



MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

QUADRILATERALS

Others

1. The sides AB and CD of a parallelogram $ABCD$ are bisected at E and F . Prove that $EBFD$ is a parallelogram.



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2. In Figure, $ABCD$ is a trapezium in which $AB \parallel CD$ and $AD = BC$. show that : $\angle A = \angle B$ (ii) $\angle C = \angle D$ (iii) $AC = BD$ (iv) Diagonal $AC =$ diagonal BD



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3. If the diagonals of a parallelogram are perpendicular, then it is a rhombus.



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4. Show that the diagonals of a rhombus are perpendicular to each other



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5. If the diagonals of a parallelogram are equal and intersect at right angles, then the parallelogram is a square.



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6. Show that the diagonals of a square are equal and bisect each other at right angles.



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7. The diagonals of a rectangle $ABCD$ meet at O . If $\angle BOC = 44^\circ$, find $\angle OAD$.



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8. $PQRS$ is a square. PR and SQ intersect at O . State the measure of $\angle POQ$.



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9. ABCD is a rectangle in which diagonal AC bisects $\angle A$ as well as $\angle C$. Show that: (i) ABCD is a square (ii) diagonal BD bisects $\angle B$ as well as $\angle D$.



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10. $ABCD$ is a rhombus with $\angle ABC = 56^{\circ}$. Determine $\angle ACD$.

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11. Each of the four angles of a rectangle is a right angle.

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12. Each of the four sides of a rhombus is of the same length.

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13. AB, CD are two parallel lines and a transversal l intersects AB at X and CD at Y Prove that the bisectors of the interior angles form a parallelogram, with all its angles right angles i.e., it is a rectangle.



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14. If ABC and DEF are two triangles such that AB, BC are respectively equal and parallel to DE, EF , then show that (i) quad $ABED$ is a parallelogram (ii) quad $BCFE$ is a parallelogram (iii) $AC=DF$ (iv) $\triangle ABC \cong \triangle DEF$



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15. In Figure, $ABCD$ is a parallelogram and X and Y are points on the diagonal BD such that $DX = BY$. Prove

that $AXCY$ is a parallelogram (ii)

$AX = CY, AY = CX$ (iii) $AYB \cong CXD$ (iv)

$AXD \cong CYB$

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16. In Figure, ABC is an isosceles triangle in which $AB = AC$ and $CP \parallel AB$ and AP is the bisector of exterior $\angle CAD$ of ABC . Prove that $\angle PAC = \angle BCA$ and (ii) $ABCP$ is a parallelogram.

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17. In Figure, X, Y are the mid-points of opposite sides AB and DC of a parallelogram $ABCD$ and DX are joined intersecting in P ; CX and BY are joined intersecting in Q . Show that $DXBY$ is a parallelogram, $PXQY$ is parallelogram.

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18. Two segments AC and BD bisect each other at O . Prove that $ABCD$ is a parallelogram.

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19. Each of the angles of a square is a right angle and each of the four sides is of the same length.

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20. The diagonals of a rectangle are of equal length.

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21. If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.

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22. A quadrilateral is parallelogram if its opposite angles are equal.

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23. A quadrilateral is a parallelogram if its opposite sides are equal.

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24. In Figure, $ABCD$ is a parallelogram in which $\angle A = 60^\circ$. If the bisectors of $\angle A$ and $\angle B$ meet at P , prove that $AD = DP$, $PC = BC$ and $DC = 2AD$.

Figure

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25. Show that if the diagonals of a quadrilateral are equal and bisect each other at right angle, then it is a square.

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26. Show that the diagonals of a square are equal and bisect each other at right angles.

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27. Show that if the diagonals of a quadrilateral bisect each other at right angles, then it is a rhombus.

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28. A quadrilateral is a parallelogram, if its one pair of opposite sides are equal and parallel.

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29. In Figure, $ABCD$ is a parallelogram and X, Y are the mid-points of sides AB and DC respectively. Show that $AXCY$ is a parallelogram. Figure

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30. In a triangle ABC median AD is produced to X such that $AD = DX$. Prove that $ABXC$ is a parallelogram.

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31. In Figure, $PQRS$ is a parallelogram, PO and QO are, respectively, the angle bisectors of $\angle P$ and $\angle Q$. Line LOM is drawn parallel to PQ . Prove that : $PL = QM$ (ii)
 $LO = OM$

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32. The diagonals of a parallelogram $ABCD$ intersect at O . A line through O intersects AB at X and DC at Y .

Prove that $OX = OY$.



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33. $ABCD$ is a parallelogram and $\angle DAB = 60^\circ$. If the bisectors AP and BP of angles A and B respectively, meet at P on CD , prove that P is the mid-point of CD .



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34. In a parallelogram $ABCD$, the bisector of $\angle A$ also bisects BC at X . prove that $AD = 2AB$.



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35. $ABCD$ is a parallelogram. L and M are points on AB and DC respectively and $AL = CM$. prove that LM and BD bisect each other.



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36. $PQRS$ is a parallelogram. PX and QY are respectively, the perpendiculars from P and Q to SR and RS produced. Prove that $PX = QY$.



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37. $ABCD$ is a parallelogram. AB is produced to E so that $BE = AB$. Prove that ED bisects BC .



