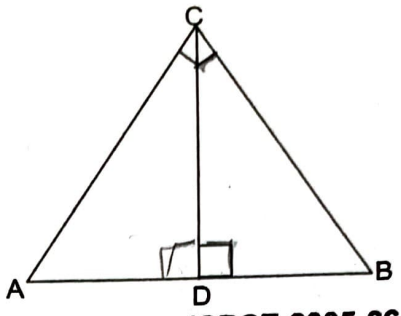
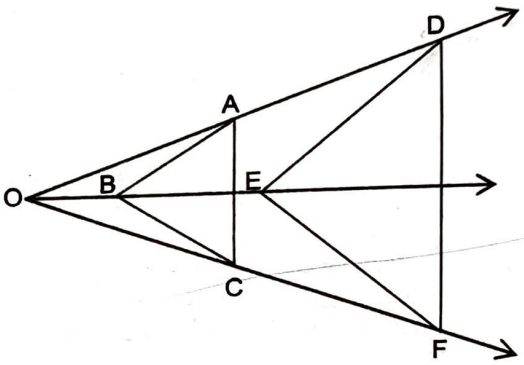
TRIANGLES

1. In figure, $\angle ACB = 90^\circ$, $CD \perp AB$. Prove that $CD^2 = BD \times AD$.



(CBSE 2005-06, 1 mark)

2. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio. Using the above, prove the following:
In figure, $AB \| DE$ and $BC \| EF$. Prove that $AC \| DF$.

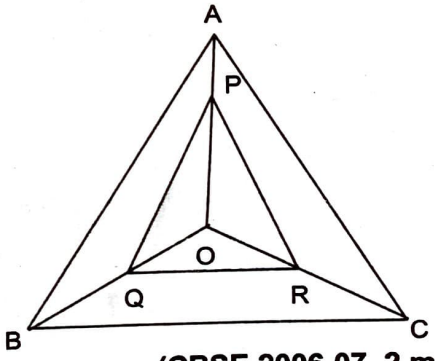


(CBSE 2007-08, 6 marks)

3. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides. **(CBSE 2005-06, 6 marks)**

4. Prove that the area of the equilateral triangle described on the side of a right angled isosceles triangle is half the area of the equilateral triangle described on its hypotenuse. **(CBSE 2005-06, 6 marks)**

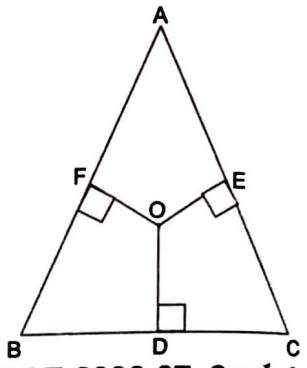
5. In figure, $PQ \| AB$ and $PR \| AC$. Prove that $QR \| BC$.



(CBSE 2006-07, 2 marks)

6. E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that $\Delta ABE \sim \Delta CFB$. **(CBSE 2007-08, 2 marks)**

7. In figure O is any point in the interior of ΔABC, OD, OE and OF are drawn perpendicular to the sides BC, CA and AB respectively. Prove that $AF^2 + BD^2 + CE^2 = OA^2 + OB^2 + OC^2 - (OD^2 + OE^2 + OF^2)$



(CBSE 2006-07, 3 marks)

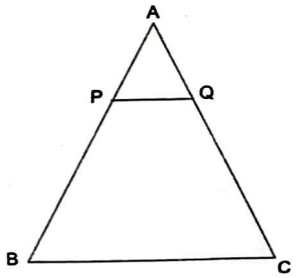
8. State and prove Pythagoras theorem. Use the above to prove the following:
ABC is an isosceles right triangle, right angled at C. Prove that $AB^2 = 2AC^2$

(CBSE 2006-07, 5 marks)

9. The lengths of the diagonals of a rhombus are 30 cm and 40 cm. Find the side of the rhombus.

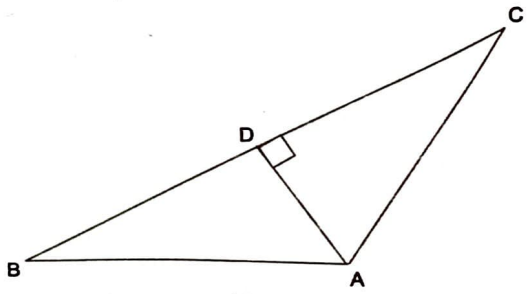
(CBSE 2007-08, 1 mark)

10. In figure, $PQ \| BC$ and $AP : PB = 1 : 2$.
Find $\frac{ar(\Delta APQ)}{ar(\Delta ABC)}$



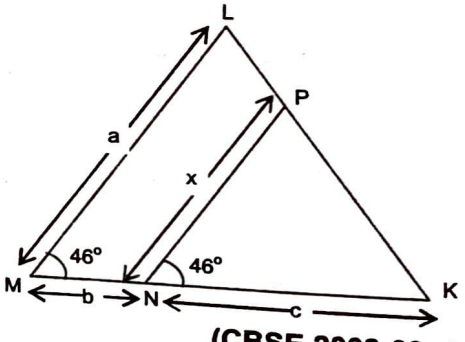
(CBSE 2007-08, 1 mark)

11. In figure $AD \perp BC$. Prove that
$AB^2 + CD^2 = BD^2 + AC^2$



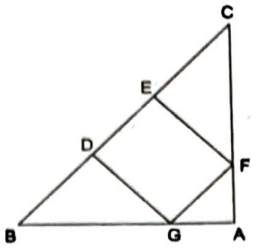
(CBSE 2007-08, 3 marks)

12. In figure $\angle M = \angle N = 46°$. Express x in terms of a, b and c where a, b, c are length of LM. MN and NK respectively.



