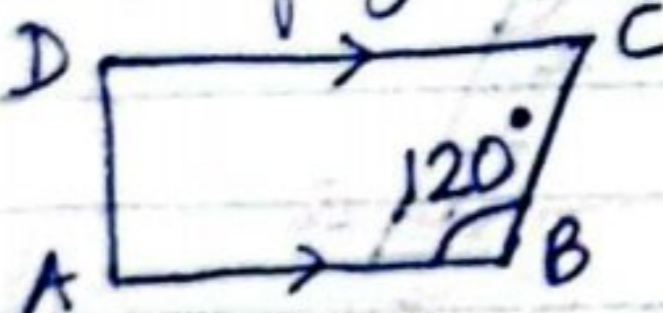


VIII Homework - 20<sup>th</sup> Feb (Understanding Quadrilaterals)

- 1) Two adjacent angles of a parallelogram are  $(3x+20)^\circ$  and  $(2x+10)^\circ$ , then the value of  $x$  is (a) 35 (b) 30 (c) 40 (d) 26
- 2) The lengths of diagonals of a rhombus are 24cm and 10cm, then the length of each side of the rhombus is (a) 13cm (b) 12cm (c) 14cm (d) 9cm.
- 3) The length and breadth of a rectangle are in the ratio 4:3 and the diagonal measures 10cm, then its perimeter is (a) 14cm (b) 48cm (c) 24cm (d) 28cm.
- 4) In a quadrilateral ABCD, the angles A, B, C and D are in the ratio 1:2:3:4, then the measure of the smallest angle is (a)  $28^\circ$  (b)  $36^\circ$  (c)  $72^\circ$  (d)  $60^\circ$
- 5) The adjacent angles of a parallelogram are in the ratio 4:5, then its smallest angle is (a)  $60^\circ$  (b)  $100^\circ$  (c)  $80^\circ$  (d)  $90^\circ$
- 6) The opposite angles of a parallelogram are  $(2x-3)^\circ$  and  $(45-x)^\circ$ , then the value of  $x$  is (a) 16 (b) 18 (c) 12 (d) 20
- 7) The length of the diagonals of a rectangle whose sides are 12cm and 5cm is (a) 14cm (b) 17cm (c) 13cm (d) 16cm
- 8) Two diagonals of a rectangle are of length  $(4x+1)$ cm and  $(2x+15)$ cm, then the value of  $x$  is (a) 10 (b) 7 (c) 9 (d) 12

Fill in the blanks

1) A trapezium can be equiangular, if it is a \_\_\_\_\_

2)   $AB \parallel DC$ , then  $\angle C =$  \_\_\_\_\_

3) If two adjacent angles of a parallelogram have equal measures, then each of the angles of the parallelogram is \_\_\_\_\_

4) The quadrilateral that have four sides equal in length are \_\_\_\_\_ and \_\_\_\_\_

5) The quadrilateral which have four right angles are \_\_\_\_\_ and \_\_\_\_\_

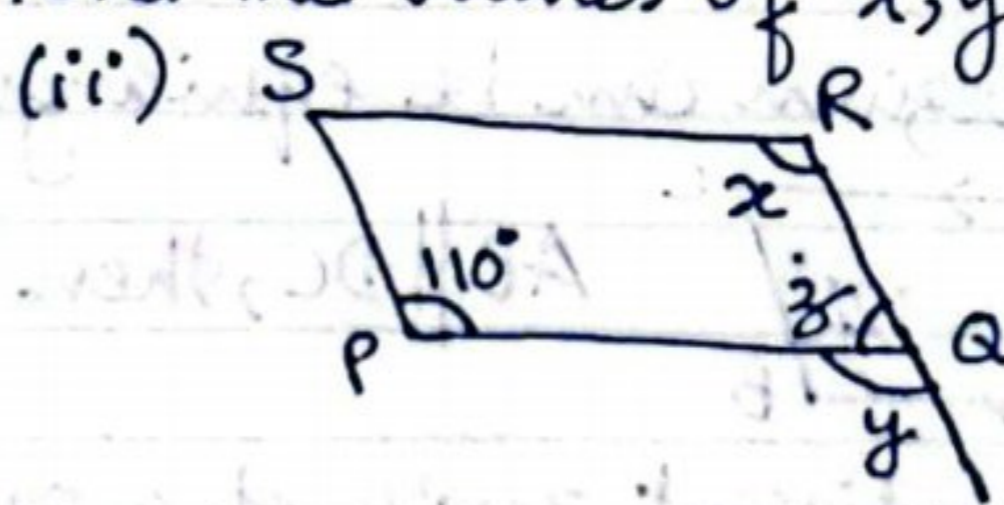
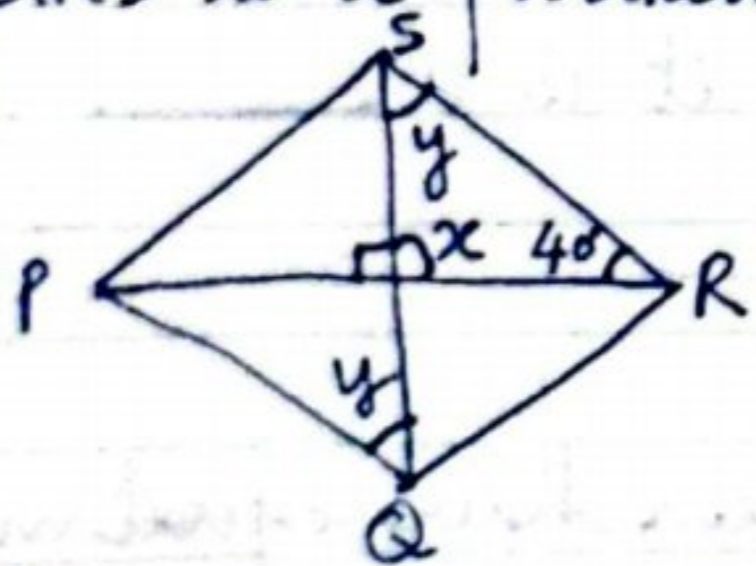
6) The quadrilateral whose diagonals bisect each other are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_



