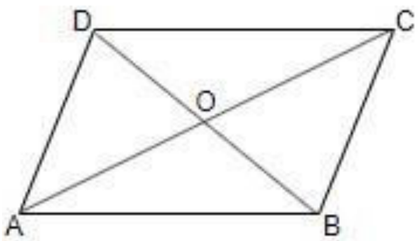
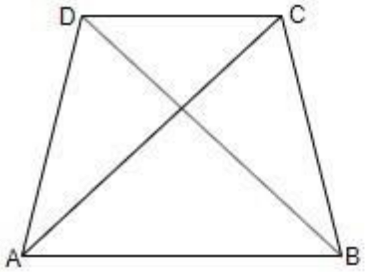
CBSE Test Paper 04
CH-8 Quadrilaterals

1. In Parallelogram ABCD, bisectors of angles A and B intersect each other at O. The measure of $\angle AOB$ is
   a. 90°
   b. 30°
   c. 60°
   d. 120°
2. A quadrilateral ABCD is a parallelogram if
   a. $\angle A = 60^0, \angle C = 60^0, \angle B = 120^0$
   b. AB = CD
   c. AB = AD
   d. AB $||$ BC
3. In the given figure, ABCD is a Rhombus. Then,



   a. $(AC^2 + BD^2) = 3AB^2$
   b. $AC^2 + BD^2 = 4AB^2$
   c. $AC^2 + BD^2 = AB^2$
   d. $AC^2 + BD^2 = 2AB^2$

4. In a Trapezium ABCD, if AB $\parallel$ CD, then $(AC^2 + BD^2)$ =?



a. $BC^2 + AD^2 + 2BC.AD$

b. $AB^2 + CD^2 + 2AB.CD$

c. $AB^2 + CD^2 + 2AD.BC$

d. $BC^2 + AD^2 + 2AB.CD$

5. The angle between two altitudes of a Parallelogram through the vertex of an obtuse angle of the Parallelogram of 60°. Find the angles of the Parallelogram

a. $200^\circ, 100^\circ, 30^\circ, 30^\circ$

b. $110^\circ, 50^\circ, 105^\circ, 105^\circ$

c. $150^\circ, 150^\circ, 30^\circ, 30^\circ$

d. $120^\circ, 60^\circ, 120^\circ, 60^\circ$

6. Fill in the blanks:

A diagonal of a parallelogram, divides it into two________triangles.

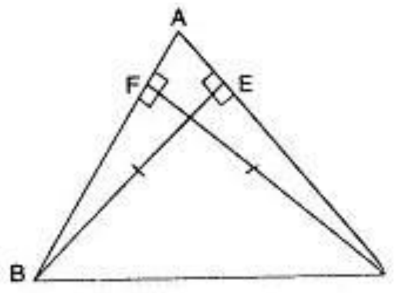
7. Fill in the blanks:

The ratio of the angles P, Q, R and S of a quadrilateral PQRS is 3 : 6 : 4 : 5, then the measure of each angle of the quadrilateral is________.

8. Three angles of a quadrilateral ABCD are equal. Is it a parallelogram?

9. Three angles of a quadrilateral are respectively equal to 110^o, 50^o and 40^o. Find its fourth angle.

10. Prove that △ABC is an isosceles triangle, if altitude BE = altitude CF.



11. Show that of all line segments drawn from a given point no on it, the perpendicular line segment is the shortest.

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

13. A diagonal of a parallelogram bisects one of its angles. Show that it is a rhombus.

14. In the following 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.

15. P, Q, R and S are respectively the mid-points of the sides AB, BC, CD and DA of a quadrilateral ABCD in which AC = BD. Prove that PQRS is a rhombus.

CBSE Test Paper 04
CH-8 Quadrilaterals

Solution

1. (a) 90°

Explanation:

Given : ABCD is a parallelogram in which AO and BO are angle bisectors of $\angle$A and $\angle$B

Now since ABCD is a parallelogram

$\therefore$ AD||BC

Now AD||BC and transversal AB intersect them

$\therefore \angle$ A + $\angle$B = 180° ($\because$ sum of consecutive interior angle is 180°)

$\Rightarrow \frac{1}{2}\angle A + \frac{1}{2}\angle B = 90^{\circ}$

$\Rightarrow$ $\angle$1 + $\angle$2 = 90° ($\because$ AO and BO are angle bisectors) ... (1)

In ΔAOB we have

$\angle$1 + $\angle$AOB + $\angle$2 = 180°

$\Rightarrow$90° +$\angle$AOB = 180° (from (1))

$\Rightarrow$ $\angle$AOB = 180° – 90° = 90°

2. (a) $\angle A = 60^0, \angle C = 60^0, \angle B = 120^0$

Explanation:

$\angle A = 60^0, \angle C = 60^0, \angle B = 120^0$

Opposite angles are equal and sum of adjacent angles are supplementary.

3. (b) $AC^2 + BD^2 = 4AB^2$

Explanation: ABCD is a rhombus.

AB = BC = CD = DA

In Rhombus, diagonals bisect each other at right angles.

