MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

TRIANGLES

Others

1. ABC is a right triangle right-angled at $CandAC = \sqrt{3}BC$.

Prove that $\angle ABC = 60^0$.

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2. If A be the area of a right triangle and b one of the sides containing the right angle, prove that the length of the altitude

on the hypotenuse is $\frac{2AB}{\sqrt{b^4+4A^2}}$

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3. In an equilateral triangle ABC if $AD \perp BC$, then AD^2 = (a) CD^2 (b) $2CD^2$ (c) $3CD^2$ (d) $4CD^2$

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4. If a perpendicular is drawn from the vertex containing the right angle of a right triangle to the hypotenuse then prove that the triangle on each side of the perpendicular are similar to each other and to the original triangle. Also, prove that the square of the perpendicular is equal to the product of the lengths of the two parts of the hypotenuse.

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5. Prove that the line segments joining the mid-points of the sides of a triangle from four triangles, each of which is similar to the original triangle.

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6. If a perpendicular is drawn from the vertex containing the right angle of a right triangle to the hypotenuse then prove that the triangle on each side of the perpendicular are similar to each other and to the original triangle. Also, prove that the square of the perpendicular is equal to the product of the lengths of the two parts of the hypotenuse.

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7. In a right triangle ABC right-angled at B, if $PandQ$ are points on the sides $ABandAC$ respectively, then (a) $AQ^2 + CP^2 = 2\left(AC^2 + PQ^2\right)$ (b) $2\left(AQ^2 + CP^2\right) = AC^2 + PQ^2$ (c)$AQ^2 + CP^2 = AC^2 + PQ^2$ (d)$AQ + CP = \frac{1}{2}(AC + PQ)$.

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8. The diagonal BD of a parallelogram $ABCD$ intersects the segment AE at the point F, where E is any point on the side BC. Prove that $DF \cdot EF = FB \cdot FA$.

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9. ABC is a triangle in which $AB = AC$ and D is a point on AC such that $BC^2 = AC \times CD$.Prove that $BD = BC$.

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10. Two poles of height a metres and b metres are p metres apart. Prove that the height of the point of intersection of the lines joining the top of each pole to the foot of the opposite pole is given by $\frac{ab}{a+b}$ metres.

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11. In a triangle ABC , let P and Q be points on AB and AC respectively such that $PQ \| BC$. Prove that the median AD bisects PQ.

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12. ABC is an isosceles triangle with $AB = AC$ and D is a point on AC such that $BC^2 = ACXCD$. Prove that $BD = BC$.

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13. If $ABCD$ is quadrilateral and E and F are the mid-points of AC and BD respectively, prove that $\overrightarrow{A}B + \overrightarrow{A}D + \overrightarrow{C}B + \overrightarrow{C}D = 4\overrightarrow{E}F$.

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14. Through the mid-point M of the side CD of a parallelogram $ABCD$, the line BM is drawn intersecting AC at $LandAD$ produced at E. Prove that $EL = 2BL$.

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15. In a ABC, D and E are points on sides $ABandAC$ respectively such that $BD = CE$. If $\angle B = \angle C$, show that $DE \| BC$.

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16. Let ABC be a triangle and D and E be two points on side AB such that $AD = BE$. If $DP \| BC$ and $EQ \| AC$, Then prove that $PQ \| AB$.

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17. The side BC of a triangle ABC is bisected at D; O is any point in AD. BO and CO produced meet AC and AB in E and F respectively and AD is produced to X so that D is the

mid-point of OX. Prove that $AO : AX = AF : AB$ and show that $FE \| BC$.

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18. In Figure, ABC is a triangle in which $AB = AC$. Point D and E are points on the sides AB and AC respectively such that $AD = AE$. Show that the points B, C, E and D are concyclic.

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19. The bisector of interior $\angle A$ of $\triangle ABC$ meets BC and D and the bisector of exterior $\angle A$ meets BC produced in E. prove that $\frac{BD}{BE} = \frac{CD}{CE}$

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20. In three line segments OA, OB and OC, point L, M, N respectively are so chosen that $LM||AB$ and $MN||BC$ but neither of L, M, N nor of A, B, C are collinear. Show that $LN \mid\mid AC$.

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21. O is any point inside a triangle ABC . The bisector of $\angle AOB, \angle BOC$ and $\angle COA$ meet the sides AB, BC and CA in point D, E and F respectively. Show that $AD \cdot BE \cdot CF = DB \cdot EC \cdot FA$

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22. ABCD is a quadrilateral in which AB=AD . The bisector of BAC and CAD intersect the sides BC and CD at the points E and F respectively. Prove that EF||BD.

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23. In $\triangle ABC, D$ is the mid-point of BC and ED is the bisector of the $\angle ADB$ and EF is drawn parallel to BC cutting AC in F . Prove that $\angle EDF$ is a right angle.

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24. AD is a median of ΔABC . The bisector of $\angle ADB$ and $\angle ADC$ meet AB and AC in E and F respectively. Prove that EF||BC

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25. In Figure, ABC is a right triangle right angled at B and points $DandE$ trisect BC. Prove that $8AE^2 = 3AC^2 + 5AD^2$.

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26. In a triangle ABC, the angles at B and C are acute. If BE and CF be drawn perpendiculars on AC and AB respectively, prove that $BC^2 = AB \cdot BF + AC \cdot CE$.

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27. Prove that in any triangle the sum of squares of any two sides is equal to twice the square of half the third side together with twice the square of the median.

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28. AD is an altitude of an equilateral triangle ABC. On AD as base, another equilateral triangle ADE is constructed. Prove that Area (triangle ADE): Area (triangle ABC)=3:4.

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29. A ladder 15 m long reaches a window which is 9 m above the ground on one side of a street. Keeping its foot at the some point, the ladder is turned to other side of the street to reach a window 12 m high. Find the width of the street.

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30. Prove that three times the sum of the squares of the sides of a triangle is equal to four times the sum of the squares of the medians of the triangle.

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31. In Figure, D, E are points on sides AB and AC respectively of $\triangle ABC$, such that $ar(BCE) = ar(BCD)$. Show that $DE \| BC$.

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32. In the trapezium ABCD,AC and BD intersect at O and also AB=2CD If the area of $AOB = 84cm^2$, find the area of COD.

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33. ABC is an isosceles triangle right-angled at B. Similar triangles ACD and ABE are constructed on side AC and AB. Find the ratio between the areas of triangle ABE and triangle ACD.

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34. In Figure, $DE \| BC$ and $AD : DB = 4 : 5$. Find $\frac{Area(DEF)}{Area(CFB)}$.

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35. ABC is a right triangle right-angled at B. Let D and E be any points on AB and BC respectively. Prove that $AE^2 + CD^2 = AC^2 + DE^2$

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36. P and Q are the mid-points of the CA and CD respectively of a triangle ABC, right angled at C. Prove that:

$4AQ^2 = 4AC^2 + BC^2$, $4BP^2 = 4BC^2 + AC^2$, and $4(AQ^2 + BP^2) = 5AB^2$.

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37. A girl of height 90 cm is walking away from the base of a lamp-post at a speed of 1.2 m/s. If the lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds.

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38. If ABC is a right triangle right-angled at $BandM$, N are the mid-points of $ABandBC$ respectively, then $4(AN^2 + CM^2) =$

(A) $4AC^2$ (B) $5AC^2$ (C) $\frac{5}{4}AC^2$ (D) $6AC^2$

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39. Determine whether the triangle having sides $(a-1)cm, 2\sqrt{a}cm$ and $(a+1)cm$ is a right angled triangle.

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

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41. The perimeters of two similar triangles are 30cm and 20cm respectively. If one side of the first triangle is 12cm, determine the corresponding side of the second triangle.

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42. Two triangles $BACandBDC$, right angled at $AandD$ respectively, are drawn on the same base BC and on the same side of BC . If AC and DB intersect at P, prove that $AP \cdot PC = DP \cdot PB$.

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43. 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

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44. In Figure, $\angle BAC = 90^0$, AD is its bisector. If $DE \perp Ac$, prove that $DE \times (AB + AC) = AB \times AC$

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45. Prove that the line segments joints joining the mid-points of the adjacent sides of a quadrilateral from a parallelogram.

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46. In figure, P is the mid-point of BC, , Q is the mid-point of AP , such that BQ produced meets AC at R. Prove that $3RA = CA$

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47. A vertical stick 12m long casts a shadow 8m long on the ground. At the same time a tower casts the shadow 40m long onthe ground. Determine the height of the tower.