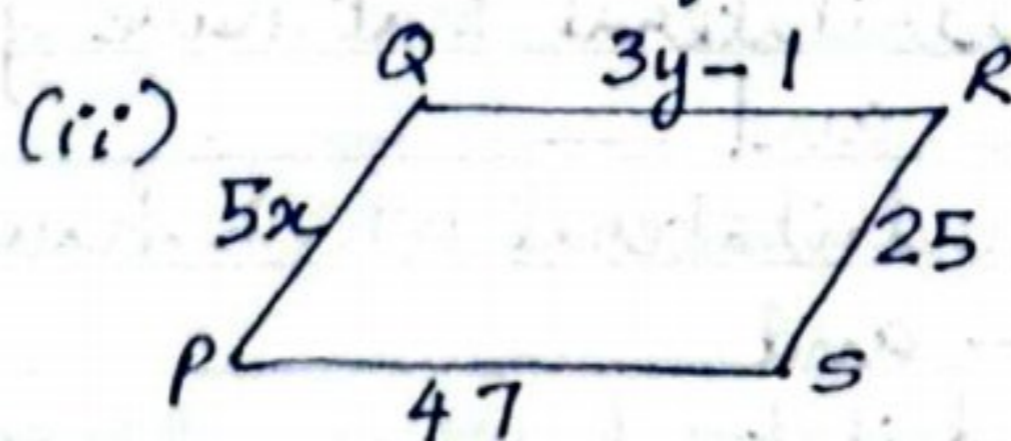
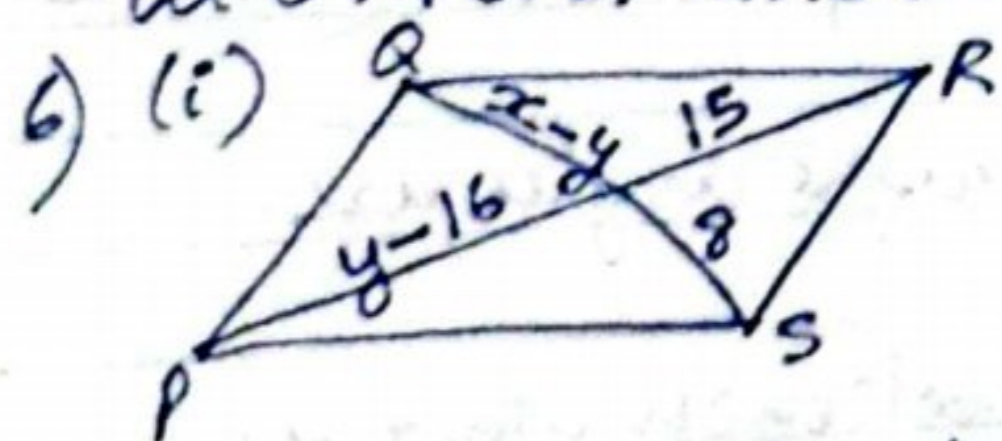
- 7) If one of the diagonals of a rhombus is equal to one of its sides, then the angles of the rhombus are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
- 8) An exterior angle of a parallelogram is  $110^\circ$ , then its angles are \_\_\_\_\_ and \_\_\_\_\_.
- 9) The quadrilateral whose diagonals are perpendicular bisectors of each other are \_\_\_\_\_ and \_\_\_\_\_.
- 10) ABCD is a rhombus, where  $AC = 8\text{cm}$  and  $BD = 6\text{cm}$ , then each side of the rhombus is \_\_\_\_\_ cm.
- 11) The measure of two angles of a quadrilateral are  $125^\circ$  and  $35^\circ$ , and the other two angles are equal, then the measure of each of the equal angles is \_\_\_\_\_.
- 12) A quadrilateral has three acute angles each measuring  $70^\circ$ . Then the fourth angle is \_\_\_\_\_.

Answer the following:-

- 1) In a quadrilateral PQRS, PO and QO are the bisectors of  $\angle P$  and  $\angle Q$  respectively. Prove that  $\angle POQ = \frac{1}{2}(\angle R + \angle S)$ .
- 2) Three angles of a quadrilateral are equal to  $100^\circ$ ,  $60^\circ$  and  $80^\circ$  respectively. Find its fourth angle.
- 3) Three angles of a quadrilateral are equal. The fourth angle measures  $120^\circ$ . What is the measure of each of the equal angles?
- 4) PQRS is a parallelogram. Find the values of  $x$ ,  $y$  and  $z$ .



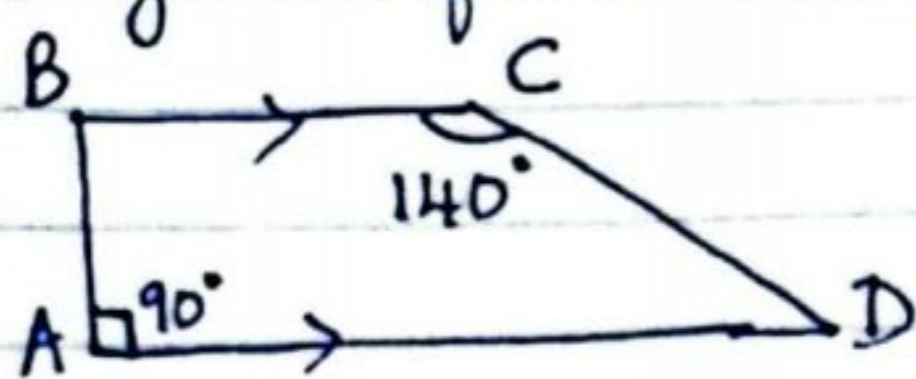
- 5) In the parallelogram ABCD, the bisectors of  $\angle A$  and  $\angle B$  meet at O. Find  $\angle AOB$ .



PQRS is a parallelogram, find the values of  $x$  and  $y$ .



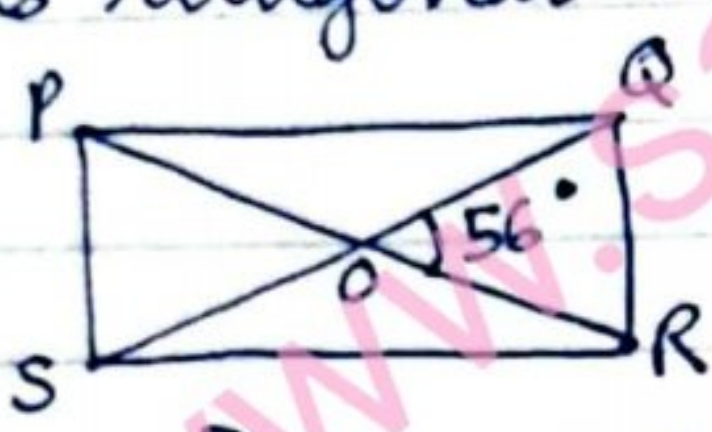
7) The diagonals of a rhombus are 16cm and 12cm. Find the length of each side of the rhombus.

