^2$ [Using Pythagoras theorem]

$AB^2 = AC^2 - CD^2 + BD^2$ [from equation (3)]

$AB^2 = AC^2 + (3/4\ BC)^2 - (1/4\ BC)^2$ [from equations (1) and (2)]

$AB^2 = AC^2 + (9BC^2 - BC^2)/16$

$AB^2 = AC^2 + 8BC^2/16$

$AB^2 = AC^2 + 1/2\ BC^2$

Thus, $2AB^2 = 2AC^2 + BC^2$