MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

CONGRUENT TRIANGLE

Others

1. BD and CE are bisectors of $\angle B$ and $\angle C$ of an isosceles ABC with $AB = AC$. Prove that $BD = CE$.

Since $AB = AC \angle ABC = \angle ACB. \ldots \ldots \ldots (i)$ [Angles opposite to equal sides are equal]

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2. Two lines AB and CD intersect at O such that BC is equal and parallel to AD. Prove that the lines AB and CD bisect at O.

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3. In Figure, $AC = BC, \angle DCA = \angle ECB$ and $\angle DBC = \angle EAC$. Prove that triangles DBC and EAC are congruent, and hece $DC = EC$ and $BD = AE$

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4. If the bisector of the vertical angle of a triangle bisects the base of the triangle. then the triangle is isosceles. GIVEN : A ABC in which AD is the bisector of $\angle A$ meeting BC in D such that $BD = DC$.

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5. In an isosceles triangle altitude from the vertex bisects the base. GIVEN : An isosceles triangle ABC such that $AB = AC$ and an altitude AD from A on side BC. TO PROVE : D bisects BC i.e. $BD = DC$. Figure

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6. If the altitude from one vertex of a triangle bisects the opposite side, then the triangle is isosceles. GIVEN : A ABC such that the altitude AD from A on the opposite side BC bisects BC i.e., $BD = DC$. TO PROVE : $AB = AC$ i.e. the triangle ABC is isosceles.

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7. Prove that the perimeter of a triangle is greater than the sum of its altitudes.

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8. In ABC, side AB is produced to D so that $BD = b \cdot$ If $\angle B = 60^0$ and $\angle A = 70^0$, prove that : $(i) AD > CD \, (ii) AD > AC$

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9. Prove that in a quadrilateral the sum of all the sides is greater than the sum of its diagonals.

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10. GIVEN : $PQRS$ is a quadrilateral. PQ is its longest side and RS is its shortest side. TO PROVE : (i) $\angle R > \angle P$ (ii) $\angle S > \angle Q$ CONSTRUCTION : Join PR and QS. Figure

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11. Of all the line segments drawn from a point P to a line m not containing P, let PD be the shortest. If B and C are points on m such

that D is the mid-point of BC, prove that $PB = PC$.

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12. If ABC is an isosceles triangle with $AB = AC$. Prove that the perpendiculars from the vertices B and C to their opposite sides are equal.

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13. If the altitudes from two vertices of a triangle to the opposite sides are equal, prove that the triangle is isosceles.

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14. AD and BC are equal perpendiculars to a line segment AB. Show that CD bisects AB.

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15. In ABC, $AB = AC$, and the bisectors of angles B and C intersect at point O. Prove that $BO = CO$ and the ray AO is the bisector of angles BAC.

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16. In Figure, line l is the bisector of angle A and B is any point on l. BP and BQ are perpendiculars from B to the arms of A. Show that : $APB \cong AQB$ $BP = BQ$ or B is equidistant from the arms of $\angle A$. Figure

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17. Prove that measure of each angle of an equilateral triangle is 60^0.

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18. Two triangles are congruent if two sides and the included angle of one are equal to the corresponding sides and the included angle of the other triangle. GIVEN : Two triangles ABC and DEF such that $AB = DE$, $AC = DF$ and $\angle A = \angle D$ PROVE : $ABC \cong DEF$ Figure

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19. In ΔABC, $\angle A = 100^0$ and $AB = AC$. Find $\angle B$ and $\angle C$

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20. Angles opposite to two equal sides of a triangle are equal. GIVEN : ABC in which $AB = AC$ TO PROVE : $\angle C = \angle B$ CONSTRUCTION : Draw the bisector AD of $\angle A$ which meets BC in D Figure

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21. In Figure, X and Y are two points on equal sides AB and AC of a ABC such that $AX = AY$. Prove that $XC = YB$.

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22. Prove that the angle between internal bisector of one base angle and the external bisector of the other base angle of a triangle is equal to one half of the vertical angle.

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23. In ABC and PQR Figure, $AB = PQ$, $BC = QR$ and CB and RQ are extended to X and Y respectively and $\angle ABX = \angle PQY$. Prove that $ABC \cong PQR$. Figure

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24. In Figure, the side BC of ABC is produced to form ray BD as shown. Ray CE is drawn parallel to BA . Show directly, without using the angle sum property of a triangle that $\angle ACD = \angle A + \angle B$ and deduced that $\angle A + \angle B + \angle C = 180^0$.