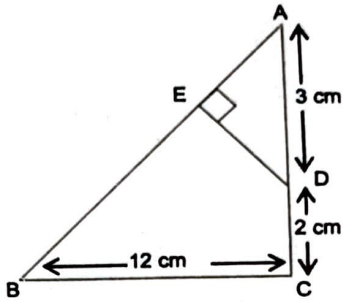
(CBSE 2008-09, 1 mark)

13. In figure DEFG is a square and $\angle BAC = 90°$. Show that $DE^2 = BD \times EC$.



(CBSE 2008-09, 3 marks)

14. In figure ΔABC is a right angled at C and $DE \perp AB$. Prove that $\Delta ABC \sim \Delta ADE$ and hence find the lengths of AE and DE.

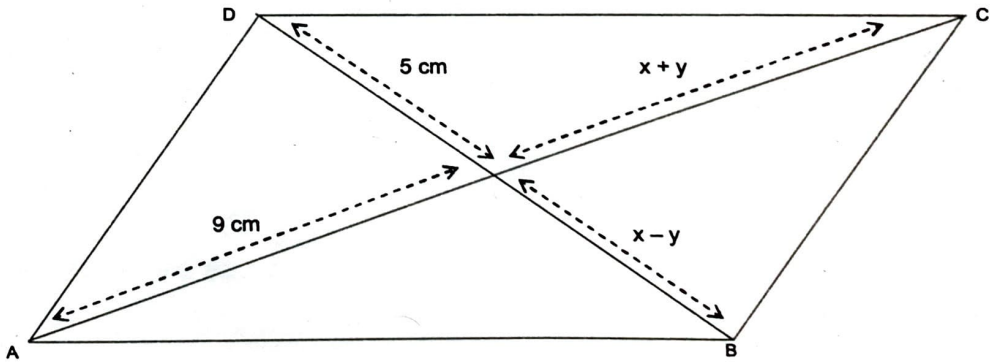


(CBSE 2008-09, 3 marks)

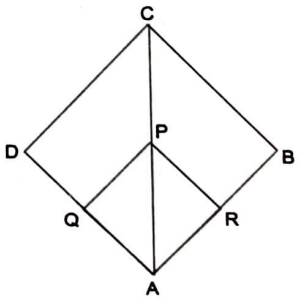
15. ΔABC and ΔPQR are similar triangles such that $\angle A = 32°$ and $\angle R = 65°$ then $\angle B$ is **(CBSE 2009-10, 1 mark)**

(A) 83° (B) 32°
(C) 65° (D) 97°

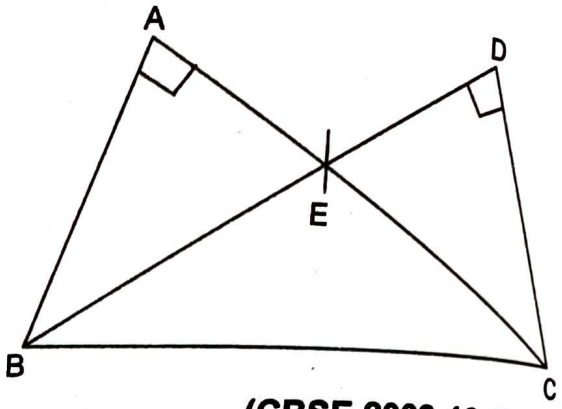
16. In figure, ABCD is a parallelogram. Find the value of x and y. **(CBSE 2009-10, 2 marks)**



17. In figure, $PQ \| CD$ and $PR \| CB$. Prove that $\frac{AQ}{QD} = \frac{AR}{RB}$. **(CBSE 2009-10, 2 marks)**

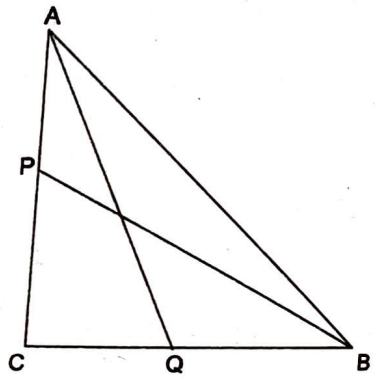


18. In figure, two triangles ABC and DBC are on the same base BC in which $\angle A = \angle D = 90^\circ$.
If CA and BD meet each other at E, show that $AE \times CE = BE \times DE$.



(CBSE 2009-10, 2 marks)

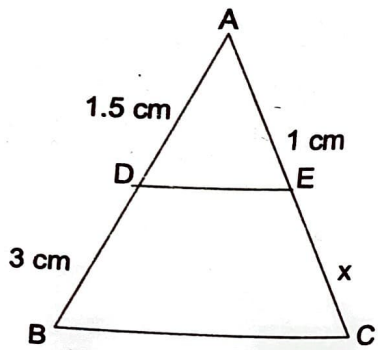
19. In figure, P and Q are the midpoints of the sides CA and CB respectively of ΔABC right angled at C.
Prove that $4\left(AQ^2 + BP^2\right) = 5AB^2$



(CBSE 2009-10, 3 marks)

20. The diagonals of a trapezium ABCD with $AB \parallel DC$ intersect each other at point O. If AB = 2CD, find the ratio of the areas of triangle AOB and COD.
(CBSE 2009-10, 3 marks)