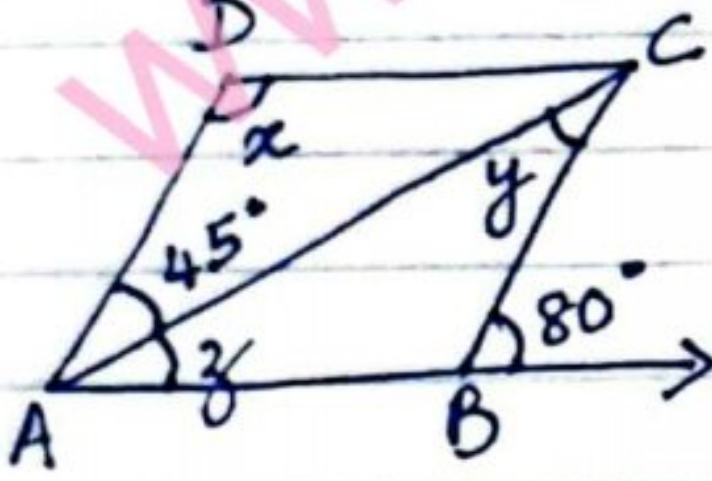
8)  ABCD is a trapezium in which  $BC \parallel AD$ . Find  $\angle D$  and  $\angle B$ .

9) The diagonals of rectangle ABCD intersect at O. If  $\angle AOB = 72^\circ$  and  $\angle DAO = 32^\circ$ , find  $\angle OCB$ .

10) The ratio of two sides of a parallelogram is 3:4 and its perimeter is 70cm. Find the lengths of the sides of the parallelogram.

11) The perimeter of a square is 36cm. Find the length of its diagonal.

12)  The diagonals of a rectangle PQRS intersect at O. If  $\angle QOR = 56^\circ$ , find  $\angle OPQ$ .

13)  ABCD is a parallelogram. Find the measures of  $x$ ,  $y$ , and  $z$ .

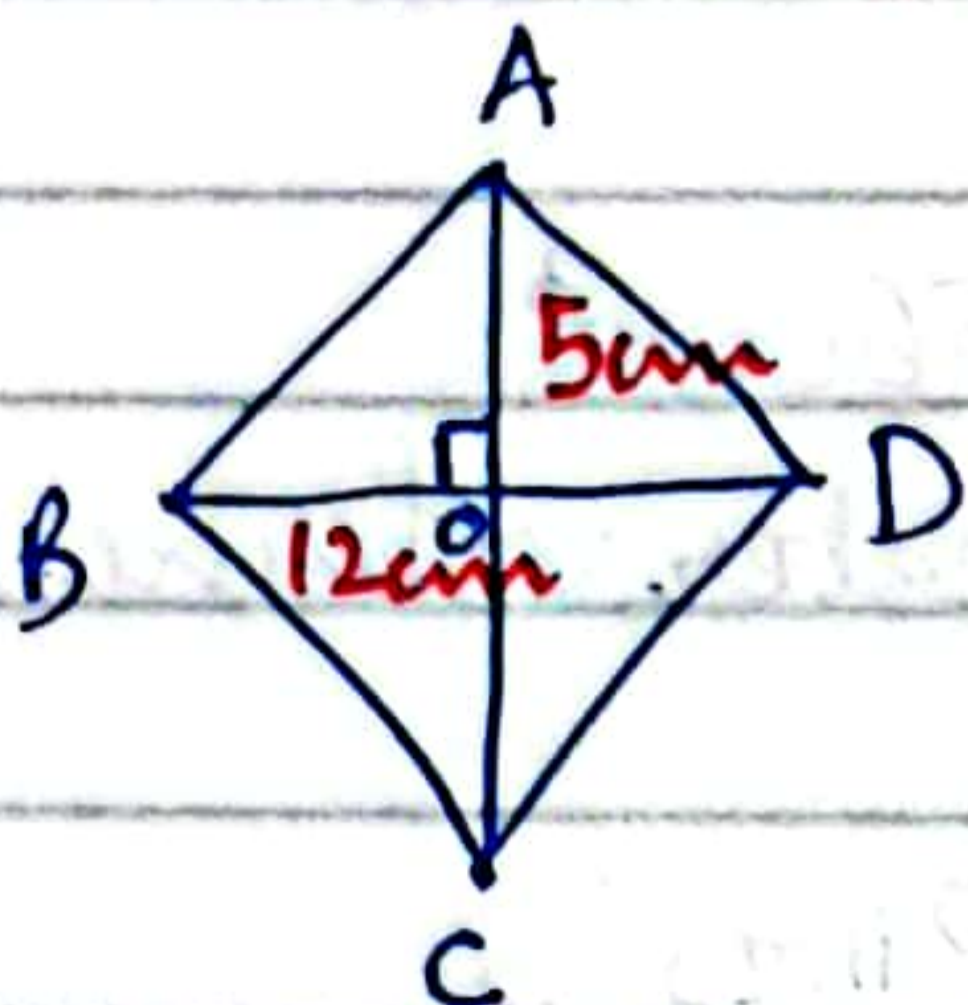


- 1) Since the adjacent angles of a parallelogram are supplementary,  $3x + 20 + 2x + 10 = 180^\circ$

$$5x = 180^\circ - 30^\circ = 150^\circ$$

$$\therefore x = 30^\circ \text{ (b)}$$

2)