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25. In a triangle the greater angle has the longer side opposite to it.

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26. If the bisectors of the base angles of a triangle enclose an angle of 135^0, prove that the triangle is a right triangle.

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27. If two sides of a triangle are unequal, the longer side has greater angle opposite to it. GIVEN : A ABC in which $AC > AB$. TO PROVE : $\angle ABC > \angle ACB$

CONSTRUCTION : Mark a point D on AC such that $AB = AD$. Joint BD.

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28. The bisectors of base angles of a triangle cannot enclose a right angle in any case.

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29. ABCD is a square, X and Y are points on sides AD and BC respectively such that AY=BX. Prove that BY=AX and $\angle BAY = \angle ABX$.

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30. If perpendiculars from any point with an angle on its arms are congruent, prove that it lies on the bisector of that angle.

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31. ABC is a triangle is which BE and CF are, respectively, the perpendiculars to the sides AC and AB. If $BE = CF$, prove that ABC is isosceles.

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32. ABC is a triangle and D is the mid-point of BC. The perpendiculars from D to AB and AC are equal. Prove that the triangle is isosceles.

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33. The side BC of aABC is produced on both sides. Show that the sum of the exterior angles so formed is greater than $\angle A$ by two right angles.

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34. P is a point equidistant from two lines l and m intersecting at a point A see in figure, Show that AP bisects the angle between them. Figure

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35. If two parallel lines are intersected by a transversal, prove that the bisectors of the interior angles on the same side of transversal intersect each other at right angles.

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36. If ABC is an isosceles triangle such that $AB = AC$ and AD is an altitude from A on BC . Prove that (i) $\angle B = \angle C$ (ii) AD bisects BC (iii) AD bisects $\angle A$

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37. A triangle ABC is right angled at $A\dot{A}L$ is drawn perpendicular to BC . Prove that $\angle BAL = \angle ACB$.

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38. The sum of any two sides of a triangle is greater than the third side.

GIVE : A ABC

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39. AB is a line segment and line l is its perpendicular bisector. If a point P lies on l, show that P is equidistant from A and B.

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40. ABC is a triangle in which $\angle A = 72^0$, the internal bisectors of angles B and C meet in O. Find the magnitude of $\angle BOC$.

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41. If one angle of a triangle is equal to the sum of the other two, show that the triangle is a right triangle.

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42. Suppose line segments AB and CD interest at O in such a way that $AO = OD$ and $OB = OC$. Prove that $AC = BD$ but AC may not be

parallel to BD .

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43. Two angles of a triangle are equal and the third angle is greater than each of those angles by 30°. Determine all the angle of the triangle.

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44. If D is the mid-point of the hypotenuse AC of a right triangle ABC, prove that $BD = \frac{1}{2}AC$. GIVEN : A ABC in which $\angle B = 90^0$ and D is the mid-point of AC. TO PROVE : $BD = \frac{1}{2}AC$ CONSTRUCTION Produce BD to E so that $BD = DE$. Join EC.

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45. In triangle ABC, $\angle B = 45^\circ$, $\angle C = 55^\circ$ and bisector of $\angle A$ meets BC at a point D. Find $\angle ADB$ and $\angle ADC$.

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46. AB is a line segment, AX and BY are two equal line segments drawn on opposite sides of line AB such that $AXBY$. If AB and XY intersect each other P, prove that $APX \cong BPY$ AB and XY bisect each other.

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47. (Exterior Angle Theorem): If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles. GIVEN : A triangle $ABC\dot{D}$ is a point of BC produced, forming exterior angle $\angle 4$. TO PROVE : $\angle 4 = \angle 1 + \angle 2$ i.e. , $\angle ACD = \angle CAB + \angle CBA$.

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48. Two triangles are congruent if two angles and the included side of one triangle are equal to the corresponding two angles and the included side of the other triangle. GIVE : Two $sABC$ and DEF such that $\angle B = \angle E, \angle C = \angle F$ and $BC = EF$ TO PROVE : $ABC \cong DEF$

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49. $A, B, C,$ are three angles of a triangle. If $A - B = 15^\circ, B - C = 30^\circ,$ find $\angle A, \angle B$ and $\angle C$

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50. In Figure, diagonal AC of a quadrilateral $ABCD$ bisects the angles A and C . Prove that $AB = AD$ and $CB = CD$

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51. In a triangle ABC, $\angle ABC = \angle ACB$ and the bisectors of $\angle ABC$ and $\angle ACB$ intersect at O such that $\angle BOC = 120^\circ$. Show that $\angle A = \angle B = \angle C = 60^\circ$

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52. If each angle of a triangle is less than the sum of the other two, show that the triangle is acute angled.