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38. If $ABCD$ is a quadrilateral in which $AB \parallel CD$ and $AD = BC$, prove that $\angle A = \angle B$.

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39. Find the measure of all the angles of a parallelogram, if one angle is 24° less than twice the smallest angle.

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40. The perimeter of a parallelogram is 22cm . If the longer side measures 6.5cm . what is the measure of the

shorter side?



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41. In Figure, $ABCD$ is a parallelogram in which P is the mid-point of DC and Q is a point on AC such that $CQ = \frac{1}{4}AC$. If PQ produced meets BC at R . Prove that R is a mid-point of BC .



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42. ABC is a triangle. D is a point on AB such that $AD = \frac{1}{4}AB$ and E is a point on AC such that $AE = \frac{1}{4}AC$. Prove that $DE = \frac{1}{4}BC$.



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43. Show that the line segments joining the mid-points of the opposite sides of a quadrilateral bisect each other

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44. BM and CN are perpendiculars to a line passing through the vertex A of a triangle ABC . If L is the mid-point of BC , prove that $LM = LN$.

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45. In Figure, AN and CP are perpendicular to the diagonal BD of a parallelogram $ABCD$. Prove that :
 $ADN \cong CBP$ (ii) $AN = CP$



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46. Given ABC , lines are drawn through A , B and C parallel respectively to the sides BC , CA and AB , forming triangle PQR . Show that $BC = \frac{1}{2}QR$.



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47. In a parallelogram $ABCD$, $\angle D = 115^\circ$, determine the measure of $\angle A$ and $\angle B$.



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48. In a parallelogram $ABCD$, prove that sum of any two consecutive angles is 180^0 .



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49. $ABCD$ is a parallelogram and line segments AX , CY bisect the angles A and C , Show that $AX \parallel CY$.



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50. In a parallelogram $ABCD$ diagonals AC and BD intersect at O and $AC = 6.8\text{cm}$ and $BD = 13.6\text{cm}$.

Find the measures of OC and OD .



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51. In a parallelogram, prove that the bisectors of any two consecutive angles intersect at right angle.



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52. The diagonals of a parallelogram bisect each other.



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53. The angle bisectors of a parallelogram form a rectangle.

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54. If diagonal of a parallelogram bisects one of the angles of the parallelogram, it also bisects the second angle.

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55. Show that the quadrilateral, formed by joining the mid-points of the sides of a square, is also a square.

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56. The diagonals of a quadrilateral $ABCD$ are perpendicular. Show that the quadrilateral, formed by joining the mid-points of its sides, is a rectangle.

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57. $ABCD$ is a rhombus and P, Q, R, S are the mid-points of AB, BC, CD, DA respectively. Prove that $PQRS$ is a rectangle.

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58. Show that the quadrilateral formed by joining the mid-points of the consecutive sides of a rectangle is a rhombus.

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59. Prove that the figure formed by joining the mid-points of the pair of consecutive sides of a quadrilateral is a parallelogram. OR $ABCD$ is a parallelogram in which P, Q, R and S are mid-points of the sides AB, BC, CD and DA respectively. AC is a diagonal. Show that :
 $PQ \parallel AC$ and $PQ = \frac{1}{2}AC$ $SR \parallel AC$ and $SR = \frac{1}{2}AC$ $PQ = SR$ (iv) $PQRS$ is a parallelogram.

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60. In Figure, AD is the median and $DE \parallel AB$. Prove that BE is the median.

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61. In a ABC , find the measures of the angles of the triangle formed by joining the mid-points of the sides of this triangle.

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62. In ABC , AD is the median through A and E is the mid-point of AD . BE produced meets AC in F (Figure).

Prove that $AF = \frac{1}{3}AC$.



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63. In Figure, AD , and BE are medians of ABC and $BE \parallel DF$. Prove that $CF = \frac{1}{4}AC$.



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64. P , Q and R are, respectively, the mid-points of sides BC , CA and AB of a triangle ABC , PR and BQ meet at X and PQ meet at Y . Prove that $XY = \frac{1}{4}BC$.



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65. P is the mid-point of side AB of a parallelogram $ABCD$. A line through B parallel to PD meets DC at Q and AD produced at R . Prove that (i) $AR = 2BC$ (ii) $BR = 2BQ$.

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66. In Figure, $ABCD$ is a trapezium in which side AB is a parallel to side DC and E is the mid-point of side AD . If F is a point on the side BC such that the segment EF is parallel to side DC . Prove that F is the mid point of BC and $EF = \frac{1}{2}(AB + DC)$.

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67. In Figure, $ABCD$ is a parallelogram. E and F are the mid-points of the sides AB and CD respectively. Prove that the line segments AF and CE trisect (divide into three equal parts) the diagonal BD .

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68. $ABCD$ is a parallelogram. P is a point on AD such that $AP = \frac{1}{3}AD$ and Q is a point on BC such that $CQ = \frac{1}{3}BP$. Prove that $AQCP$ is a parallelogram.

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69. In a $\triangle ABC$, BM and CN are perpendiculars from B and C respectively on any line passing through A . If L is the mid-point of BC , prove that $ML = NL$.

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70. In Figure, M , N and P are the mid-points of AB , AC and BC respectively. If $MN = 3\text{cm}$, $NP = 3.5\text{cm}$ and $MP = 2.5\text{cm}$, calculate BC , AB and AC .