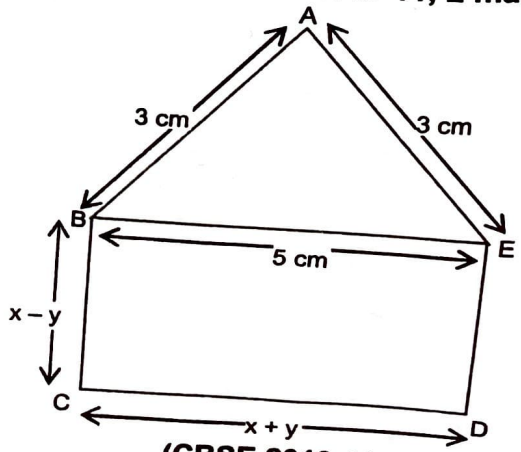
21. $DE \parallel BC$ then x equals to:
(A) 2.5 cm
(B) 2 cm
(C) 1.4 cm
(D) 4 cm



(CBSE 2010-11, 1 mark)

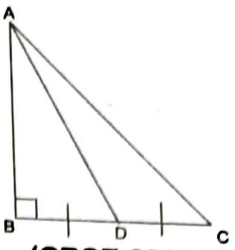
22. X and Y are points on the sides PQ and PR respectively of a ΔPQR. If the lengths of PX, QX, PY and YR (in centimeters) are 4,4.5, 8 and 9 respectively. Then show $XY \parallel QR$
(CBSE 2010-11, 2 marks)

23. In the figure below ABCDE is a pentagon with BE parallel to CD and BC is parallel to DE.
BC is perpendicular to CD. If the perimeter of ABCDE is 21 cm, find the value of x and y.



(CBSE 2010-11, 3 marks)

24. In figure, ΔABC is right angled at B and D is the mid point of BC. Prove that $AC^2 = 4AD^2 - 3AB^2$



(CBSE 2010-11, 3 marks)

25. Prove that in a right triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides.

(CBSE 2010-11, 4 marks)

26. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. Prove it

(CBSE 2010-11, 4 marks)

27. In ΔPQR, E and F points on the sides PQ and PR respectively such that $EF \| QR$. If PE = 6 cm, QE = 2 cm and FR = 3 cm, then find PF.

(CBSE 2013-14, 1 mark)

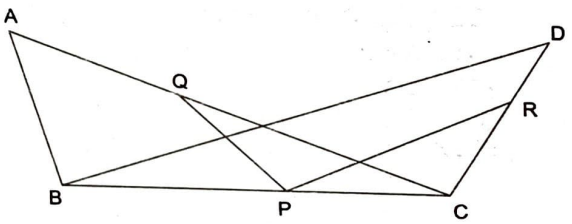
28. Find the side of a rhombus whose diagonal are of length 60 cm and 80 cm.

(CBSE 2013-14, 2 marks)

29. In ΔABC, perpendicular drawn from A intersects BC at D such that 3DB = CD. Prove that $2AB^2 = 2AC^2 - BC^2$

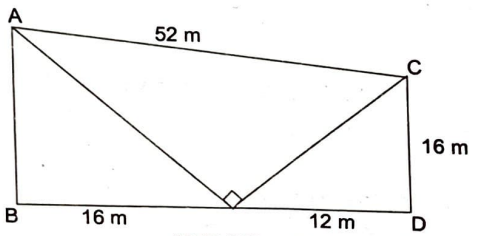
(CBSE 2013-14, 3 marks)

30. In the figure, ΔABC and ΔDBC have same base BC and lie on the same side. If $PQ \| BA$ and $PR \| BD$, then prove that $QR \| AD$.



(CBSE 2013-14, 3 marks)

31. In the given figure, AB and CD are two pillars P is a point on BD such that BP = 16 m and PD = 12 m. If CD = 16 m and AC = 52 m, then find AB and AP when it is given that $\angle APC = 90°$.



(CBSE 2013-14, 4 marks)

32. If $\Delta ABC \sim \Delta DEF$ and AX, DY are respectively the medians of ΔABC and ΔDEF. Then prove that

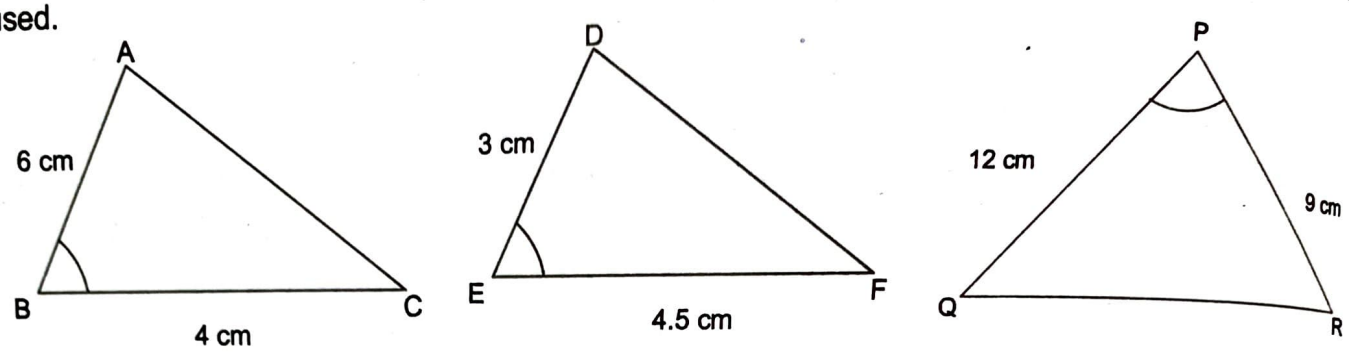
(A) $\Delta ABC \sim \Delta DEY$

(B) $\Delta ACX \sim \Delta DFY$

(C) $\frac{AX}{DY} = \frac{BC}{EF}$

(CBSE 2013-14, 4 marks)

33. State which of the two triangles given in the figure are similar. Also state the similarity criterion used.

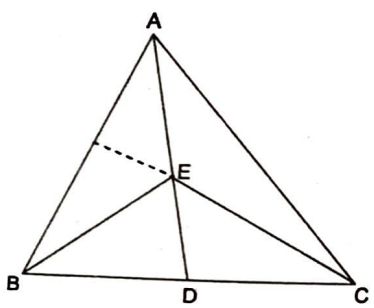


(CBSE 2014-15, 2 marks)

