MATHS

BOOKS - S CHAND IIT JEE FOUNDATION
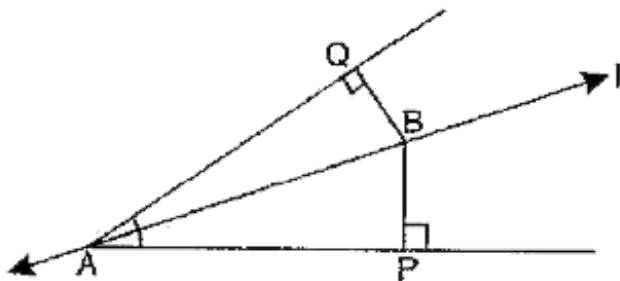
TRIANGLES

Solved Examples

1. In the given figure, line I is the bisector of an angle A and B is any point on I. BP and BQ are

perpendiculars from B to the arms of ∠A. Show that B is equidistant from the arms of ∠A.

2. ABC is a triangle and D is the mid-point of BC . The perpendiculars from D to AB and

AC are equal. Prove that the triangle is isosceles.

3. In Fig. 4.91, QA and PB are perpendiculars to AB . If $AO = 10cm$, $BO = 6cm$ and $PB = 9cm$. Find AQ . (FIGURE)

4. D is a point on the side BC of ABC such that $\angle ADC = \angle BAC$. Prove that $\dfrac{CA}{CD} = \dfrac{CB}{CA}$ or, $CA^2 = CB \times CD$.

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5. If $\triangle ABC$ is similar to $\triangle DEF$ such that $BC = 3cm, EF = 4cm$ and area of $\triangle ABC = 54cm^2$. Find the area of $\triangle DEF$.

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6. Prove that the area of the equilateral triangle described on the side of a square is half the area of the equilateral triangle described on its diagonal.
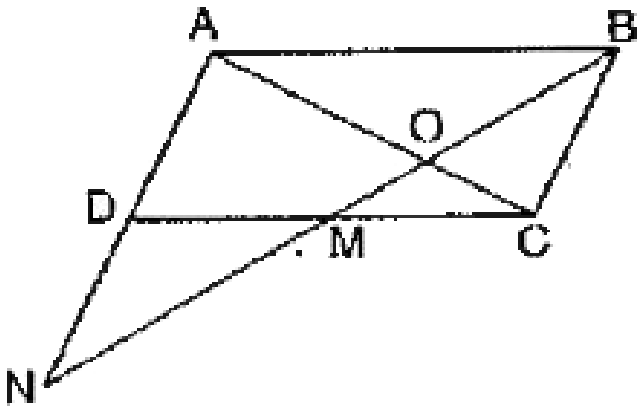
7. In an isosceles triangle ABC with AB = AC, BD is perpendicular from B to side AC. Prove that

$$BD^2 - CD^2 = 2CD.\ AD$$

8. In the given figure, M is the mid-point of the side CD of the parallelogram ABCD. What is ON:OB?

A. $3:2$

B. $2:1$

C. $3:1$

D. $5:2$

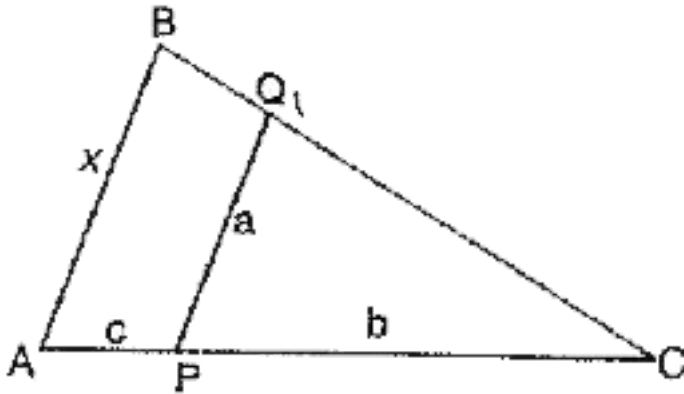**Answer: A::B**

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9. In the given triangle, AB is parallel to PQ.AP=c, PC=b, PQ=a, AB=x. What is the value of

x?

