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CBSE Board Class 10 Maths Chapter 6- Triangles
Objective Questions

Areas of Similar Triangles

1. If △ ABC ~ △ DEF such that AB = 12 cm and DE = 14 cm. Find the ratio of areas of △ ABC and △ DEF.

   (A) 49/9
   (B) 36/49
   (C) 49/16
   (D) 25/49

Answer: (B) 36/49

Solution: We know that the ratio of areas of two similar triangles is equal to the ratio of the squares.
Of any two corresponding sides,
area of △ ABC / area of △ DEF = $(AB/DE)^2 = (12/14)^2 = 36/49$

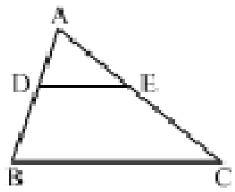
2. D and E are points on the sides AB and AC respectively of a △ABC such that DE || BC. Which of the following statement is true?

   (i) △ ADE ~ △ ABC
   (ii) (area of △ ADE/ area of △ ABC) = (AD^2/AB^2)
   (iii) (area of △ ADE/ area of △ ABC)= (AB^2/ AD^2)

   (A) only (iii)
   (B) only (i)
   (C) only (i) and (ii)
   (D) all (i) , (ii) and (iii)

Answer: (i) △ ADE ~ △ ABC and (ii) (area of △ ADE/ area of △ ABC) = (AD^2/AB^2)

Solution:



In △ ADE and △ ABC, we have

∠ ADE = ∠ B

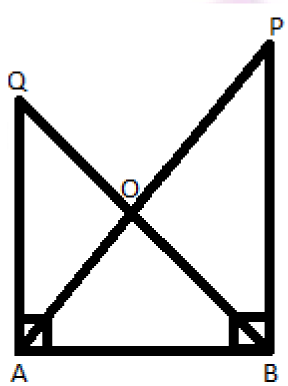
[Since DE || BC ∠ ADE = ∠ B (Corresponding angles)]

and, ∠ A = △ A [Common]

△ ADE ~ △ ABC

Therefore, (area of △ ADE / area of △ ABC) = (AD^2/AB^2)

3.



In the figure, PB and QA are perpendicular to segment AB. If OA = 5 cm, PO = 7cm and area (ΔQOA) = 150 cm^2, find the area of ΔPOB.

(A) 233 cm^2
(B) 294 cm^2
(C) 300 cm^2
(D) 420 cm^2

Answer: (B) 294 cm^2

Solution: Consider Δ~QOA and Δ POB

QA || PB,

Therefore, ∠ AQO = ∠ PBO [Alternate angles]

∠ QAO = ∠ BPO [Alternate angles]

and

∠ QOA = ∠ BOP [Vertically opposite angles]

Δs QOA ~ BOP [by AAA similarity]

Therefore, (OQ/ OB) = (OA/OP)

Now, area (POB)/ area (QOA) **=** $(OP)^2 / (OA)^2 = 7^2 / 5^2$

Since area (QOA) =150cm^2

⇒area (POB) =294cm^2

4. Two isosceles triangles have equal angles and their areas are in the ratio 16: 25. The ratio of corresponding heights is:

(A) 4:5
(B) 5:4
(C) 3:2
(D) 5:7

Answer: (A) 4:5

Solution: For similar isosceles triangles,

$\text{Area}(\Delta_1) / \text{Area}(\Delta_2) = (h_1)^2 / (h_2)^2$

$(h_1 / h_2) = 4/5$

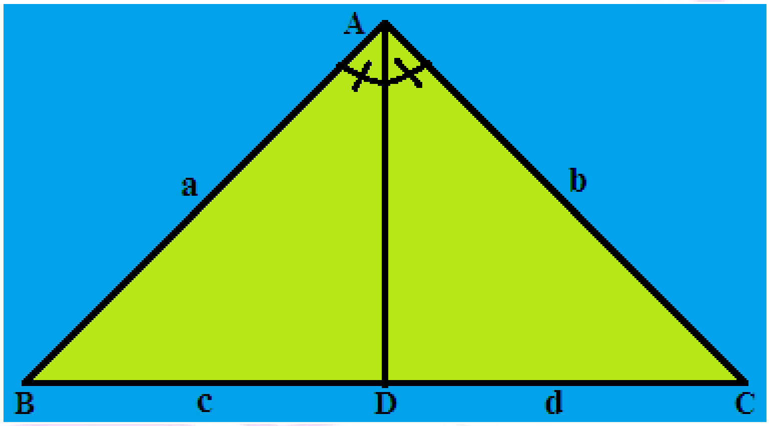
Basic Proportionality Theorem

5. In △ABC, AB = 3 and, AC = 4 cm and AD is the bisector of ∠A. Then, BD : DC is —

(A) 9: 16
(B) 4:3
(C) 3:4
(D) 16:9

Answer: (C) 3:4

Solution:



The Angle-Bisector theorem states that if a ray bisects an angle of a triangle, then it divides the opposite side into segments that are proportional to the other two sides (It may be similar or may not depending on type of triangle it divides)

In △ABC

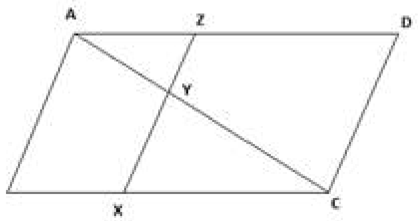
as per the statement AB/ AC= BD/DC i.e. a/b= c/d

So, BD/ DC= AB/AC= ¾

So, BD: DC = 3: 4

6. ABCD is a parallelogram with diagonal AC If a line XY is drawn such that XY ∥ AB.

BX/XC=?



(A) (AY/AC)
(B) DZ/AZ
(C) AZ/ZD
(D) AC/AY

Answer: (C) AZ/ZD

Solution: In the Δ ABC,

AB ∥ XZ

AB ∥ XY

∴ BX/ XC= AY/YC…. (By BPT)….. (1)

In parallelogram ABCD,
AB ∥ CD

AB ∥ CD ∥ XZ

In the Δ ACD,
CD ∥ YZ

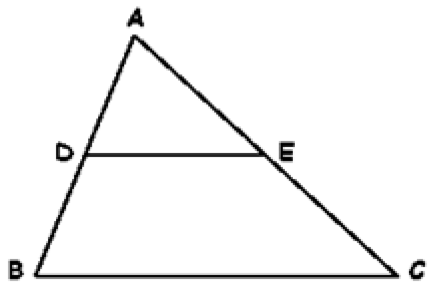
∴ AY/YC= AZ/ZD ... (By BPT)...... (2)

From 1 & 2,

BX/XC= AY/YC= AZ/ZD

BX/XC= AZ/ZD

7.



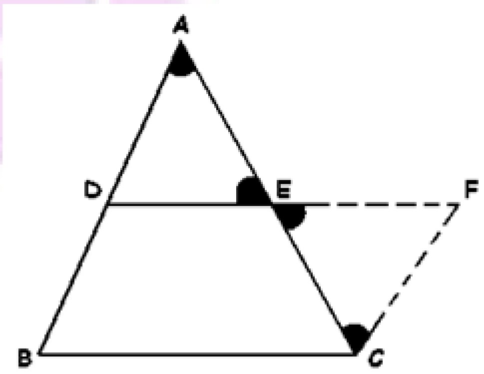
In ABC, Given that DE//BC, D is the midpoint of AB and E is a midpoint of AC.

The ratio AE: EC is ____.

(A) 1: 3
(B) 1:1
(C) 2:1
(D) 1:2

Answer: (B) 1:1

Solution:



DE is parallel to BC

So, In triangles ABC, ADE

∠DAE = ∠ECF {Alternate angles}

∠ADE = ∠EFC {Alternate angles}

∠BAC = ∠DAE
By A.A.A similarity ABC≡ADE

⇒ AD/DB= AE/EC (Basic Proportionality Theorem)

Since, D is midpoint of AB.