34. In a ΔABC, AD is perpendicular to BC and $AD^2 = BD \times CD$, Prove that ABC is a right angled Triangle.

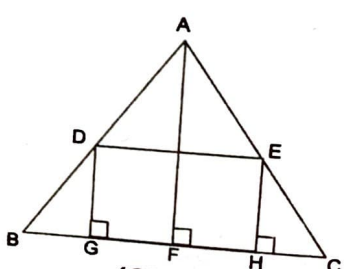
(CBSE 2014-15, 3 marks)

35. ΔABC and ΔEBC are in same base BC. If AE produced intersects BC at D, then prove that $\frac{ar(\Delta ABC)}{ar(\Delta EBC)} = \frac{AD}{ED}$



(CBSE 2014-15, 3 marks)

36. In the given figure, ABC is a triangle and GHED is a rectangle. BC = 12 cm,
HE = 6cm, FC = BF and altitude AF = 24 cm.
Find the area of the rectangle.



(CBSE 2014-15, 4 marks)

37. "In a triangle if square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle'. Prove it.

(CBSE 2014-15, 4 marks)

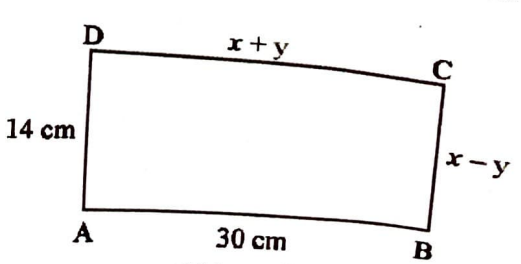
38. In ΔPQR, S and T are points in the sides PQ and PR respectively such that $ST \| QR$. If PS = 4 cm, PQ = 9 cm and PR = 4.5 cm, then find PT

(CBSE 2014-15, 1 mark)

39. Given $\Delta ABC \sim \Delta PQR$, if $\frac{AB}{PQ} = \frac{1}{3}$, then find $\frac{ar\,\Delta ABC}{ar\,\Delta PQR}$.

(CBSE 2017-18, 1 mark)

40. In figure, ABCD is a rectangle. Find the values of x and y.



(CBSE 2017-18, 2 marks)

41. Prove that the area of an equilateral triangle described on one side of the square is equal to half the area of the equilateral described on one of its diagonal.

OR

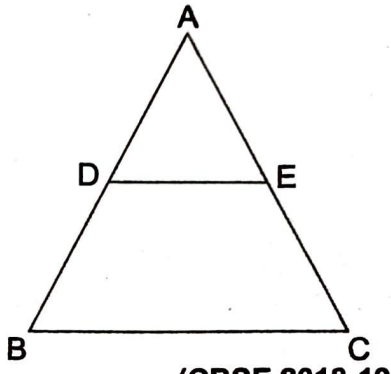
If the area of two similar triangles are equal, prove that they are congruent.

(CBSE 2017-18, 3 marks)

42. Prove that, in a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.

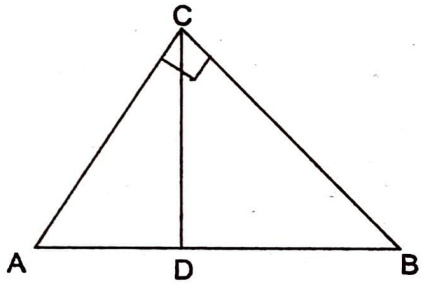
(CBSE 2017-18, 4 marks)

43. In figure $DE \| BC$, $AD = 1$ cm and $BD = 2$ cm. What is the ratio of the $ar(\Delta ABC)$ to the $ar(\Delta ADE)$?



(CBSE 2018-19, 1 mark)

44. In figure, $\angle ACB = 90^\circ$ and $CD \perp AB$, prove that $CD^2 = BD \times AD$.



OR

If P and Q are the points on side CA and CB respectively of ΔABC, right angled at C, prove that $(AQ^2 + BP^2) = (AB^2 + PQ^2)$

(CBSE 2018-19, 3 marks)

45. Prove that in a right angle triangle, the square of the hypotenuse is equal the sum of squares of the other two sides.

(CBSE 2018-19, 4 marks)

46. Given $\Delta ABC \sim \Delta PQR$, if $\frac{AB}{PQ} = \frac{1}{3}$, then $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} =$ _____.

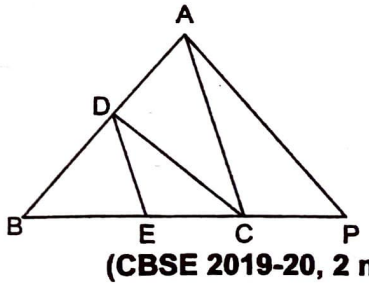
(CBSE 2019-20, 1 mark)

47. ABC is an equilateral triangle of side 2a, then length of one of its altitude is _____.

(CBSE 2019-20, 1 mark)

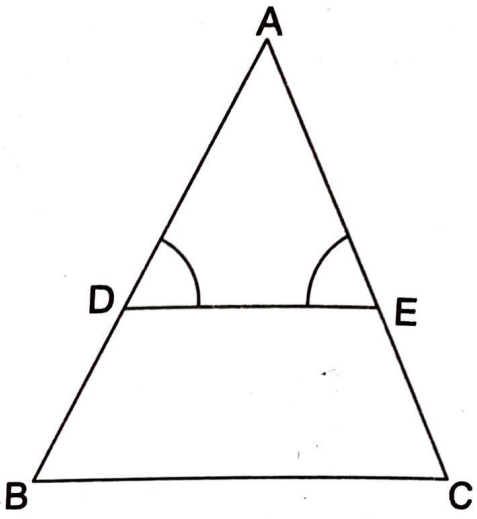
48. In figure , $DE \| AC$ and $DC \| AP$.