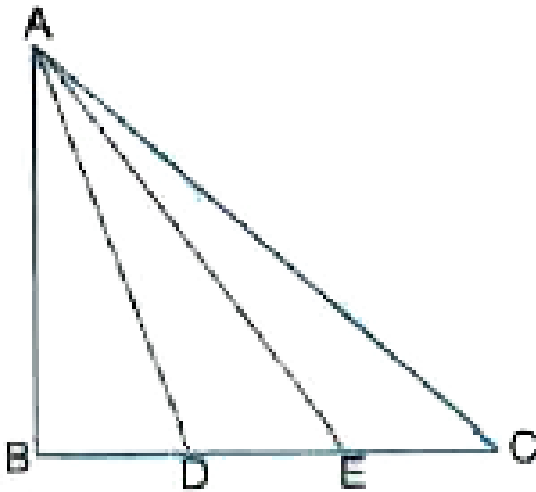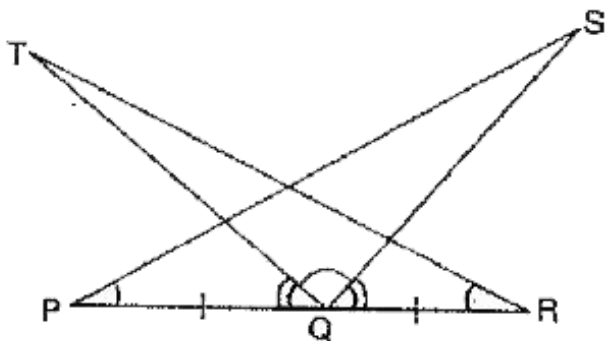**10.** In Fig. 7.86, if D and E trisects BC. Prove that

$$8AE^2 = 3AC^2 + 5AD^2.$$

Fig. 7.86

Question Bank

1. In the given figure, $\triangle RTQ \cong \triangle PSQ$ by ASA congruency condition. Which of the following

pairs does not satisfy the condition.

A. $PQ = QR$

B. $\angle P = \angle R$

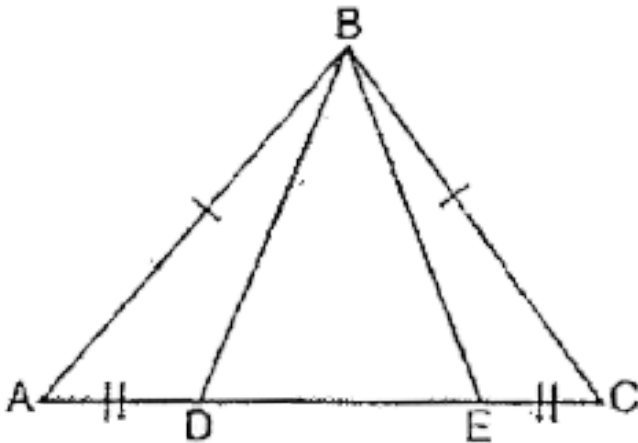C. $\angle TQP = \angle SQR$

D. None of these

Answer: D

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2. It is given that $AB = BC$ and $AD = EC$.

The $\triangle ABC \cong \triangle CBD$ by _____ congruency.

A. SSS

B. ASA

C. SAS

D. AAS

Answer: C

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3. ABCD is a quadrilateral. AM and CN are perpendiculars to BD, AM= CN and diagonals AC and BD intersect at O, then which one of the following is correct?

A. AO=OC

B. BO=OD

C. AO=BO

D. CO=DO

Answer: A

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4. Squares ABDE and ACFH are drawn externally on the sides AB and AC respectively of a scalene $\triangle ABC$. Which one of the following is correct?

A. BH=CE

B. AD = AF

C. BF=CD

D. DF = EH

Answer: A

5. In the given figure, the two sides AB and BC, and the median AD of $\triangle ABC$ are correspondingly equal to the two sides PQ and

QR, and the medium PM of $\triangle PQR$. Prove that

$\triangle ABC \cong \triangle PQR$.