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71. Prove that the line segment joining the mid-points of the diagonals of a trapezium is parallel to each of the

parallel sides and is equal to half the difference of these sides.

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72. In a triangle ABC median AD is produced to X such that $AD = DX$. Prove that $ABXC$ is a parallelogram.

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73. In $\triangle ABC$ the lines are drawn parallel to BC, CA and AB respectively through A, B and C intersecting at P, Q and R . Find the ratio of perimeter of $\triangle PQR$ and $\triangle ABC$

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74. $ABCD$ is a kite having $AB = AD$ and $BC = CD$.

Prove that the figure formed by joining the mid-points of the sides, in order, is a rectangle.



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75. Prove that In a parallelogram, opposite side are equal



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76. The opposite angles of a parallelogram are equal.



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77. The sides BA and DC of a quadrilateral $ABCD$ are produced as shown in Figure. Prove that $a + b = x + y$.

Figure



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78. In a quadrilateral $ABCD$, AO and BO are the bisectors of $\angle A$ and $\angle B$ respectively. Prove that $\angle AOB = \frac{1}{2}(\angle C + \angle D)$.



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79. The angles of quadrilateral are respectively 100° , 98° , 92° . Find the fourth angle.





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80. The angles of a quadrilateral are in the ratio 3:5:9:13. Find all the angles of the quadrilateral.



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81. A diagonal of parallelogram divides it into two congruent triangles.



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82. In Figure, bisectors of $\angle B$ and $\angle D$ of quadrilateral $ABCD$ meet CD and AB produced at P and Q

respectively.

Prove

that

:

$$\angle P + \angle Q = \frac{1}{2}(\angle ABC + \angle ADC)$$

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83. In a quadrilateral $ABCD$, CO and DO are the bisectors of $\angle C$ and $\angle D$ respectively. Prove that

$$\angle COD = \frac{1}{2}(\angle A + \angle B).$$

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84. Let ABC be an isosceles triangle with $AB = AC$ and let D, E, F be the mid points of BC, CA and AB respectively. Show that $AD \perp FE$ and AD is bisected by FE .



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85. ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallel to BC intersects AC at D. Show that (i) D is the mid-point of AC
(ii) $MD \perp AC$ (iii) $CM = MA = \frac{1}{2}AB$



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86. The line drawn through the mid-point of one side of a triangle, parallel to another side, intersects the third side at its mid-point.



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87. In Figure, D , E and F are, respectively the mid-points of sides BC , CA and AB of an equilateral triangle ABC . Prove that DEF is also an equilateral triangle.

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88. In $\triangle ABC$, D , E and F are respectively the mid-points of sides AB , BC and CA . Show that $\triangle ABC$ is divided into four congruent triangles by joining D , E and F .

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89. l , m and n are three parallel lines intersected by transversals p and q such that l , m and n cut off equal

intercepts AB and BC on p (see Fig.). Show that l , m and n cut off equal intercepts DE and EF on q also

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90. $ABCD$ is a square E , F , G and H are points on AB , BC , CD and DA respectively, such that $AE = BF = CG = DH$. Prove that $EFGH$ is square.

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91. $ABCD$ is a rhombus, $EABF$ is a straight line such that $EA = AB = BF$. Prove that ED and FC when produced meet at right angles.

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92. $ABCD$ is a parallelogram. AD is produced to E so that $DE = DC$ and EC produced meets AB produced in F . Prove that $BF = BC$.

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93. The line segment joining the mid-points of any two sides of a triangle is parallel to the third side and equal to half of it.

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94. In a quadrilateral $ABCD$, CO and DO are the bisectors of $\angle C$ and $\angle D$ respectively. Prove that

$$\angle COD = \frac{1}{2}(\angle A + \angle B)$$

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95. The angle of a quadrilateral are respectively 100° , 98° , 92° . Find the fourth angle.

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96. In a quadrilateral $ABCD$, the angles A , B , C and D are in the ratio $1:2:3:4$. Find the measure of each angles of the quadrilateral.



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97. The sides BA and DC of a quadrilateral $ABCD$ are produced as shown in Figure. Prove that $a + b = x + y$.

Figure



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98. In a quadrilateral $ABCD$, AO and BO are the bisectors of $\angle A$ and $\angle B$ respectively. Prove that $\angle AOB = \frac{1}{2}(\angle C + \angle D)$.



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99. In Figure, bisectors of $\angle B$ and $\angle D$ of quadrilateral $ABCD$ meet CD and AB produced at P and Q respectively. Prove that :

$$\angle P + \angle Q = \frac{1}{2}(\angle ABC + \angle ADC)$$

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100. The angle of a quadrilateral are respectively 100° , 98° , 92° . Find the fourth angle.

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101. In a quadrilateral $ABCD$, the angles A , B , C and D are in the ratio $1:2:4:5$. Find the

measure of each angles of the quadrilateral.

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102. In a quadrilateral $ABCD$, CO and DO are the bisectors of $\angle C$ and $\angle D$ respectively. Prove that $\angle COD = \frac{1}{2}(\angle A + \angle B)$.

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103. The angles of a quadrilateral are in the ratio $3:5:9:13$. Find all the angles of the quadrilateral.