AD=DB

⇒ AD/DB= 1/1=AE/EC

⇒ AE/EC= 1 /1

∴ AE: EC= 1:1

8. In ΔABC, AC = 15 cm and DE || BC. If AB/AD=3, Find EC.

(A) 5cm
(B) 10 cm
(C) 2.5cm
(D) 9cm

Answer: (B) 10cm

Solution: Given: DE∥BC
From basic proportionality theorem

AD/DB=AE/EC

Now, AB/AD= (AD+DB) /AD= 1 + (DB/AD)

⇒1+ (DB/AD) = 3

⇒ (DB/AD) = 2

⇒ AD/DB=AE/EC = ½

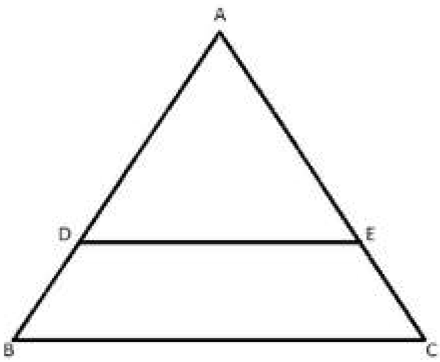
⇒2AE=EC⇒AC=AE+EC−−−−−−− (1)
On substituting value of EC in (1), we get
15=3AE⇒5=AE⇒EC=10cm

9. △ ABC is an acute angled triangle. DE is drawn parallel to BC as shown. Which of the following are always true?

i) △ ABC ~ △ ADE

ii) AD/BD= AE/EC

iii) DE= BC/2



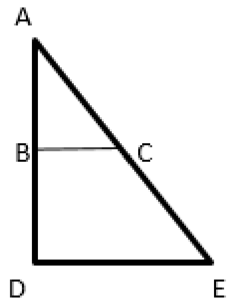
(A) Only (i)
(B) (i) and (ii) only
(C) (i), (ii) and (iii)
(D) (ii) and (iii) only

Answer: (B) (i) and (ii) Only

Solution: Since DE || BC, AD/BD=AE/EC and hence △ABC ~ △ADE

DE = BC/2 only if D and E are the mid points of AB and AC respectively. So this may not be true always.

10. The triangles ABC and ADE are similar



Which of the following is true?

(A) EC/AC=AD/DE
(B) BC/BD=CE/DE
(C) AB/AD=BC/DE
(D) All of the Above

Answer: (C) AB/AD=BC/DE

Solution: Since the given triangles are similar, the ratios of corresponding sides are equal.

So, AB/AD=BC/DE=AC/AE

11. If in △ CAB and △ FED, AB/ EF=BC/FD=AC/ED, then:

(A) △ ABC~△ DEF
(B) △ CAB~△ DEF
(C) △ ABC~△ EFD
(D) △ CAB~△ EFD

Answer: (C) △ ABC~△ EFD

Solution: If two triangles are similar, corresponding sides are proportional.
Therefore, △ABC~△EFD.

12. A tower of height 24m casts a shadow 50m and at the same time, a girl of height 1.8m casts a shadow. Find the length of the shadow of girl.

(A) 3.75m
(B) 3.5m
(C) 3.25m
(D) 3m

Answer: (A) 3.75m

Solution: In △ABC and △DEC

∠ABC=∠DEC=90°

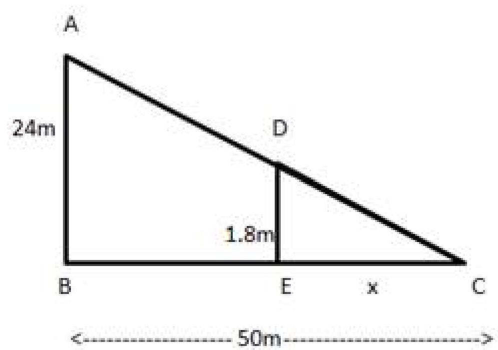
∠C=∠C (common)

Therefore, △ABC∼△DEC [by AA similarity]

So, DE/AB=EC/BC

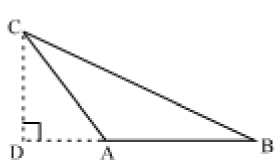
EC=DE × (BC/AB)

EC= 1.8 × (50/24) ⇒EC=3.75 m



Pythagoras Theorem

13. In the adjoining figure, if BC = a, AC = b, AB = c and ∠CAB = 120°, then the correct relation is-



(A) $a^2 = b^2 + c^2 – bc$
(B) $a^2 = b^2 + c^2 + bc$
(C) $a^2 = b^2 + c^2 - 2bc$
(D) $a^2 = b^2 + c^2 + 2bc$

Answer: (B) $a^2 = b^2 + c^2 + bc$

Solution: In △CDB,

$BC^2 = CD^2 + BD^2$ [By Pythagoras Theorem]