Since the diagonals of a rhombus bisect each other at  $90^\circ$ ,

$$OA = \frac{1}{2} AC = \frac{1}{2} \times 10 = 5 \text{ cm}$$

$$OB = \frac{1}{2} BD = \frac{1}{2} \times 24 = 12 \text{ cm}$$

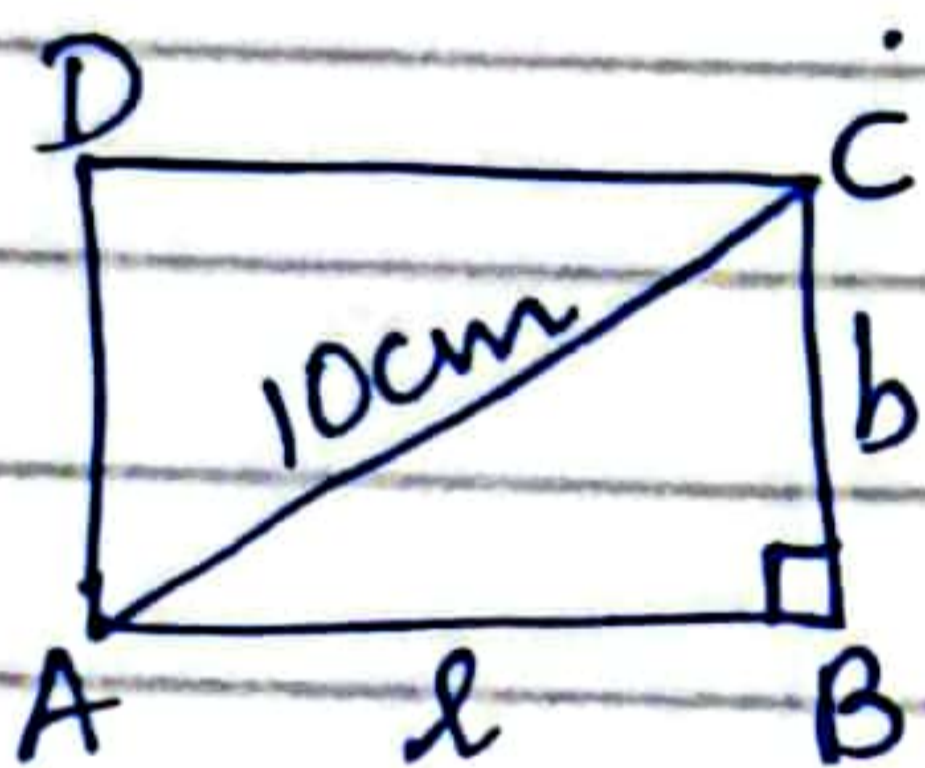
$$\text{and } \angle AOB = 90^\circ$$

Using Pythagoras Theorem in rt.  $\triangle AOB$ ,

$$AB^2 = OA^2 + OB^2 = 25 + 144 = 169$$

$$\therefore AB = \sqrt{169} = 13 \text{ cm} \text{ (a)}$$

3)



Since each angle measures  $90^\circ$  in a rectangle,

$$\text{let } l = 4x, b = 3x$$

Using Pythagoras theorem,

$$AC^2 = AB^2 + BC^2$$

$$100 = 16x^2 + 9x^2 = 25x^2$$

$$\therefore x^2 = \frac{100}{25} = 4$$

$$x = \sqrt{4} = 2 \text{ cm}$$

$$l = 4 \times 2 = 8 \text{ cm}$$

$$b = 3 \times 2 = 6 \text{ cm}$$

$$\text{Perimeter of rectangle ABCD} = 2(l + b) = 2(8 + 6)$$

$$= 2 \times 14 = 28 \text{ cm} \text{ (d)}$$

4)

Let the angles be  $x, 2x, 3x$  and  $4x$

Then, using angle sum property in quadrilateral,

$$x + 2x + 3x + 4x = 360^\circ$$

$$10x = 360^\circ$$

$$x = 36^\circ$$

$\therefore$  Measure of smallest angle =  $x = 36^\circ$  (b)



5) Since the adjacent angles are supplementary,

$$4x + 5x = 180^\circ$$

$$9x = 180^\circ$$

$$x = 20^\circ$$

Hence, the smallest angle =  $4x = 4 \times 20^\circ = 80^\circ$  (c)

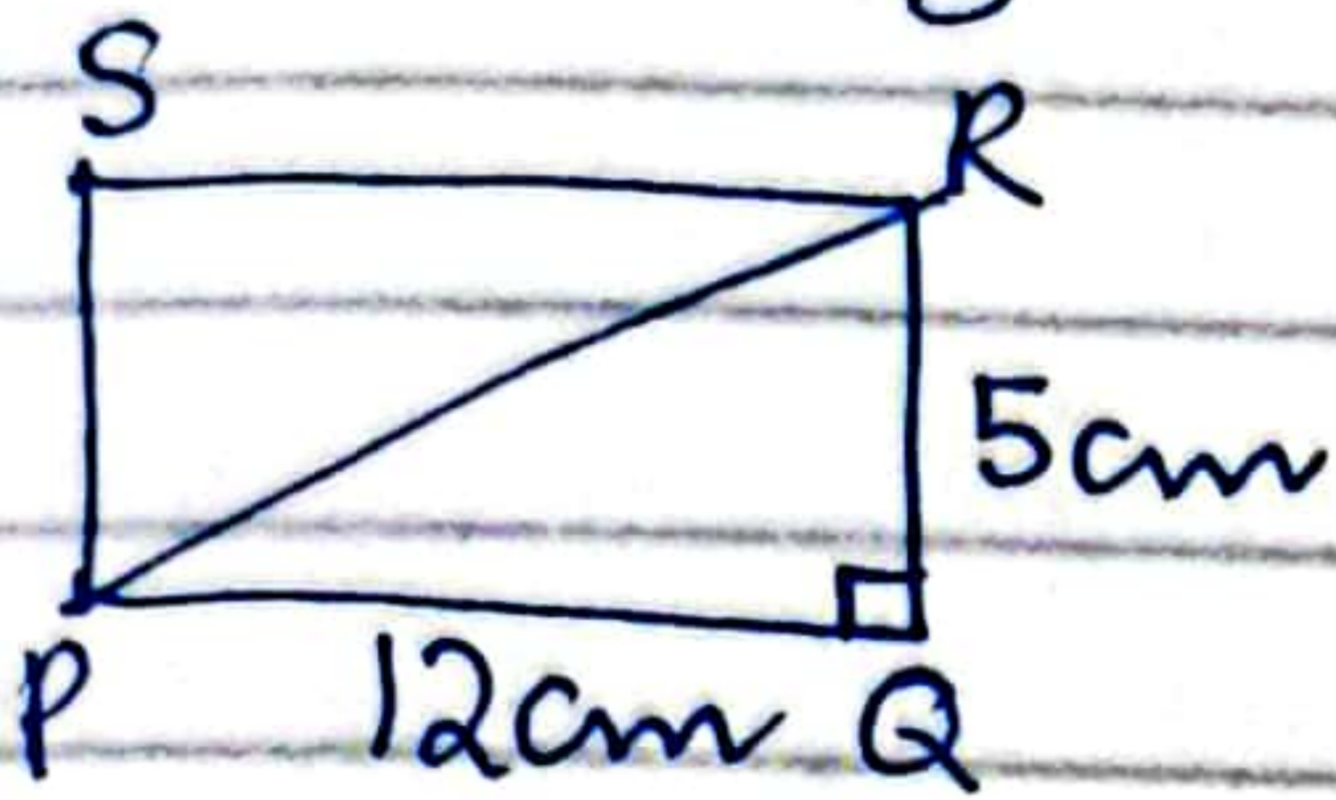
6) Since the opposite angles are equal,

$$2x - 3 = 45 - x$$

$$3x = 48$$

$$x = \frac{48}{3} = 16 \text{ (a)}$$

7)



Since PQRS is a rectangle,  $\angle Q = 90^\circ$ .  
Using angle sum property in  $\triangle PQR$

$$PR^2 = PQ^2 + QR^2 = 12^2 + 5^2 = 144 + 25$$

$$= 169$$

$$\therefore PR = \sqrt{169} = 13 \text{ cm (c)}$$

8) Since the diagonals are equal,  $4x + 1 = 2x + 15$

$$4x - 2x = 15 - 1$$

$$2x = 14$$

$$x = 7 \text{ (b)}$$

Fill in the blanks

1) rectangle.