A. $\triangle ABD \cong \triangle PQM$

B. $\triangle ABC \cong \triangle PQR$

C. $\triangle ABD \cong \triangle PMR$

D. $\triangle ADC \cong \triangle PMR$

Answer: C

6. In the given figure, OA = OB, OC = OD, $\angle AOB = \angle COD$. Which of the following statements is true?
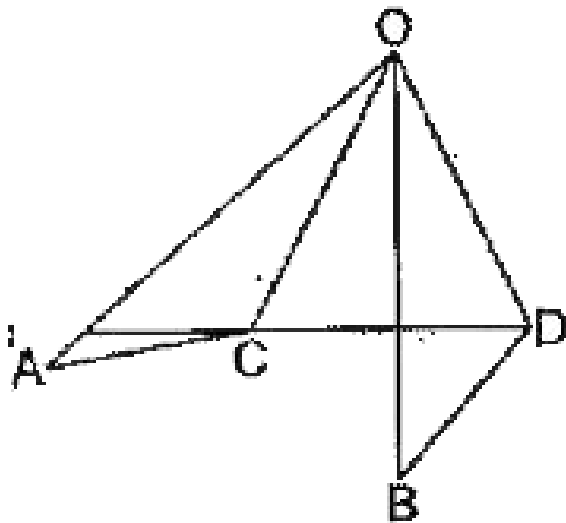
A. AC = CD

B. OA=OD
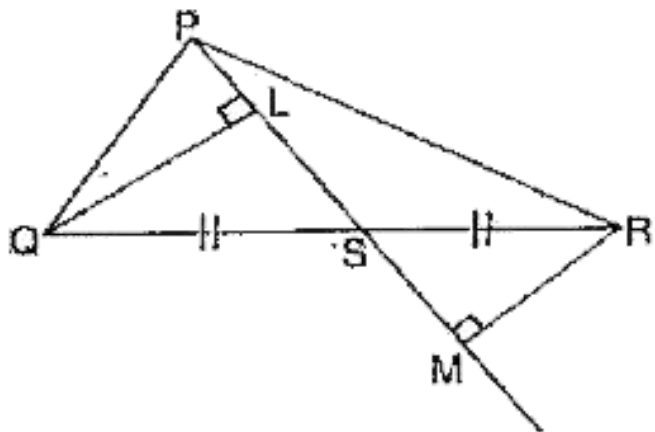
C. AC=BD

D. $\angle OCA = \angle ODC$

Answer: C

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7. PS is a median and QL and RM are perpendiculars drawn from Q and R respectively on PS and PS produced. Then

which of the following statements is correct?

A. PQ=RM

B. QL=RM

C. PL=SR

D. PS=SM

Answer: B

8. In the adjoining figure, QX and RX are the bisectors of the angles Q and R respectively of the angles Q and R respectively of the triangle PQR. If $XS \perp PQ.$ Prove that :

(i) $\Delta XTQ \cong \Delta XSQ$

(ii) PX bisects angle P.
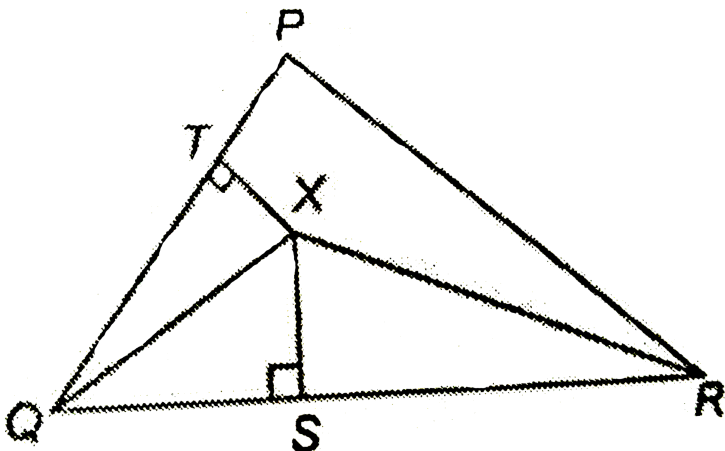
A. SAS

B. RHS

C. AAS

D. ASA

Answer: C

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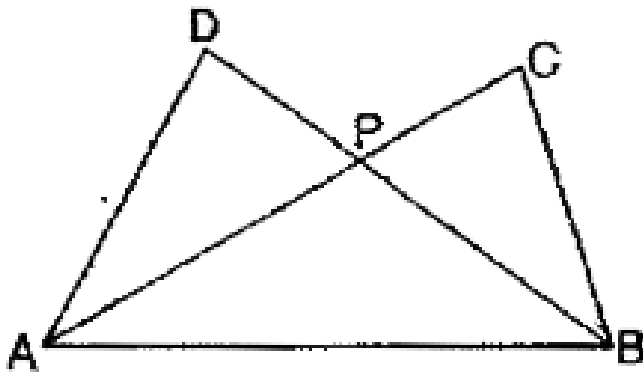
9. In the given figure $AD = BC$, $AC = BD$. Then $\triangle PAB$ is