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48. In a quadrilateral $ABCD$, if bisectors of the $\angle ABC and \angle ADC$ meet on the diagonal AC, prove that the bisectors of $\angle BAD and \angle BCD$ will meet on the diagonal BD.

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49. In ABC, the bisector of $\angle B$ meets AC at D. A line $PQ \| AC$ meets AB, BC and BD at P, Q and R respectively. Show that (i) $PR \cdot BQ = QR \cdot BP$ (ii) $AB \cdot CQ = BC \cdot AP$

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50. The bisectors of the angles B and C of a triangle ABC, meet the opposite sides in D and E respectively. If DE||BC, prove that the triangle is isosceles.

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51. In ABC, $\angle B = 2\angle C$ and the bisector of $\angle B$ intersects AC at D. Prove that $\frac{BD}{DA} = \frac{BC}{BA}$

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52. In Figure, $DE \| BC$, if $AD = x, DB = x - 2, AE = x + 2$ and $EC = x - 1$, find the value of x.

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53. Lex X by any point on the side BC of a triangle ABC. If XM, XN are drawn parallel to BA and CA meeting CA, BA in M, N

respectively; MN meets BC produced in T, prove that $TX^2 = TB$ x TC

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54. In Figure PQ is parallel to MN. if $\frac{KP}{PM} = 4/13$ and $KN = 20.4cm$. Find KQ.

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55. In Figure DE||BC and CD||EF. Prove that $AD^2 = AB \cdot AF$.

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56. $DandE$ are respectively the points on the side $ABandAC$ of a ABC such that $AB = 5.6cm, AD = 1.4cm, AC = 7.2cm$

and $AE = 1.\ 8cm,$ show that $DE \mid\ \mid BC.$

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57. ABCD is a parallelogram. P is a point on the side BC DP when produced meets AB produced at L. Prove that $\frac{DP}{PL} = \frac{DC}{BL}$ (ii) $\frac{DL}{DP} = \frac{AL}{DC}$

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58. In Figure $DEAC$ and $DCap.$ Prove that $\frac{BE}{EC} = \frac{BC}{CP}$

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59. Prove that the area of equilateral triangle described on the side of a square is half the area of the equilateral triangle

described on its diagonal.

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60. Equilateral triangles are drawn on the sides of a right triangle. Show that the area of the triangle on the hypotenuse is equal to the sum of the areas of triangles on the other two sides.

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61. Two triangle ABC and DBC lie on the same side of the base BC . From a point P on BC, PQ||AB and PR||BD are drawn. They meet AC in Q and DC in R respectively. Prove that QR||AD`.

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62. $ABCD$ is a quadrilateral; $P, Q, RandS$ are the points of trisection of side AB ,BC ,CD and DA respectively and are adjacent to A and C ; prove that $PQRS$ is parallelogram.

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63. $ABCD$ is a parallelogram and APQ is a straight line meeting BC at $PandDC$ produced at Q. prove that the rectangle obtained by $BPandDQ$ is equal to the rectangle contained by $ABandBC$.

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64. ABCD is a quadrilateral in which P, Q, R and S are mid-points of the sides AB, BC, CD and DA. AC is a diagonal. Show that : (i) $SR \mid\mid AC$ and $SR = \frac{1}{2}AC$ (ii) $PQ = SR$ (iii) PQRS is a parallelogram

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65. Through the mid-point M of the side CD of a parallelogram $ABCD$, the line BM is drawn intersecting AC at $LandAD$ produced at E . Prove that $EL = 2BL$.

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66. D is the mid-point of side BC of a triangle ABC.AD is bisected at the point E and BE produced cuts AC at the point X. Prove that BE:EX=3:1.

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67. Fill in the blanks using the correct word given in brackets: (a) All circles are ..... (congruent, similar) (b) All squares are

..... (similar, congruent) (c) All ..... triangles are similar (isosceles, equilaterals):

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68. Fill in the blanks using the correct word given in brackets: Two triangles are similar, if their corresponding angles are ..... (proportional, equal) Two triangles are similar, if their corresponding sides are ..... (proportional, equal) (iii) Two polygons of the same number of sides are similar, if (a) their corresponding angles are and (b) their corresponding sides are ..... (equal, proportional).

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69. Write the truth value (T/F) of each of the following statements:(1) Any two similar figures are congruent.(2) Any two

congruent figures are similar. (3) Two polygons are similar, if their corresponding sides are proportional.

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70. Write the truth value (T/F) of each of the following statements: (1)Two polygons are similar if their corresponding angles are proportional. (2)Two triangles are similar if their corresponding sides are proportional. (3) Two triangles are similar if their corresponding angles are proportional.

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71. In a given $\triangle ABC, DE \| BC$ and $\frac{AD}{DB} = \frac{3}{5}$. If $AC = 5.6$, find AE.

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72. In Figure, $LM \mid\mid AB$ If $AL = x - 3$, $AC = 2x$, $BM = x - 2$ and $BC = 2x + 3$, find the value of x.

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73. In Fig. if $ST \mid\mid QR$. Find PS

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74. In Fig. (i) and (ii), $PQ \mid\mid BC$. Find QC in (i) and AQ in (ii)

(FIGURE)

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75. In Fig. if $EF||DC||AB$. Prove that $\frac{AE}{ED} = \frac{BF}{FC}$. (FIGURE)

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76. In Fig. if $EF||DC||AB$. Prove that $\frac{AE}{ED} = \frac{BF}{FC}$. (FIGURE)

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77. In Fig. if $PQ \mid\mid BC$ and $PR \mid\mid CD$. Prove that (i) $\frac{AR}{AD} = \frac{AQ}{AB}$ (ii) $\frac{QB}{AQ} = \frac{DR}{AR}$.

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78. Any point X inside DEF is joined to its vertices. From a point P in DX, PQ is drawn parallel to DE meeting XE at Q and QR

is drawn parallel to EF meeting XF in R . Prove that $PR \| DF$.

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79. In Fig. 4.31, if $\frac{AD}{DC} = \frac{BE}{EC}$ and $\angle CDE = \angle CED$, prove that CAB is isosceles. (FIGURE)

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80. In Fig. 4.32, $DE \| AQ$ and $DF \| AR$. Prove that $EF \| QR$. (FIGURE)

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81. In Fig. 4.33, $\frac{PS}{SQ} = \frac{PT}{TR}$ and $\angle PST = \angle PRQ$. Prove that PQR is an isosceles triangle. (FIGURE)

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82. In Fig. 4.34, A, B and C are points on OP, OQ and OR respectively such that $ABPQ$ and $BCQR$. Show that $ACPR$. (FIGURE)

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83. In a ABC , D and E are points on the sides AB and AC respectively such that $DE \| BC$ If $AD = 6\,cm$, $DB = 9\,cm$ and $AE = 8\,cm$, find AC .

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84. In a ABC , D and E are points on the sides AB and AC respectively such that DE/BC If $AD = 4$, $AE = 8$, $DB = x - 4$, and $EC = 3x - 19$, find x .

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85. In a ABC , D and E are points on the sides AB and AC respectively such that DE/BC If $AD = 2\,cm$, $AB = 6\,cm$ and $AC = 9\,cm$, find AE . .

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86. In a ABC , D and E are points on the sides AB and AC respectively such that $DEBC$ If $AD = 8x - 7$, $DB = 5x - 3$, $AE = 4x - 3$ and $EC = (3x - 1)$, find the value of x . .

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87. In a ABC, $D\ and\ E$ are points on the sides AB and AC respectively. For each of the following cases show that DE/BC : $AB = 12\ cm$, $AD = 8\ cm$, $AE = 12\ cm\ and\ AC = 18\ cm$.

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88. In a ABC, $D\ and\ E$ are points on the sides AB and AC respectively. For each of the following cases show that DE/BC : $AB = 10.8cm$, $BD = 4.5\ cm$, $AC = 4.8cm\ and\ AE = 2.8cm$.

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89. In a ABC , P and Q are point on the sides AB and AC respectively, such that PQ/BC . If $AP = 2.4cm$, $AQ = 2cm$, $QC = 3cm$ and $BC = 6cm$, find AB and PQ .

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90. In a ABC , D and E are points on AB and AC respectively such that $DE \| BC$. If $AD = 2.4cm$, $AE = 3.2cm$, $DE = 2cm$ and $BC = 5cm$, find BD and CE .