2) Since  $AB \parallel DC$ ,  $\angle B + \angle C = 180^\circ$  (co-interior angles)

$$\therefore \angle C = 180^\circ - 120^\circ = 60^\circ$$

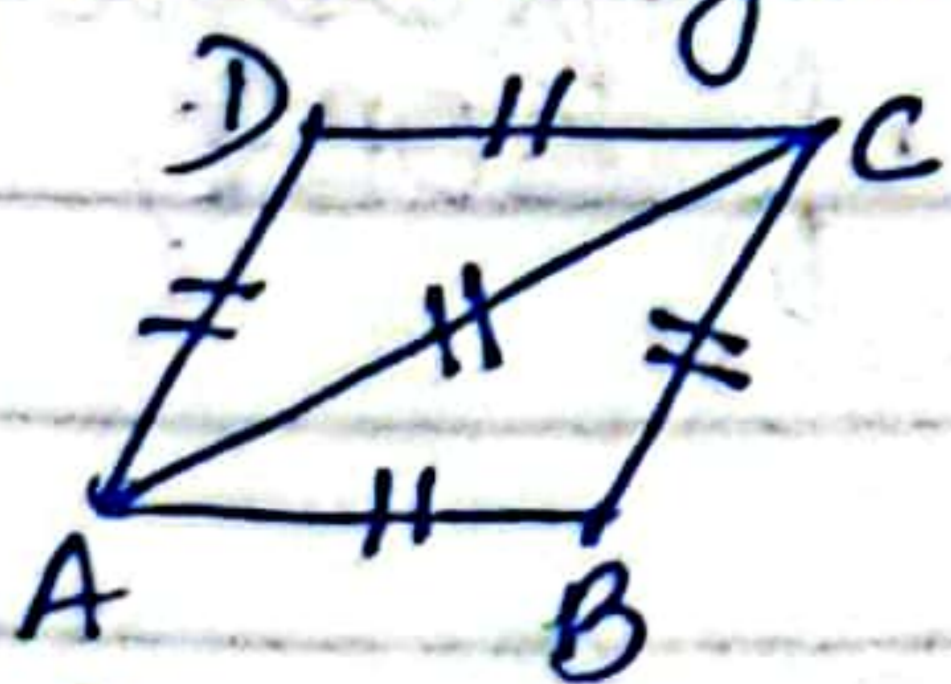
3) Since the adjacent angles are supplementary, each measures  $90^\circ$ .

4) rhombus, square

5) square, rectangle

6) parallelogram, rhombus, square, rectangle.

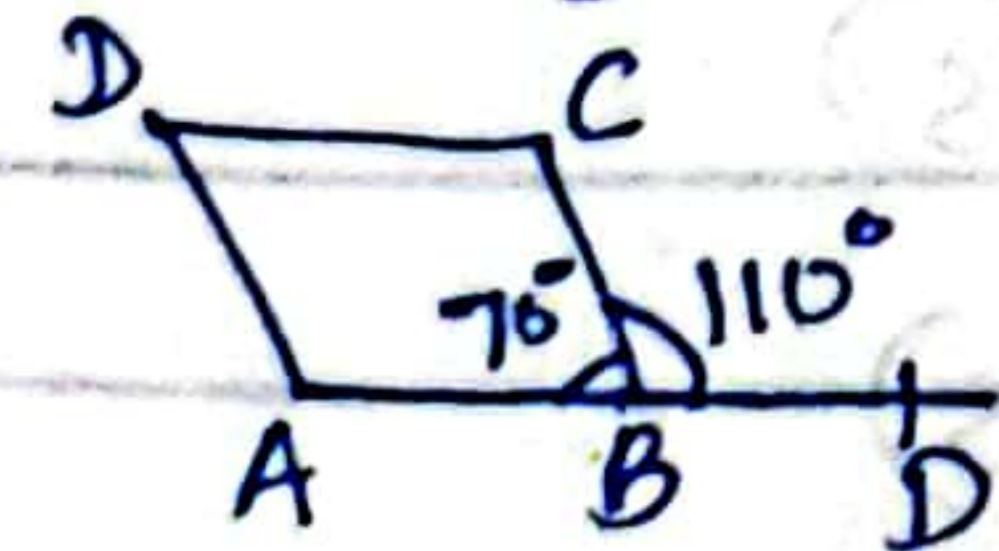
7)



Since  $\triangle ABC$  is an equilateral  $\triangle$ ,

$$\angle B = 60^\circ, \angle A = 120^\circ, \angle C = 120^\circ, \angle D = 60^\circ$$

8)



$$\angle CBD + \angle CBA = 180^\circ \text{ (linear pair)}$$

$$\angle B = 180^\circ - 110^\circ = 70^\circ$$

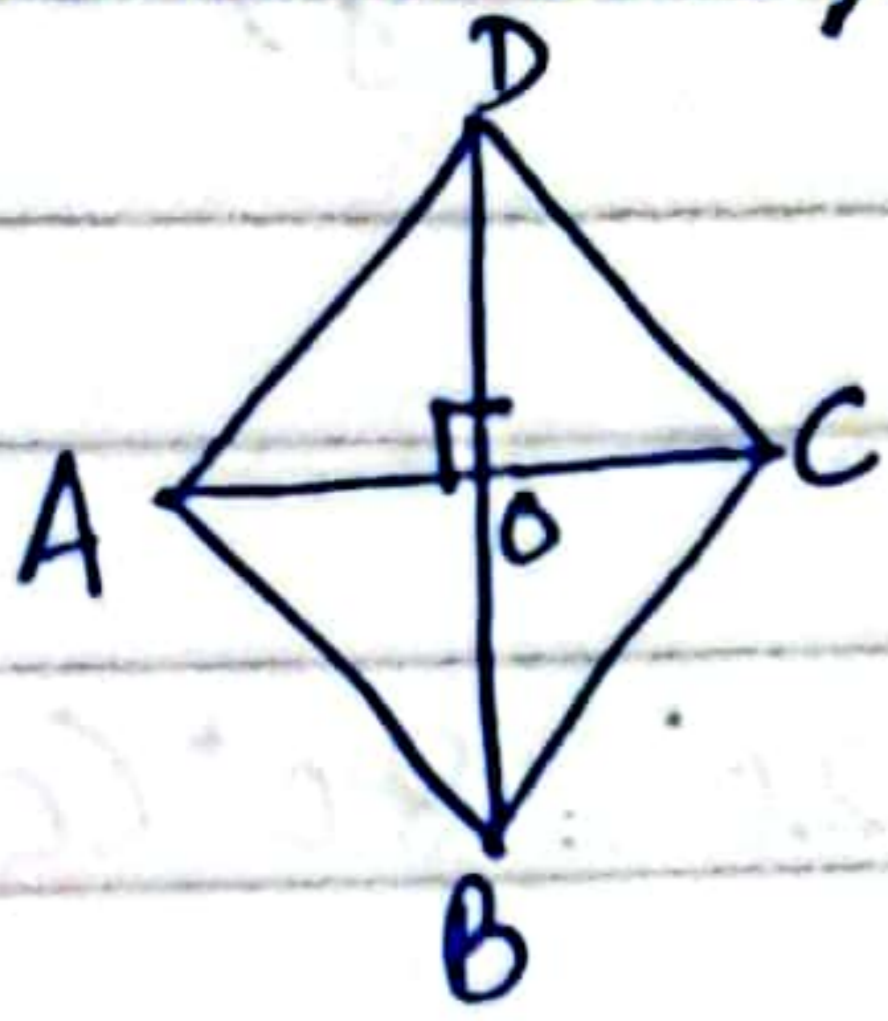
$$\angle A = 180^\circ - 70^\circ = 110^\circ \text{ (adjacent angles are supplementary)}$$