$BC^2 = CD^2 + (DA+AB)^2$

$BC^2 = CD^2 + DA^2 + AB^2 + (2\times DA\times AB)$ (i)

In △ADC,

$CD^2 + DA^2 = AC^2$ (ii) [By Pythagoras Theorem]

Also, $\cos 60^\circ = AD/AC$

$AC = 2AD$ (iii)

Putting the values from (ii) and (iii) in (i), we get

$BC^2 = AC^2 + AB^2 + (AC\times AB)$

$a^2 = b^2 + c^2 + bc$

Alternatively,

Since ∠A is an obtuse angle in ΔABC, so

$BC^2 = AB^2 + AC^2 + 2AB . AD$

$= AB^2 + AC^2 + 2\times AB\times \frac{1}{2} \times AC$

[∵ $AD = AC \cos 60^\circ = 1/2AC$]

$= AB^2 + AC^2 + AB \times AC$

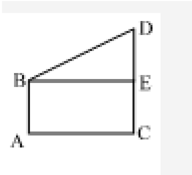
$a^2 = b^2 + c^2 + bc.$

14. If the distance between the top of two trees 20 m and 28 m tall is 17 m, then the horizontal distance between the trees is :

(A) 11m
(B) 31m
(C) 15m
(D) 9m

Answer: (C) 15m

Solution: Let AB and CD be two trees such that AB = 20 m, CD = 28 m & BD = 17 m



Draw BE parallel to CD. Then, ED = 8 m.

By applying Pythagoras theorem:

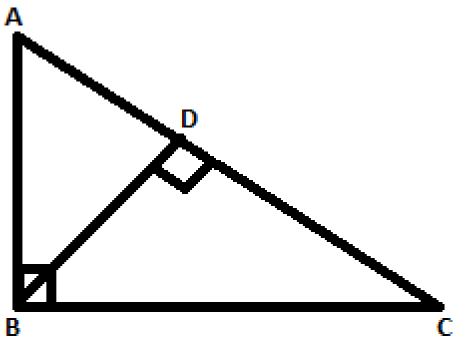
$BE^2+DE^2=BD^2$

$\therefore \quad BE = \sqrt{BD^2 - ED^2} = \sqrt{17^2 - 8^2}$

$= \sqrt{225}$ =15m

$\therefore$ AC = BE = 15 m

15.

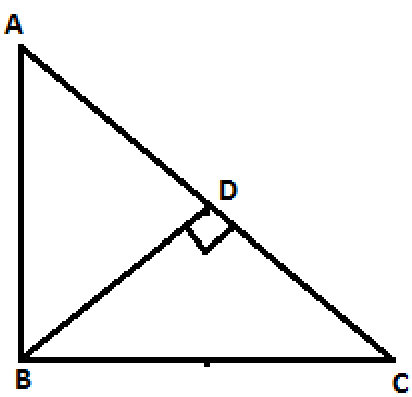


In the figure △ABC is a right angled triangle with right angle at B. BD is perpendicular to AC. Then which of the following options will hold true?

(A) $AD^2=DC\times AC$
(B) $AB^2=AD\times AC$
(C) $AB^2=AD\times DC$
(D) $AB^2=DC^2+AD^2$

Answer: (B) $AB^2=AD\times AC$

Solution:

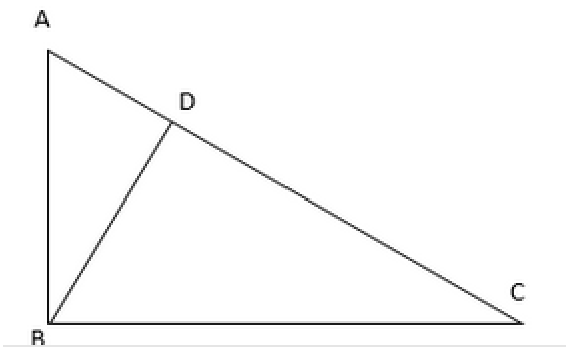


In △ABC and △ADB
$\angle ABC=\angle ADB=90^\circ$
$\angle A=\angle A$ (common angle)
Therefore, △ABC∼△ADB [by AA similarity]

AB/AD= AC/ AB

$AB^2=AC\times AD$

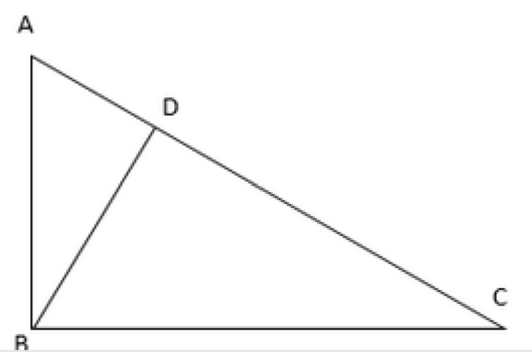
16. In a right △ABC, a perpendicular BD is drawn on to the largest side from the opposite vertex. Which of the following does not give the ratio of the areas of △ABD and △ACB?