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104. In a parallelogram $ABCD$, prove that sum of any two consecutive angles is 180^0 .



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105. In a parallelogram $ABCD$, $\angle D = 115^0$, determine the measure of $\angle A$ and $\angle B$.



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106. In Figure, $ABCD$ is a parallelogram. Compute the values of x and y



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107. In Figure, find the four angles A , B , C and D in the parallelogram $ABCD$

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108. In a parallelogram $ABCD$ diagonals AC and BD intersect at O and $AC = 6.8\text{ cm}$ and $BD = 5.6\text{ cm}$. Find the measures of OC and OD .

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109. $ABCD$ is a parallelogram and line segments AX , CY bisect the angles A and C , respectively. Show that $AX \parallel CY$



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110. Given $\triangle ABC$, lines are drawn through A , B and C parallel respectively to the sides BC , CA and AB , forming $\triangle PQR$. (Figure). Show that $BC = \frac{1}{2}QR$.



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111. In Figure, AN and CP are perpendicular to the diagonal BD of a parallelogram $ABCD$. Prove that :

(i) $\triangle ADN \cong \triangle CBP$

(ii) $AN = CP$



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112. In Figure, $PQRS$ is a parallelogram, PO and QO are, respectively, the angle bisectors of $\angle P$ and $\angle Q$. Line LOM is drawn parallel to PQ . Prove that:

(i) $PL = QM$

(ii) $LO = OM$



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113. The diagonals of a parallelogram $ABCD$ intersect at O . A line through O intersects AB at X and DC at Y . Prove that $OX = OY$.



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114. In Figure, $ABCD$ is a parallelogram and $\angle DAB = 60^\circ$. If the bisectors AP and BP of angles A and B respectively, meet at P on CD , prove that P is the mid-point of CD .



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115. In a parallelogram $ABCD$, the bisector of $\angle A$ also bisects BC at X . Prove that $AD = 2AB$.



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116. $ABCD$ is a parallelogram. L and M are points on AB and DC respectively and $AL = CM$. Prove that

LM and BD bisect each other.

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117. $PQRS$ is a parallelogram. PX and QY are respectively, the perpendiculars from P and Q to SR and RS produced. Prove that $PX = QY$

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118. $ABCD$ is a parallelogram. AB is produced to E so that $BE = AB$. Prove that ED bisects BC .

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119. Two opposite angles of a parallelogram are $(3x - 2)^0$ and $(50 - x)^0$. Find the measure of each angle of the parallelogram.



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120. If an angle of a parallelogram is two-third of its adjacent angle, find the angles of the parallelogram.



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121. Find the measure of all the angles of a parallelogram, if one angle is 24^0 less than twice the smallest angle.



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122. The perimeter of a parallelogram is 22cm . If the longer side measures 6.5cm what is the measure of the shorter side?



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123. In a parallelogram $ABCD$, $\angle D = 135^\circ$, determine the measures of $\angle A$ and $\angle B$



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124. $ABCD$ is a parallelogram in which $\angle A = 70^\circ$. Compute $\angle B$, $\angle C$ and $\angle D$



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125. In Figure, $ABCD$ is a parallelogram in which $\angle A = 60^\circ$. If the bisectors of $\angle A$ and $\angle B$ meet at P , prove that $AD = DP$, $PC = BC$ and $DC = 2AD$.

Figure



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126. In Figure, $ABCD$ is a parallelogram in which $\angle DAB = 75^\circ$ and $\angle DBC = 60^\circ$. Compute $\angle CDB$ and $\angle ADB$



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127. $ABCD$ is a parallelogram and E is the mid-point of BC , DE and AB when produced meet at F . Then

$$AF = \frac{3}{2}AB \text{ (b) } 2AB \text{ (c) } 3AB \text{ (d) } \frac{5}{4}AB$$



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128. Which of the following statements are true (T) and which are false (F)? (i) In a parallelogram, the diagonals are equal. (ii) In a parallelogram, the diagonals bisect each other. (iii) In a parallelogram, the diagonals intersect each other at right angles. (iv) In any quadrilateral, if a pair of opposite sides is equal, it is a parallelogram. (v) If all the angles of a quadrilateral are equal, it is a parallelogram. (vi) If three sides of a quadrilateral are

equal , it is a parallelogram. (vii) If three angles of a quadrilateral are equal, it is a parallelogram. (viii) If all the sides of a quadrilateral are equal it is a parallelogram

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129. Show that if the diagonals of a quadrilateral bisect each other at right angles, then it is a rhombus.

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130. Show that the diagonals of a square are equal and bisect each other at right angles.

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131. Show that if the diagonals of a quadrilateral are equal and bisect each other at right angles, then it is a square

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132. In a triangle ABC median AD is produced to X such that $AD = DX$. Prove that $ABXC$ is a parallelogram.

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133. In Figure, $ABCD$ is a parallelogram and X, Y are the mid-points of sides AB and DC respectively. Show

that $AXCY$ is a parallelogram.



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134. In Figure, X , Y are the mid-points of opposite sides AB and DC of a parallelogram $ABCD$. AY and DX are joined intersecting in P ; CX and BY are joined intersecting in Q . Show that

(i) $AXCY$ is a parallelogram

(ii) $DXBY$ is a parallelogram

(iii) $PXQY$ is a parallelogram



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135. Two segments AC and BD bisect each other at O .
Prove that $ABCD$ is a parallelogram.