$$\therefore \angle A = \angle C = 110^\circ; \angle B = \angle D = 70^\circ$$



9) Rhombus, square

10)



Since diagonals of a rhombus bisect each other at  $90^\circ$ ,

$$OA = \frac{1}{2} AC = 4 \text{ cm}$$

$$OD = \frac{1}{2} BD = 3 \text{ cm}$$

Using Pythagoras theorem in rt.  $\triangle AOD$ ,

$$AD^2 = OA^2 + OD^2 = 16 + 9 = 25$$

$$\therefore AD = \sqrt{25} = \underline{5 \text{ cm}}$$

11) Using angle sum property,

$$125^\circ + 35^\circ + x + x = 360^\circ$$

$$2x = 360^\circ - 160^\circ = 200^\circ$$

$$x = \underline{100^\circ}$$

Hence, measure of each equal angles =  $100^\circ$

12) Using angle sum property,

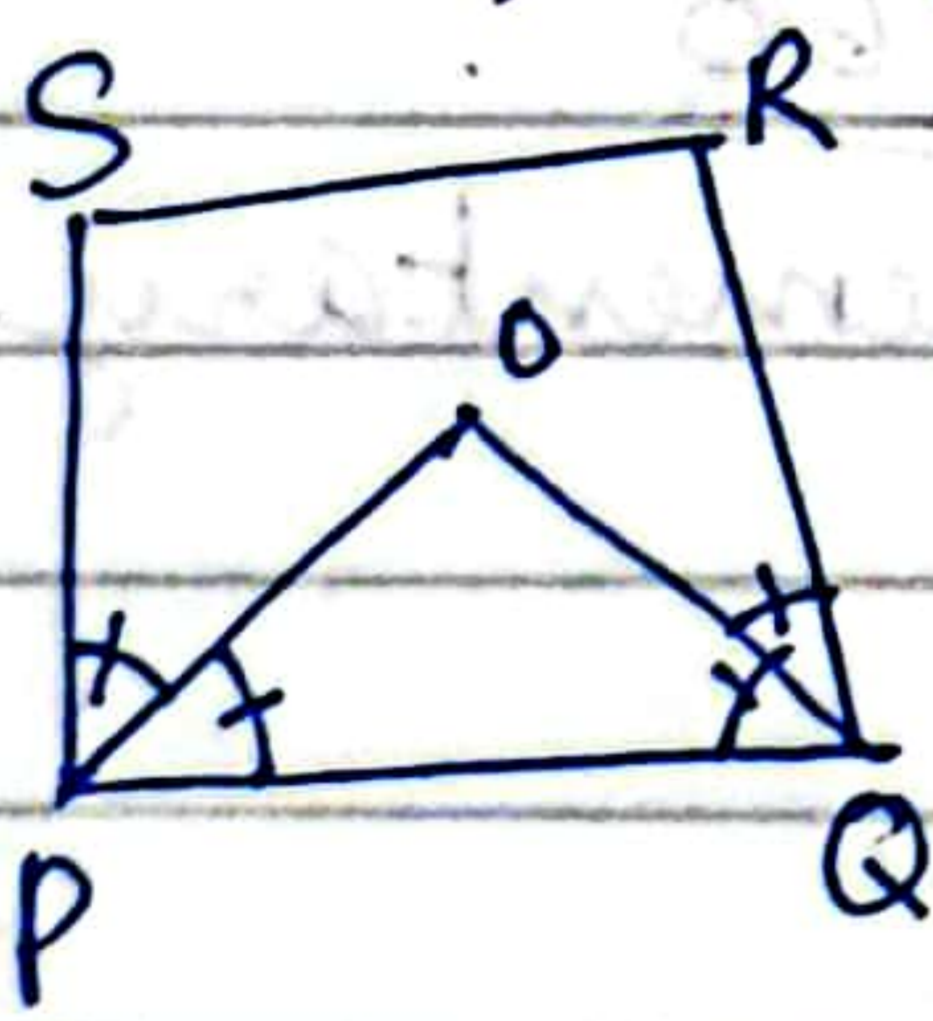
$$70^\circ + 70^\circ + 70^\circ + x = 360^\circ$$

$$x = 360^\circ - 210^\circ = 150^\circ$$

Hence, the fourth angle =  $\underline{150^\circ}$

Answer the following:-

1)



Given: in quadrilateral PQRS,

OP bisects  $\angle SPQ$

OQ bisects  $\angle RQP$

To prove:  $\angle POQ = \frac{1}{2} (\angle R + \angle S)$

Proof:- Using angle sum property of quadrilateral ~~ADPQ~~,  
 $\angle P + \angle Q + \angle R + \angle S = 360^\circ$

$$\Rightarrow \angle P + \angle Q = 360^\circ - (\angle R + \angle S)$$

$$\Rightarrow \frac{1}{2} \angle P + \frac{1}{2} \angle Q = \frac{360^\circ}{2} - \frac{1}{2} (\angle R + \angle S)$$

$$\Rightarrow \frac{1}{2} (\angle P + \angle Q) = 180^\circ - \frac{1}{2} (\angle R + \angle S)$$

Using angle sum property in  $\triangle OPQ$ ,



$$\angle OPQ + \angle OQP + \angle POQ = 180^\circ$$

$$\frac{1}{2}\angle P + \frac{1}{2}\angle Q + \angle POQ = 180^\circ$$

$$\angle POQ = 180^\circ - \frac{1}{2}(\angle P + \angle Q)$$

$$= 180^\circ - 180^\circ + \frac{1}{2}(\angle R + \angle S)$$

$\therefore \angle POQ = \frac{1}{2}(\angle R + \angle S)$ . Hence Proved.