(A) $(AB/AC)^2$
(B) $(AD/AB)^2$
(C) $(AB/AD)^2$
(D) $(BD/CB)^2$

Answer: (C) $(AB/AD)^2$

Solution:



Consider ΔABD and ΔACB:

∠BAD = ∠BAC [common angle]

∠BDA = ∠ABC [90°]

By AA similarity criterion, △ABD ~ △ACB

Hence,

ar (ΔABD)/ ar(ΔACB) = $(AB/AC)^2$= $(AD/AB)^2$= $(BD/CB)^2$

Similar Triangles

17. △ ABC is such that AB = 3 cm, BC = 2 cm and CA = 2.5 cm.△ DEF is similar to △ABC. If EF = 4 cm, then the perimeter of △DEF is –

(A) 7.5 cm
(B) 15cm
(C) 30cm
(D) 22.5cm

Answer: (B) 15cm

Solution: AB/DE= AC/DF=BC/EF=2/4=1/2

DE = 2×AB = 6 cm, DF = 2×AC = 5 cm

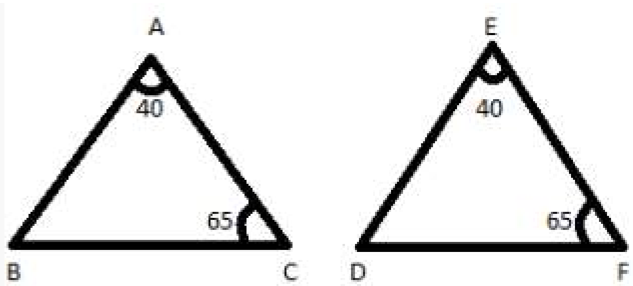
∴ Perimeter of △DEF = (DE + EF + DF) = 15 cm.

18. In △ ABC and △ DEF, ∠A = ∠E = 40∘ and AB/ED=AC/EF. Find ∠B if ∠F is 65°

(A) 85°
(B) 75°
(C) 35°
(D) 65°

Answer: (B) 75°

Solution:



AB/ED= AC/EF (Given)
∠A = ∠E = 40°

Since, the ratio of adjacent sides and the included angles are equal.
∴△ABC is similar to △EDF by SAS similarity criterion.

Now, $\angle C = \angle F = 65°$ [Corresponding angles of a similar triangles are equal]

$\therefore \angle B = 180° - (\angle A + \angle C)$
$= 180° - (40° + 65°) = 75°$

19. The ratio of the corresponding sides of two similar triangles is 1: 3. The ratio of their corresponding heights is _________

(A) 1:3
(B) 3:1
(C) 1:9
(D) 9:1

Answer: (A) 1:3

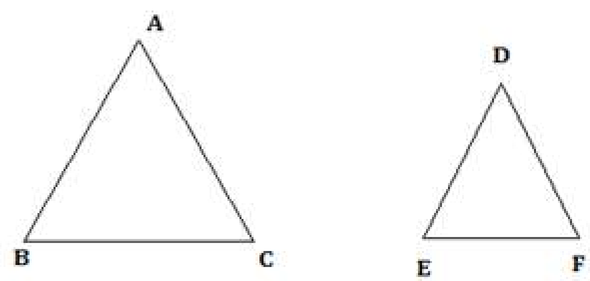
Solution: Ratio of heights = Ratio of sides = 1: 3.

20. If Δ ABC and Δ DEF are similar such that 2AB = DE and BC = 8 cm, then Find EF.

(A) 16 cm
(B) 12 cm
(C) 8 cm
(D) 4 cm

Answer: (A) 16 cm

Solution:



2AB = DE

2BC = EF

⇒ 2×8 = EF

⇒ EF = 16 cm

(E)