



MATHS

BOOKS - NAGEEN PRAKASHAN ENGLISH

QUADRILATERALS

Solved Examples

1. The angles of a quadrilateral are in the ratio 3:4:5:6. Find all its angles.

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2. Three angles of a quadrilateral are in the ratio 4:6:3. If the fourth angle is 100° find the three angles of the quadrilateral.

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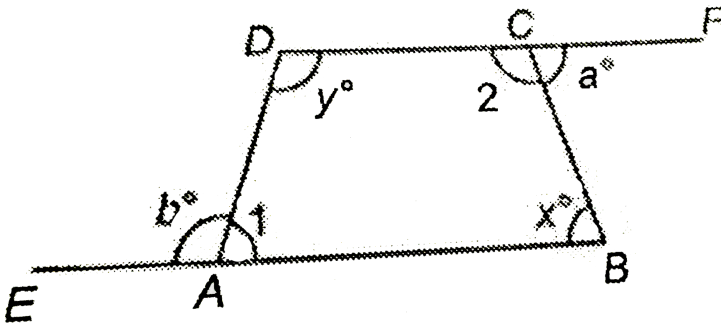
3. The angles of a quadrilateral are in the ratio 4:3:6:5. Show that it is a trapezium.

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4. The side BA and DC of a quadrilateral ABCD are produced to E and F respectively. If

$\angle BCF = a^\circ$, $\angle ABC = x^\circ$, $\angle ADC = y^\circ$ and $\angle DAE = b^\circ$,

prove that $x + y = a + b$.



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5. In a rectangle ABCD, diagonals AC and BD intersect at O. If

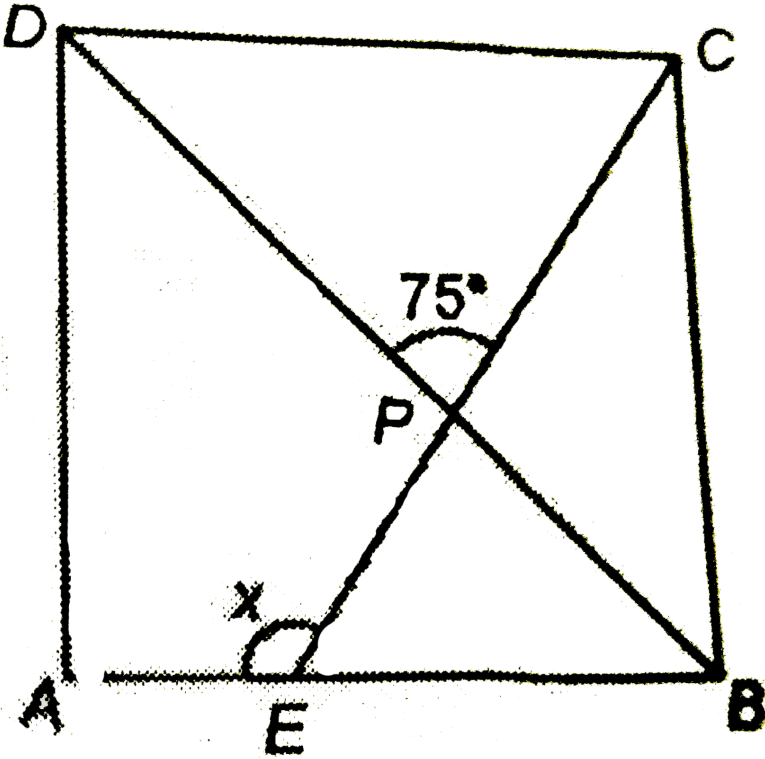
$\angle OAB = 35^\circ$, find :

(a) $\angle ABC$ (b) $\angle ABO$ (c) $\angle COD$ (d) $\angle BOC$



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6. In the given figure, $ABCD$ is a square. Find x .



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7. In 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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8. In a parallelogram ABCD, the bisectors of $\angle A$ and $\angle B$ intersect each other at point P. Prove that $\angle APB = 90^\circ$.

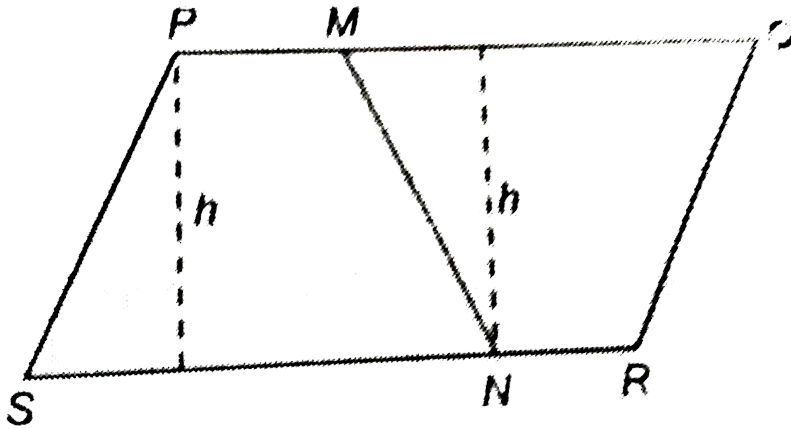
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9. Find the remaining angle of a parallelogram if one of its angles is 110° .

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10. PQRS is a parallelogram such that PQ is parallel to SR and SP is parallel to RQ. The length of side PQ is 20 cm. M is point between P and Q such that the length of PM is 3 cm. N is a point between points S and R. Find the length of SN such that segment MN divides

the parallelogram in two regions with equal areas.

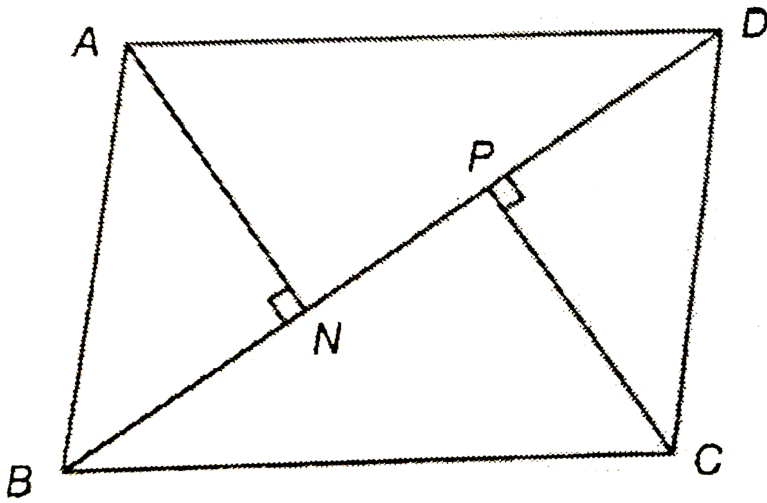


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11. In the given figure, ABCD is a parallelogram in which AN and CP are perpendiculars on diagonal BD. Prove that :

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

(ii) $AN = CP$



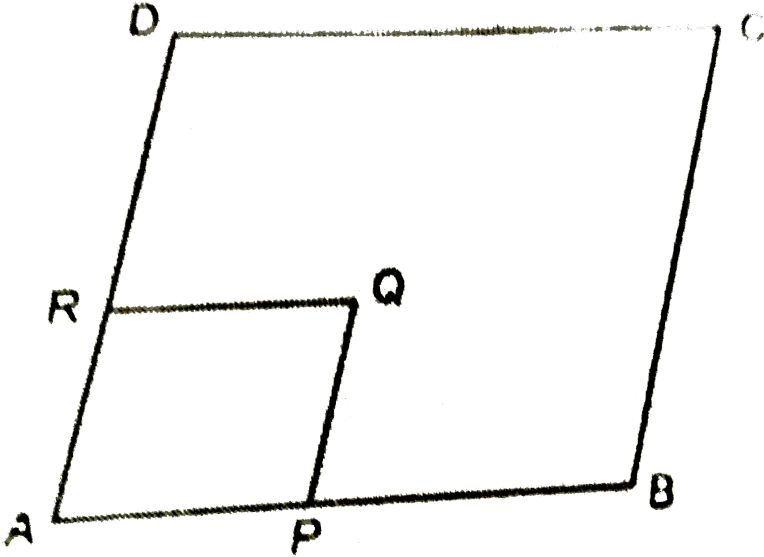
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12. ABCD is a quadrilateral in which $AB \parallel DC$ and $AD = BC$. Prove that $\angle A = \angle B$ and $\angle C = \angle D$.