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136. In Figure, $ABCD$ is a parallelogram and X and Y are points on the diagonal BD such that $DX = BY$.

Prove that $AICY$ is a parallelogram (ii)

$AX = CY, AY = CX$ $AYB \cong CXD$ (iv)

$AXD \cong CYB$

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137. ABC is an isosceles triangle in which $AB = AC$. AP bisects exterior angle DAC and $CP \parallel AB$. Show that angle $PAC = \text{Angle } BCA$ (ii) $ABCP$ is a Parallelogram

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138. AB, CD are two parallel lines and a transversal l intersects AB at X and CD at Y . Prove that the bisectors of the interior angles form a parallelogram, with all its angles right angles i.e., it is a rectangle.

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139. If ABC and DEF are two triangles such that AB, BC are respectively equal and parallel to DE, EF .

Then show that

(i) Quadrilateral $ABED$ is a parallelogram

(ii) Quadrilateral $BCFE$ is a parallelogram

(iii) $AC = DF$

(iv) $ABC \cong DEF$



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140. $PQRS$ is a square such that PR and SQ intersect at O . State the measure of $\angle POQ$.



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141. The diagonals of a rectangle $ABCD$ meet at O . If $\angle BOC = 44^{\circ}$, find $\angle OAD$

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142. If $PQRS$ is a square, then write the measure of $\angle SRP$

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143. If $ABCD$ is a rectangle with $\angle BAC = 32^{\circ}$, find the measure of $\angle DBC$

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144. If $ABCD$ is a rhombus with $\angle ABC = 56^\circ$, find the measure of $\angle ACD$

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145. $ABCD$ is a rhombus. Show that diagonal AC bisects $\angle A$ as well as $\angle C$ and diagonal BD bisects $\angle B$ as well as $\angle D$.

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146. $ABCD$ is a rectangle in which diagonal AC bisects $\angle A$ as well as $\angle C$. Show that: (i) $ABCD$ is a square (ii) diagonal BD bisects $\angle B$ as well as $\angle D$.



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147. In Figure, $ABCD$ is a trapezium in which $AB \parallel CD$ and $AD = BC$. show that : $\angle A = \angle B$ (ii) $\angle C = \angle D$
 $ABC \cong BAD$ diagonal $AC = \text{diagonal } BD$



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148. In Figure, $ABCD$ is a trapezium in which $AB \parallel CD$ and $AD = BC$. Show that :

(i) $\angle A = \angle B$

(ii) $\angle C = \angle D$

(iii) $ABC \cong BAD$

(iv) diagonal $AC = \text{diagonal } BD$



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149. In a parallelogram $ABCD$, determine the sum of angles $\angle C$ and $\angle D$



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150. In a parallelogram $ABCD$, if $\angle D = 135^\circ$, determine the measures of its other angles.



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151. $ABCD$ is a square. AC and BD intersect at O . State the measure of $\angle AOB$.



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152. $ABCD$ is a rectangle with $\angle ABD = 40^\circ$. Determine $\angle DBC$



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153. The sides AB and CD of a parallelogram $ABCD$ are bisected at E and F . Prove that $EBFD$ is a parallelogram.



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154. P and Q are the points of trisection of the diagonal BD of a parallelogram $ABCD$. Prove that CQ is parallel to AP . Prove also that AC bisects PQ

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155. $ABCD$ is a square E, F, G and H are points on AB, BC, CD and DA respectively, such that $AE = BF = CG = DH$. Prove that $EFGH$ is square.

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156. $ABCD$ is a rhombus, $EABF$ is a straight line such that $EA = AB = BF$. Prove that ED and FC when

produced meet at right angles.

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157. $ABCD$ is a parallelogram. AD is produced to E so that $DE = DC$ and EC produced meets AB produced in F . Prove that $BF = BC$.

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158. In Figure, D , E and F are, respectively the mid-points of sides BC , CA and AB of an equilateral triangle ABC . Prove that DEF is also an equilateral triangle.

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159. Prove that the four triangles formed by joining in pairs, the mid-points of three sides of a triangle, are congruent to each other.

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160. l , m and n are three parallel lines intersected by transversals p and q such that l , m and n cut off equal intercepts AB and BC on p (see Figure). Show that l , m and n cut off equal intercepts DE and EF on q also.

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161. Let ABC be an isosceles triangle with $AB = AC$ and let D, E, F be the mid points of BC, CA and AB respectively. Show that $AD \perp FE$ and AD is bisected by FE .

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162. ABC is a triangle right angled at B ; and P is the mid-point of AC . Prove that: $PQ \perp AB$ (ii) Q is the mid point of AB $PB = PA = \frac{1}{2}AC$

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163. P , Q and R are, respectively, the mid points of sides BC , CA and AB of a triangle ABC and AD is the perpendicular from vertex A to BC , then prove that the points P, Q, R and D are cyclic.



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164. In Figure, AD and BE are medians of ABC and $BE \parallel DF$. Prove that $CF = \frac{1}{4}AC$.



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165. In ABC , AD is the median through A and E is the mid-point of AD . BE produced meets AC in F (Figure).

Prove that $AF = \frac{1}{3}AC$.