Prove that $\frac{BE}{EC} = \frac{BC}{CP}$.



(CBSE 2019-20, 2 marks)

49. In figure, $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$, prove that BAC is an isosceles triangle.

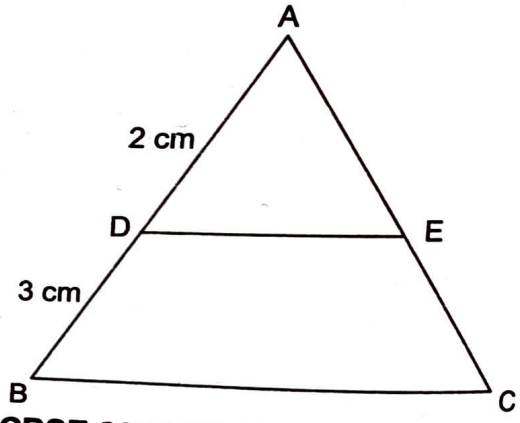


(CBSE 2019-20, 3 marks)

50. In a triangle, if square of one side is equal to the sum of the squares of the other two sides, then prove that the angle opposite to the first side is a right angle. **(CBSE 2019-20, 3 marks)**

51. In figure, $DE \| BC$, $AD = 2\,cm$ and BD = 3 cm, then $ar(\Delta ABC) : ar(\Delta ADE)$ is equal to:

(A) 4 : 25
(B) 2 : 3
(C) 9 : 4
(D) 25 : 4



(CBSE 2021-22, TERM-I, 1 mark)

52. In ΔABC and ΔDEF, $\angle F = \angle C$, $\angle B = \angle E$ and $AB = \frac{1}{2}DE$. Then, the two triangles are

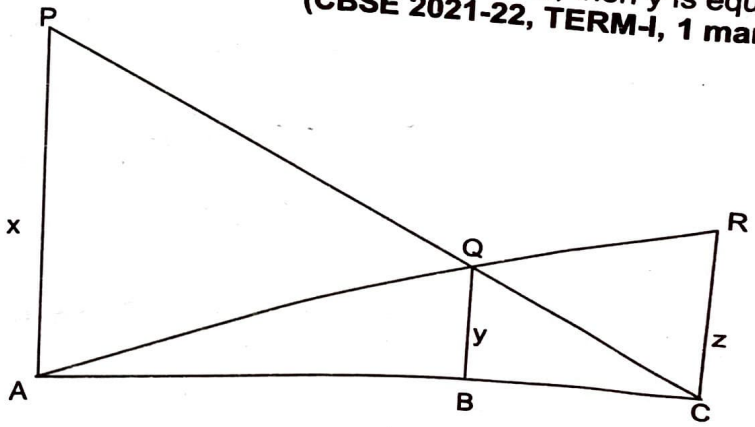
(A) Congruent, but not similar
(B) Similar, but not congruent
(C) Neither congruent nor similar
(D) Congruent as well as similar

(CBSE 2021-22, TERM-I, 1 mark)

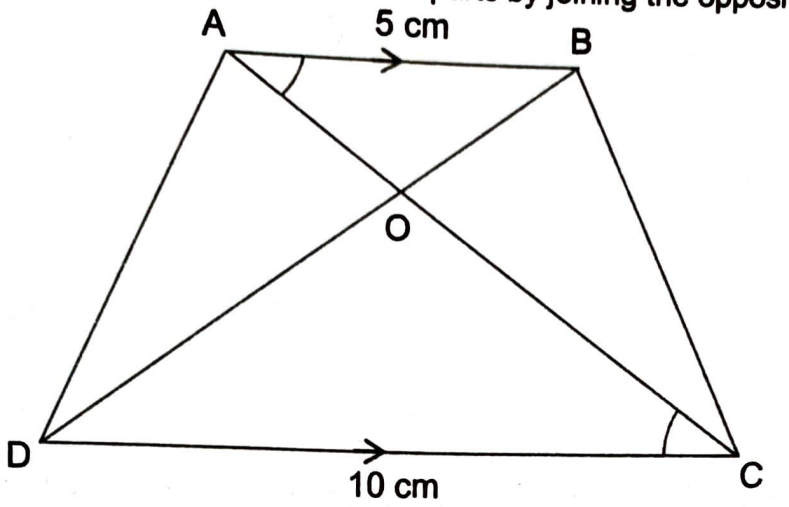
53. In figure, PA, QB and RC are each perpendicular to AC. If x = 8 cm and z = 6 cm, then y is equal to

(A) $\frac{56}{7}$cm
(B) $\frac{7}{56}$cm
(C) $\frac{25}{7}$cm
(D) $\frac{24}{7}$cm

(CBSE 2021-22, TERM-I, 1 mark)



54-58. **Case Study – II:** A farmer has a field in the shape of trapezium, whose map with scale 1 cm = 20 m, is given below: The field is divided into four parts by joining the opposite vertices.