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53. In two right triangles, one side and an acute angle of one triangle are equal to one side and the corresponding acute angle of the other triangle. Prove that the two triangles are congruent.

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54. If Figure, if $QT \perp PR, \angle TQR = 40^0$ AND $\angle SPR = 30^0,$ find x and y. Figure

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55. If D is any point on the base BC produced, of an isosceles triangle ABC, prove that $AD > AB$.

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56. In figure, sides QP and RQ of PQR are produced to point S and T respectively. If $\angle SPR = 135^\circ$ and $\angle PQT = 110^\circ,$ find $\angle PRQ$. Figure

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57. Show that in a right triangle the hypotenuse is the longest side. GIVEN : A right triangle ABC in which $\angle ABC = 90^0$. TO PROVE : Hypotenuse

AC is the longest side, i.e. $AC > AB$ (ii) $AC > BC$

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58. An exterior angle of a triangle is 110^0 , and one of the interior opposite angles is 30^0. Find the other two angles of the triangle.

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59. Show that the sum of the three altitudes of a triangle is less than the sum of three sides of the triangle. GIVEN : A ABC in which $AD \perp BC$, $BE \perp AC$ and $CF \perp AB$. PROVE : `A D+B E+C F

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60. The sides BC, CA and AB of a triangle ABC, are produced in order, forming exterior angles $\angle ACD$, $\angle BAE$ and $\angle CBF$. Show that $\angle ACD + \angle BAE + \angle CBF = 360^0$

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61. Prove that any two sides of a triangle are together greater than twice the median drawn to the third side. GIVEN : ABC in which AD is a median. PROVE : $AB + AC > 2AD$ CONSTRUCTION : Produce AD to E such that $AD = DE$. Join EC.

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62. Prove that the sum of the three angles of a triangle is 180^0.

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63. In a ABC, if $\angle A = 50^\circ$ and $\angle B = 60^\circ$, determine the shortest and largest sides of the triangle.

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64. In a triangle $ABC, \angle B = 115^\circ, \angle C = 40^\circ,$ Find $\angle A$

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65. The sum of two equal angles of a triangle is equal to its third angle. Determine the measure of the third angle.

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66. Of the three angles of a triangle, one is twice the smallest and another is three times the smallest. Find the angles.

A. 30,40,110

B. 30,60,90

C. 45,45,90

D. none

Answer: B

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67. Prove that the perimeter of a triangle is greater than the sum of the three medians.

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68. If the angles of a triangle are in the ratio $2:3:4$. determine three angles.

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69. The sum of two angles of a triangle is 80° and their difference is 20° . Find all the angles.

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70. A triangle ABC is an isosceles triangle if any one of the following conditions hold: Altitude AD bisects $\angle BAC$. Bisector of $\angle BAC$ is perpendicular to the base BC.

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71. In a ABC, if $2\angle A = 3\angle B = 6\angle C$, determine $\angle A$, $\angle B$ and $\angle C$.

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72. In a right angled triangle, one acute angle is double the other. Prove that the hypotenuse is double the smallest side. GIVEN : A ABC in which $\angle B = 90^0$ and $\angle ACB = 2\angle CAB$. to prove : $AC = 2BC$ CONSTRUCTION : Produce CB to D such that $BD = CB$. Join AD.

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73. The sides AB and AC of a ABC are produced to P and Q respectively. If the bisectors of $\angle PBC$ AND $\angle QCB$ intersect at O, then $\angle BOC = 90^0 - \frac{1}{2}\angle A$ GIVEN : A ABC in which sides AB and AC are produced to P and Q respectively. The bisectors of $\angle PBC$ and $\angle QCB$ intersect at O.

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74. AD and BE are respectively altitudes of triangleÂ ABC such that AE=BD. Prove that AD=BE.

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75. If the bisector of the exterior vertical angle of a triangle be parallel to the base. Show that the triangle is isosceles.

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76. Prove that Two right triangles are congruent if the hypotenuse and one side of one triangle are respectively equal to the hypotenuse and one side of the other triangle.

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77. In given figure the altitudes AD, BE and CF , the altitudes of triangle ABC are equal. Prove that ABC is an equilateral triangle.