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91. In Fig. state if $PQ \| EF$

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92. M and N are points on the sides PQ and PR respectively of a PQR . For each of the following cases, state whether $MN \| QR$:

$(i) PM = 4cm,\ QM = 4.5cm,\ PN = 4cm,\ NR = 4.5cm$

$(ii) PQ = 1.28cm,\ PR = 2.56cm,\ PM = 0.16cm,$

$PN = 0.32cm$

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93. If D and E are points on sides AB and AC respectively of a triangle ABC such that $DE \| BC$ and $BD = CE$. Prove that ABC is isosceles.

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94. In Fig. 4.41, AD is the bisector of $\angle A$. If $BD = 4cm$, $DC = 3cm$ and $AB = 6cm$, determine AC . (FIGURE)

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95. In Fig. 4.42, AD is the bisector of $\angle BAC$. If $AB = 10cm$. $AC = 14cm$ and $BC = 6cm$, find BD and DC . (FIGURE)

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96. If the diagonal BD of a quadrilateral $ABCD$ bisects both $\angle B$ and $\angle D$, show that $\frac{AB}{BC} = \frac{AD}{CD}$.

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97. If the bisector of an angle of a triangle bisects the opposite side, prove that the triangle is isosceles.

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98. In triangle ABC, if AD is the bisector of $\angle A$, prove that: $\frac{Area(ABD)}{Area(ACD)} = \frac{AB}{AC}$

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99. BO and CO are respectively the bisectors of $\angle B$ and $\angle C$ of ABC. AO produced meets BC at P. Show that: $\frac{AB}{BP} = \frac{AO}{OP}$ (ii) $\frac{AC}{CP} = \frac{AO}{OP}$ (iii) $\frac{AB}{AC} = \frac{BP}{PC}$ (iv) AP is the bisector of $\angle BAC$.

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100. In a $\triangle ABC$, AD is the bisector of $\angle A$, meeting side BC at D. $(i) If BD = 2.5 cm$, $AB = 5 cm$ and $AC = 4.2 cm$, find DC. $(ii) If BD = 2 cm$, $AB = 5 cm$ and $DC = 3 cm$, find AC. $(iii) If AB = 3.5 cm$, $AC = 4.2 cm$ and $DC = 2.8 cm$, find BD.

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101. In a $\triangle ABC$, AD is the bisector of $\angle A$, meeting side BC at D. $(i) If AB = 10 cm$, $AC = 14 cm$ and $BC = 6 cm$, find BD and DC $(ii) If AC = 4.2 cm$, $DC = 6 cm$ and $BC = 10 cm$, find AB. $(iii) If AB = 5.6 cm$, $AC = 6 cm$ and $DC = 3 cm$, find BC.

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102. In a ABC , AD is the bisector of $\angle A$, meeting side BC at D . If $AD = 5.6cm$, $BC = 6cm$ and $BD = 3.2cm$, find AC . (ii) If $AB = 10cm$, $AC = 6cm$ and $BC = 12cm$, find BD and DC .

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103. In Fig. 4.57, AE is the bisector of the exterior $\angle CAD$ meeting BC produced in E . If $AB = 10cm$, $AC = 6cm$ and $BC = 12cm$, find CE . (FIGURE)

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104. In Fig. 4.58, ABC is a triangle such that $\frac{AB}{AC} = \frac{BD}{DC}$, $\angle B = 70o$, $\angle C = 50o$. Find $\angle BAD$. (FIGURE)

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105. In $\triangle ABC$ (Figure), if $\angle 1 = \angle 2$, prove that $\frac{AB}{AC} = \frac{BD}{DC}$.

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106. D, E and F are the points on sides BC, CA and AB respectively of ABC such that AD bisects $\angle A$, BE bisects $\angle B$ and CF bisects $\angle C$. If $AB = 5cm$, $BC = 8cm$ and $CA = 4cm$, determine AF, CE and BD.

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107. In Fig. 4.60, check whether AD is the bisector of $\angle A$ of ABC in the following: (FIGURE)

$AB = 5cm$, $AC = 10cm$, $BD = 1.5cm$ and $CD = 3.5cm$

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108. In given figure, check whether AD is the bisector of ∠ A of △ ABC in each of the following: (i) AB = 5 cm, AC = 10 cm, BD = 1.5 cm and CD = 3.5 cm (ii) AB = 4 cm, AC = 6 cm, BD = 1.6 cm and CD = 2.4 cm (iii) AB = 8 cm, AC = 24 cm, BD = 6 cm and BC = 24 cm (iv) AB = 6 cm, AC = 8 cm, BD = 1.5 cm and CD = 2 cm (v) AB = 5 cm, AC = 12 cm, BD = 2.5 cm and BC = 9 cm

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109. In Fig. , AD bisects $\angle A$, $AB = 12cm$, $AC = 20cm$ and $BD = 5cm$, determine CD

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110. In Fig. $AB \mid\mid DC$. Find the value of x

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111. In Fig. if $AB \mid\mid CD$, find the value of x.

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112. In Figure, if $AB \mid\mid CD$ find the value of x.

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113. In Fig. $AB \mid\mid CD$. If $OA = 3x - 19$, $OB = x - 4$, $OC = x - 3$ and $OD = 4$, find x.

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114. State which pairs of triangles in Figure are similar. Write the similarity criterion used by you for answering the question and also write the pairs of similar triangles in the symbolic form:

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115. In Fig. 4.87, find $\angle F$. (FIGURE)

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116. In Fig. 4.88, $ACB \sim APQ$. If $BC = 8cm$, $PQ = 4cm$, $BA = 6.5cm$, $AP = 2.8cm$, find CA and AQ . (FIGURE)

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117. In Fig. 4.89, if $EDC \sim EBA$, $\angle BEC = 115o$ and $\angle EDC = 70o$. Find $\angle DEC$, $\angle DCE$, $\angle EAB$, $\angle AEB$ and $\angle EBA$. (FIGURE)

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118. In Fig. 4.90, if $POS \sim ROQ$, prove that $PSQR$. (FIGURE)

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119. In Fig. 4.90, if $PS \| QR$, prove that $POS \sim ROQ$. (FIGURE)

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

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121. In Figure, $\angle CAB = 90$ and $AD \perp BC$. If $AC = 75cm$, $AB = 1m$ and $BD = 1.25m$ find AD.

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122. The perimeters of two similar triangles ABC and PQR are respectively 36cm and 24cm. If $PQ = 10cm$, find AB .

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123. In Figure if $\angle ADE = \angle B$ show that $ADE \sim ABC$. If $AD = 3.8cm$, $AE = 3.6cm$, $BE = 2.1cm$ and $BC = 4.2cm$, find DE.

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124. In Figure, $\frac{AO}{OC} = \frac{BO}{OD} = \frac{1}{2}$ and $AB = 5cm$. Find the value of DC.

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125. In Fig. 4.97, if $\angle A = \angle C$, then prove that $AOB \sim COD$.

(FIGURE)

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126. In Fig. if $AB \perp BC$ and $DE \perp AC$. Prove that $ABC \sim AED$

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127. In Fig. 4.99, if $\angle P = \angle RTS$, prove that $RPQ \sim RTS$. (FIGURE)

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128. In Fig., if $\frac{QT}{PR} = \frac{QR}{QS}$ and $\angle 1 = \angle 2$. Prove that $PQS \sim TQR$. (FIGURE)

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129. In Fig. 4.101, AD and CE are two altitudes of ABC. Prove that $AEF \sim CDF$ (ii) $ABD \sim CBE$

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130. In Fig. 4.102 (i) and (ii) , if CD and GH $(D\ and\ H$ lie on AB and FE) are respectively bisectors of $\angle ACB$ and $\angle EGF$ and $ABC\sim FEG$, prove that (FIGURE) $DCA\sim HGF$ (ii) $\frac{CD}{GH}=\frac{AC}{FG}$ (iii) $DCB\sim HGE$

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131. In Figure, CD and GH are respectively the medians of ABC and EFG . If $ABC\sim FEG$, prove that $(i)ADC\sim FHG$ $(ii)\frac{CD}{GH}=\frac{AB}{FE}$ $(iii)CDB\sim GHE$

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132. In Figure, if $BD \perp AC$ and $CE \perp AB$, prove that $(i) \triangle AEC \sim \triangle ADB \, (ii) \frac{CA}{AB} = \frac{CE}{DB}$

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

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134. In Fig. 4.106, considering triangles BEP and CPD , prove that $BP \times PD = EP \times PC$ (FIGURE)

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135. P and Q are points on sides AB and AC respectively of ABC. If $AP = 3cm$, $PB = 6cm$, $AQ = 5cm$ and $QC = 10cm$, show that $BC = 3\,PQ$.

