Parallelogram solved Worksheet/ Questions Paper

1.Q. Name each of the following parallelograms.

(i) The diagonals are equal and the adjacent sides are unequal.

(ii) The diagonals are equal and the adjacent sides are equal.

(iii) The diagonals are unequal and the adjacent sides are equal.

(iv) All the sides are equal and one angle is 60°.

(v) All the sides are equal and one angle is 90°.

(vi) All the angles are equal and the adjacent sides are unequal.

Ans: (i) rectangle (ii) square (iii) rhombus (iv) rhombus (v) square (vi) rectangle

2. Q. State whether True or False.

a) All rectangles are squares

Answer: All squares are rectangles but all rectangles can't be squares, so this statement is false.

(b) All kites are rhombuses.

Answer: All rhombuses are kites but all kites can't be rhombus

(c) All rhombuses are parallelograms

Answer: True

(d) All rhombuses are kites.

Answer: True

(e) All squares are rhombuses and also rectangles

Answer: True; squares fulfill all criteria of being a rectangle because all angles are right angle and opposite sides are equal. Similarly, they fulfill all criteria of a rhombus, as all sides are equal and their diagonals bisect each other.

(f) All parallelograms are trapeziums.

Answer: False;

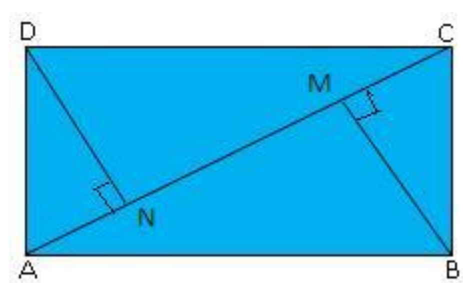
All trapeziums are parallelograms, but all parallelograms can't be trapezoid.

(g) All squares are not parallelograms.

Answer: False; all squares are parallelograms

(h) All squares are trapeziums. Answer: True

3. Q. In the adjacent figure, ABCD is a rectangle. If BM and DN are perpendiculars from B and D on AC, prove that Δ BMC ≅ Δ DNA. Is it true that BM = DN?



Solution:

In Δs BMC and DNA,

BC = DA [Opposite sides]

∠BCM = ∠DAN (alternate angles)

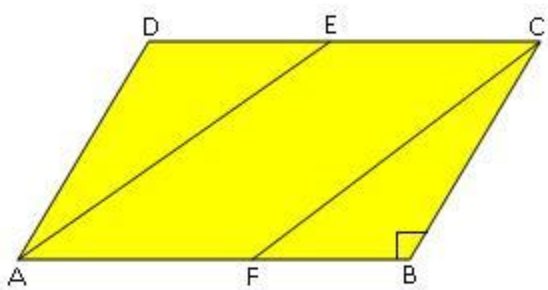
∠DNA = ∠BMC = 90° [DN and BM are perpendicular to AC]

By AAS Congruency,

Δ BMC ≅ Δ DNA

By CPCT, BM=DN

4.Q. In the adjacent figure, ABCD is a parallelogram and line segments AE and CF bisect the angles A and C respectively. Show that AE ∥ CF.



Solution: $\angle A = \angle C$ [Opposite angles]

Given that, line segments AE and CF bisect the angles A and C respectively

$^1/_2\angle A = {^1/_2}\angle C$,

$\Rightarrow \angle DAE = \angle BCF$ ----------(i)

Now, In Δs ADE and CBF,

AD = BC [Opposite sides]

$\angle B = \angle D$ [Opposite angles]

$\angle DAE = \angle BCF$ [from (i)]

Therefore, Δ ADE $\cong$ ΔCBF [By ASA congruency]

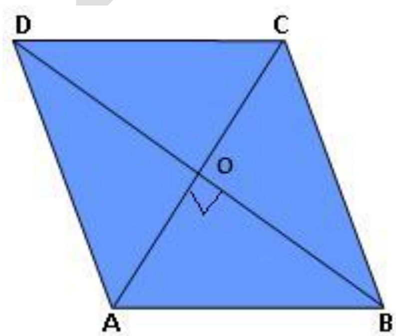
By CPCT,DE=BF

But,CD=AB $\Rightarrow$ CD - DE = AB - BF. So, CE = AF.

Therefore, AECF is a quadrilateral having pairs of side parallel and equal,So, AECF is a parallelogram.

Hence, AE ∥ CF.

5.Q. The lengths of the diagonals of a rhombus are 16 cm and 12 cm respectively. Find the length of each of its sides.



Solution:

Let, AC=12cm and BD=16cm

BO=1/2BD=8cm also, A0 =1/2 AC=6cm

Now, In Right Δ AOB,

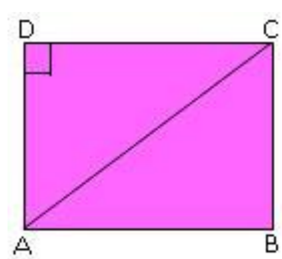
$AB^2 = AO^2 + OB^2$

$AB^2 = 6^2 + 8^2 = 100 = 10^2$

AB = 10 cm

The length of each of its sides=10cm

6.Q. In the given figure ABCD is a square. Find the measure of $\angle CAD$.