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78. A point O is taken inside an equilateral four sided figure $ABCD$ such that its distances from the angular points D and B are equal. Show that AO and OC are in one and the same straight line. GIVEN : A point O inside an equilateral quadrilateral four sided figure $ABCD$ such that $BO = OD$. TO PROVE : AO and OC are in one and the same straight line.

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79. If two isosceles triangles have a common base, prove that the line joining their vertices bisects them at right angles.

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80. Explain -Side Side Side(SSS) Congruence .

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81. $ABCD$ is a parallelogram, if the two diagonals are equal, find the measure of $\angle ABC$.

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82. In a ABC, it is given that $AB = AC$ and the bisectors of $\angle B$ and $\angle C$ intersect at O, If M is a point on BO produced, prove that

$\angle MOC = \angle ABC$.

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83. ABC is a triangle in which $\angle B$ =2 $\angle C\dot{D}$ is a point on BC such that AD bisects $\angle BAC$ and $AB = CD$. Prove that $\angle BAC = 72^0$.

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84. In ABC, $\angle A = 100^0 and\ AB = AC$. Find $\angle B\ and\ \angle C$

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85. Prove that measure of each angle of an equilateral triangle is 60^0.

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86. Given: In $\triangle ABC$ and $\triangle PQR$, $AB = PQ$, $BC = QR$ *and* CB *and* RQ are extended to X *and* Y respectively and $\angle ABX = \angle PQY$. Prove that $ABC \cong PQR$

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87. Suppose line segments AB *and* CD intersect at O in such a way that $AO = OD$ *and* $OB = OC$. Prove that $AC = BD$ but AC may not be parallel to BD

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88. If D is the mid-point of the hypotenuse AC of a right triangle ABC, prove that $BD = \frac{1}{2}AC$

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89. AB is a line segment and line l is its perpendicular bisector. If a point P lies on l, show that P is equidistant from A and B.

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90. In quadrilateral $ACBD$, $AC = AD \; and \; AB$ bisects $\angle A$. Show that $ABC \cong ABD$. What can you say about $BC \; and \; BD$?

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91. Prove that ABC is isosceles if any one of the following holds: (i) $Altitude$ AD bisects BC (ii) Median AD is perpendicular to the base BC

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92. In right triangle ABC, right angle at C, M is the mid-point of the hypotenuse AB. C is jointed to M and produced to a point D such that

$DM = CM$. Point D is joined to point B. Show that $AMC \cong BMD$ (ii) $\angle DBC = 90^\circ$ (iii)$DBC \cong ACB$ (iv) $CM = \frac{1}{2}AB$

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93. Prove that the medians of an equilateral triangle are equal.

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94. In a ABC, if $\angle A = 120^0 and\ AB = AC$. Find $\angle B\ and\ \angle C$

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95. In ABC, if $AB = AC\ and\ \angle B = 70^0$, find $\angle A$

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96. The vertical angle of an isosceles triangle is 100^0. Find its base angles.

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97. Find the measure of each exterior angle of an equilateral triangle.

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98. If the base of an isosceles triangle is produced on both sides, prove that the exterior angles so formed are equal to each other.

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99. Determine the measure of each of the equal angles of a right-angled isosceles triangle.

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100. ABC is a right-angled triangle is which $\angle A = 90^0 and\ AB = AC$. Find $\angle B\ and\ \angle C$

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101. AB is a line segment. $AX\ and\ BY$ are two equal line segments drawn on opposite sides of line AB such that $AX \| \| BY$. If $AB\ and\ XY$ intersect each other at P, prove that $APX \cong BPY$ (ii) $AB\ and\ XY$ bisect each other.

In the given figure, segment AX and BY are equa

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102. In two right triangles, one side and an acute angle of one triangle are equal to one side and the corresponding acute angle of the other triangle. Prove that the two triangles are congruent.

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103. Two lines $AB\ and\ CD$ intersect at O such that BC is equal and parallel to AD. Prove that the lines $AB\ and\ CD$ bisect at O

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104. $BD\ and\ CE$ are bisectors of $\angle B\ and\ \angle C$ of an isosceles ABC with $AB = AC$. Prove that $BD = CE$

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105. abc is an isosceles triangle with $AB = AC$. Side $BA$is produced to D such that $AB = AD$. Prove that $\angle BCD$ is a right angle.