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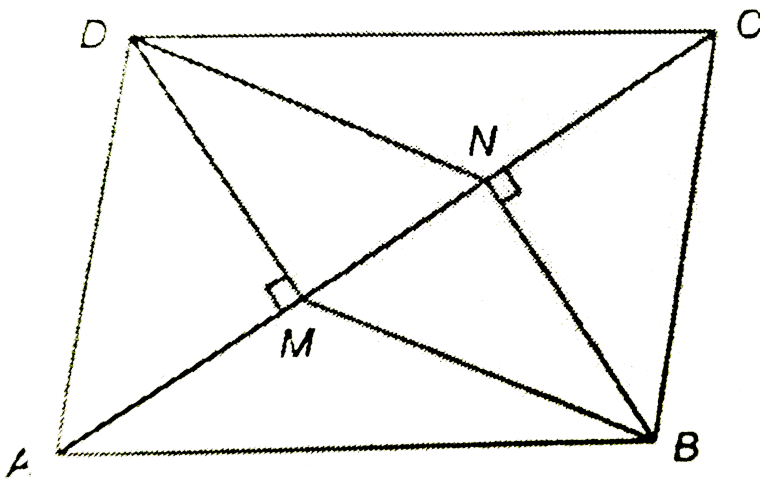
13. In the adjoining figure, $\square ABCD$ and $\square APQR$ are two parallelograms. Prove that :

$$\angle C = \angle Q \text{ and } \angle B = \angle R$$



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14. In the given figure, $\square ABCD$ is a parallelogram. If $DM \perp AC$ and $BN \perp AC$, then show that $\square BNDM$ is a parallelogram.



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

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16. $ABCD$ is a parallelogram. Two points P and Q are taken on sides AD and BC respectively such that $AP = \frac{1}{3}AD$ and $CQ = \frac{1}{3}BC$.
Prove that $AQCP$ is a parallelogram.



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17. A cyclic polygon has n sides such that each of its interior angle measures 114° . What is the measure of the angle subtended by each of its sides at the geometrical centre of the polygon?



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18. The number of diagonals of a regular polygon is 27. Then, find the measure of each of the interior angles of the polygon.



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19. 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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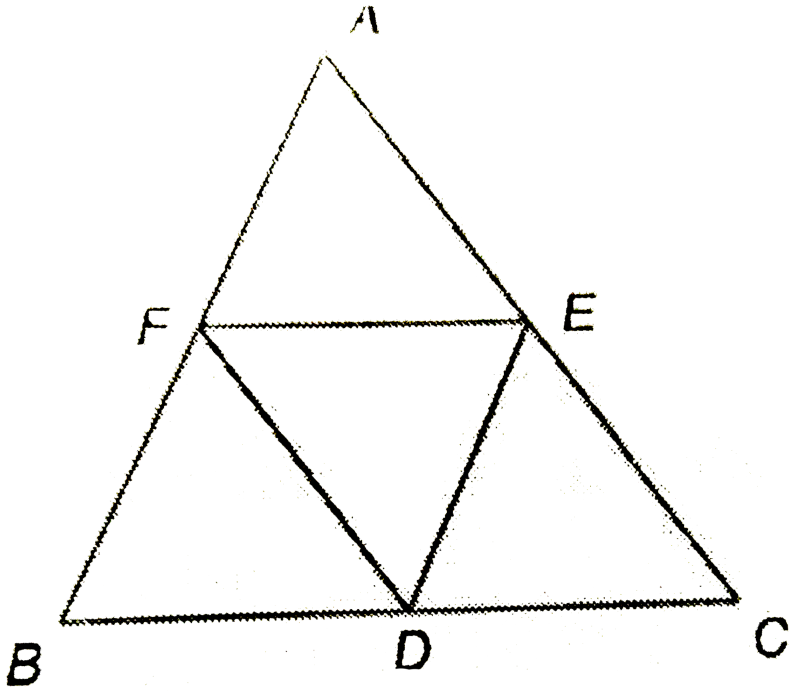
20. L and M are the mid-points of sides AB and DC respectively of parallelogram ABCD. Prove that segments DL and BM trisect diagonal AC.



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21. In the adjoining figure D, E and F are the mid-points of the sides BC, CA and AB of the equilateral $\triangle ABC$. Prove that $\triangle DEF$ is also

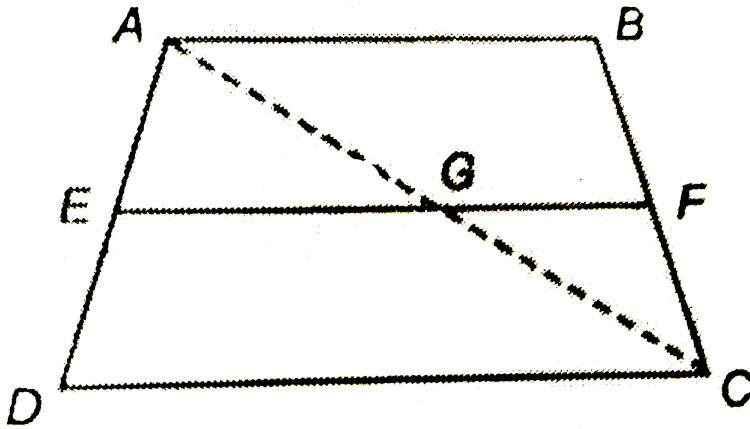
an equilateral triangle.



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22. In the given figure. $ABCD$ is a trapezium in which $AB \parallel DC$ and E is the mid-point of AD , if $EF \parallel DC$, then show that

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

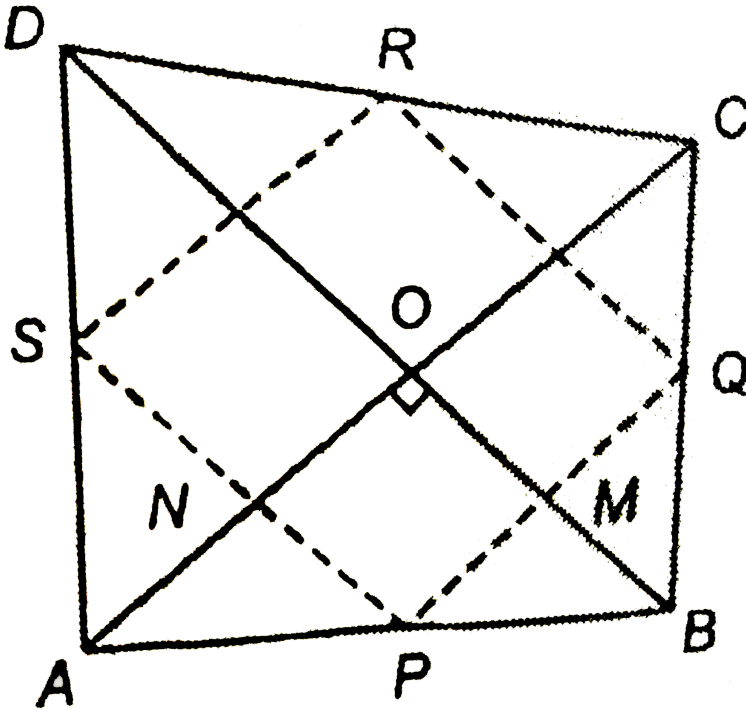


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23. If the mid-point of the consecutive sides of any quadrilateral are connected by straight line segments, prove that the resulting quadrilateral is a parallelogram.

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24. The diagonals of a quadrilateral $ABCD$ are mutually perpendicular. Prove that the quadrilateral formed by joining the mid-points of its consecutive sides is a rectangle.



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

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

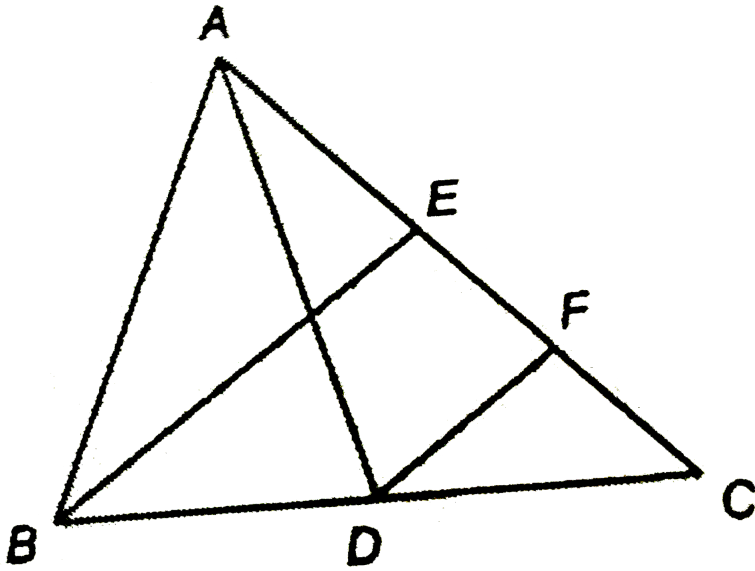
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27. Prove by vector method that the line segment joining the mid-points of the diagonals of a trapezium is parallel to the parallel sides and equal to half of their difference.

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28. In the adjoining figure. AD and BE are two medians of $\triangle ABC$.