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166. In a ABC , find the measures of the angles of the triangle formed by joining the mid-points of the sides of this triangle.



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167. In Figure, AD is the median and $DE \parallel AB$. Prove that BE is the median.



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168. $ABCD$ is a rhombus and P, Q, R, S are the mid-points of AB, BC, CD, DA respectively. Prove that $PQRS$ is a rectangle.



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169. Show that the line segments joining the mid-points of the opposite sides of a quadrilateral bisect each other.



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170. Show that the quadrilateral formed by joining the mid-points of the consecutive sides of a rectangle is a rhombus.

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171. $ABCD$ is a rhombus and P, Q, R, S are the mid-points of AB, BC, CD, DA respectively. Prove that $PQRS$ is a rectangle.

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172. The diagonals of a quadrilateral $ABCD$ are perpendicular. Show that the quadrilateral, formed by joining the mid-points of its sides, is a rectangle.

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173. Show that the quadrilateral, formed by joining the mid-points of the sides of a square is also a square.

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174. In Figure, $ABCD$ is a parallelogram. E and F are the mid-points of the sides AB and CD respectively. Prove that the line segments AF and CE trisect (divide into three equal parts) the diagonal BD .

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175. $ABCD$ is a parallelogram. P is a point on AD such that $AP = \frac{1}{3} AD$ and Q is a point on BC such that

$CQ = \frac{1}{3}BC$. Prove that $AQCP$ is a parallelogram.



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176. P is the mid-point of side AB of a parallelogram $ABCD$. A line through B parallel to PD meets DC at Q and AD produced at R . Prove that:

(i) $AR = 2BC$

(ii) $BR = 2BQ$



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177. In Figure, $ABCD$ is a trapezium in which side AB is parallel to side DC and E is the mid-point of side AD . If F is a point on the side BC such that the segment EF is

parallel to side DC . Prove that F is the mid point of BC

$$\text{and } EF = \frac{1}{2}(AB + DC).$$



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178. Prove that the line segment joining the mid-points of the diagonals of a trapezium is parallel to each of the parallel sides and is equal to half the difference of these sides.



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179. In $\triangle ABC$, D , E and F are, respectively, the mid-points of BC , CA and AB . If the lengths of side

AB , BC and CA are 7cm, 8cm, and 9cm, respectively,

find the perimeter of $\triangle DEF$.



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180. In a triangle

$\triangle abc$, $\angle A = 50^\circ$, $\angle B = 60^\circ$ and $\angle C = 70^\circ$. Find the

measures of the angles of the triangle formed by joining

the mid-points of the sides of this triangle.



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181. In a triangle, P , Q and R are the mid-points of sides

BC , CA and AB respectively. If

$AC = 21 \text{ cm}$, $BC = 29 \text{ cm}$ and $AB = 30 \text{ cm}$, find the perimeter of the quadrilateral $ARPQ$

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182. In a ABC median AD is produced to X such that $AD = DX$. Prove that $ABXC$ is a parallelogram.

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183. In a ABC , E and F are the mid-points of AC and AB respectively. The altitude AP to BC intersects FE at Q . Prove that $AQ = QP$.

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184. In a $\triangle ABC$, BM and CN are perpendiculars from B and C respectively on any line passing through A . If L is the mid-point of BC , prove that $ML = NL$.

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185. In triangle ABC is right-angled at B . Given that $AB = 9\text{cm}$, $AC = 15\text{cm}$ calculate BC .

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186. M , N and P are the mid-points of AB , AC and BC respectively. If

$MN = 3\text{cm}$, $NP = 3.5\text{cm}$ and $MP = 2.5\text{cm}$,

calculate BC , AB and AC

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187. ABC is a triangle and through A , B , C lines are drawn parallel to BC , CA and AB respectively intersecting at P , Q and R . Prove that the perimeter of PQR is double the perimeter of ABC

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188. In Figure, $BE \perp AC$, AD is any line from $A \rightarrow BC$ intersecting BE in H , P , Q and R are

respectively the mid-points of AH , AB and BC . Prove that $\angle PQR = 90^\circ$

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189. In figure $AB = AC$ and $CP \parallel BA$ and AP is the bisector of exterior $\angle CAD$ of ABC . Prove that

(i) $\angle PAC = \angle BCA$

(ii) $ABCP$ is a parallelogram

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190. Let ABC be an isosceles triangle in which $AB = AC$. If D , E , F be the mid-points of the sides

BC , CA and AB respectively, show that the segment AD and EF bisect each other at right angles.

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191. ABC is a triangle. D is a point on AB such that $AD = \frac{1}{4}AB$ and E is a point on AC such that $AE = \frac{1}{4}AC$. Prove that $DE = \frac{1}{4}BC$

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192. In Figure, $ABCD$ is a parallelogram in which P is the mid-point of DC and Q is a point on AC such that $CQ = \frac{1}{4}AC$. If PQ produced meets BC at R , prove that R is a mid-point of BC .



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193. In Figure, $ABCD$ and $PQRC$ are rectangles and Q

is the mid-point of AC . Prove that $DP = PC$ (ii)

$$PR = \frac{1}{2} AC$$



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194. $ABCD$ is a parallelogram, E and F are the mid-

points of AB and CD respectively. GH is any line

intersecting AD , EF and BC at G , P and H

respectively. Prove that $GP = PH$



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195. BM and CN are perpendicular to a line passing through the vertex A of a triangle ABC . If L is the mid-point of BC , prove that $LM = LN$.