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106. In Figure, $AB = AC\dot{B}E\ and\ CF$ are respectively the bisectors of $\angle B$ and $\angle C$. Prove that $ebc \cong FCB$

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107. If ABC is an isosceles triangle with $AB = AC$. Prove that the perpendiculars from the vertices $B \, and \, C$ to their opposite sides are equal.

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108. If the altitudes from two vertices of a triangle to the opposite sides are equal, prove that the triangle is isosceles.

In $\triangle ABE$ and $\triangle ACF \angle AEB = \angle AFC \left(90^0 each\right)$

$\angle BAE = \angle CAF$(common angle)

$\angle ABE = \angle ACF$ using angle sum property

$BE = CF, \ \triangle ABE \cong \triangle ACF$

$\Rightarrow AB = AC$

Hence triangle ABC is an isosceles tangent as two sides are equal to each other

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109. $AD\ and\ BC$ are equal perpendiculars to a line segment AB . Show that CD bisects AB.

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110. In $ABC,\ AB = AC,$ and the bisectors of angles $B\ and\ C$ intersect at point O. Prove that $BO = CO$ and the ray AO is the bisector of angle BAC

Since the angles opposite to equal sides are equal,

$AB = AC$

$\Rightarrow \angle C = \angle B$

$\Rightarrow 2\angle B = 2\angle C$

Since BO and CO are bisectors of $\angle B\ \text{and}\ \angle C$, we also have

$\angle ABO = 2\angle B$

$\angle ACO = 2\angle C$

$\angle ABO = 2\angle B = 2\angle C\ = \angle ACO.$

Consider $\triangle\ BCO: \angle OBC = \angle OCB$

$BO = CO$(Sides opposite to equal angles are equal)

Finally, consider triangles ABO and ACO.

$BA = CA$(given)

$BO = CO$(proved)

$\angle ABO = \angle ACO$ (proved)

Hence, by S.A.S postulate $\triangle ABO \cong \triangle ACO$

$\angle BAO = \angle CAO$

$AObi\sec ts\angle A.$

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111. In a right angled triangle, one acute angle is double the other. Prove that the hypotenuse is double the smallest side.

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112. A triangle ABC is an isosceles triangle if any one of the following conditions hold: Altitude AD bisects $\angle BAC$ Bisector of $\angle BAC$ is perpendicular to the base BC

In triangle,ABC

let the altitude AD bisects $\angle BAC$

Then we have to prove that the triangle ABC, is isosceles.

In $\triangle `sADB$ and ADC,

$\angle BAD = \angle CAD$

(AD is bisector of$\angle BAC$)

$AD = AD$(common)

$\angle ADB = \angle ADC$ (Each equal to 90)

$\Rightarrow \triangle ADB \cong \triangle ADC$ (by ASA congruence criterion)

$AB = AC$(cpct)

Hence, A triangle ABC is an isosceles

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113. A triangle ABC is an isosceles triangle if any one of the following conditions hold: Bisector of $\angle BAC$ is perpendicular to the base BC

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114. In two right triangles one side an acute angle of one are equal to the corresponding side and angle of the other. Prove that the triangles are congruent.

Let ABC and DEF be two right triangles such that

$\angle A = \angle D, BC = EF$ and $\angle B = \angle E = 90^0$

Thus, in $\triangle$ `$sABC$ and DEF

$\angle A = \angle D$

$\angle B = \angle E = 90^0$

$BC = EF$ So, by AAS congruence criterion, we obtain

$\triangle ABC \cong \triangle DEF$

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115. Join$A \to D$

Hence,$AD \parallel BC$

$\angle ACB = \angle CAD$(alternateangle

$\angle BAC = \angle ACD$(alternateangle)

Hence$AB = AC$ (by ASA congurency)so, it is isosceles triangle.

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116. In an isosceles triangle, if the vertex angle is twice the sum of the base angles, calculate the angles of the triangle.

Let each base angle be x in an isosceles $\triangle ABC$

Then vertex angle be $2(x+x)=4x$

Since sum of angles of a triangle is 180^0

Hence,$4x+x+x=180^0$

$6x=180^0$

$\Rightarrow x=30^0$

Angles are $30^0, 30^0, 120^0$

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117. PQR is a triangle is which $PQ=PR\ and\ S$ is any point on the side PQ . Through $S,$ a line is drawn parallel to QR and intersecting PR at T. Prove that $PS=PT$

$In\ \triangle PQR, we have PQ=PR$

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118. In a ABC, it is given that $AB = AC$ and the bisectors of $\angle B \; and \; C$ intersect at O. If M is a point on BO produced, prove that $\angle MOC = \angle ABC$

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119. P is a point on the bisector of an angle $\angle ABC$. If the line through P parallel to AB meets BC at Q, prove that triangle BPQ is isosceles.