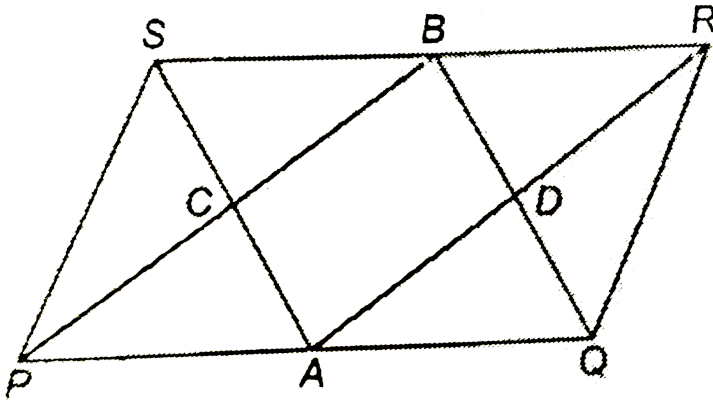
If $DF \parallel BE$, then prove that $CF = \frac{1}{4}AC$.



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29. In the adjoining figure, PQRS is a parallelogram. A and B are the mid-points of PQ of SR respectively. If $PS = BR$, then prove that

quadrilateral $ADBC$ is a rectangle.



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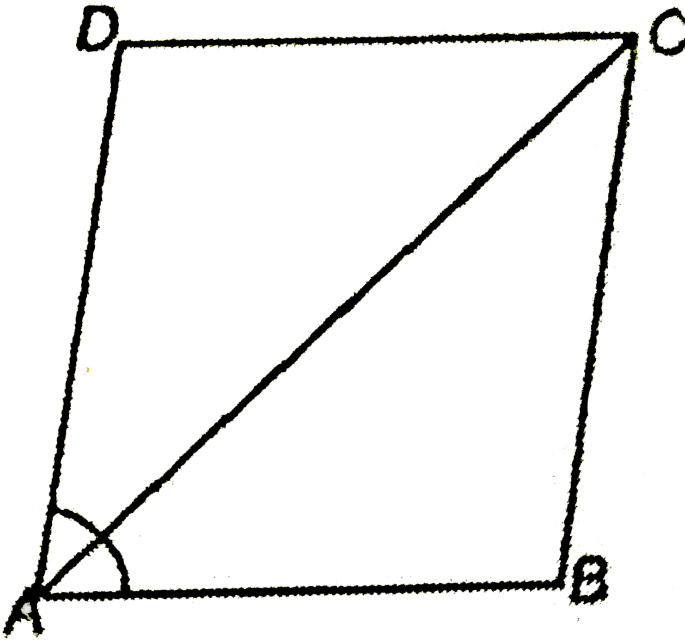
Problems From Ncert Exemplar

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

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2. Diagonal AC of a parallelogram ABCD bisects $\angle A$ (see figure). Show that:

(i) it bisects $\angle C$ also (ii) ABCD is a rhombus.

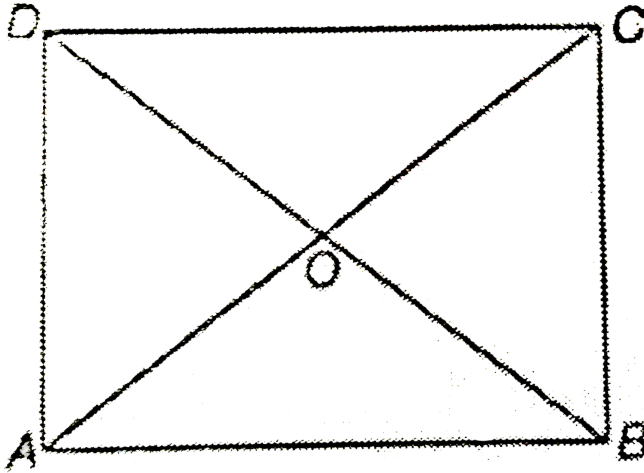


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3. ABCD is a rectangle in which diagonal AC bisects $\angle A$ as well as $\angle C$. Show that

(i) ABCD is a square

(ii) diagonal BD bisects $\angle B$



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4. In parallelogram ABCD two points P and Q are taken on diagonal BD such that $DP = BQ$ (set figure). Show that:

$$(i) \Delta APD \cong CQB$$

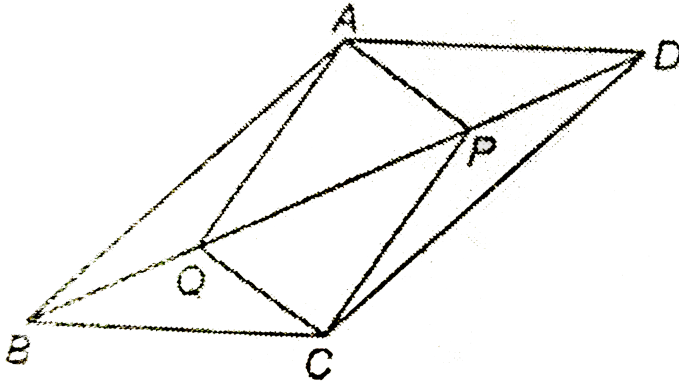
$$(ii) AP = CQ$$

$$(iii) \Delta AQB \cong \Delta CPD$$

$$(iv) AQ = CP$$

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(v) $APCQ$ is a parallelogram.



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5. P, Q, R and S are respectively the mid-points of the sides AB, BC, CD and DA of a quadrilateral ABCD such that $AC \perp BD$. Prove that PQRS is a rectangle.

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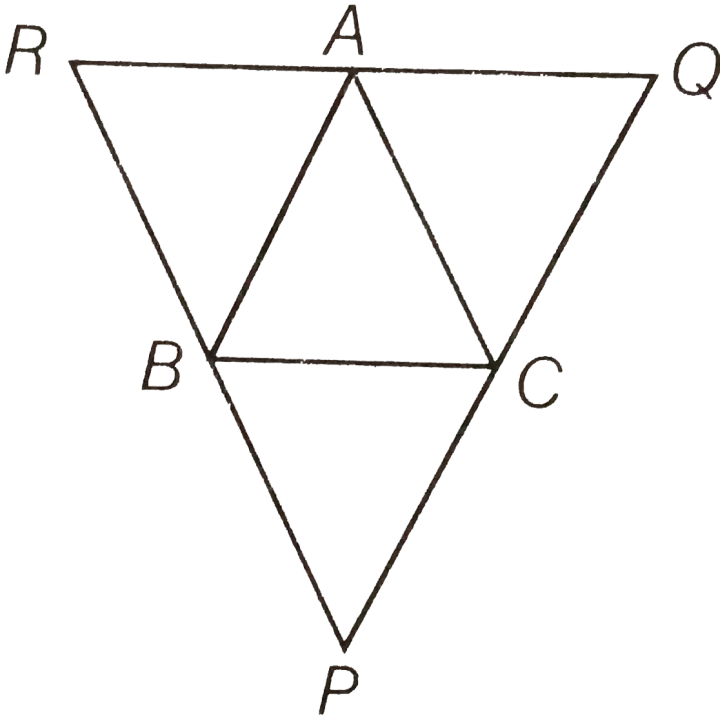
6. Show that the line segments joining the mid-points of the opposite sides of a quadrilateral bisect each other.



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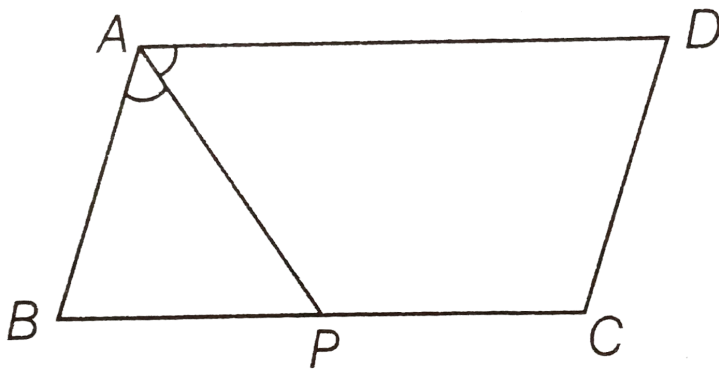
7. Through A, B and C lines RQ, PR and QP have been drawn, respectively parallel to sides BC, CA and AB of a $\triangle ABC$ as shown in

figure. Show that $BC = \frac{1}{2}QR$.