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196. Show that the line segments joining the mid-points of the opposite sides of a quadrilateral bisect each other



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197. Fill in the blanks to make the following statements correct The triangle formed by joining the mid-points of the sides of an isosceles triangle is The triangle formed

by joining the mid-points of the sides of a right triangle is The figure formed by joining the mid-points of consecutive sides of a quadrilateral is



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198. In a parallelogram $ABCD$, write the sum of angle A and B



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199. In a parallelogram $ABCD$, if $\angle D = 115^\circ$, then write the measure of $\angle A$



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200. $PQRS$ is a square such that PR and SQ intersect at O . State the measure of $\angle POQ$

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201. In a quadrilateral $ABCD$, bisectors of angles A and B intersect at O such that $\angle AOB = 75^\circ$, then write the value of $\angle C + \angle D$

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202. The diagonals of a rectangle $ABCD$ meet at O . If $\angle BOC = 44^\circ$, find $\angle OAD$

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203. If $PQRS$ is a square, then write the measure of $\angle SRP$

A. 90°

B. 45°

C. 40°

D. 50°

Answer: B



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204. If $ABCD$ is a rectangle with $\angle BAC = 32^\circ$, find the measure of $\angle DBC$.

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205. If $ABCD$ is a rhombus with $\angle ABC = 56^\circ$, find the measure of $\angle ACD$

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206. The perimeter of a parallelogram is 22cm. If the longer side measures 6.5cm, what is the measure of shorter side?

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207. If the angles of a quadrilateral are in the ratio 3:5:9:13, then find the measure of smallest angle.

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208. If the bisectors of two adjacent angles A and B of a quadrilateral $ABCD$ intersect at a point O such that $\angle C + \angle D = k\angle AOB$, then find the value of k .

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209. In a parallelogram $ABCD$, if $\angle A = (3x - 20)^0$, $\angle B = (y + 15)^0$, $\angle C = (x + 40)^0$, then find the values of x and y

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210. If measures opposite angles of a parallelogram are $(60 - x)^0$ and $(3x - 4)^0$, then find the measure of angles of the parallelogram.

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211. In a parallelogram $ABCD$, the bisector of $\angle A$ also bisects BC at X . Find $AB:AD$



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212. In Figure, $PQRS$ is an isosceles trapezium. Find x and y



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213. In Figure, $ABCD$ is a trapezium. Find the value of x and y



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214. In Figure, $PQRS$ is a rhombus in which the diagonal PR is produced to T . If $\angle SRT = 152^\circ$, find x , y and z



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215. In Figure, $ABCD$ is a rectangle in which diagonal AC is produced to E . If $\angle ECD = 146^\circ$, find $\angle AOB$



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216. $ABCD$ is a parallelogram. If $\angle C = 58^\circ$, find $\angle A$



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217. Complete each of the following statements by means of one of those given in brackets again each: If one pair of opposite sides are equal and parallel, then the figure is

..... (parallelogram, rectangle, trapezium) If in a quadrilateral only one pair of opposite sides are parallel, the quadrilateral is (square, rectangle, trapezium)

A line drawn from the mid-point of one side of a triangle another side intersects the third side at its mid-point. (perpendicular to, parallel to, to meet) If one

angle of a parallelogram is a right angle, then it is necessarily a (rectangle, square, rhombus)

Consecutive angles of parallelogram are (supplementary, complementary) If both pairs of opposite

sides of a quadrilateral are equal, then it is necessarily (rectangle, parallelogram, rhombus) if opposite angles of

a quadrilateral are equal, then it is necessarily a (parallelogram, rhombus, rectangle) If consecutive sides

of a parallelogram are equal, then it is necessarily a (kite, rhombus, square)



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218. The opposite sides of a quadrilateral have (a) no common point (b) one common point (c) two common points (d) Infinitely many common points



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219. The consecutive sides of a quadrilateral have (a) no common point (b) one common point (c) two common points (d) Infinitely many common points



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220. $PQRS$ is a quadrilateral. PR and QS intersect each other O . In which of the following cases, $PQRS$ is a parallelogram?

(i) $\angle P = 100^\circ, \angle Q = 80^\circ, \angle R = 95^\circ$

(ii) $\angle P = 85^\circ, \angle Q = 85^\circ, \angle R = 95^\circ$

(iii)

$PQ = 7\text{CM}, QR = 7\text{CM}, RS = 8\text{CM}, SP = 8\text{CM}$

(iv)

$OP = 6.5\text{cm}, OQ = 6.5\text{cm}, OR = 5.2\text{cm}, OS = 5.2\text{cm}$



221. Which of the following quadrilateral is not a rhombus? a.All four sides are equal b.Diagonals bisect each other c.Diagonals bisect opposite angles d.One angle between the diagonals is 60°



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222. Diagonals necessarily bisect opposite angles in a (a) rectangle (b) parallelogram (c) isosceles trapezium (d) square



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223. If the two diagonals of a parallelogram are equal, it is a rectangle.



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224. The bisectors of any two adjacent angles of a parallelogram intersect at:

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D



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225. Show that the bisectors of angles of a parallelogram form a rectangle.