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120. Prove that each angle of an equilateral triangle is 60^0

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121. Angle $A,\ B,\ C$ of a triangle ABC are equal to each other. Prove that ABC is equilateral.

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122. ABC is a triangle in which $\angle B = 2\angle C\dot{D}$ is a point on BC such that AD bisects $\angle BAC\ and\ AB = CD$. Prove that $\angle BAC = 72^\circ$

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123. ABC is a right angled triangle in which $\angle A = 90^0 and\ AB = AC$. Find $\angle B\ and\ \angle C$

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124. $ABCD$ is a parallelogram, if the two diagonals are equal, find the measure of $\angle ABC$.

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125. If two isosceles triangles have a common base, prove that the line joining their vertices bisects them at right angles.

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126. $ABC\ and\ DBC$ are two isosceles triangles on the same bas BC and vertices $A\ and\ D$ are on the same side of BC . If AD is extended to intersect BC at $P,$ show that $ABD\ \cong\ ACD$ (ii) $ABP\ \cong\ ACP$

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127. $ABC\ and\ DBC$ are two isosceles triangles on the same bas BC and vertices $A\ and\ D$ are on the same side of BC . If AD is extended to intersect BC at $P,$ show that AP bisects $\backslash\ \angle A$ as well as $\angle D\ AP$ is the perpendicular bisector of BC

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128. A point O is taken inside an equilateral four sided figure $ABCD$ such that its distances from the angular points D and B are equal. Show that AO and OC are in one and the same straight line. GIVEN : A point O inside an equilateral quadrilateral four sided figure $ABCD$ such that $BO = OD$. TO PROVE : AO and OC are in one and the same straight line.

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129. $AD,\ BE\ and\ CF,$ the altitudes of ABC are equal. Prove that ABC is an equilateral triangle.

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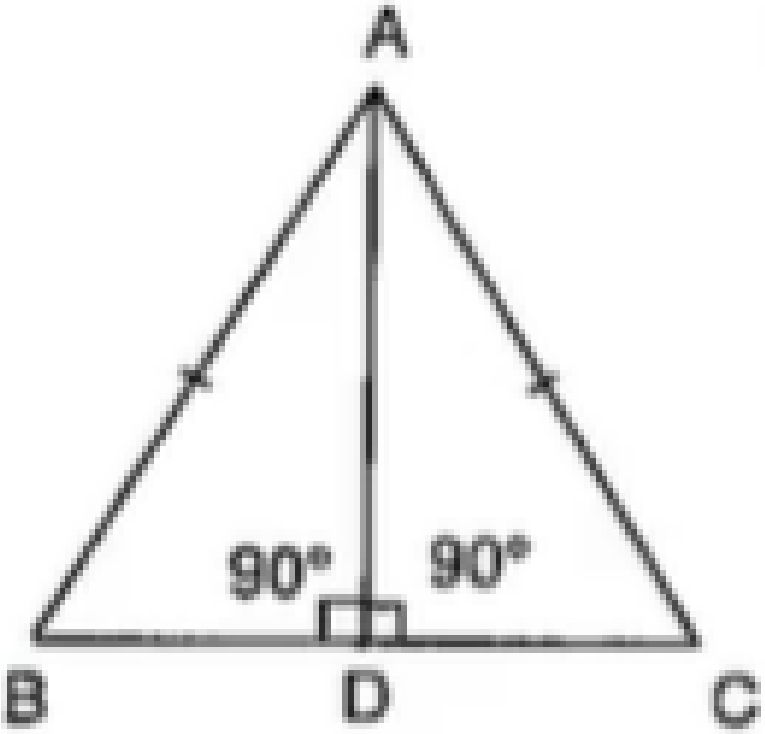
130. If ABC is an isosceles triangle such that $AB = AC$ and AD is an altitude from A on BC . Prove that (i) $\angle B = \angle C$ (ii) AD bisects BC (iii)

AD bisects $\angle A$



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131. ABC is a triangle and D is the mid-point of BC . The perpendiculars from D to AB and AC are equal. Prove that the triangle is isosceles.

.Given : D is the mid-point of BC and PD=DQ.