Based on the above information, answer any four of the following questions:

54. The two triangular regions AOB and COD are **(CBSE 2021-22, TERM-I, 1 mark)**
(A) Similar by AA criterion
(B) Similar by SAS criterion
(C) Similar by RHS criterion
(D) Not similar

55. The ratio of the area of the ΔAOB to the area of ΔCOD, is **(CBSE 2021-22, TERM-I, 1 mark)**
(A) 4 : 1
(B) 1 : 4
(C) 1 : 2
(D) 2 : 1

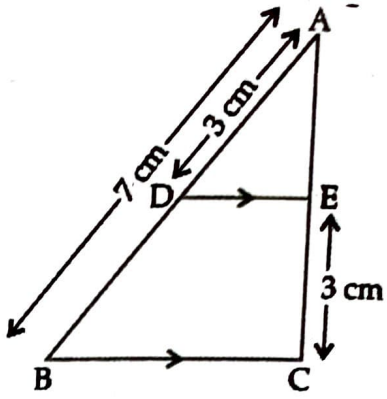
56. If the ratio of the perimeter of ΔAOB to the perimeter of ΔCOD would have been 1 : 4, then **(CBSE 2021-22, TERM-I, 1 mark)**
(A) AB = 2 CD
(B) AB = 4 CD
(C) CD = 2 AB
(D) CD = 4 AB

57. If in ΔAOD and BOC, $\frac{AO}{BC} = \frac{AD}{BO} = \frac{OD}{OC}$, then **(CBSE 2021-22, TERM-I, 1 mark)**
(A) $\Delta AOD \sim \Delta BOC$
(B) $\Delta AOD \sim \Delta BCO$
(C) $\Delta ADO \sim \Delta BCO$
(D) $\Delta ODA \sim \Delta OBC$

58. If the ratio of areas of two similar triangles AOB and COD is 1 : 4, then which of the following statements is true? **(CBSE 2021-22, TERM-I, 1 mark)**
(A) The ratio of their perimeters is 3 : 4
(B) The corresponding altitudes have a ratio 1 : 2
(C) The medians have a ratio 1 : 4
(D) The angle bisectors have a ratio 1 : 16

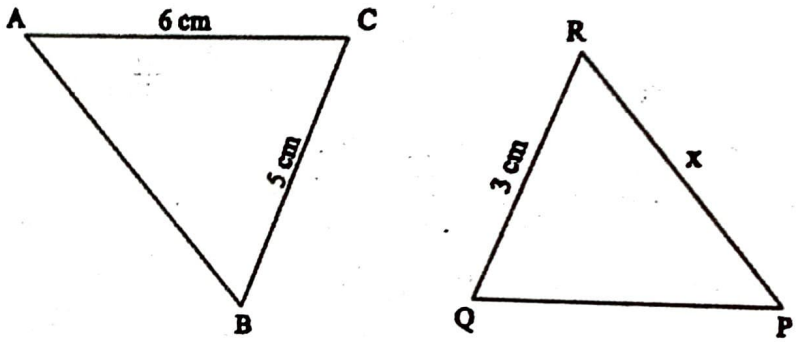
59. If $\Delta PQR \sim \Delta ABC$; PQ = 6 cm, AB = 8 cm and the perimeter of ΔABC is 36 cm, then the perimeter of ΔPQR is **(CBSE 2022-23, 1 mark)**
(A) 20.25 cm
(B) 27 cm
(C) 48 cm
(D) 64 cm

60. In the given figure, DE||BC. If AD = 3cm, AB = 7 cm and EC = 3 cm, then the length of AE is _____.
(A) 2 cm
(B) 2.25 cm
(C) 3.5 cm
(D) 4 cm



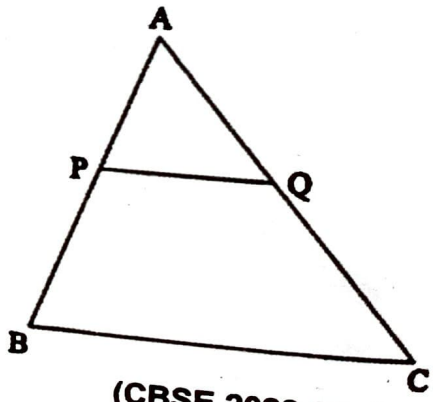
(CBSE 2022-23, 1 mark)

61. In the given figure, $\Delta ABC \sim \Delta QPR$. If AC = 6 cm, BC = 5 cm, QR = 3 cm and PR = x; then the value of x is:
(A) 3.6 cm
(B) 2.5 cm
(C)10 cm
(D) 3.2 cm



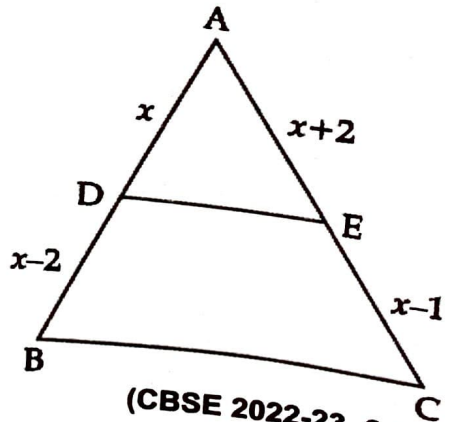
(CBSE 2022-23, 1 mark)

62. In ΔABC, PQ || BC. If PB = 6 cm, AP = 4 cm, AQ = 8 cm, find the length of AC.
(A) 12 cm
(B) 20 cm
(C) 6 cm
(D) 14 cm



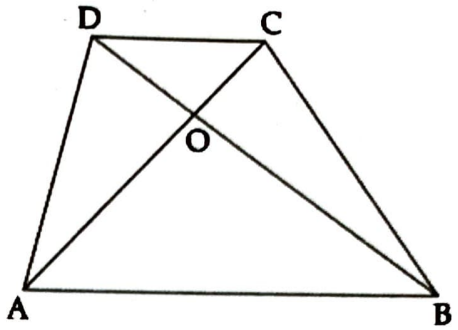
(CBSE 2022-23, 1 mark)

63. In the given figure, ABC is a triangle in which DE||BC. If AD = x, DB = x – 2, AE = x + 2 and EC = x – 1, then find the value of x.