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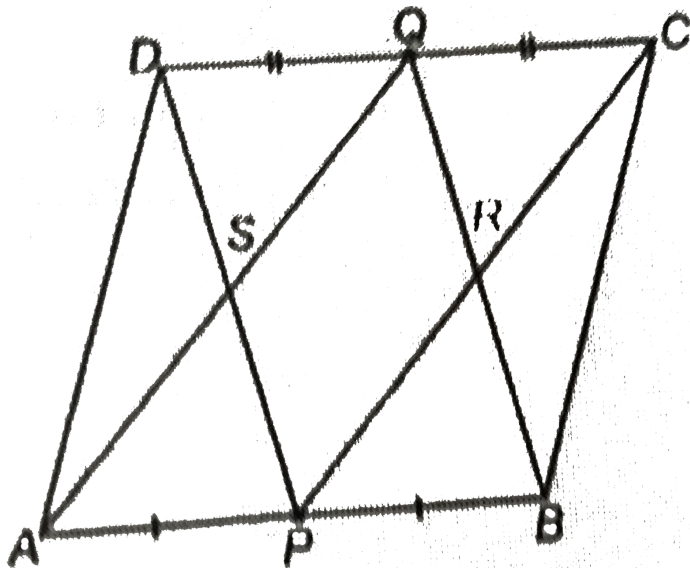
8. In figure, P is the mid-point of side BC of a parallelogram ABCD such that $\angle BAP = \angle DAP$. Prove that $AD = 2CD$.



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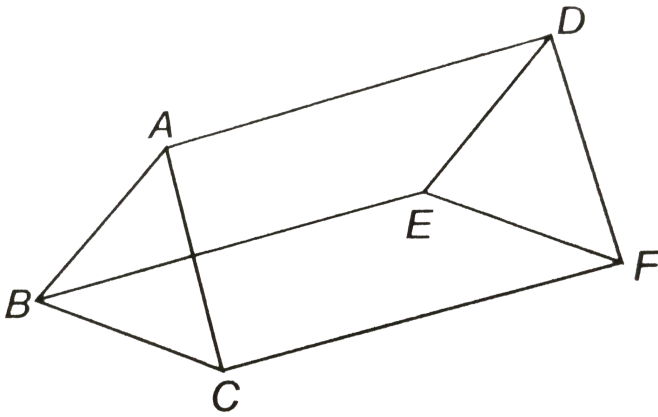
9. P and Q are the mid-point of the opposite sides AB and CD of a parallelogram ABCD. AQ intersects DP at S and BQ intersects CP at

R. Show that PQRS is a parallelogram.



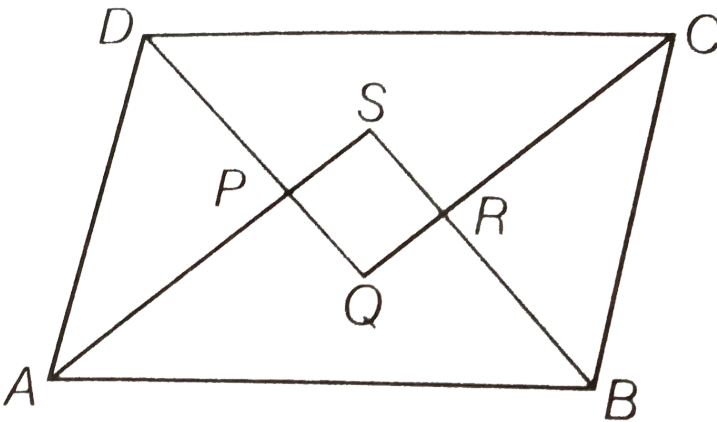
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10. In figure, $AB \parallel DE$, $AB = DE$, $AC \parallel DF$ and $AC = DF$. Prove that $BC \parallel EF$ and $BC = EF$.



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11. Prove that the quadrilateral formed by the bisectors of the angles of a parallelogram is a rectangle.



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Exercise 8 A

1. The angles of a quadrilateral are 89° and 113° . If the other two angles are equal, find the equal angles.

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2. In quadrilateral ABCD, $\angle A = 100^\circ$, $\angle B = 70^\circ$ and $\angle C : \angle D = 8 : 11$, then find $\angle D$.

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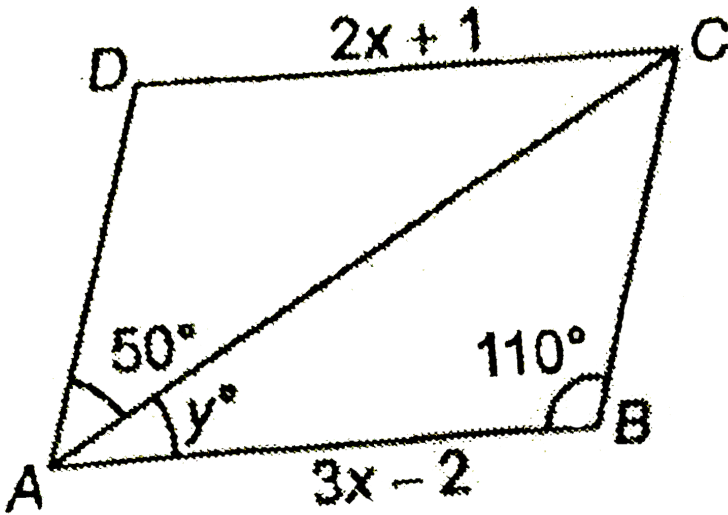
3. In quadrilateral ABCD, side AB is parallel to side DC. If $\angle A : \angle D = 1 : 2$ and $\angle C : \angle B = 4 : 5$.

(i) Calculate each angle of the quadrilateral.

(ii) Assign a special name to quadrilateral ABCD.

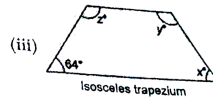
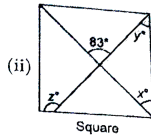
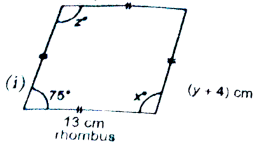
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4. Find the values of x and y from adjoining parallelogram.



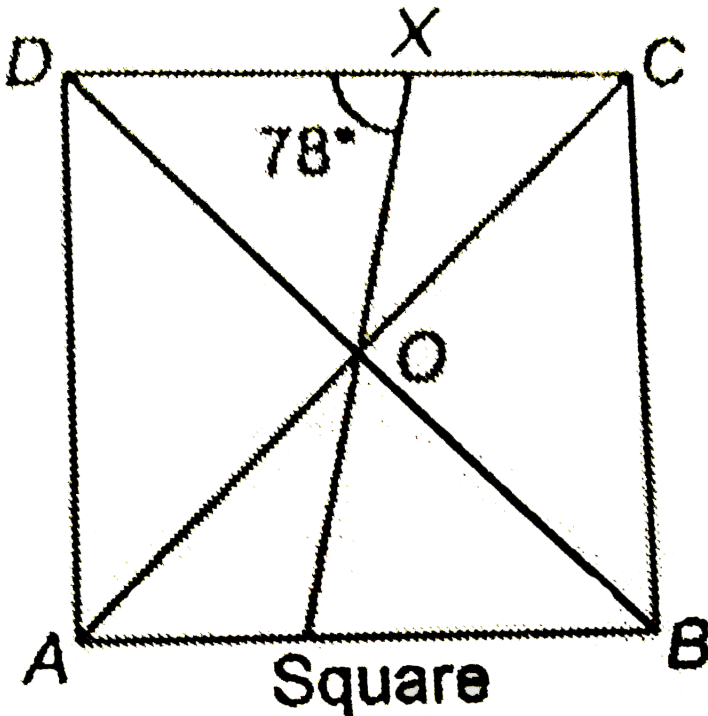
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5. Find x, y and z in each of the following figure:



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6. In the given figure, find (i) $\angle XOD$ (ii) $\angle XOC$