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136. In Figure, express x in terms of a, b and c.

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137. In Figure, $\angle BAC = 90\cdot$ and segment $AD \perp BC$. Prove that $AD^2 = BD \times DC$.

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138. In $\triangle ABC$, if $AD \perp BC$ and $AD^2 = BD \times DC$, prove that $\angle BAC = 90^\circ$.

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139. In a ABC, BD and CE are the altitudes. Prove that ADB and AEC are similar. Is $CDB \sim BEC$?

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140. In Figure, $ABCD$ is a trapezium with $AB \| DC$. If $\triangle AED$ is similar to $\triangle BEC$, prove that $AD = BC$.

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141. If E is a point on side AD produced of a parallelogram ABCD and BE intersects CD at F , Prove that $\triangle ABE \sim \triangle CFB$.

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142. In Figure, ABC is a right triangle right angled at B and D is the foot of the the perpendicular drawn from B on AC . If $DM \perp BC$ and $DN \perp AB$, prove that: $(i) DM^2 = DN \times MC$ $(ii) DN^2 = DM \times AN$

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143. In Figure, AD and BE are respectively perpendiculars to BC and AC . Show that: $(i) \triangle ADC \sim \triangle BEC$ $(ii) CA \times CE = CB \times CD$ $(iii) \triangle ABC \sim \triangle DEC$ $(iv) CD \times AB = CA \times DE$

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144. In Fig. 4.124, E is a point on side CB produced of an isosceles triangle ABC with $AB = AC$. If $AD \perp BC$ and $EF \perp AC$, prove that (i) $\triangle$ ABD~ $\triangle$ ECF (ii) $AB \times EF = AD \times EC$. (FIGURE)

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145. In Fig. 4.125, $FEC \cong GBD$ and $\angle 1 = \angle 2$. Prove that $ADEABC$. (FIGURE)

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146. In Fig. 4.126, $\frac{OA}{OC} = \frac{OD}{OB}$. Prove that $\angle A = \angle C$ and $\angle B = \angle D$. (FIGURE)

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147. In Figure, $DEFG$ is a square and $\angle BAC = 90$. Prove that (i) A G F ~ D B G $(ii) AGF \sim EFC$ (iii) D B G ~ E F C $(iv) DE^2 = BDxEC$

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148. In ABC, DE is parallel to base BC, with D on AB and E on AC. If $\frac{AD}{DB} = \frac{2}{3}$, find $\frac{BC}{DE}$.

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149. In Figure, if $AD \perp BC$ and $\frac{BD}{DA} = \frac{DA}{DC}$, prove that ABC is a right triangle.

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150. In Figure, if $\triangle ABE \cong \triangle ACD$, prove that $\triangle ADE \sim \triangle ABC$.

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151. In Figure, $\angle ACB = 90^{\circ}$ and $CD \perp AB$. Prove that $\frac{CB^2}{CA^2} = \frac{BD}{AD}$

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152. In Figure, $\triangle ACB \sim \triangle APQ$. If $BC = 8cm$, $PQ = 4cm$, $BA = 6.5cm$ and $AP = 2.8cm$, find CA and AQ.

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153. A vertical stick 10 cm long casts a shadow 8 cm long. At the same time a tower casts a shadow 30m long. Determine the height of the tower.

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154. In Figure, $AB \parallel QR$. Find the length of PB.

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155. In Fig. 4.138, $XY \parallel BC$. Find the length of XY.

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156. In a right angled triangle with sides a and b and hypotenuse c , the altitude drawn on the hypotenuse is x . Prove that $ab = cx$.

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157. In Figure, $\angle ABC = 90^o$ and $BD \perp AC$. If $BD = 8cm$, $AD = 4cm$, find CD .

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158. In Fig. 4.140, $\angle ABC = 90o$ and $BD \perp AC$. If $AB = 5.\ 7cm$, $BD = 3.\ 8\ cm$ and $CD = 5.\ 4cm$, find BC . (FIGURE)

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159. In Figure $DE \mid \mid BC$ such that AE = (1/4) AC If $AB = 6cm$, then 'f i n d' AD`.

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160. In Fig. 4.142, $PA,\ QB$ and RC are each perpendicular to AC. Prove that $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$. (FIGURE)

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161. In Fig. 4.143, $\angle A = \angle CED$, prove that $CAB \sim CED$. Also, find the value of x. (FIGURE)

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162. The perimeters of two similar triangles are 25cm and 15cm respectively. If one side of first triangle is 9cm, what is the corresponding side of the other triangle?

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163. In ABC and DEF, it is being given that: $AB = 5cm$, $BC = 4cm$ and $CA = 4.2cm$; $DE = 10cm$, $EF = 8cm$ and $FD = 8.4cm$. If $AL \perp BC$ and $DM \perp EF$, find $AL : DM$.

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164. D and E are the points on the sides AB and AC respectively of a triangle ABC such that:

$AD = 8cm$, $DB = 12cm$, $AE = 6cm$ and $CE = 9cm$. Prove that $BC = 5/2\, DE$.

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165. In ABC , AL and CM are the perpendiculars from the vertices A and C to BC and AB respectively. If AL and CM intersect at O , prove that: (i) triangle OMA is similar to triangle OLC (ii) $\frac{OA}{OC} = \frac{OM}{OL}$

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166. In Fig. 4.144, we have $AB \parallel CD \parallel EF$. If $AB = 6cm$, $CD = x\ cm$, $EF = 10cm$, $BD = 4cm$ and $DE = y\ cm$, calculate the values of x and y . (FIGURE)

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167. In Fig. 4.145, if $AB \perp BC$, $DC \perp BC$ and $DE \perp AC$, prove that $CED \sim ABC$. (FIGURE)

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168. In an isosceles triangle ABC, where $CA = CB$ the base AB is produced both the ways to P and Q respectively, such that $AP \times BQ = AC^2$. Prove that triangle APC is similar to triangle BCQ.

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169. Diagonals AC and BD of a trapezium $ABCD$ with AB, DC intersect each other at the point O. Using similarity criterion for two triangles, show that $\frac{OA}{OC} = \frac{OB}{OD}$.

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170. If ABC and AMP are two right triangles, right angled at B and M respectively such that $\angle MAP = \angle BAC$. Prove that $\frac{CA}{PA} = \frac{BC}{MP}$

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171. A vertical stick of length 6m casts a shadow 4m long on the ground and at the same time a tower casts a shadow 32m long. Find the height of the tower.

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172. In Fig. ABC is right angled at C and $DE \perp AB$. Prove that $ABC \sim ADE$ and hence find the length of AE and DE

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173. If $ABC \sim DEF$ such that $AB = 1.\ 2cm$ and $DE = 1.\ 4cm$. Find the ratio of areas of ABC and DEF.

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174. In two similar triangles ABC and PQR, if their corresponding altitudes AD and PS are in the ratio 4:9, find the ratio of the areas of triangle ABC and triangle PQR.

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175. If $\Delta ABC \sim \Delta DEF$ such that area of ΔABC is $9\ cm^2$ and the area of ΔDEF is $16\ cm^2$ and $BC = 2.\ 1$ cm. Find the length of EF.

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176. In Fig. 4.166, PB and QA are perpendiculars to segment AB. If $PO = 5cm$, $QO = 7cm$ and Area $POB = 150\,cm^2$ find the area of QOA . (FIGURE)

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177. 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.

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178. In Fig. 4.170, $ABCD$ is a trapezium in which $AB \parallel DC$ and $AB = 2\,DC$. Determine the ratio of the areas of AOB and

COD . (FIGURE)

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179. $D,\ E,\ F$ are the mid-points of the sides $BC,\ CA$ and AB respectively of a ΔABC . Determine the ratio of the areas of DEF and ABC .

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180. D and E are points on the sides AB and AC respectively of a ABC such that $DEBC$ and divides ABC into two parts, equal in area, find $\frac{BD}{AB}$.

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181. Two isosceles triangles have equal vertical angles and their areas are in the ratio $16:25$. Find the ratio of their corresponding heights.

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182. In Fig. 4.176, $XY \mid\mid AC$ and XY divides triangular region ABC into two parts equal in area. Determine $\frac{AX}{AB}$.