To prove : $\triangle ABC$ is isosceles.

Proof

Let DE and DF be the perpendiculars from D on AB and AC respectively.

In $\triangle sBDE$ and CDF

DE=DF (given)

$\angle BED = \angle CFD = 90^{\cdot}$

BD=DC (Dis the mid-point of BC)

$\therefore \triangle BDE \cong \triangle CDF$ (By RHS)

$\angle B = \angle C$ (by CPCT)

AC=AB (Sides opposites to equal angles are equal)

$\therefore \triangle ABC$ is isosceles.

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132. ABC is a triangle is which BE and CF are, respectively, the perpendiculars to the sides AC and AB . If $BE = CF$, prove that ABC is isosceles.

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133. In perpendiculars from any point within an angle on its arms are congruent, prove that it lies on the bisector of that angle.

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134. $ABCD$ is a square, $X\ and\ Y$ are points on sides $AD\ and\ BC$ respectively such that $AY = BX$. Prove that $BY = AX\ and\ \angle BAY = \angle ABX$

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135. Which of the following statements are true (T) and which are false (F): Side opposite to equal angles of a triangle may be unequal. Angle opposite to equal sides of a triangle are equal. The measure of each angle of an equilateral triangle is 60^0. If the altitude from one vertex of a triangle bisects the opposite side, then the triangle may be isosceles. The bisectors of two equal angles of a triangle are equal. If the bisector of the vertical angle of a triangle bisects the base, then the triangle may be

isosceles. The two altitudes corresponding to two equal sides of a triangle need not be equal. If any two sides of a right triangle are respectively equal to two sides of other right triangle, then the two triangles are congruent. Two right triangles are congruent if hypotenuse and a side of one triangle are respectively equal to the hypotenuse and a side of the other triangle.

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136. Fill the blanks in the following so that each of the following statements is true.

(i) Sides opposite to equal angles of a triangle are .....

(ii) Angle opposite to equal sides of a triangle are .....

(iii) In an equilateral triangle all angles are .....

(iv) In a ΔABC if $\angle A = \angle C$, then AB = ...

(v) If altitudes CE and BF of a triangle ABC are equal, then AB = ...

(vi) In an isosceles triangle ABC with AB = AC, if BD and CE are its altitudes, then BD is ..... CE.

(vii) In right triangles ABC and DEF, if hypotenuse AB = EF and side AC = DE, then ΔABC ≅ Δ .....

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137. In a $ABC,$ if $\angle A = 45^0 \; and \; \angle B = 70^0.$ Determine the shortest and largest sides of the triangle.

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138. In a $ABC,$ if $\angle A = 50^0 \; and \; \angle B = 60^0$, determine the shortest and largest sides of the triangle.

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139. If D is any point on the base BC produced, of an isosceles triangle $ABC,$ prove that $AD > AB$.

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140. Prove that any two sides of a triangle are together greater than twice the median drawn to the third side.

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141. Prove that the perimeter of a triangle is greater than the sum of its three medians. In the $\triangle ABC$, D,E and F are the midpoints of sides BC,CA and AB respectively.

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142. In PQR , S is any point on the side QR . Show that $PQ + QR + RP > 2PS$

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143. Of all the lines segments drawn from a point P to a line m not containing P, let PD be the shortest. If $B\ and\ C$ are points on m such that D is the mid-point of BC, prove that $PB = PC$

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144. In ABC, if $\angle A = 40^0 and \angle B = 60^0$. Determine the longest and shortest sides of the triangle.

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145. In a ABC, if $\angle B = \angle C = 45^0$, which is the longest side?

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146. Is it possible to draw a triangle with sides of length $2cm,\ 3cm\ and\ 7cm$?

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147. In ABC, $\angle B = 35^0, \angle C = 65^0$ and the bisector of $\angle BAC$ meets BC in P. Arrange AP, BP and CP in descending order.

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148. Prove that the perimeter of a triangle is greater than the sum of its altitudes.

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149. Prove that in a quadrilateral the sum of all the sides is greater than the sum of its diagonals.

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150. In Figure, prove that $CD + DA + AB + BC > 2AC$

$CD + DA + AB + BC > 2AC$

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151. Which of the following statements are true (T) and which are false (F)? Sum of the three sides of a triangle is less than the sum of its three altitudes. Sum of any two sides of a triangle is greater than twice the median drawn to the third side. Sum of any two sides of a triangle is greater than the third side. Difference of any two sides of a triangle is equal to the third side. If two angles of a triangle are unequal, then the greater angle has the larger side opposite to it. Of all the line segments that can be drawn from a point to a line not containing it, the perpendicular line segment is the shortest one.