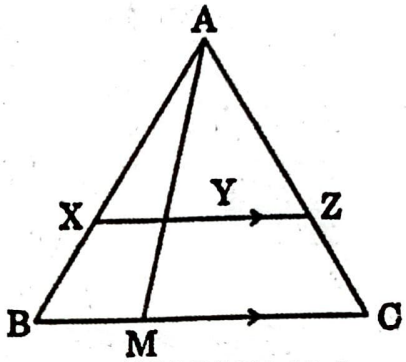
(CBSE 2022-23, 2 marks)

64. Diagonals AC and BD of trapezium ABCD with AB||DC intersect each other at point O. Show that $\frac{OA}{OC}=\frac{OB}{OD}$.



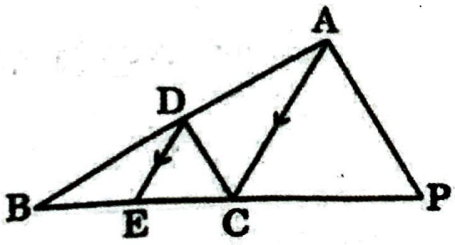
(CBSE 2022-23, 2 marks)

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



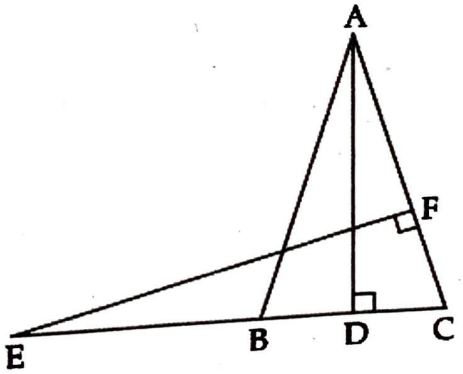
(CBSE 2022-23, 2 marks)

66. In the given figure, DE||AC and $\frac{BE}{EC}=\frac{BC}{CP}$. Prove that DC||AP.



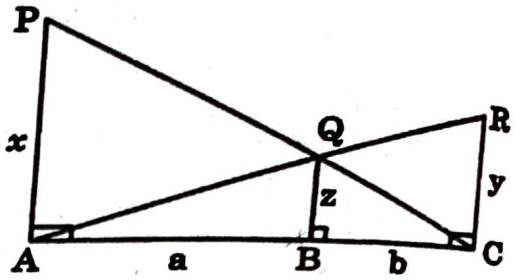
(CBSE 2022-23, 2 marks)

67. In the given figure, E is a point on the side CB produced of an isosceles triangle ABC with AB = AC. If AD ⊥ BC and EF ⊥ AC, them prove that ΔABD – ΔECF.



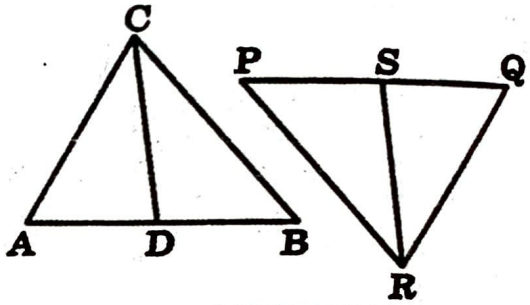
(CBSE 2022-23, 3 marks)

68. PA, QB and RC are each perpendicular to AC. If AP = x, QB = z, RC = y, AB = a and BC = b, then prove that $\frac{1}{x}+\frac{1}{y}=\frac{1}{z}$.



(CBSE 2022-23, 5 marks)

69. In the given figure, CD and RS are respectively the medians of ΔABC and ΔPQR. If ΔABC ~ ΔPQR. Then prove that:
(i) ΔADC ~ ΔPSR
(ii) AD × PR = AC × PS



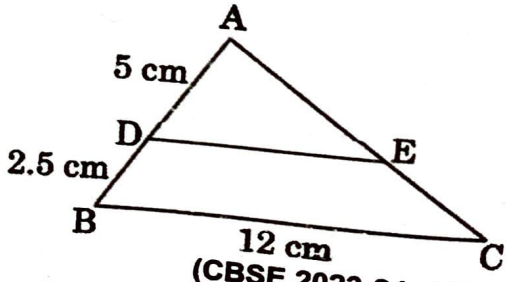
(CBSE 2022-23, 5 marks)

70. D is a point on the side BC of a triangle ABC such that ∠ADC = ∠BAC, prove that $CA^2 = CB \times CD$.
(CBSE 2022-23, 5 marks)

71. 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.
(CBSE 2022-23, 5 marks)

72. If AD an PM are medians of triangles ABC and PQR, respectively where ΔABC ~ ΔPQR, prove that $\frac{AB}{PQ}=\frac{AD}{PM}$.
(CBSE 2022-23, 5 marks)

73. In the given figure ΔABC is shown. DE is parallel to BC. If AD = 5 cm, DB = 2.5 cm and BC = 12 cm, then DE is equal to:

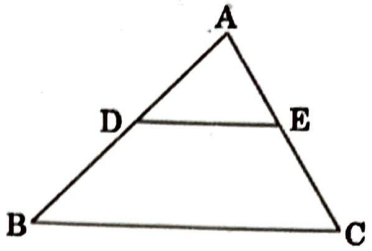


(A) 10 cm
(B) 6 cm
(C) 8 cm
(D) 7.5 cm
(CBSE 2023-24, 1 Mark)

74. The perimeters of two similar triangles ABC and PQR are 56 cm and 48 cm respectively. PQ/AB is equal to:
(CBSE 2023-24, 1 Mark)
(A) $\frac{7}{8}$
(B) $\frac{6}{7}$
(C) $\frac{7}{6}$
(D) $\frac{8}{7}$