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183. Triangles ABC and DEF are similar. If area $(ABC) = 16\ cm^2$, area $(DEF) = 25\ cm^2$ and $BC = 2.3cm$, find EF. (ii) If area $(ABC) = 9\ cm^2$, area $(DEF) = 64\ cm^2$ and $DE = 5.1cm$, find AB. (iii) If $AC = 19cm$ and $DF = 8cm$, find the ratio of the area of two triangles.

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184. Triangles ABC and DEF are similar. If area $(ABC) = 36\,cm^2$, area $(DEF) = 64\,cm^2$ and $DE = 6.2cm$, find AB. (ii) If $AB = 1.2cm$ and $DE = 1.4cm$, find the ratio of the areas of ABC and DEF .

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185. In Fig. 4.177, $ACB \sim APQ$. If $BC = 10cm$, $PQ = 5cm$, $BA = 6.5cm$ and $AP = 2.8cm$ find CA and AQ . Also, find the area $(ACB) : area\,(APQ)$. (FIGURE)

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186. The areas of two similar triangles are $81\,cm^2$ and $49\,cm^2$ respectively. Find the ratio of their corresponding heights. What is the ratio of their corresponding medians?

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187. The areas of two similar triangles are $169\,cm^2$ and $121\,cm^2$ respectively. If the longest side of the larger triangle is 26cm, find the longest side of the smaller triangle.

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188. Two isosceles triangles have equal vertical angles and their areas are in the ratio $36:25$. Find the ratio of their corresponding heights.

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189. The areas of two similar triangles are $25\,cm^2$ and $36\,cm^2$ respectively. If the altitude of the first triangle is 2.4cm, find the corresponding altitude of the other.

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190. The corresponding altitudes of two similar triangles are 6 cm and 9 cm respectively. Find the ratio of their areas.

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191. ABC is a triangle in which $\angle A = 90^o$, $AN \perp BC$, $BC = 12cm$ and $AC = 5cm$. Find the ratio of the areas of ANC and ABC.

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192. In Fig. 4.178, $DE \parallel BC$ (FIGURE) (i) If $DE = 4cm$, $BC = 6cm$ and Area $(ADE) = 16\,cm^2$, find the area of ABC. (ii) If $DE = 4cm$, $BC = 8cm$ and Area $(ADE) = 25\,cm^2$, find the area of ABC. (iii) If $DE : BC = 3 : 5$. Calculate the ratio of the areas of ADE and the trapezium $BCED$.

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193. In ABC, D and E are the mid-points of AB and AC respectively. Find the ratio of the areas of ADE and ABC.

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194. In Figure, $\triangle ABC$ and $\triangle DBC$ are on the same base BC. If AD and BC intersect at O, prove that $\frac{Area\,(ABC)}{Area\,(DBC)} = \frac{AO}{DO}$.

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195. $ABCD$ is a trapezium in which AB is parallel to CD. The diagonals AC and BD intersect at O. Prove that (i) $AOB \sim COD$ (ii) If $OA = 6cm$, $OC = 8cm$, Find: $\frac{Area\,(AOB)}{Area\,(COD)}$ (b) $\frac{Area\,(AOD)}{Area\,(COD)}$

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196. In ABC, P divides the side AB such that $AP : PB = 1 : 2$. Q is a point in AC such that $PQBC$. Find the ratio of the areas of APQ and trapezium $BPQC$.

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197. The areas of two similar triangles are $100\,cm^2$ and $49\,cm^2$ respectively. If the altitude of the bigger triangle is 5 cm, find the corresponding altitude of the other.

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

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199. If $\Delta ABC \sim \Delta DEF$ such that $AB = 5cm$, area $(\Delta ABC) = 20\,cm^2$ and area $(\Delta DEF) = 45\,cm^2$, determine

DE.

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200. In ABC, PQ is a line segment intersecting AB at P and AC at Q such that $PQBC$ and PQ divides ABC into two parts equal in area. Find $\frac{BP}{AB}$.

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201. The areas of two similar triangles ABC and PQR are in the ratio $9:16$. If $BC = 4.5cm$, find the length of QR.

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202. ABC is a triangle and PQ is a straight line meeting AB in P and AC in Q . If $AP = 1cm$, $PB = 3cm$, $AQ = 1.5cm$, $QC = 4.5cm$, prove that area of ΔAPQ is one-sixteenth of the area of ΔABC .

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203. If D is a point on the side AB of $\triangle ABC$ such that $AD : DB = 3 : 2$ and E is a point on BC such that $DE \| AC$. Find the ratio of areas of $\triangle ABC$ and $\triangle BDE$.

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204. In Figure, ABC is an obtuse triangle, obtuse angled at B . If $AD \perp CB$, prove that $AC^2 = AB^2 + BC^2 + 2\,BC \times BD$.

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205. In Figure, $\angle B$ of ABC is an acute angle and $AD \perp BC$, prove that $AC^2 = AB^2 + BC^2 - 2\,BC \times BD$

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206. A right triangle has hypotenuse of length $p\,cm$ and one side of length $q\,cm$. If $p - q = 1$, find the length of the third side of the triangle.

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207. The sides of certain triangles are given below. Determine which of them are right triangles: (i) $a = 6cm$, $b = 8cm$ and $c = 10cm$ (ii) $a = 5cm$, $b = 8cm$ and $c = 11cm$.

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208. A man goes 10m due east and then 24 m due north. Find the distance from the starting point.

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209. A ladder is placed in such a way that its foot is at a distance of 5m from a wall and its tip reaches a window 12 m above the ground. Determine the length of the ladder.

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210. A ladder 25m long reaches a window of a building 20m above the ground. Determine the distance of the foot of the ladder from the building.

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

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212. In Fig. 4.192, ABC is a right triangle right-angled at B . AD and CE are the two medians drawn from A and C respectively. If $AC = 5cm$ and $AD = \frac{3\sqrt{5}}{2}cm$, find the length of CE . (FIGURE)

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213. The perpendicular AD on the base BC of a triangle ABC intersects BC at D so that $DB = 3CD$. Prove that $2\,AB^2 = 2\,AC^2 + BC^2$.

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214. ABC is a right triangle right-angled at C. Let $BC = a,\ CA = b,\ AB = c$ and let p be the length of perpendicular from C on AB, prove that (i) $cp = ab$

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215. Prove that three times the square of any side of an equilateral-triangle is equal to four times the square of the altitude.

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216. In an equilateral triangle with side a , prove that Altitude $= \frac{a\sqrt{3}}{2}$ (ii) Area $= \frac{\sqrt{3}}{4}a^2$

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217. ABC is an isosceles right triangle right-angled at C . Prove that $AB^2 = 2AC^2$.

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218. In an isosceles triangle ABC with $AB = AC$, BD is perpendicular from B to the side AC . Prove that $BD^2 - CD^2 = 2\,CDAD$

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219. ABC is a triangle in which $AB = AC$ and D is any point in BC. Prove that $AB^2 - AD^2 = BDCD$.

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220. In ABC, AD is perpendicular to BC. Prove that: $AB^2 + CD^2 = AC^2 + BD^2$ (ii) $AB^2 - BD^2 = AC^2 - CD^2$

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221. From a point O in the interior of a ABC, perpendiculars OD, OE and OF are drawn to the sides BC, CA and AB respectively. Prove that: (i) $AF^2 + BD^2 + CE^2 = OA^2 + OB^2 + OC^2 - OD^2 - OE^2 - OF^2$ (ii) $AF^2 + BD^2 + CE^2 = AE^2 + CD^2 + BF^2$

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222. A point O in the interior of a rectangle $ABCD$ is joined with each of the vertices A, B, C and D. Prove that $OB^2 + OD^2 = OC^2 + OA^2$

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223. $ABCD$ is a rhombus. Prove that $AB^2 + BC^2 + CD^2 + DA^2 = AC^2 + BD^2$

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224. In a triangle ABC, $AC > AB$, D is the mid-point of BC and $AE \perp BC$. Prove that: (i) $AB^2 = AD^2 - BC \cdot DE + \frac{1}{4}BC^2$

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225. In a triangle ABC, $AC > AB$, D is the mid-point of BC and $AE \perp BC$. Prove that: (i) $AB^2 = AD^2 - BC.DE + \frac{1}{4}BC^2$ (ii) $AB^2 + AC^2 = 2AD^2 + \frac{1}{2}BC^2$

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226. In an equilateral triangle ABC the side BC is trisected at D. Prove that $9AD^2 = 7AB^2$

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227. In a $\triangle ABC$, $AD \perp BC$ and $AD^2 = BD \times CD$. Prove that ABC is a right triangle.