A. equilateral

B. right angled

C. scalene

D. isosceles

Answer: D

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10. In a right angled triangle, one acute angle is double the other. The hypotenuse is _____ the smallest side.

A. $\sqrt{2}$ times

B. three times

C. double

D. 4 times

Answer: C

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

A. $BC.\,EF = AC.\,FD$

B. $AB.\,EF = AC.\,DE$

C. $BC.\,DE = AB.\,EF$

D. $BC.\,DE = AB.\,FD$

Answer: C

12. In the figure, x equals
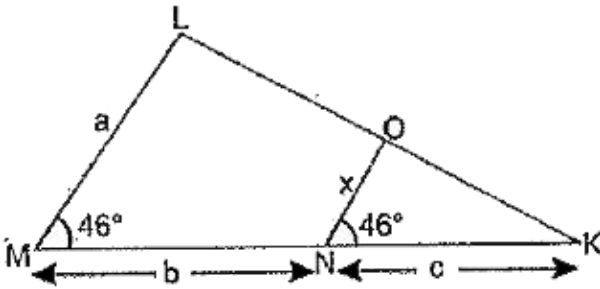
A. $\dfrac{ab}{a+c}$

B. $\dfrac{ac}{a+b}$

C. $\dfrac{ac}{b+c}$

D. $\dfrac{ab}{b+c}$

Answer: C

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13. What value of x will make DE ∥ AB in the given figure?
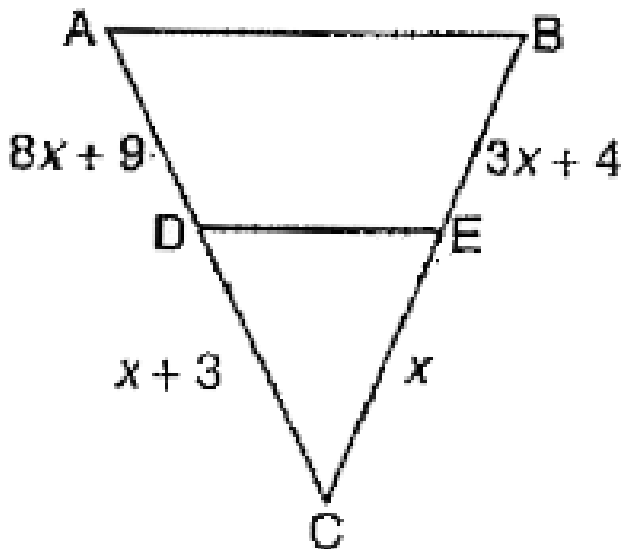
A. x = 3

B. x = 2

C. x = 1

D. x = 5

Answer: B

14. If the medians of two equilateral triangles are in the ratio 3:2, then what is ratio of the sides?

A. 1 : 1

B. $2:3$

C. $3:2$

D. $\sqrt{3}:\sqrt{2}$

Answer: C

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15. The areas of two similar triangles are 121 cm^2 and $64cm^2$ respectively. If the median of the first triangle is 12.1 cm, then the corresponding median of the other is :

A. 6.4 cm

B. 10 cm

C. 8.8 cm

D. 3.2 cm

Answer: C

16. In the given figure, DE is parallel to BC and the ratio of the areas of $\triangle ADE$ and trapezium BDEC is 4:5. What is DE: BC?