Solution: In Δ ADC,

DA = DC

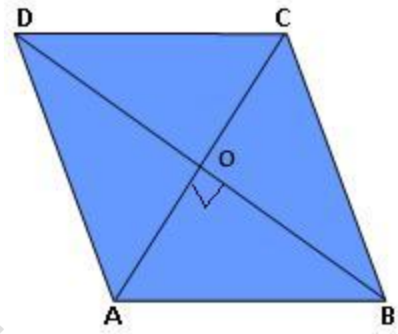
$\Rightarrow \angle ACD = \angle DAC = x°$ (say)

Then, $\angle ACD + \angle DAC + \angle ADC = 180^0$

$\Rightarrow$ x° + x° + 90° = 180°.

$\Rightarrow$ x = 90/2=45^0

7.Q. ABCD is a rhombus whose diagonals AC and BD intersect at a point O. If side AB = 10cm and diagonal BD = 16 cm, find the length of diagonal AC.



Solution: We know that the diagonals of a rhombus bisect each other at right angles

Therefore, BO = $^1/_2$BD = ($^1/_2$ × 16) cm = 8 cm, AB = 10 cm and ∠AOB = 90°.

From right ∆OAB, we have

$AB^2 = AO^2 + BO^2$

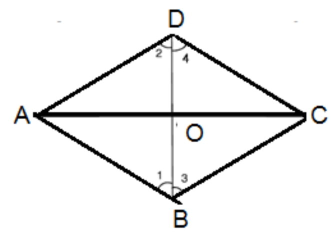
⇒ $AO^2 = (AB^2 – BO^2) = \{(10)^2 - (8)^2\}$ cm^2

= (100 - 64) cm^2 = 36 cm^2

⇒ AO = √36 cm = 6 cm.

Therefore, AC = 2 × AO = (2 × 6) cm = 12 cm

8. Q. One of the diagonals of a rhombus is equal to one of its sides. Find the angles of the rhombus.



Solution : In rhombus, ABCD,

AB = AD = BD

∴ ∆ABD is an equilateral triangle.

∴ ∠DAB = ∠1 = ∠2 = 60° ...(i)

Similarly, ∠BCD = ∠3 = ∠4 = 60° ...(ii)

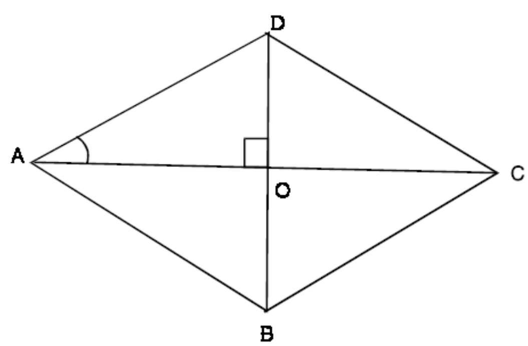
from (i) and (ii)

∠ABC = ∠B = ∠1 + ∠3 = 60° + 60° = 120°

∠ADC = ∠D = ∠2 + ∠4 = 60° + 60° = 120°

Hence, ∠A = 60°, ∠B = 120°, ∠C = 60° and ∠D = 120°.

9. Q. The diagonals of a rhombus ABCD intersect at O. If ∠ADC = 120° and OD = 6 cm, find (i) ∠OAD (ii) side AB (iii) perimeter of the rhombus ABCD.



Solution: Given that

∠ADC = 120°

i.e., ∠ADO + ∠ODC = 120°

But ∠ADO = ∠ODC (∆AOD≅ ∆COD)

∴ 2∠ADO = 120°

i.e. ∠ADO = 60° ...(i)

Also, we know that the diagonals of a rhombus bisect each that at 90°. ∴ ∠DOA = 90° ...(ii)

Now, in ∆DOA

∠ADO + ∠DOA + ∠OAD = 180°

From (i) and (ii), we have

60° + 90° + ∠OAD = 180°

⇒ ∠OAD = 30°

∴ ∠DAB = 60° ∴ ΔDAB is an equilateral triangle

(ii) Now OD = 6 cm

⇒ OD + OB = BD =6 cm + 6 cm = BD = 12 cm Since, AB = BD = AD = 12 cm ⇒ AB = 12 m.

(iii) Now Perimeter = 4 × side = (4 × 12) cm = 48 cm

Hence, the perimeter of the rhombus = 48 cm.