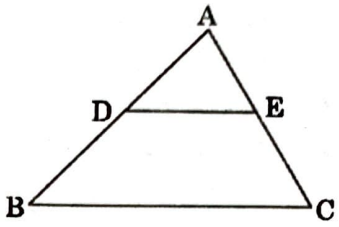
75. If the diagonals of a quadrilateral divide each other proportionally, then it is a:
(CBSE 2023-24, 1 Mark)
(A) parallelogram
(B) rectangle
(C) square
(D) trapezium

76. 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 ____.
(A) 2.5 (B) 3
(C) 5 (D) 6



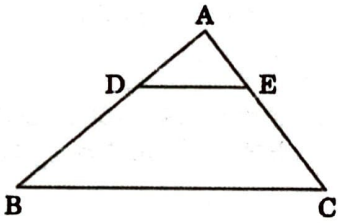
(CBSE 2023-24, 1 Mark)

77. In ΔABC, DE || BC (As shown in the figure). If AD = 4 cm, AB = 9 cm, AC = 13.5 cm, then the length of EC is ____.
(A) 6 cm (B) 7.5 cm
(C) 9 cm (D) 5.7 cm



(CBSE 2023-24, 1 Mark)

78. In the given figure, ΔABC, DE || BC. If AD = 2.4 cm, DB =- 4 cm and AE = 2 cm, then the length of AC is:
(A) $\frac{10}{3}$ cm (B) $\frac{3}{10}$ cm
(C) $\frac{16}{3}$ cm (D) 1.2 cm



(CBSE 2023-24, 1 Mark)

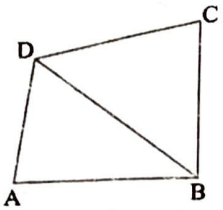
Direction: In Q. No 79 is Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labeled as Assertion (A) and the other is labeled as Reason (R). Select the correct answer to these questions from the codes (A). (B), (C) and (D) as given below: **(CBSE 2023-24, 1 Mark)**

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

79. Assertion (A): ABCD is a trapezium with DC | AB. E and F are points on AD and BC respectively, such that EF || AB, Then $\frac{AE}{ED} = \frac{BF}{FC}$.

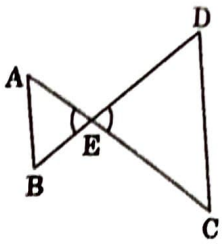
Reason (R): Any line parallel to parallel sides of a trapezium divide the non-parallel sides proportionally.

80. In the given figure, ABCD is a quadrilateral. Diagonal BD bisects $\angle B$ and $\angle D$ both:
Prove that:
(i) $\Delta ABD \sim \Delta CBD$
(ii) AB = BC



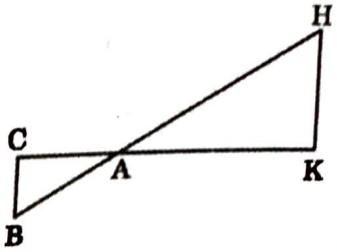
(CBSE 2023-24, 2 Marks)

81. In the given figure, $\frac{EA}{EC}=\frac{EB}{ED}$, prove that $\Delta EAB \sim \Delta ECD$



(CBSE 2023-24, 2 Marks)

82. In the given figure, $\Delta AHK \sim \Delta ABC$. If AK = 8 cm, BC = 3.2 cm and HK = 6.4 cm, then find the length of AC.



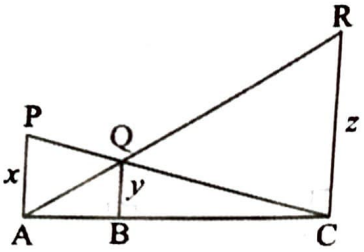
(CBSE 2023-24, 2 Marks)

83. (a) If a line 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.

(CBSE 2023-24, 5 Marks)

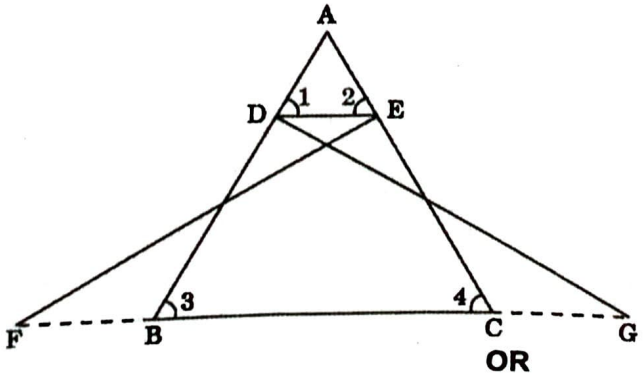
OR

(b) In the given figure PA, QB and RC are each perpendicular to AC. If AP = x, BQ = y and CR = z, then prove that $\frac{1}{x}+\frac{1}{z}=\frac{1}{y}$.



84. (a) In the given figure, $\Delta FEC \cong \Delta GDB$ and $\angle 1 = \angle 2$. Prove that $\Delta ADE \sim \Delta ABC$.

(CBSE 2023-24, 5 Marks)



OR

(b) Sides AB and AC and median AD of a ΔABC are respectively proportional to sides PQ and PR and median PM of another ΔPQR. Show that $\Delta ABC \sim \Delta PQR$.

85. (a) 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.

OR **(CBSE 2023-24, 5 Marks)**

(b) Sides AB and AC and median AD to ΔABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that $\Delta ABC \sim \Delta PQR$.

86. State and prove Basic Proportionality theorem. **(CBSE 2023-24, 5 Marks)**

87. (a) E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that $\Delta ABE \sim \Delta CFB$. **(CBSE 2023-24, 5 Marks)**

OR

(b) Sides AB, BC and the median AD of ΔABC are respectively proportional to sides to sides PQ, QR and the median PM of another ΔPQR prove that $\Delta ABC \sim \Delta PQR$.