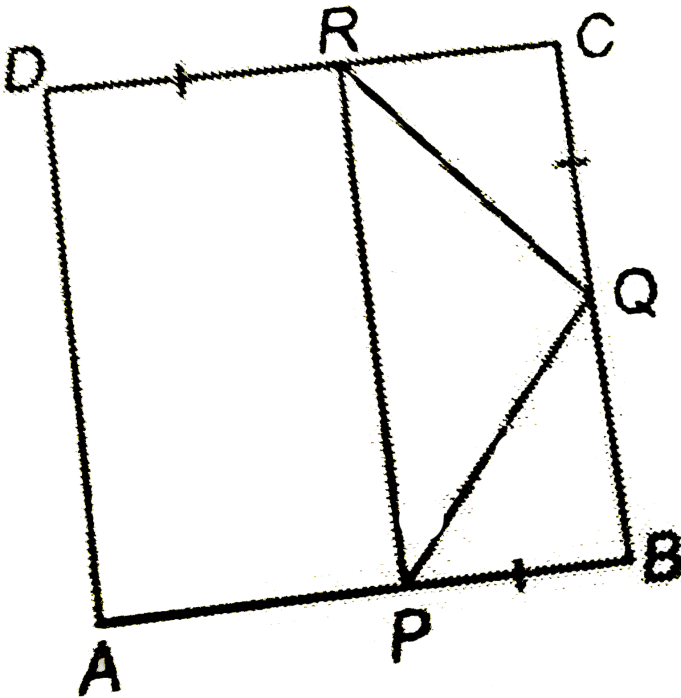


7. In the given figure, ABCD is a square and $\angle PQR = 90^\circ$. If $PB = QC = DR$, prove that.

(i) $QB = RC$

(ii) $PQ = QR$

(iii) $\angle QPR = 45^\circ$



8. In a square ABCD, diagonals meet at O. P is point on BC such that

$OB = BP$. Show that (i) $\angle POC = \left(22\frac{1}{2}\right)^\circ$

(ii) $\angle BDC = 2\angle POC$

(iii) $\angle BOP = 3\angle COP$

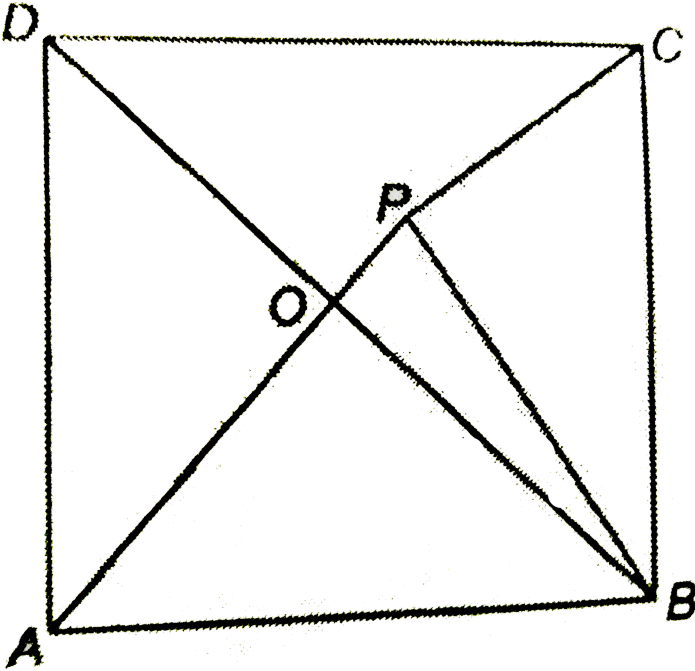


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9. The give figure shows a square ABCD and an equilateral triangle

APB. Calculate :

- (1) $\angle AOB$ (ii) $\angle BPC$
(iii) $\angle PCD$ (iv) reflex $\angle APC$

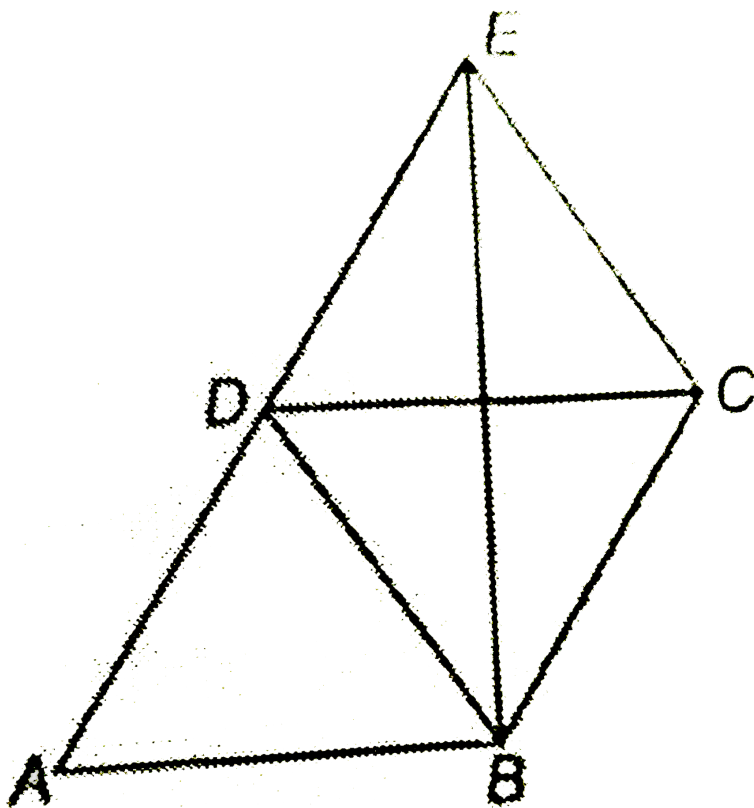


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10. In the given figure, ABCD is a rhombus with $A = 67^\circ$. If DEC is an equilateral triangle, calculate

- (i) $\angle CBE$

(ii) $\angle DBE$



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11. If the adjacent angles of a parallelogram are in the ratio $\frac{1}{3} : \frac{1}{2}$.

Find all the angles of parallelogram.

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12. Prove that the sum of two consecutive angles of a parallelogram is 180° .

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13. One angle of a parallelogram is 60° . Find its remaining angles.

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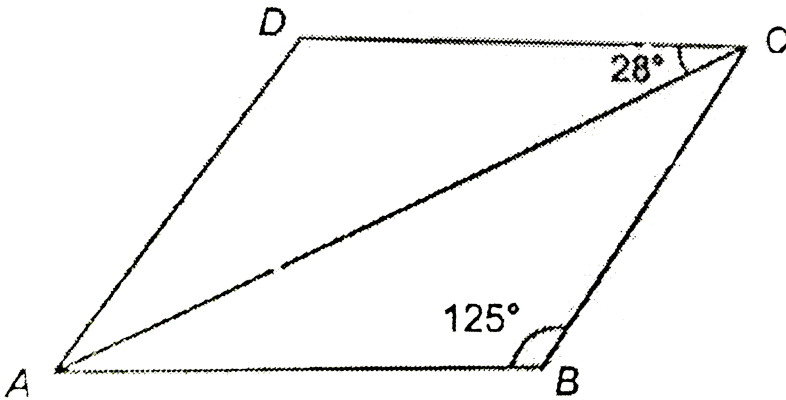
14. One diagonal of a parallelogram bisects its one of the angles. Show that it will also bisect the opposite angle.

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15. The opposite angles of a parallelogram are $(3x - 2)^\circ$ and $(150 - x)^\circ$. Find each angle of the parallelogram.

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16. In the adjoining figure, ABCD is a parallelogram. If $\angle ABC = 125^\circ$, $\angle ACD = 28^\circ$, then find $\angle DAC$.



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17. In a parallelogram, one angle is twice of its consecutive angle.

Find all the angles of the parallelogram.



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18. In a parallelogram ABCD, AX and CY are the bisectors of $\angle A$ and $\angle C$ respectively. Prove that $AX \parallel CY$.



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19. In a parallelogram PQRS, PX and QY are the perpendiculars drawn from P and Q respectively to SR and SR produced. Prove that $PX = QY$.



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20. In a parallelogram ABCD, the bisector of $\angle A$ bisects the line B at point X. Prove that $AD = 2AB$.

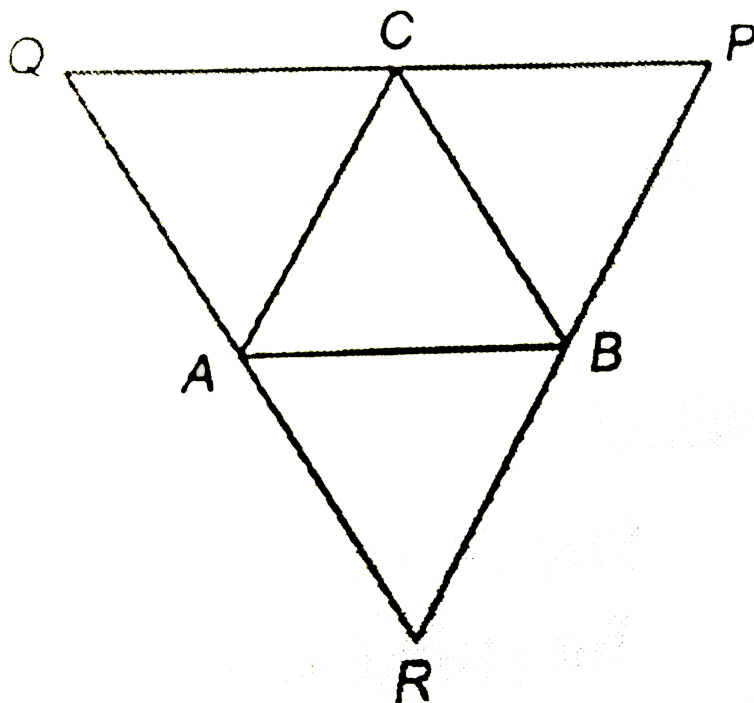
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21. In a parallelogram ABCD, $\angle BCD = 60^\circ$. If the bisectors AP and BP of $\angle A$ and $\angle B$ respectively, meet the side CD at point P, then prove that $CP = PD$.

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22. In the adjoining figure, ΔPQR is formed by the sides PQ, QR and RP which are drawn parallel to sides AB, BC and CA respectively of ΔABC . Prove that

$$PQ + QR + RP = 2(AB + BC + CA).$$



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23. X and Y are the mid-points of the opposite sides AB and DC of a parallelogram ABCD. Prove that $\square AXCY$ is a parallelogram.