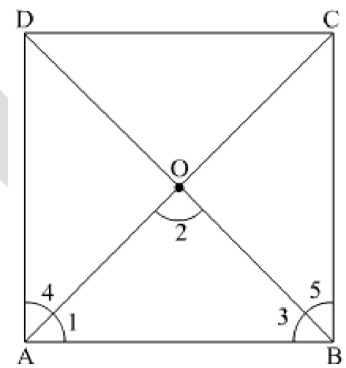
10. Q. In a quadrilateral ABCD, AC and BD are the bisectors of <A and <B resp. Prove that <AOB = 1/2 (<C + < D)

Given, AO and BO are the bisectors of angle A and angle B respectively.

∴ ∠1 = ∠4 and ∠3 = ∠5 ... (1)

To prove: $\angle 2 = \frac{1}{2}(\angle C + \angle D)$

Proof:



In quadrilateral ABCD

∠A + ∠B + ∠C + ∠D = 360°

$\frac{1}{2}(\angle A + \angle B + \angle C + \angle D) = 180°$ ... (2)

Now in ΔAOB

∠1 + ∠2 + ∠3 = 180° ... (3)

Equating (2) and (3), we get

$\angle 1 + \angle 2 + \angle 3 = \frac{1}{2}\angle A + \frac{1}{2}\angle B + \frac{1}{2}(\angle C + \angle D)$

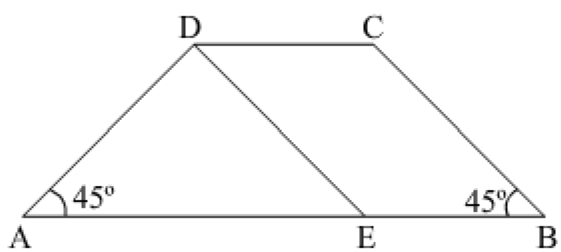
$\angle 1 + \angle 2 + \angle 3 = \angle 1 + \angle 3 + \frac{1}{2}(\angle C + \angle D)$

$\therefore \angle 2 = \frac{1}{2}[\angle C + \angle D]$ Hence proved

11.Q. ABCD is a trapezium where AB parallel to CD. measure of < A = < B =45^o. Prove that AD=BC

Solution:

Given: ABCD is a trapezium with AB II CD and ∠A = ∠B = 45°



Construction: Draw DE II CB.

Now In quadrilateral DEBC

DE II CB and DC II EB

⇒ DEBC is a parallelogram

⇒ DE = BC ....(1)

Also DE II CB and AB is the transversal

⇒ ∠B = ∠DEA = 45° (Corresponding Angles)

Now in ΔADE

∠A = ∠DEA = 45°

⇒ AD = DE (In a triangle sides opposite to equal angles are equal) .....(2)

From (1) and (2) we get, AD = BC

<u>12. Q. ABCD is a rhombus in which the altitude from D to side AB bisects AB. Then find value of < A and < B respectively.</u>

Solution: **Given :** ABCD is a rhombus. DE is the altitude on AB such that AE = EB.

In ΔAED and ΔBED,

DE = DE (Common side)

∠DEA = ∠DEB (90°)

AE = EB (Given)

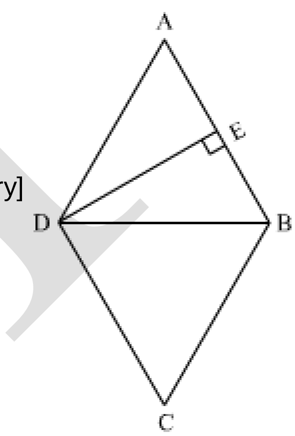
∴ ΔAED ≅ ΔBED (SAS congruence rule)

⇒ AD = BD (C.P.C.T.)

Also, AD = AB [Sides of rhombus are equal]

⇒ AD = AB = BD

Thus, ΔABD is an equilateral triangle.



∴ ∠A = 60°

⇒ ∠C = ∠A = 60° [Opposite angles of rhombus are equal]

∠ABC + ∠BCD = 180° [Sum of adjacent angles of a rhombus is supplementary]

∴∠ABC + 60° = 180°

⇒ ∠ABC = 180° – 60°

⇒ ∠ABC = 120°

∴ ∠ADC = ∠ABC = 120° [Opposite angles of a rhombus are equal]

Thus, angles of rhombus are 60°, 120°, 60° and 120°.

13. Three angles of a quadrilateral are in the ratio 3:4:5. The difference of the least and the greatest of these angles is 45. Find all the four angles of the quadrilateral.

Ans: The ratio of the three angles of quadrilateral = 3 : 4 : 5

Let the angles be 3x, 4x and 5x.

The greatest angle among these is 5x and the least is 3x.

According to the question,

5x – 3x = 45

⇒ 2x = 45

⇒ x = 45 ÷ 2

⇒ x = 22.5

Hence, the three angles of quadrilateral are 3 × 22.5 = 67.5°, 4 × 22.5° = 90° and 5 × 22.5° = 112.5°.

Fourth angle of quadrilateral = 360° – 67.5° + 90° + 112.5° = 360° – 270° = 90°