2) Using angle sum property,

$$100^\circ + 60^\circ + 80^\circ + x = 360^\circ$$

$$x = 360^\circ - 240^\circ = 120^\circ$$

Hence, the fourth angle is 120°

3) Using angle sum property,

$$x + x + x + 120^\circ = 360^\circ$$

$$3x = 240$$

$$x = \frac{240}{3} = 80^\circ$$

Hence the measure of each <sup>equal</sup> angle = 80°

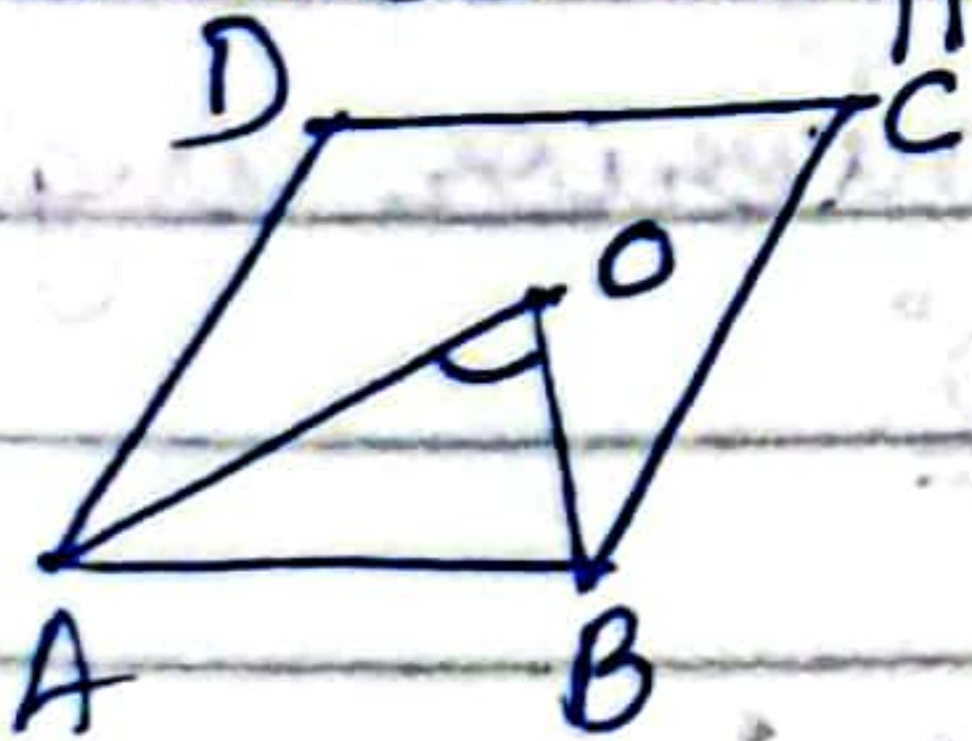
4) (i)  $x = 90^\circ$

In  $\triangle SOR$ , using angle sum property,  $y = 180^\circ - (40^\circ + 90^\circ)$

$$= 180^\circ - 130^\circ = \underline{50^\circ}$$

Since  $SR \parallel PQ$ ,  $z = y = 50^\circ$  (alternate interior angles)

5)



$\angle A + \angle B = 180^\circ$  (adjacent angles are supplementary)

$$\frac{1}{2}\angle A + \frac{1}{2}\angle B = \frac{180^\circ}{2} = 90^\circ$$

Using angle sum property in  $\triangle AOB$ ,

$$\angle OAB + \angle OBA + \angle AOB = 180^\circ$$

$$\frac{1}{2}\angle A + \frac{1}{2}\angle B + \angle AOB = 180^\circ$$

$$\angle AOB = 180^\circ - 90^\circ = \underline{90^\circ}$$

4) (ii)

$\angle P = \angle R = x = \underline{110^\circ}$  (opposite angles are equal)

$z + 110^\circ = 180^\circ$  (adjacent angles are supplementary)

$$z = 180^\circ - 110^\circ = \underline{70^\circ}$$

$$y + z = 180^\circ \Rightarrow y = 180^\circ - 70^\circ = \underline{110^\circ}$$



6) (i) Since diagonals bisect each other,  $y - 16 = 15$   
 $y = 15 + 16 = \underline{\underline{31}}$