So, AO = CO and BO = DO

In triangle AOB , $AO^2 + BO^2 = AB^2$ (Pythagoras theorem)

$(1/2\ AC)^2 + (1/2\ BD)^2 = AB^2$

$AC^2/4 + BD^2/4 = AB^2$

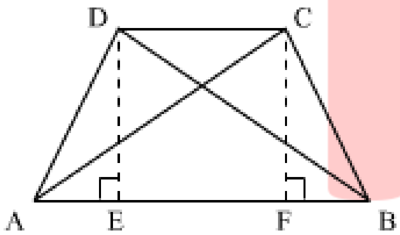
$AC^2 + BD^2 = 4\ AB^2$

4. (d) $BC^2 + AD^2 + 2AB.CD$

Explanation:

Given: ABCD is a trapezium with AB $\parallel$ CD

Construction: Draw DE and CF $\perp$ to AB



Then in $\triangle$ ABC

$\angle$BAC is acute

$\therefore BC^2 = AC^2 + AB^2 - 2\ AF : AB$ ...(1)

and In $\triangle$BDA

$\angle$DBA is acute

$\therefore AD^2 = BD^2 + AB^2 - 2\ BE : AB$ ...(2)

Adding (1) and (2) we get

$BC^2 + AD^2 = AC^2 + BD^2 + 2AB^2 - 2AF\cdot AB - 2BE\cdot AB$

$\Rightarrow AC^2 + BD^2 = BC^2 + AD^2 - 2\ AB\ [AB - AF - BE]$

$= BC^2 + AD^2 - 2AB\ [AB - (AE + EF) - (BF + EF)]$

$= BC^2 + AD^2 - 2AB\ [AB - (AE + EF + BF + EF)]$

$= BC^2 + AD^2 - 2AB[AB - (AB + CD)]$ ($\because EF = DC$)

$= BC^2 + AD^2 - 2AB[- CD)]$

$= AD^2 + BC^2 + 2AB \times CD$

5. (d) $120^\circ, 60^\circ, 120^\circ, 60^\circ$

Explanation:

Let ABCD be a parallelogram and AP and CQ are the altitudes drawn from vertex A on sides DC and BC.

In quadrilateral APCQ, sum of the all angles = 360^0

So, $60^0 + 90^0 + \angle C + 90^0 = 360^0$

$\angle C = 360^0 - 240^0 = 120^0$

$\angle C + \angle B = 180^0$ (co-interior angles)

$\angle B = 180^0 - 120^0 = 60^0$

In parallelogram, opposite angles are equal.

So, $\angle A = \angle C = 120^0$ and $\angle B = \angle D = 60^0$

6. congruent

7. $60^o, 120^o, 80^o, 100^o$

8. It need not be a parallelogram, because if $\angle A = \angle B = \angle C = 70°$ and $\angle D = 150°$. But $\angle B \neq \angle D$.

9. Let the fourth angle be x.

Sum of all angles of a quadrilateral = 360^o

$110^o + 50^o + 40^o + x = 360^o$

$\Rightarrow 200^o + x = 360^o$

$\Rightarrow$ x = 160^{o}

10. In $\triangle$BEA and $\triangle$CFA,

BE = CF……. [Given]

$\angle$BEA = $\angle$CFA ……..[Each 90^{o}]

$\angle$BAE = $\angle$CAF ……[Common]

$\therefore \triangle BEA = \triangle CFA$ …… [AAS axiom]

$\triangle$ AB = AC……..[c.p.c.t.]

Hence, $\triangle$ABC is an isosceles.

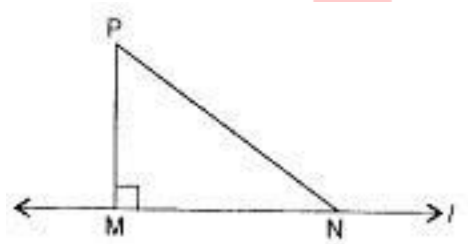
11. Given: l is a line and P is a point not lying on l.

PM $\perp$ l

N is any point on l other M

To Prove : PM < PN

Proof : In $\triangle$PMN, $\angle$M = 90^{o}



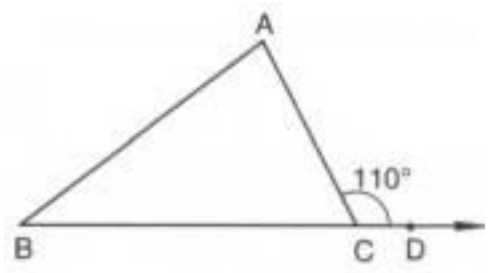
$\therefore$ $\angle$N is an acute angle……..[Angle sum property of a triangle]

$\therefore$ $\angle$M > $\angle$N

$\therefore$ PN > PM ……[Side opposite to greater angle is greater]

$\therefore$ PM < PN

12.



Let ABC be a triangle whose side BC is produced to form an exterior angle $\angle$ACD such that ext. $\angle$ACD = 110°.