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152. Fill in the blanks to make the following statements true: In a right triangle the hypotenuse is the ..... side. The sum of three altitudes of a triangle is ..... than its perimeter. The sum of any two sides of a triangle is ..... than the third side. If two angles of a triangle are unequal, then the smaller angle has the ..... side opposite to it. Difference of any two sides of a triangle is ..... than the third side. If two sides of a triangle are unequal, then the larger side has ..... angle opposite to it.

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153. In two congruent triangles $ABC \text{ and } DEF$, if $AB = DE \text{ and } BC = EF$. Name the pairs of equal angles.

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154. In two triangles $ABC \text{ and } DEF$, it is given that $\angle A = \angle D$, $\angle B = \angle E$ and $\angle C = \angle F$. Are the two triangles necessarily congruent?

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155. If $ABC\ and\ DEF$ are two triangles such that $AC = 2.5\,cm,\ BC = 5\,cm,\ \angle C = 75^0,\ de = 25.\,CM,\ df = 5\,CM\ and\ \angle$. Are two triangles congruent?

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156. In two triangles $ABC\ and\ ADC,$ if $AB = AD\ and\ BC = CD.$ Are they congruent?

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157. In triangle $ABC\ and\ CDE,$ if $AC = CE,\ BC = CD,\ \angle A = 60^0,\ \angle C = 30^0\ and\ \angle D = 90^0.$ Are two triangle congruent?

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158. ABC is an isosceles triangle in which $AB = AC\dot{B}E \, and \, CF$ are its two medians. Show that $BE = CF$.

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159. Find the measure of each angle of an equilateral triangle.

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160. CDE is an equilateral triangle formed on a side CD of a square $ABCD$. Show that $ADE \cong BCE$.

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161. Show that the sum of the three altitudes of a triangle is less than the sum of three sides of the triangle.

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162. If $ABC \cong ACB$, then ABC is isosceles with $AB = AC$ (b) $AB = BC\ AC = BC$ (d) $None\ of\ these$

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163. If $ABC \cong PQR$ and ABC is not congruent to RPQ, then which of the following not true: $BC = PQ$ (b) $AC = PR$ (c) $AB = PQ$ (D) $QR = BC$

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164. In triangles $ABC\ and\ PQR$ three equality relations between some parts are as follows: $AB = QP$, $\angle B = \angle P\ and\ BC = PR$ State which of the congruence conditions applies: SAS (b) ASA (c) SSS (d) RHS

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165. In triangles $ABC \text{ and } PQR$, if $\angle A = \angle R,\ \angle B = \angle P \text{ and } AB = RP$, then which one of the following congruence conditions applies:

(a) SAS

(b) ASA

(c) SSS

(d) RHS

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166. If $PQR \cong EFD$, then $ED =$ PQ (b) QR (c) PR (d) None of these

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167. If $PQR \cong EFD$, then $\angle E = \angle P$ (b) $\angle Q$ (c) $\angle R$ (d) None of these

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168. In a ABC, if $AB = AC \, and \, BC$ is produced to D such that $\angle ACD = 100^0$, then $\angle A =$ 20^0 (b) 40^0 (c) 60^0 (d) 80^0

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169. In an isosceles triangle, if the vertex angle is twice the sum of the base angles, then the measure of vertex angle of the triangle is 100^0 (b) 120^0 (c) 110^0 (d) 130^0

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170. D, E, F are the mid-point of the sides BC, $CA \, and \, AB$ respectively of ABC. Then DEF is congruent to triangle. ABC (b) AEF (c) BFD, CDE (d) AFE, BFD, CDE

Given : D, E, F are the mid-point of the sides BC, CA and AB .

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171. Which of the following is not a criterion for congruence of triangles?

SAS (b) SSA (c) ASA (d) SSS

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172. If ABC and DEF are two triangles such that $ABC \cong FDE \, and \, AB = 5cm, \, \angle B = 40^0 \, and \, \angle A = 80^0$. Then, which of the following is true? $DF = 5cm, \, \angle F = 60^0$ (b) $DE = 5cm, \, \angle E = 60^0$ $DF = 5 \, cm, \, \angle E = 60^0$ (d) $DE = 5cm, \, \angle D = 40^0$

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