A. $1 : 2$

B. $2 : 3$

C. $4 : 5$

D. None of these

Answer: B

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17. ABCD is a trapezium in which $AB \mid \mid CD$ and $AB = 2CD$. It its diagonals intersect

each other at O then ratio of the area of triangle AOB and COD is

A. $1:2$

B. $2:1$

C. $4:1$

D. $1:4$

Answer: C

18. AB, EF and CD are parallel lines. Given that EG=5cm, GC= 10 cm, AB = 15 cm and DC= 18 cm. What is the value of AC?
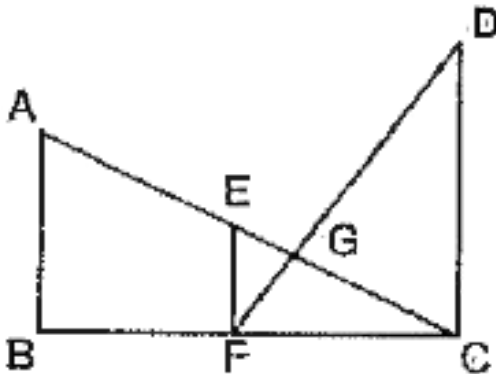
A. 20 cm

B. 24 cm

C. 25 cm

D. 28 cm

Answer: C

19. In the given figure, if PA = x, RC = y and QB = z, then which one of the following is correct?
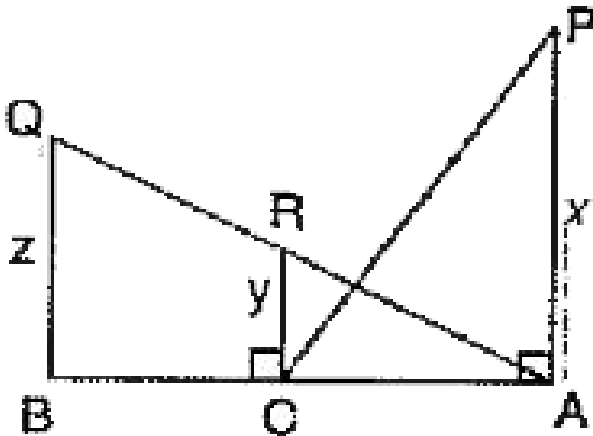
A. $2y = x + z$

B. $4y = x + z$

C. $xy + yz = xz$

D. $xy + xz = yz$

Answer: C

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20. In $\triangle PQR$, QR=10, RP=11 and PQ=12. D is the midpoint of PR, DE is drawn parallel to PQ

meeting QR in E. EF is drawn parallel to RP meeting PQ in F. What is the length of DF?

A. $\dfrac{11}{2}$

B. 6

C. $\dfrac{33}{4}$

D. 5

Answer: D

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21. The hypotenuse of a right triangle is 6 m more than twice the shortest side. If the third side is 2 m less than the hypotenuse, find the hypotenuse of the triangle.

A. 24 m

B. 34 m

C. 26 m

D. 10 m

Answer: C

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22. If the distance from the vertex to the centroid of an equilateral triangle is 6 cm, then what is the area of the triangle?

A. $24cm^2$

B. $27\sqrt{3}cm^2$

C. $12cm^2$

D. $12\sqrt{3}cm^2$

Answer: B

23. $\triangle ABC$ is an equilateral triangle such that

AD $\perp$ BC, then $AD^2 =$

A. $\dfrac{3}{2}DC^2$

B. $2DC^2$

C. $3CD^2$

D. $4DC^2$

Answer: C

24. P and Q are points on the sides CA and CB respectively of ABC , right angled at C . Prove that $AQ^2 + BP^2 = AB^2 + PQ^2$.

A. $BC^2 + PQ^2$

B. $AB^2 + PC^2$

C. $AB^2 + PQ^2$

D. $BC^2 + AC^2$

Answer: C

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25. ABC is a right-angled triangle, right angled at A and AD is the altitude on BC. If AB : AC= 3:4, what is the ratio BD:DC?

   A. $3 : 4$

   B. $9 : 16$

   C. $2 : 3$

   D. $1 : 2$

Answer: B

26. ABC is a right angle triangle right angled at A. A circle is inscribed in it the length of the two sidescontaining right angle are 6 cm and 8 cm then the radius of the circle is

A. 3 cm

B. 2 cm

C. 5 cm

D. 4 cm

Answer: B

27. $\triangle ABC$ is right angled at A and $AD \perp BC$. Then $\dfrac{BD}{DC} =$

A. $\left(\dfrac{AB}{AC}\right)^2$

B. $\dfrac{AB}{AC}$

C. $\left(\dfrac{AB}{AD}\right)^2$

D. $\dfrac{AB}{AD}$

Answer: B

28. If ABC is a right angled triangle at B and M, N are the mid-points of AB and BC, then $4(AN^2 + CM^2)$ is equal to :

   A. $4AC^2$

   B. $5AC^2$

   C. $\dfrac{5}{4}AC^2$

   D. $6AC^2$

Answer: B

29. li $\triangle PQR$, PD $\perp$ QR such that D lies on QR, if PQ=a,PR=b,QD=c and DR=d, then prove that (a+b)(a-b)=(c+d)(c-d).