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

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229. ABC is an isosceles triangle with $AC = BC$. If $AB^2 = 2\,AC^2$, prove that ABC is right triangle.

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230. In PQR, $QM \perp PR$ and $PR^2 - PQ^2 = QR^2$. Prove that $QM^2 = PM \times MR$

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231. Prove that the sum of the squares of the diagonals of parallelogram is equal to the sum of the squares of its sides.

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232. In a right triangle ABC right-angled at C, P and Q are the points on the sides CA and CB respectively, which divide these sides in the ratio $2:1$. Prove that 9AQ^2=9AC^2+4BC^2

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233. If the sides of a triangle are 3 cm, 4 cm and 6 cm long, determine whether the triangle is a right-angle triangle.

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234. The sides of certain triangles are given below. Determine which of them are right triangles. $(i) a = 7cm$, $b = 24cm$ and $c = 25cm$ (ii) $a = 9cm$, $b = 16cm$ and $c = 18cm$ (iii) $a = 1.\ 6cm$, $b = 3.\ 8cm$ and $c = 4cm$ (iv) $a = 8cm$, $b = 10cm$ and $c = 6cm$

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235. A man goes 15 metres due west and then 8 metres due north. How far is he from the starting point?

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236. A ladder 17m long reaches a window of a building 15m above the ground. Find the distance of the foot of the ladder from the building.

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237. Two poles of heights 6 m and 11 m stand on a plane ground. If the distance between their feet is 12m, find the distance between their tops.

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238. In an isosceles triangle $ABC,\ AB = AC = 25cm,\ \ BC = 14cm$. Calculate the altitude from A on BC .

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239. The foot of a ladder is 6m away from a wall and its top reaches a window 8m above the ground. If the ladder is shifted in

such a way that its foot is 8m away from the wall, to what height does its tip reach?

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240. Two poles of height 9m and 14m stand on a plane ground. If the distance between their feet is 12m, find the distance between their tops.

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241. Using Pythagoras theorem determine the length of AD in terms of b and c shown in Figure.

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242. A triangle has sides 5cm, 12cm and 13cm. Find the length to one decimal place, of the perpendicular from the opposite vertex to the side whose length is 13cm.

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243. $ABCD$ is a square. F is the mid-point of AB. BE is one third of BC. If the area of $FBE = 108\,cm^2$, find the length of AC.

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244. In an isosceles triangle ABC, if $AB = AC = 13$ cm and the altitude from A on BC is 5 cm, find BC.

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245. In a ABC, $AB = BC = CA = 2a$ and $AD \perp BC$. Prove that $AD = a\sqrt{3}$ (ii) Area $(ABC) = \sqrt{3}\, a^2$

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246. The lengths of the diagonals of a rhombus are 24cm and 10cm. Find each side of the rhombus.

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247. Each side of a rhombus is 10cm. If one of its diagonals is 16cm find the length of the other diagonal.

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248. In an acute angled triangle , express a median in term of its sides.

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249. Calculate the height of an equilateral triangle each of whose sides measures 12cm.

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250. In right-angled triangle ABC in which $\angle C = 90^\circ$, if D is the mid-point of BC , prove that $AB^2 = 4\,AD^2 - 3\,AC^2$.

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251. In Fig. 4.220, D is the mid-point of side BC and $AE \perp BC$. If $BC = a,\ AC = b,\ AB = c,\ ED = x,\ AD = p$ and $AE = p$ and $AE = h$, prove that: (FIGURE) $b^2 = p^2 + ax + \frac{a^2}{4}$ (ii) $c^2 = p^2 - ax + \frac{a^2}{4}$ (iii) $b^2 + c^2 = 2\,p^2 + \frac{a^2}{2}$

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252. In Fig. 4.221, $\angle B < 90o$ and segment $AD \perp BC$, show that $b^2 = h^2 + a^2 + x^2 - 2\,ax$ (ii) $b^2 = a^2 + c^2 - 2\,ax$ (FIGURE)

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253. In ABC, $\angle A$ is obtuse, $PB \perp AC$ and $QC \perp AB$. Prove that: $AB \times AQ = AC \times AP$ (ii) $BC^2 = (AC \times CP + AB \times BQ)$

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254. In a right ABC right-angled at C, if D is the mid-point of BC, prove that $BC^2 = 4\left(AD^2 - AC^2\right)$.

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255. In a quadrilateral $ABCD$, $\angle B = 90^o$, $AD^2 = AB^2 + BC^2 + CD^2$, prove that $\angle ACD = 90^o$

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256. In an equilateral ABC, $AD \perp BC$, prove that $AD^2 = 3\,BD^2$

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257. ABD is a right triangle right-angled at A and $AC \perp BD$. Show that $AB^2 = BC\dot{B}D$ (ii) $AC^2 = BC\dot{D}C$ (iii) $AD^2 = BD\dot{C}D$ (iv) $\frac{AB^2}{AC^2} = \frac{BD}{DC}$

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258. A guy wire attached to a vertical pole of height 18m is 24m long and has a stake attached to the other end. How far from the base of the pole should the stake be driven so that the wire will be taut?

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259. An aeroplane leaves an airport and flies due north at a speed of 1000km/hr. At the same time, another aeroplane leaves the

same airport and flies due west at a speed of 1200km/hr. How far apart will be the two planes after $1\frac{1}{2}$ hours?

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260. In each of the figures [4.222 (i)-(iv)] given below, a line segment is drawn parallel to one side of the triangle and the lengths of certain line-segments are marked. Find the value of x in each of the following: (FIGURE)

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261. In ABC, points P and Q are on CA and CB, respectively such that $CA = 16cm$, $CP = 10cm$, $CB = 30cm$ and $CQ = 25cm$. Is $PQ \| AB$?

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262. In Figure, $DE \mid\mid CB$. Determine AC and AE.

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263. In Figure, given that $\triangle ABC \sim \triangle PQR$ and $ABCD \sim PQRS$. Determine the values of x, y, z in each case.

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264. In ABC, P and Q are points on sides AB and AC respectively such that $PQ \mid\mid BC$. If $AP = 4cm$, $PB = 6cm$ and $PQ = 3cm$, determine BC.

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265. In each of the following figures, you find two triangles. Indicate whether the triangles are similar. Give reasons in support of your answer. (FIGURES)

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266. In $\triangle PQR$, M and N are points on sides PQ and PR respectively such that $PM = 15cm$ and $NR = 8cm$. If $PQ = 25cm$ and $PR = 20cm$ state whether $MN \| QR$.

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267. In ABC, P and Q are points on sides AB and AC respectively such that $PQ \| BC$. If $AP = 3cm$, $PB = 5cm$ and $AC = 8cm$, find AQ.

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268. In Figure, $\triangle AMB \sim \triangle CMD$; determine MD in terms of x, y and z.

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269. In ABC, the bisector of $\angle A$ intersects BC in D. If $AB = 18cm$, $AC = 15cm$ and $BC = 22cm$, find BD

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270. In Figure, $l \| m$ Name three pairs of similar triangles with proper correspondence; write similarties. Prove that $\frac{AB}{PQ} = \frac{AC}{PR} = \frac{BC}{RQ}$

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271. In Figure, $AB \mid\mid DC$ Prove that $(i) \triangle DMU \sim \triangle BMV$

$(ii) DM \times BV = BM \times DU$

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272. $ABCD$ is a trapezium in which $ABDC$. P and Q are points on sides AD and BC such that $PQAB$. If $PD = 18$, $BQ = 35$ and $QC = 15$, find AD .

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273. In ABC, D and E are points on sides AB and AC respectively such that $AD \times EC = AE \times DB$. Prove that $DEBC$.

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274. $ABCD$ is a trapezium having $ABDC$. Prove that O , the point of intersection of diagonals, divides the two diagonals in the same ratio. Also prove that $\frac{ar(OCD)}{ar(OAB)} = \frac{1}{9}$, if $AB = 3\,CD$.

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275. Corresponding sides of two triangles are in the ratio $2 : 3$. If the area of the smaller triangle is $48\ cm^2$, determine the area of the larger triangle.

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276. The areas of two similar triangles are $36\ cm^2$ and $100\ cm^2$. If the length of a side of the smaller triangle in 3 cm, find the length of the corresponding side of the larger triangle.

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277. Corresponding sides of two similar triangles are in the ratio $1:3$. If the area of the smaller triangle in $40\ cm^2$, find the area of the larger triangle.