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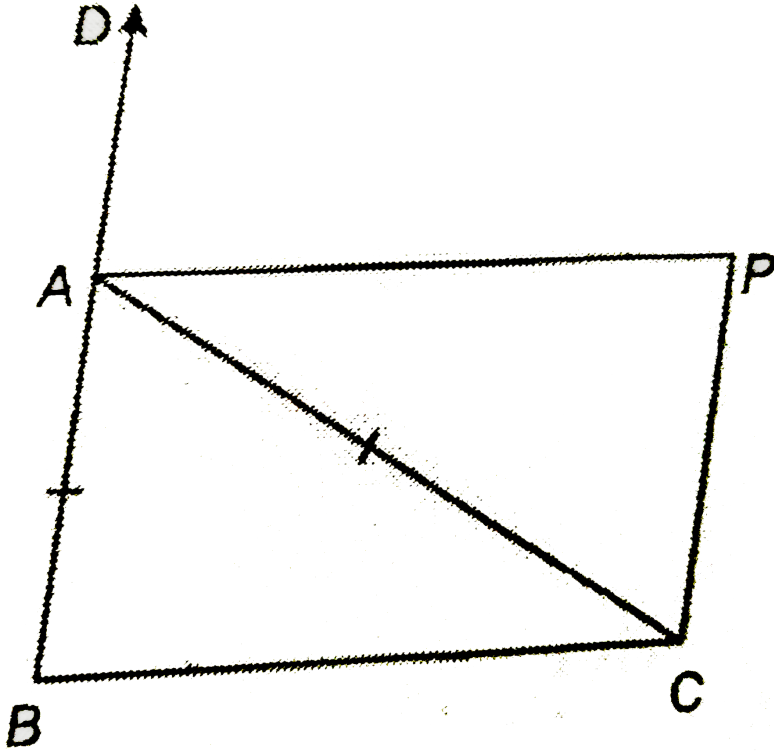
24. Two points X and Y lie on the diagonal BD of a parallelogram ABCD such that $DX = BY$. Prove that $\square AXCY$ is a parallelogram.



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25. In the adjoining figure, $\triangle ABC$ is an isosceles triangle in which $AB = AC$. Side CP is parallel to AB and AP is the bisector of exterior angle CAD of $\triangle ABC$. Prove that $\angle PAC = \angle BCA$ and $\square ABCP$

is a parallelogram.

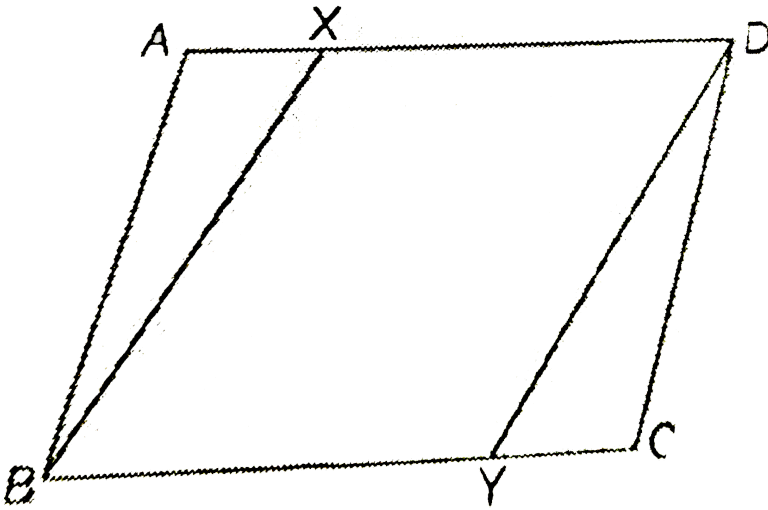


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26. AB and CD are two parallel lines and a transversal 'l' intersects these lines at X and Y respectively. Prove that the bisectors of interior angles from a parallelogram whose each angle is 90° .

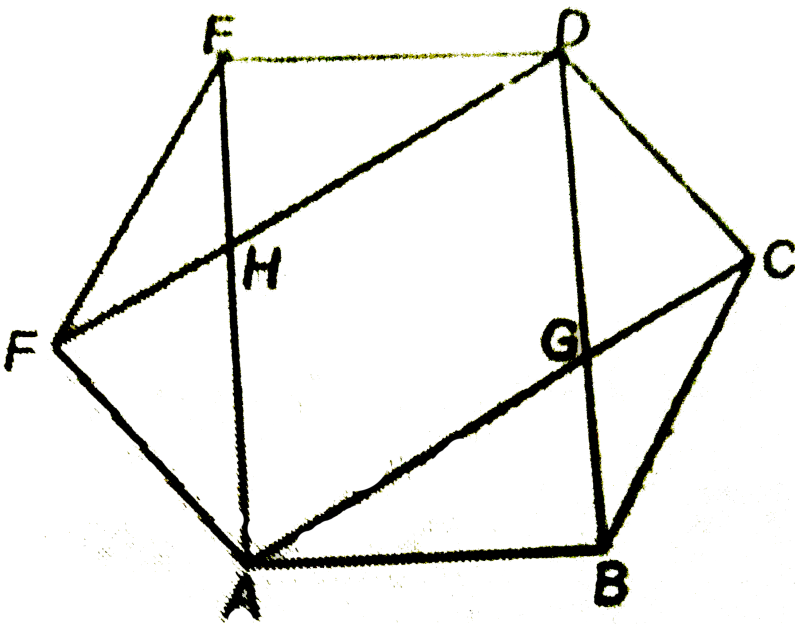
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27. In the adjoining figure $\square ABCD$ is a parallelogram. Points X and Y lie on the sides AD and BC respectively and $AX = \frac{1}{4}AD$ and $CY = \frac{1}{4}BC$. Show that $\square XBYD$ is a parallelogram.



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28. In the adjoining figure, $ABCDEF$ is a regular hexagon. Prove that $\square ABDE$, $\square ACDF$ and $\square AGDH$ are parallelograms.



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29. Two triangles $\triangle ABC$ and $\triangle DEF$ are given such that $AB \parallel DE$, $BC \parallel EF$ and $AB = DE$, $BC = EF$. Show that $AC \parallel DF$ and $AC = DE$.

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1. The sides AB and AC are equal of an isosceles triangle ABC. D E and F are the mid-points of sides BC, CA and AB respectively. Prove that:

(i) Line segment AD is perpendicular to line segment EF.

(ii) Line segment AD bisects the line segment EF.

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

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3. E is the mid-point of the median AD of $\triangle ABC$. Line segment BE meets AC at point F when produce, prove that $AF = \frac{1}{3}AC$.



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

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5. Show that, in a parallelogram ABCD, the internal and external bisectors of $\angle A$ and $\angle B$ form a rectangle.

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6. If the mid-point of the consecutive sides of any quadrilateral are connected by straight line segments, prove that the resulting quadrilateral is a parallelogram.

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7. In a right-angled triangle ABC , $\angle ABC = 90^\circ$ and D is mid-point of AC . Prove that $BD = \frac{1}{2}AC$.

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8. $\square PQRS$ is a rectangle. If A , B and C are the mid-points of PQ , PS and QR respectively, then prove that

$$AB + AC = \frac{1}{2}(PR + SQ).$$

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9. 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 and CR meet at Y . Prove that $XY = \frac{1}{4}BC$.

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10. In $\triangle PQR$, $PQ = PR$ and S is the mid-point of PQ . A line drawn from S parallel to QR , intersects the line PR at T . Prove that $PS = PT$.

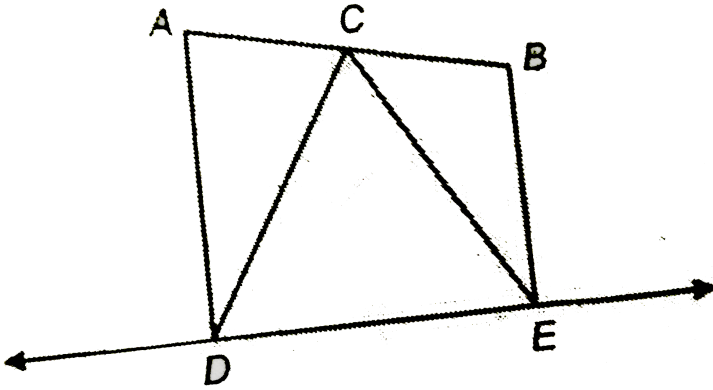
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11. M and N divide the side AB of a triangle ABC into three equal parts. Through M and N , lines are drawn parallel to BC and intersecting AC at points P and Q respectively. Prove that P and Q divide AC into three equal parts.

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12. In the adjoining figure, two points A and B lie on the same side of a line ' l '. C is the mid-point of AB . If $AD \perp l$ and $BE \perp l$, then

prove that $CD = CE$.