Let $\angle$B = 30°. By exterior angle theorem, we have

ext. $\angle$ACD = $\angle$B + $\angle$A

$\Rightarrow$ 110° = 30° + $\angle$A

$\Rightarrow \angle A = 110° - 30° = 80°$

In $\triangle ABC$, we have

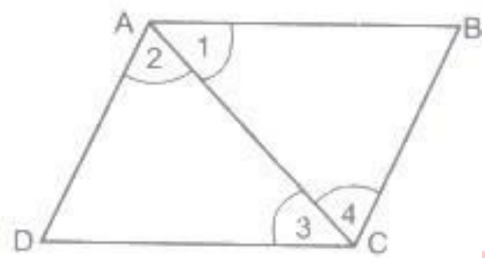
$\angle A + \angle B + \angle C = 180°$

$\Rightarrow 80° + 30° + \angle C = 180°$

$\Rightarrow \angle C = 180° - (80° + 30°) = 70°$

Hence, the other two angles of the triangle are 80° and 70°

13. ABCD is a parallelogram and diagonal AC bisect $\angle A$. We have to show that ABCD is a rhombus.



$\angle 1 = \angle 2$ ...(1) [$\because$ AC bisect $\angle A$]

$\angle 2 = \angle 4$...(2) [Alt. interior angles]

From (1) and (2), we get

$\angle 1 = \angle 4$

Now, in ΔABC, we have

$\angle 1 = \angle 4$ [Proved above]

$\therefore$ BC = AB [$\because$ Side. Opp. To equal $\angle s$ are equal]

Also, AB = DC and AD = BC [$\because$ Opposite sides of a parallelogram are equal]

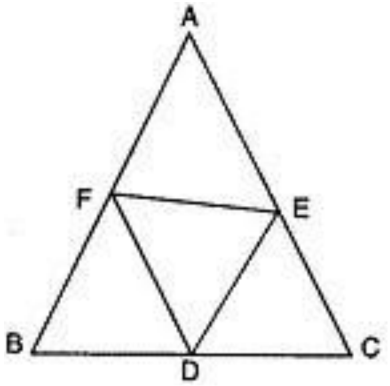
So, ABCD is a parallelogram in which its sides AB = BC = CD = AD.

Hence, ABCD is a rhombus.

14. Given : D, E and F are respectively the mid-points of sides BC, CA and AB of an equilateral triangle ABC.

To Prove : $\triangle$DEF is also an equilateral triangle.

Proof :



Since line segment joining the mid-points of two sides of a triangle is half of the third side. Therefore, D and E are mid-points of BC and AC respectively.

$\Rightarrow$ DE = $\frac{1}{2}$ AB --- (i)

E and F are the midpoints of AC and AB respectively.

$\therefore$ EF = $\frac{1}{2}$ BC --- (ii)

F and D are the midpoints of AB and BC respectively.

$\triangle$ FD = $\frac{1}{2}$ AC --- (iii)

Now, $\triangle$ABC is an equilateral triangle.

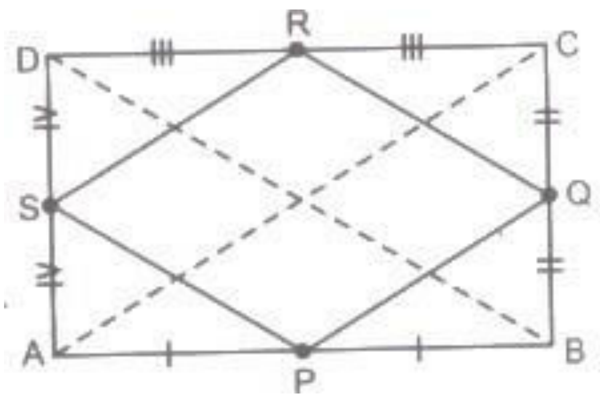
$\Rightarrow$ AB = BC = CA

$\Rightarrow$ $\frac{1}{2}$ AB = $\frac{1}{2}$BC = $\frac{1}{2}$CA

$\Rightarrow$ DE = EF = FD [using (i), (ii), (iii)]

Hence, DEF is an equilateral triangle.

15. Given: A quadrilateral ABCD in which AC = BD and P, Q, R and S are respectively the mid-point of the sides of AB, BC, CD and DA of quadrilateral ABCD.



To prove: PQRS is a rhombus

Proof: In ΔABC, P and Q are the mid-points of AB and BC respectively, i.e., PQ joins mid-points of sides AB and BC.

$\therefore PQ || AC$ ....(1)

And $PQ = \frac{1}{2}AC$ [by Mid-point theorem] .... (2)

In triangle ADC, R and S are the mid-points of CD and AD respectively.

$\therefore SR || AC$ ....(3)

And $SR = \frac{1}{2}AC$ ...(4) [by Mid-point theorem]

From (1) and (3), we obtain

PQ||SR

From (2) and (4), we obtain

PQ = RS

$\Rightarrow$ PQRS is a parallelogram.

In triangle ABD, join mid-points of sides of DA and AB respectively i.e; join SP.

$\therefore SP = \frac{1}{2}BD$ ....(5) [Mid-point theorem]

Since, AC = BD .... (6) [Given]

From equations (2), (5) and (6), we obtain

SP = PQ

Since adjacent sides of parallelogram are equal, so, Parallelogram PQRS is a rhombus.

Hence, proved.