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278. In ABC, AD and BE are altitudes. Prove that $\frac{ar(DEC)}{ar(ABC)} = \frac{DC^2}{AC^2}$

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279. The diagonals of quadrilateral $ABCD$ intersect at O. Prove that $\frac{ar(ACB)}{ar(ACD)} = \frac{BO}{DO}$

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280. In Figure, each of PA, QB, RC and SD is perpendicular to l. If $AB = 6cm$, $BC = 9cm$, $CD = 12cm$ and $PS = 36cm$, then determine PQ, QR and RS.

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281. In ABC, ray AD bisects $\angle A$ and intersects BC in D. If $BC = a$, $AC = b$ and $AB = c$, prove that $BD = \frac{ac}{b+c}$ (ii) D C = $\frac{ab}{b+c}$

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282. In each of the figures given below, an altitude is drawn to the hypotenuse by a right-angled triangle. The length of different

line-segments are marked in each figure. Determine x, y, z in each case.

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283. There is a staircase as shown in Figure, connecting points A and B. Measurements of steps are marked in the figure. Find the straight line distance between A and B.

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284. In ABC, $\angle A = 60o$. Prove that `B C^2=A B^2+A C^2-A B.A C .

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285. In ABC , $\angle C$ is an obtuse angle. $AD \perp BC$ and $AB^2 = AC^2 + 3\,BC^2$. Prove that $BC = CD$.

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286. A point D is on the side BC of an equilateral triangle ABC such that $DC = \frac{1}{4}\,BC$. Prove that $AD^2 = 13\,CD^2$.

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287. In ABC , if $BD \perp AC$ and $BC^2 = 2\,ACCD$, then prove that $AB = AC$.

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288. In a quadrilateral $ABCD$, given that $\angle A + \angle D = 90o$. Prove that $AC^2 + BD^2 = AD^2 + BC^2$.

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289. In $\triangle ABC$, given that $AB = AC$ and $BD \perp AC$. Prove that $BC^2 = 2\,AC \cdot CD$

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290. $ABCD$ is a rectangle. Points M and N are on BD such that $AM \perp BD$ and $CN \perp BD$. Prove that $BM^2 + BN^2 = DM^2 + DN^2$.

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291. In ABC , AD is a median. Prove that $AB^2 + AC^2 = 2\,AD^2 + 2\,DC^2$.

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292. In an equilateral triangle, prove that three times the square of one side is equal to four times the square of one of its altitudes.

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293. In a ABC , $\angle ABC = 135o$. Prove that $AC^2 = AB^2 + BC^2 + 4\,ar(ABC)$

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294. In a quadrilateral $ABCD$, $\angle B = 90o$. If $AD^2 = AB^2 + BC^2 + CD^2$ then prove that $\angle ACD = 90o$.

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295. In a triangle ABC , N is a point on AC such that $BN \perp AC$. If $BN^2 = ANNC$, prove that $\angle B = 90o$.

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296. Nazinia is fly fishing in a stream. The tip of her fishing rod is 1.8 m above the surface of the water and the fly at the end of the string rests on the water 3.6 m away and 2.4 m from a point directly under the tip of the rod. Assuming that h

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297. State basic proportionality theorem and its converse.

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298. In the adjoining figure, find AC . (FIGURE)

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299. In the adjoining figure, if AD is the bisector of $\angle A$ if BD=4cm ,DC=3cm and AB=6cm , what is AC ?

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300. State AA similarity criterion.

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301. State SSS similarity criterion.

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302. State SAS similarity criterion.

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303. In the adjoining figure, DE is parallel to BC and $AD = 1cm$, $BD = 2cm$. What is the ratio of the area of $\triangle ABC$ to the area of $\triangle ADE$?

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304. In the figure given below $DE \| BC$. If $AD = 2.4cm$, $DB = 3.6cm$ and $AC = 5cm$, Find AE .

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305. If the areas of two similar triangles ABC and PQR are in the ratio $9:16$ and $BC = 4.5cm$, what is the length of QR ?

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306. The areas of two similar triangles are $169\ cm^2$ and $121\ cm^2$ respectively. If the longest side of the larger triangle is 26cm, what is the length of the longest side of the smaller triangle?

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307. If $\triangle ABC$ and $\triangle DEF$ are similar triangles such that $\angle A = 57^0$ and $\angle E = 73^0$, what is the measure of $\angle C$?

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308. If the altitude of two similar triangles are in the ratio $2:3$, what is the ratio of their areas?

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309. If ABC and DEF are two triangles such that $\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{3}{4}$, then write Area $(ABC):Area(DEF)$.

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310. If $\triangle ABC$ and $\triangle DEF$ are similar triangles such that $AB = 3cm$, $BC = 2cm$ $CA = 2.5cm$ and $EF = 4cm$, find the perimeter of DEF .

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311. State Pythagoras theorem and its converse.

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

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313. In Figure, $PQ \| BC$ and $AP:PB=1:2$. Find $\frac{area(APQ)}{area(ABC)}$.

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314. In Fig. 4.237, $LM=LN=46o$. Express x in terms of a, b and c where a, b, c are lengths of LM, MN and NK respectively. (FIGURE)

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315. In Figure, S and T are points on the sides PQ and PR respectively of $\triangle PQR$ such that $PT=2cm$, $TR=4cm$ and ST is parallel to QR . Find the ratio of the areas of $\triangle PST$ and $\triangle PQR$.

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316. In Figure, $\triangle AHK$ is similar to $\triangle ABC$. If $AK = 10cm$, $BC = 3.5cm$ and $HK = 7cm$, find AC.

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317. In Figure, $DE \| BC$ in $\triangle ABC$ such that $BC = 8cm$, $AB = 6cm$ and $DA = 1.5cm$. Find DE.

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318. In Fig. 4.241, $DEBC$ and $AD = \frac{1}{2}BD$. If $BC = 4.5cm$, find DE. (FIGURE)

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319. A vertical stick 20 m long casts a shadow 10m long on the ground. At the same time, a tower casts a shadow 50m long on the ground. The height of the tower is (a) 100m (b) 120m (c) 25m (d) 200m

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320. Sides of two similar triangles are in the ratio $4:9$. Areas of these triangles are in the ratio. $2:3$ (b) $4:9$ (c) $81:16$ (d) $16:81$

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321. The areas of two similar triangles are $9\,cm^2$ and $16\,cm^2$ respectively . The ratio of their corresponding sides is

A. (a)$3:4$

B. (b) $4:3$

C. (c) $2:3$

D. (d) $4:5$

Answer: null

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322. The areas of two similar triangles ABC and DEF are $144\,cm^2$ and $81\,cm^2$ respectively. If the longest side of triangle ABC be 36 cm, then the longest side of the triangle DEF is

A. (a) 20cm

B. (b) 26cm

C. (c) 27cm

D. (d) 30cm

Answer: null

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323. ABC and BDE are two equilateral triangles such that D is the mid-point of BC . The ratio of the areas of the triangles ABC and BDE is $2:1$ (b) $1:2$ (c) $4:1$ (d) $1:4$

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324. Two isosceles triangles have equal angles and their areas are in the ratio $16:25$. The ratio of their corresponding heights is $4:5$ (b) $5:4$ (c) $3:2$ (d) $5:7$

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325. If ABC and DEF are similar triangles such that $2\,AB = DE$ and $BC = 8cm$, then $EF =$

A. (a) 16cm

B. (b) 12cm

C. (c) 8cm

D. (d) 4cm

Answer: null

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326. If ABC and DEF are two triangles such that $\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{2}{5}$, then $Area(ABC) : Area(DEF) =$

A. (a) $2:5$

B. (b) $4:25$

C. (c) $4:15$

D. (d) $8:125$

Answer: null

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327. Triangle ABC is such that $AB = 3cm$, $BC = 2cm$ and $CA = 2.5cm$. If DEF $similar ABC$ and $EF = 4cm$, then perimeter of DEF is

A. (a) $7.5cm$

B. (b) $15cm$

C. (c) $22.5cm$

D. (d) $30cm$

Answer: null

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328. XY is drawn parallel to the base BC of ΔABC cutting AB at X and AC at Y . If $AB = 4\,BX$ and $YC = 2cm$, then $AY =$

(a) $2cm$ (b) $4cm$ (c) $6cm$ (d) $8cm$

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329. Two poles of height 6m and 11m stand vertically upright on a plane ground. If the distance between their foot is 12m, the distance between their tops is (a) 12m (b) 14m (c) 13m (d) 11m

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330. In ABC , a line XY parallel to BC cuts AB at X and AC at Y . If BY bisects $\angle XYC$, then (a)$BC = CY$ (b) $BC = BY$ (c) $BC \neq CY$ (d) $BC \neq BY$

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331. In ΔABC , D and E are points on side AB and AC respectively such that DE is parallel to BC & $AD: DB = 3:1$. If $EA = 3.3cm$, then $AC =$ mmmmmmmm (a) $1.1cm$ (b) $4cm$ (c) $4.4cm$ (d) $5.5cm$

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332. In triangles ABC and DEF , $\angle A = \angle E = 40^0$, $AB: ED = AC: EF$ and $\angle F = 65^0$, then $\angle B =$ $(a)35^0$ $(b)65^0$ $(c)75^0$ $(d)85^0$

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333. If $\triangle ABC$ and $\triangle DEF$ are similar triangles such that $\angle A = 47^0$ and $\angle E = 83^0$, then $\angle C =$ (a) 50^0 (b) 60^0 (c) 70^0 (d) 80^0

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334. If D, E and F are the mid-points of the sides of a $\triangle ABC$, the ratio of the areas of the triangles DEF and ABC is .....