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13. AB and CD are the parallel sides of a trapezium. E is the mid-point of AD . A line through E and parallel to side AB meets the line BC at point F . Prove that F is the mid-point of BC .

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14. Prove that a line drawn from the vertex of a triangle to its base is bisected by the line joining the mid points of the remaining two

sides of the triangle.

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15. In a parallelogram ABCD, E and F are the mid-points of sides BC and AD respectively. Show that the line segment BF and ED trisect the diagonal AC.

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Revision Exercise Very Short Answer Questions

1. Three angles of a quadrilateral are respectively 90° , 91° , 69° . Find the fourth angle.

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2. Find the other angles of a parallelogram if its one angle is 60°



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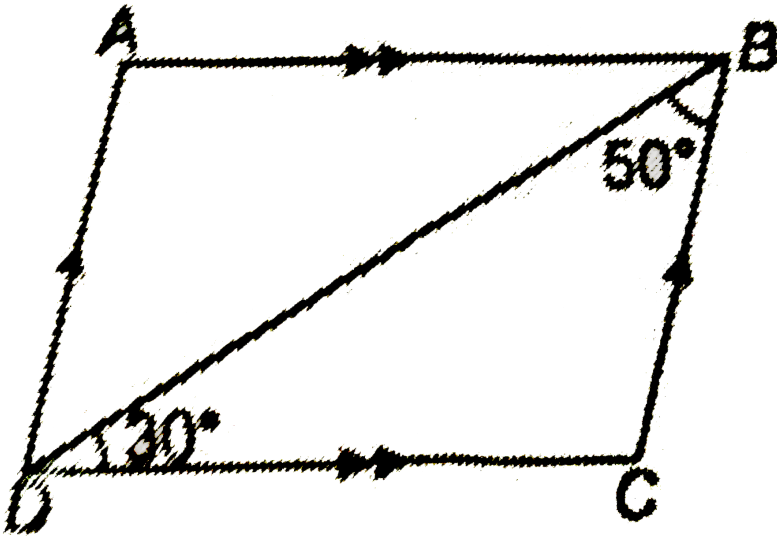
3. Find the angles of the parallelogram ABCD, if

$$\angle C = \frac{2}{3} \angle D$$



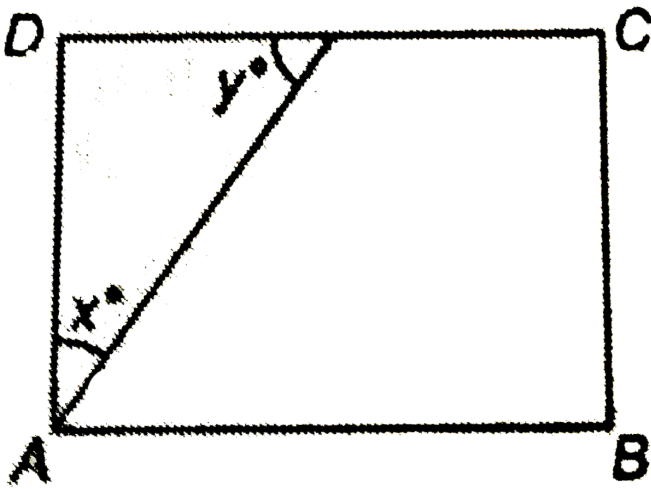
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4. Find $\angle A$ of the given figure.



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5. In the given figure, if ABCD is a rectangle and $x : y = 2 : 7$ find x and y .



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6. In a $\triangle ABC$, D , E and F are respectively the mid-points of BC , CA and AB . If the lengths of side AB , BC and CA are 7 cm, 8 cm and 9 cm respectively, find the perimeter of $\triangle DEF$.

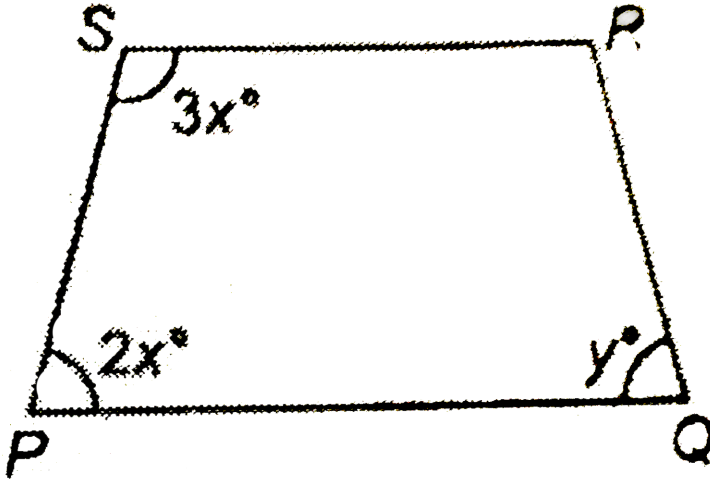
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7. If the bisectors of two adjacent angles A and B of a quadrilateral $ABCD$ intersect at a point O such that

$\angle C + \angle D = k\angle AOB$, then find the value of k .

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8. In the given figure PQRS is an isosceles trapezium, find x and y .



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9. In a rhombus ABCD if $\angle ACB = 40^\circ$, then find $\angle ADC$.

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10. 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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Revision Exercise Short Answer Questions

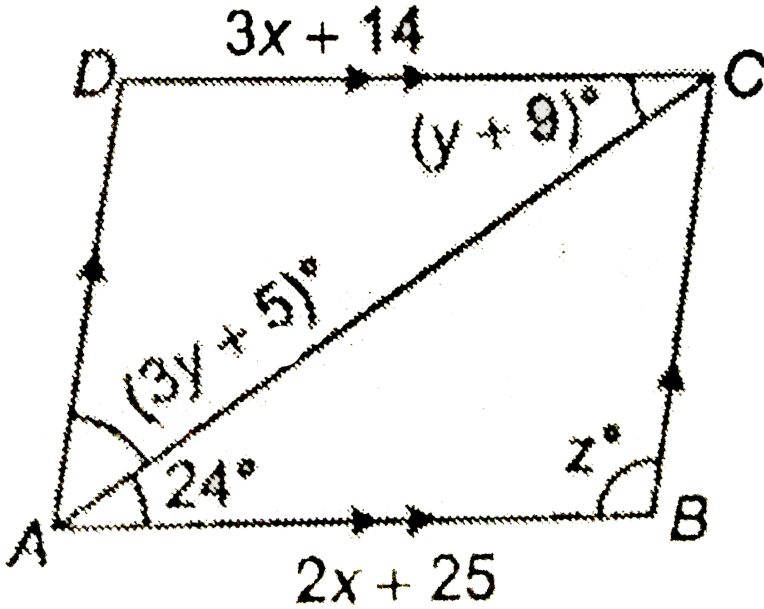
1. In an isosceles-trapezium, show that the opposite angles are supplementary.

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2. In the given figure $ABCD$ is a parallelogram. $AB = (2x+25)$ cm, $CD = (3x+14)$ cm,

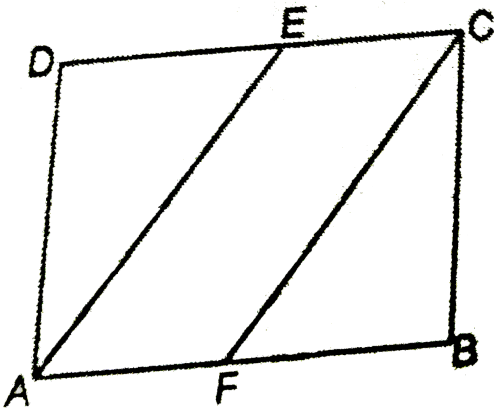
$\angle B = z^\circ$, $\angle BAC = 24^\circ$, $\angle DAC = 3y + 5^\circ$ and $\angle DCA = y + 9^\circ$,

find the values of x , y and z .



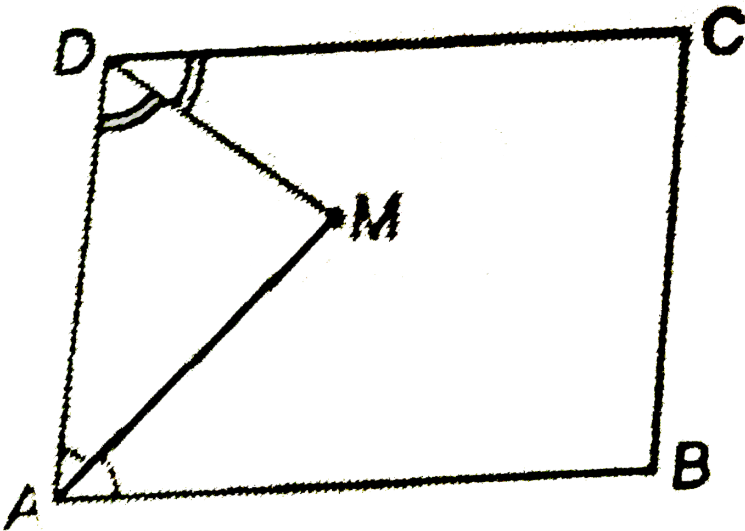
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3. $ABCD$ is a parallelogram and AE and CF bisect $\angle A$ and $\angle C$ respectively. Prove that $AE \parallel FC$.