A. $(a - d)(a + d) = (b - c)(b + c)$

B. $(a - c)(b - d) = (a + c)(b + d)$

C. $(a - b)(a + b) = (c + d)(c - d)$

D. $(a - b)(c - d) = (a + b)(c + d)$

Answer: C

30. ABC is a triangle right- angled at B and D is a point on BC produced $(BD > BC)$, such that $BD = 2DC$. Which one of the following is correct?

A. $AC^2 = AD^2 - 3CD^2$

B. $AC^2 = AD^2 - 2CD^2$

C. $AC^2 = AD^2 - 4CD^2$

D. $AC^2 = AD^2 - 5CD^2$
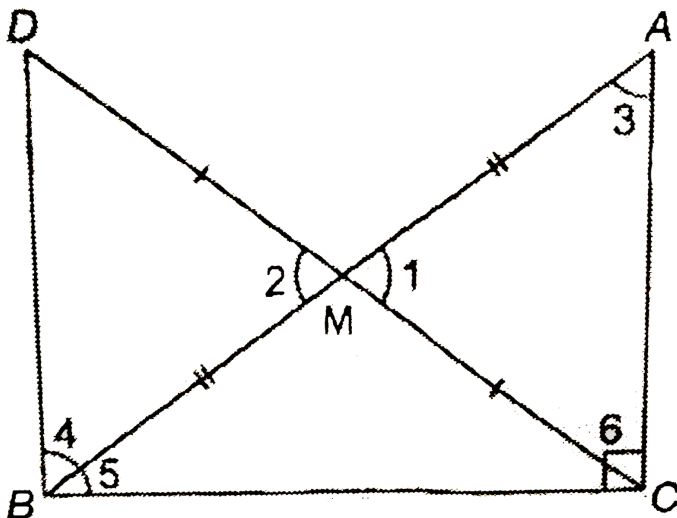
Answer: A

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Self Assessment Sheet

1. In right triangle ABC, right angle at C, M is the mid-point of the hydrotenuse AB. C is joined to M and produced to a point D such that $DM = CM$. Point D is joined to point B.

Show that

(i) $\triangle AMC \cong \triangle BMD$ (ii) $\angle DBC = \angle ACB$

(iii) $\triangle DBC \cong \triangle ACB$ (iv) $CM = \dfrac{1}{2}AB$

A. ASA

B. RHS

C. SSS

D. SAS

Answer: D

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2. AD is angular bisector of AABC such that

BD:DC = 2:3. If AB = 7cm, what is AC: BC?

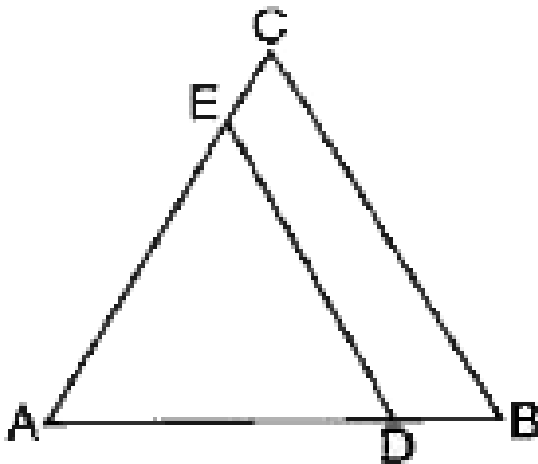A. $2 : 3$

B. $3 : 2$

C. $21 : 10$

D. None of these

Answer: C

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3. In the given figure DE || BC.

$$AD = x, DB = x - 2$$

$$AE = x + 2, EC = x - 1$$

What is the value of x?