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335. In a ABC, $\angle A = 90^o$, $AB = 5cm$ and $AC = 12cm$. If $AD \perp BC$, then $AD =$ $(a)\frac{13}{2}cm$ (b) $\frac{60}{13}cm$ (c) $\frac{13}{60}cm$ (d)

$\frac{2\sqrt{15}}{3} cm$

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336. In an equilateral triangle ABC, if $AD \perp BC$, then (a) $2\,AB^2 = 3\,AD^2$ (b) $4\,AB^2 = 3\,AD^2$ (c) $3\,AB^2 = 4\,AD^2$ (d) $3\,AB^2 = 2\,AD^2$

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337. If ABC is an equilateral triangle such that $AD \perp BC$, then $AD^2 = (a)\frac{3}{2}DC^2$ (b) $2\,DC^2$ (c) $3\,CD^2$ (d) $4\,DC^2$

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338. In a ABC , perpendicular AD from A on BC meets BC at D . If $BD = 8cm$, $DC = 2cm$ and $AD = 4cm$, then ABC is isosceles (b) ABC is equilateral (c) $AC = 2\,AB$ (d) ABC is right-angled at A .

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339. In a ΔABC , point D is on side AB and point E is on side AC , such that $BCED$ is a trapezium. If $DE : BC = 3 : 5$, then Area$(ADE) : Area(BCED) =$

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340. In a ABC , AD is the bisector of $\angle BAC$. If $AB = 6cm$, $AC = 5cm$ and $BD = 3cm$, then $DC =$ $11.\,3cm$ (b) $2.\,5cm$ (c) $3 : 5cm$ (d) None of these

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341. In a ABC , AD is the bisector of $\angle BAC$. If $AB = 8cm$, $BD = 6cm$ and $DC = 3cm$. Find AC $4cm$ (b) $6cm$ (c) $3cm$ (d) $8cm$

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342. $ABCD$ is a trapezium such that $BC \| AD$ and $AD = 4cm$. If the diagonals AC and BD intersect at O such that $\frac{AO}{OC} = \frac{DO}{OB} = \frac{1}{2}$, then $BC =$ (a) $7cm$ (b) $8cm$ (c) $9cm$ (d) $6cm$

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343. If ABC is an isosceles triangle and D is a point on BC such that $AD \perp BC$ then,

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344. ABC is a right triangle right-angled at A and $AD \perp BC$. Then, $\frac{BD}{DC} =$ mm (a) $\left(\frac{AB}{AC}\right)^2$ (b) $\frac{AB}{AC}$ (c) $\left(\frac{AB}{AD}\right)^2$ (d) $\frac{AB}{AD}$

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345. If E is a point on side CA of an equilateral triangle ABC such that $BE \perp CA$, then $AB^2 + BC^2 + CA^2 = 2\,BE^2$ (b) $3\,BE^2$ (c) $4\,BE^2$ (d) $6\,BE^2$

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346. If in ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FD}$, then $ABC \sim DEF$ when

$\angle A = \angle F$ (b) $\angle A = \angle D$ (c) $\angle B = \angle D$ (d) $\angle B = \angle E$

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347. If in two triangles ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FE} = \frac{CA}{FD}$, then $FDECAB$ (b) $FDEABC$ (c) $CBAFDE$ (d) $BCAFDE$

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348. $ABCDEF$, $ar(ABC) = 9cm^2$, $ar(DEF) = 16cm^2$. If $BC = 2.1cm$, then the measure of EF is $2.8cm$ (b) $4.2cm$ (c) $2.5cm$ (d) $4.1cm$

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349. The length of the hypotenuse of an isosceles right triangle whose one side is $4\sqrt{2}$ cm is $12cm$ (b) $8cm$ (c) $8\sqrt{2}cm$ (d) $12\sqrt{2}cm$

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350. A man goes 24m due west and then 7m due north. How far is he from the starting point? (a) 31m (b) 17m (c) 25m (d) 26m

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351. If $\Delta ABC \sim \Delta DEF$ such that $BC = 3cm$, $EF = 4cm$ and $ar(ABC) = 54cm^2$, then $ar(DEF) =$

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352. If $\Delta ABC \sim \Delta PQR$ such that $ar(ABC) = 4ar(PQR)$. If $BC = 12cm$, then $QR =$

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353. The areas of two similar triangles are $121\ cm^2$ and $64\ cm^2$ respectively. If the median of the first triangle is $12.1\ cm$, then the corresponding median of the other triangle is (a) 11cm (b) 8.8cm (c) 11.1cm (d) 8.1cm

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354. If $ABCDEF$ such that $DE = 3cm$, $EF = 2cm$, $DF = 2.5cm$, $BC = 4cm$, then perimeter of ABC is (a) 18cm (b) 20cm (c) 12cm (d) 15cm

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355. In an equilateral triangle ABC if $AD \perp BC$, then

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356. If $ABCDEF$ such that $AB = 9.\ 1cm$ and $DE = 6.\ 5cm$. If the perimeter of DEF is 25cm, then the perimeter of ABC is (a) 36cm (b) 30cm (c) 34cm (d) 35cm

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357. In an isosceles triangle ABC if $AC = BC$ and $AB^2 = 2AC^2$, then $\angle C =$ $30o$ (b) $45o$ (c) $90o$ (d) $60o$

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358. ABC is an isosceles triangle in which $\angle C = 90o$. If $AC = 6cm$, then $AB =$ $6\sqrt{2}cm$ (b) $6cm$ (c) $2\sqrt{6}cm$ (d) $4\sqrt{2}cm$

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359. If in two triangles ABC and DEF , $\angle A = \angle E,\ \angle B = \angle F$, then which of the following is not true? $\frac{BC}{DF} = \frac{AC}{DE}$ (b) $\frac{AB}{DE} = \frac{BC}{DF}$ (c) $\frac{AB}{EF} = \frac{AC}{DE}$ (d) $\frac{BC}{DF} = \frac{AB}{EF}$

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360. In an isosceles triangle ABC , if $AB = AC = 25cm$ and $BC = 14cm$, then the measure of altitude from A on BC is (a) 20cm (b) 22cm (c) 18cm (d) 24cm

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361. In Fig. 4.242 the measures of $\angle D$ and $\angle F$ are respectively (FIGURE) $50,\ 40$ (b) $20,\ 30$ (c) $40,\ 50$ (d) $30,\ 20$

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362. In Figure, the value of x for which $DE \mid\mid AB$ (a) 4 (b) 1 (c) 3 (d) 2

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363. In Fig. 4.244, if $\angle ADE = \angle ABC,$ then $CE =$ (FIGURE) (a) 2 (b) 5 (c) $9/2$ (d) 3

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364. In Fig. 4.245, $RSDBPQ$. If $CP = PD = 11cm$ and $DR = RA = 3cm$. Then the values of x and y are respectively (FIGURE) $12,\ 10$ (b) $14,\ 6$ (c) $10,\ 7$ (d) $16,\ 8$

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365. In Fig. 4.246, if $PBCF$ and $DPEF$, then $\frac{AD}{DE} =$ (FIGURE) $\frac{3}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{2}{3}$

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366. A chord of a circle of radius 10cm subtends a right angle at the centre. The length of the chord (in cm) is

A. (a) $5\sqrt{2}$

B. (b) $10\sqrt{2}$

C. (c) $\frac{5}{\sqrt{2}}$

D. (d) $10\sqrt{3}$

Answer: null

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