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226. The figure formed by joining the mid-points of the adjacent sides of a quadrilateral is a (a) parallelogram (b) rectangle (c) square (d) rhombus



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227. The figure formed by joining the mid-points of the adjacent sides of a quadrilateral is a

A. parallelogram

B. rectangle

C. rhombus

D. trapezium

Answer: A



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228. Show that the quadrilateral formed by joining the mid-points of the consecutive sides of a rectangle is a

rhombus.



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229. The figure formed by joining the mid-points of the adjacent sides of a rhombus is a (a)square (b) rectangle (c) trapezium (d) none of these



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230. Show that the quadrilateral, formed by joining the mid-points of the sides of a square, is also a square.



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231. The figure formed by joining the mid-point of the adjacent sides of a parallelogram is a (a)rectangle (b) parallelogram (c) rhombus (d) square



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232. Find the measure of all the angles of a parallelogram, if one angle is 24° less than twice the smallest angle.



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233. In a parallelogram $ABCD$, if $\angle DAB = 75^{\circ}$ and $\angle DBC = 60^{\circ}$, then $\angle BDC =$ (a) 75° (b) 60° (c) 45° (d) 55°



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234. In a parallelogram $ABCD$, if $\angle DAB = 75^\circ$ and $\angle DBC = 60^\circ$, then $\angle BDC =$ (a) 75° (b) 60° (c) 45° (d) 55°



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235. $ABCD$ is a parallelogram and E and F are the centroids of triangles ABD and BCD respectively, then $EF =$

(a) AE

(b) BE

(c) CE

(d) DE



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236. $ABCD$ is a parallelogram, M is the mid-point of BD and BM bisects $\angle B$. Then, $\angle AMB = 45^0$ (b) 60^0 (c) 90^0 (d) 75^0



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237. $ABCD$ is a parallelogram and E is the mid-point of BC , DE and AB when produced meet at F . Then $AF =$

A. $\frac{3}{2}AB$

B. $2AB$

C. $3AB$

D. $\frac{5}{4}AB$

Answer: B



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238. If an angle of a parallelogram is two-third of its adjacent angle, find the smallest angle of the parallelogram.

A. 108°

B. 72°

C. 90°

D. none of these

Answer: B



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239. If the degree measures of the angles of quadrilateral are $4x$, $7x$, $9x$ and $10x$, what is the sum of the measures of the smallest angle and largest angle? (a) 140° (b) 150° (c) 168° (d) 180°



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240. In a quadrilateral $ABCD$, $\angle A + \angle C$ is 2 times $\angle B + \angle D$. If $\angle A = 140^\circ$ and $\angle D = 60^\circ$, then $\angle B =$

A. (a) 60°

B. (b) 80°

C. (c) 120°

D. (d) None of these

Answer: A



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241. If the diagonals of a rhombus are 18 cm and 24 cm respectively, then its side is equal to

A. 16 cm

B. 15 cm

C. 20 cm

D. 17 cm

Answer: B



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242. The diagonals AC and BD of a rectangle $ABCD$ intersect each other at P . If $\angle ABD = 50^\circ$, then $\angle DPC = 70^\circ$ (b) 90° (c) 80° (d) 100°



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243. $ABCD$ is a parallelogram in which diagonal AC bisects $\angle BAD$. If $\angle BAC = 35^\circ$, then $\angle ABC =$ (a) 70° (b) 110° (c) 90° (d) 120°



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244. In a rhombus $ABCD$, if $\angle ACB = 40^\circ$, then $\angle ADB =$ (a) 70° (b) 45° (c) 50° (d) 60°



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245.

In

$\triangle ABC$, $\angle A = 30^\circ$, $\angle B = 40^\circ$ and $\angle C = 110^\circ$. The

angles of the triangle formed by joining the mid-points of the sides of this triangle are

A. (a) 70° , 70° , 40°

B. (b) 60° , 40° , 80°

C. (c) 30° , 40° , 110°

D. (d) 60° , 70° , 50°

Answer: C



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246. The diagonals of a parallelogram $ABCD$ intersect at

O . If $\angle BOC = 90^\circ$ and $\angle BDC = 50^\circ$, then $\angle OAB =$

(a) 40° (b) 50° (c) 10° (d) 90°



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247. $ABCD$ is a trapezium in which $AB \parallel DC$,
 M and N are the mid-points of AD and BC respectively.

If $AB = 12\text{CM}$, $MN = 14\text{CM}$, then $CD =$

A. 10cm

B. 12cm

C. 14cm

D. 16cm

Answer: D



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248. Diagonals of a quadrilateral $ABCD$ bisect each other. If $\angle A = 45^\circ$, then $\angle B =$ (a) 115° (b) 120° (c) 125° (d) 135°



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249. P is the mid-point of side BC of a parallelogram $ABCD$ such that $\angle BAP = \angle DAP$. If $AD = 10\text{cm}$, then $CD =$

A. 5cm

B. 10cm

C. 6cm

D. 8cm

Answer: A



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250. In ABC , E is the mid-point of median AD such that BE produced meets AC at F . If $AC = 10.5 \text{ CM}$, then $AF =$ (a) 3cm (b) 3.5cm (c) 2.5cm (d) 5cm



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