A. 3

B. 4

C. 5

D. 6

Answer: B

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4. If in $\triangle s$ ABC and DEF, $\angle A = \angle E = 37°$, AE :

ED = AC : EF and $\angle F = 69°$, then what is the

value of $\angle B$?

   A. $69°$

   B. $74°$

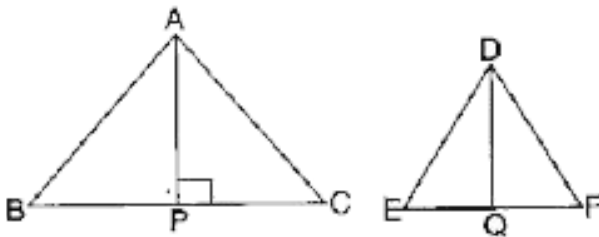   C. $84°$

   D. $94°$

Answer: B

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5. Triangles ABC and DEF are similar. If the length of the perpendicular AP from A on the opposite side BC is 2 cm and the length of the perpendicular DQ from D on the opposite side EF is 1 cm, then what is the area of $\triangle ABC$?

A. One and half times the area of the triangle DEF

B. Four times the area of triangle DEF

C. Twice the area of the triangle DEF.

D. Three times the area of triangle DEF.

Answer: B

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6. In the given figure, $ABCD$ is a parallelogram. E and F are the centroids of $\triangle\ ABD$ and $\triangle\ BCD$, respectively.EF is equal to

A. AE

B. BE

C. CE

D. DE

Answer: A

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7. In a $\triangle ABC$, perpendicular AD from A on BC meets BC at D. If BD = 8 cm, DC = 2 cm and AD=4 cm, then

A. $\triangle ABC$ is isosceles

B. $\triangle ABC$ is equilateral

C. Ac = 2AB

D. $\triangle ABC$ is right angled at A

Answer: D

8. If E is a point on side r:A of an equilateral triangle ABC such that $BE \perp CA$, then prove that $AB^2 + BC^2 + CA^2 = 4BE^2$.

A. $2BE^2$

B. $3BE^2$

C. $4BE^2$

D. $6BE^2$

Answer: C

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9. In a right triangle ABC right angled at C, P and Q are points on the sides CA and CB respectively, which divide these sides in the

ratio 2:1. Then, which of the following statements is true?

A. $9AQ^2 = 9BC^2 + 4AC^2$

B. $9AQ^2 = 9AC^2 + 4BC^2$
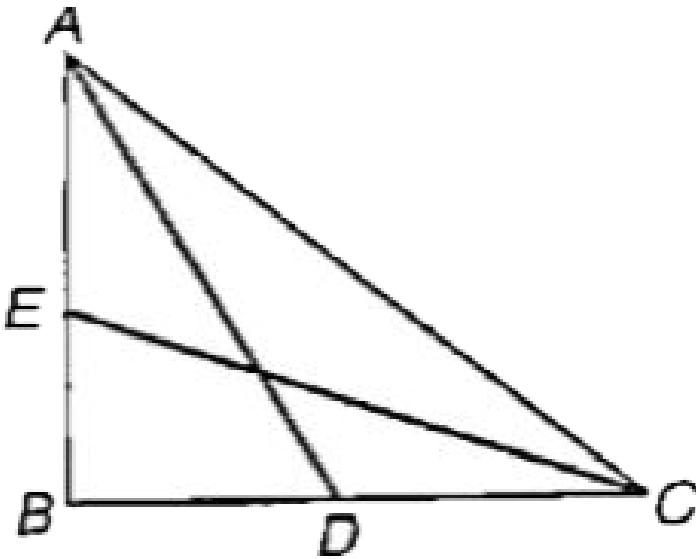
C. $9AQ^2 = 9BC^2 + 4PQ^2$

D. $9AQ^2 = 9AB^2 - 4BP^2$

Answer: B

10. In figure, ABC is a right triangle, right angled at B. AD and CE are the two medians drawn from A and C respectively. If AC = 5 cm and $AD = \dfrac{3\sqrt{5}}{2}$ cm, find the length of CE:

A. 2 cm

B. $2\sqrt{5}$ cm

C. $5\sqrt{2}$ cm

D. $3\sqrt{2}$ cm

Answer: B

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