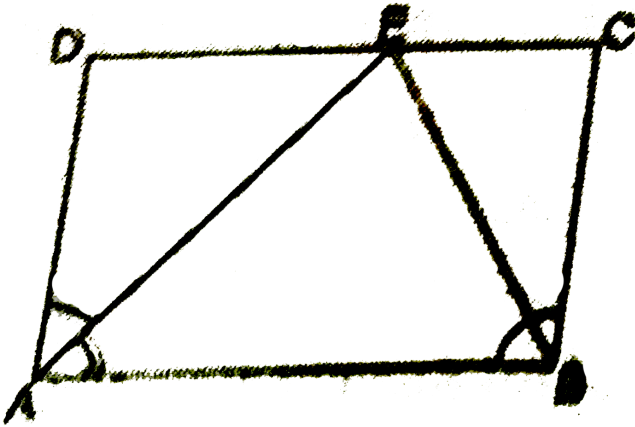
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4. In the given figure, AM bisects angle A and DM bisects angle D of parallelogram ABCD. Prove that $\angle AMD = 90^\circ$.



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5. In the given figure ABCD is a parallelogram. Prove that $AB = 2BC$.



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6. E and F are points on diagonal AC of a parallelogram ABCD such that $AE=CF$. Show that BFDE is a parallelogram.

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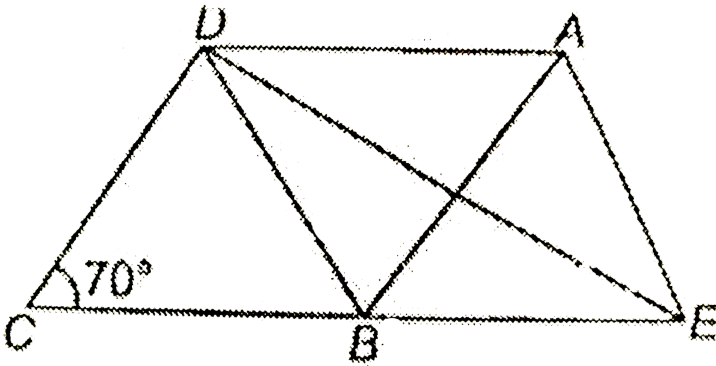
7. In a quadrilateral ABCD, $AB = AD$ and $CB = CD$. Prove that:

AC is perpendicular bisector of BD

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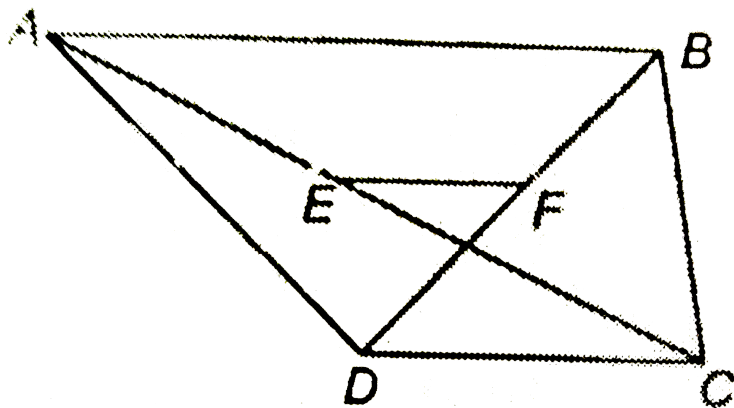
8. In the adjoining figure, ABCD is a rhombus and ABE is an equilateral triangle. If $\angle BCD = 70^\circ$, find

(a) $\angle ADE$ (b) $\angle BDE$ (c) $\angle BED$



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9. In a trapezium ABCD, if E and F be the mid-points of diagonal AC and BD respectively. Prove that $EF = \frac{1}{2}(AB - CD)$.



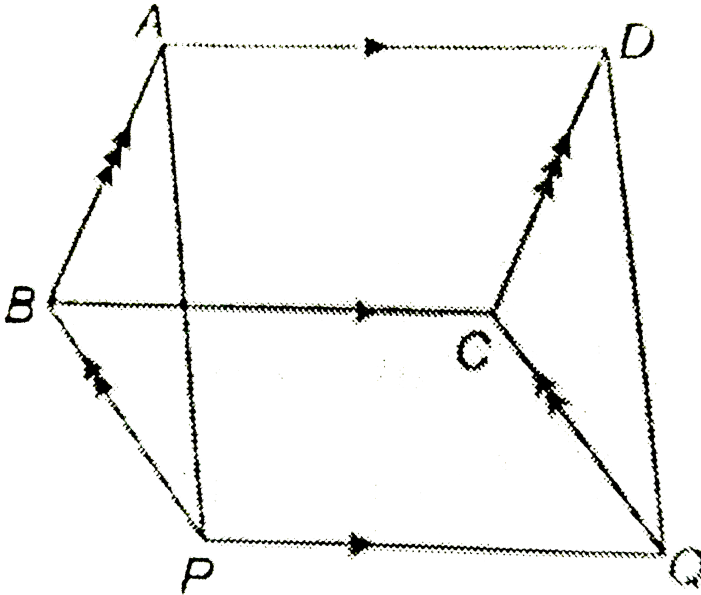
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10. In a quadrilateral ABCD the line segment bisecting $\angle C$ and $\angle D$ meet at E. Prove that $\angle A + \angle B = 2\angle CED$.

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1. In the adjoining figure, ABCD and PBCQ are parallelograms. Prove that

$$\triangle ABP \cong \triangle DCQ$$



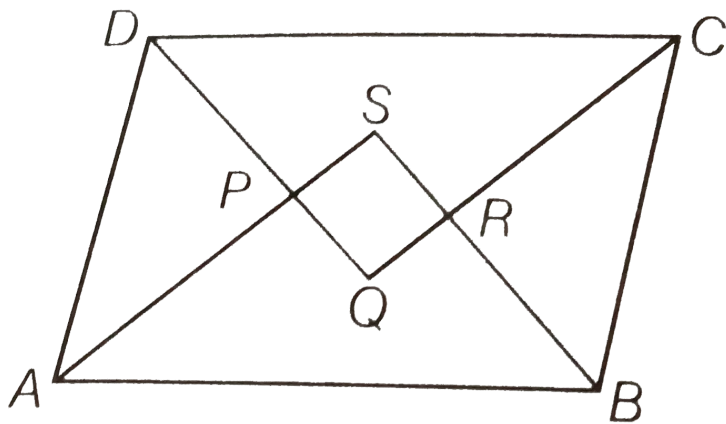
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2. A transversal cuts two parallel lines at A and B. The two interior angles at A are bisected and so are the two interior angles at B, the

four bisectors from a quadrilateral ACBD, prove that ABCD is parallelogram.

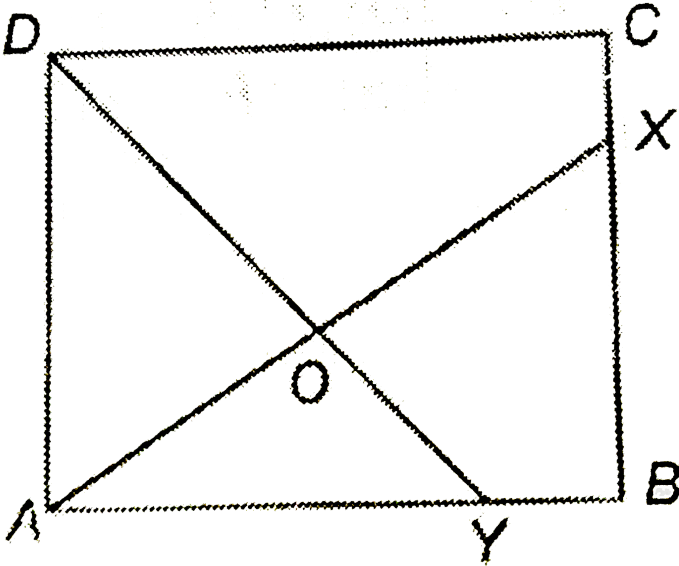
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3. Prove that the quadrilateral formed by the bisectors of the angles of a parallelogram is a rectangle.



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4. In a square ABCD, A is joined to a point X on BC and D is joined to a point Y on AB. If $AX = DY$, prove that AX is perpendicular to DY.



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5. ABCD is a rhombus. RABS is a straight line such that $RA = AB = BS$. Prove that RD and SC when produced meet at right angles.

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