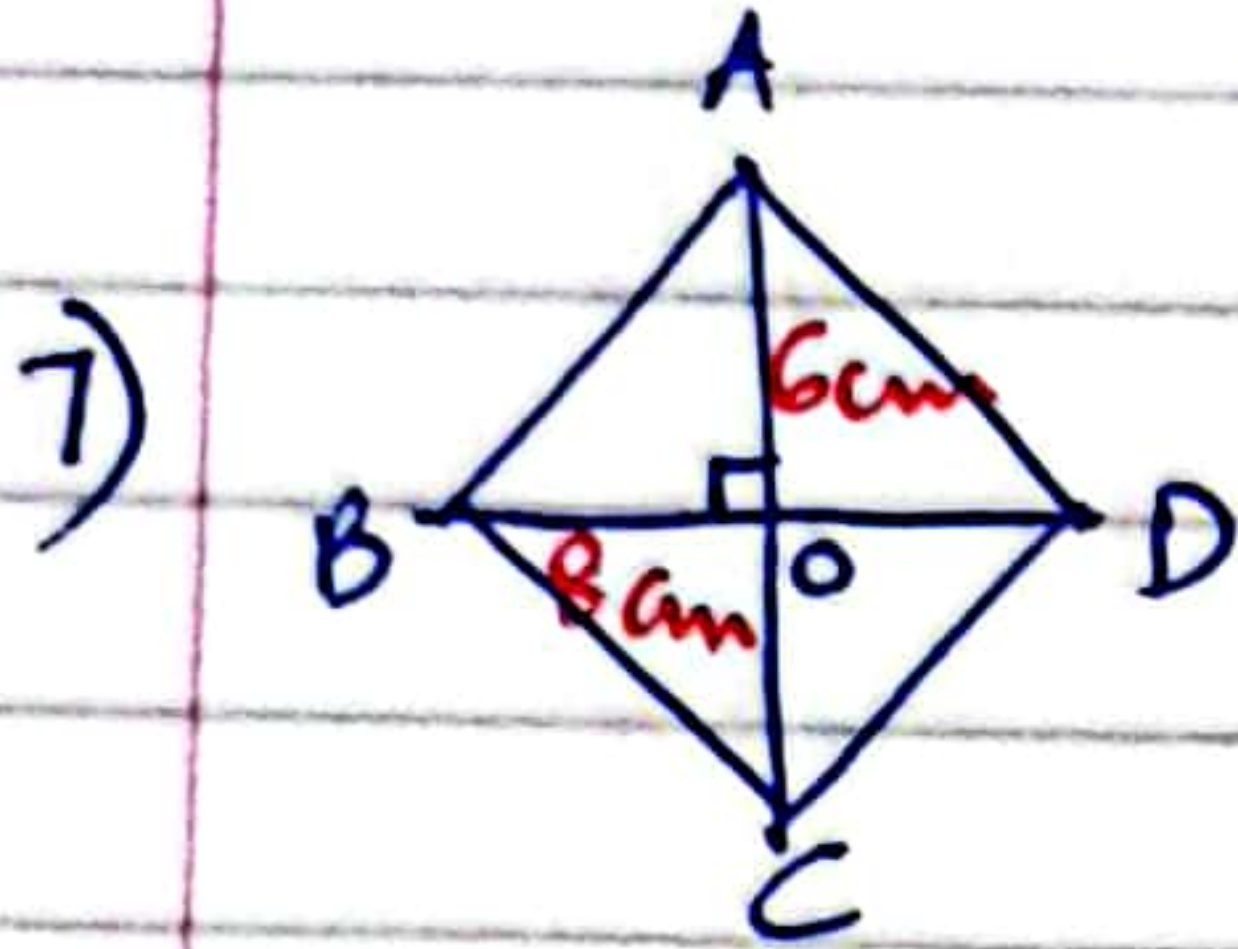
$$x - y = 8$$

$$x = 8 + 31 = \underline{\underline{39}}$$

(ii) Since opposite sides are equal,  $3y - 1 = 47$   
 $3y = 47 + 1 = 48$   
 $y = \frac{48}{3} = \underline{\underline{16}}$

$$5x = 25$$

$$x = \frac{25}{5} = \underline{\underline{5}}$$



Since the diagonals of a rhombus bisect each other at  $90^\circ$ ;

$$OA = \frac{1}{2} AC = \frac{1}{2} \times 12 = 6 \text{ cm}$$

$$OB = \frac{1}{2} BD = \frac{1}{2} \times 16 = 8 \text{ cm}$$

In rt.  $\triangle OAB$ , using Pythagoras Theorem,  
 $AB^2 = OA^2 + OB^2 = 6^2 + 8^2 = 36 + 64 = 100$   
 $AB = \sqrt{100} = 10 \text{ cm}$

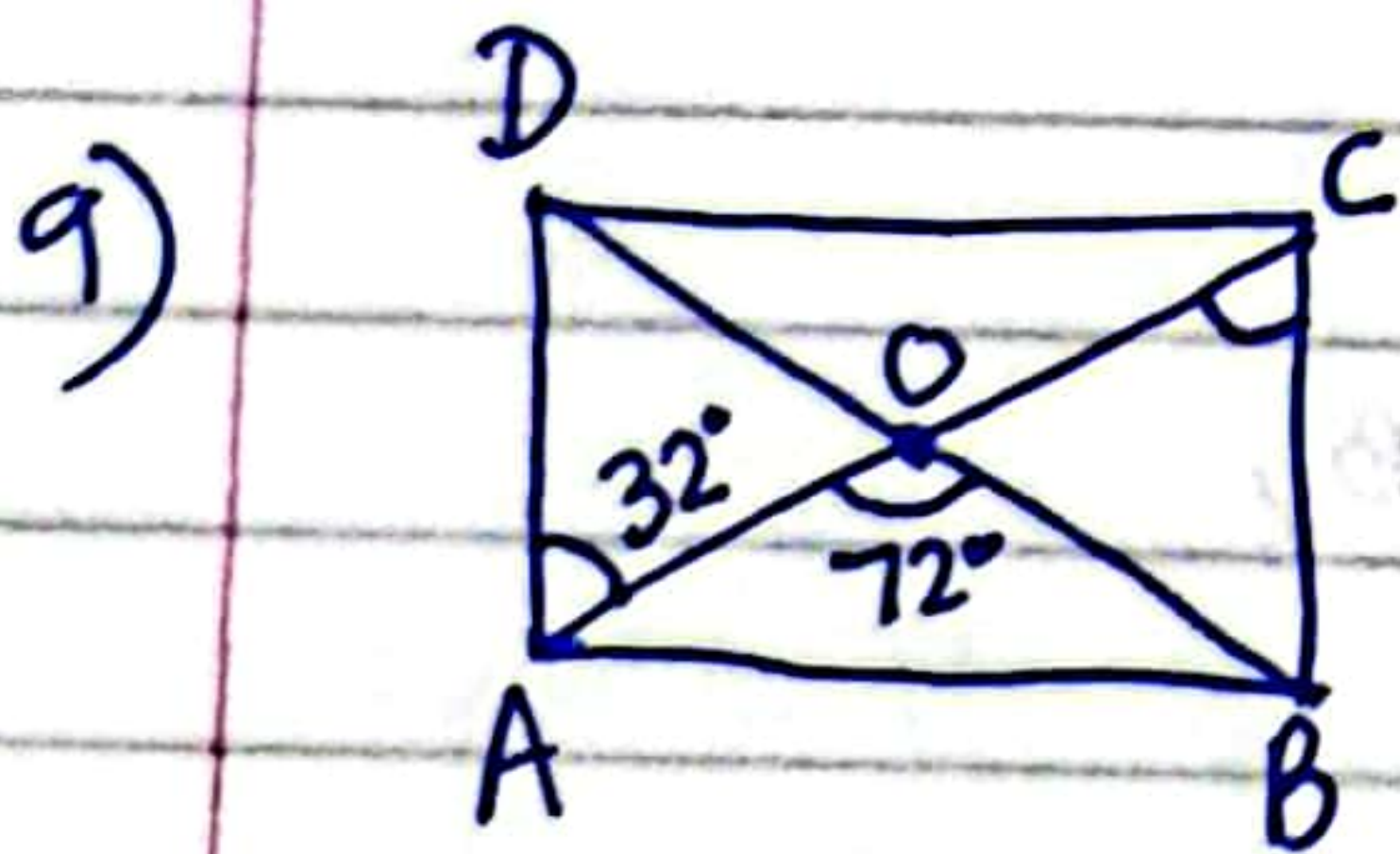
$\therefore$  length of each side = 10 cm

8) Since  $AD \parallel BC$ ,  $\angle A + \angle B = 180^\circ$  (Co-interior angles)

$$\angle B = 180^\circ - 90^\circ = \underline{\underline{90^\circ}}$$

Similarly,  $\angle C + \angle D = 180^\circ$

$$\angle D = 180^\circ - 140^\circ = \underline{\underline{40^\circ}}$$



Since  $AD \parallel BC$ ,  $\angle DAO = \angle OCB = \underline{\underline{32^\circ}}$   
 (alternate interior angles)

10) Let the sides be  $3x$  and  $4x$

$$\text{Perimeter} = (3x + 4x) \times 2 = 70$$

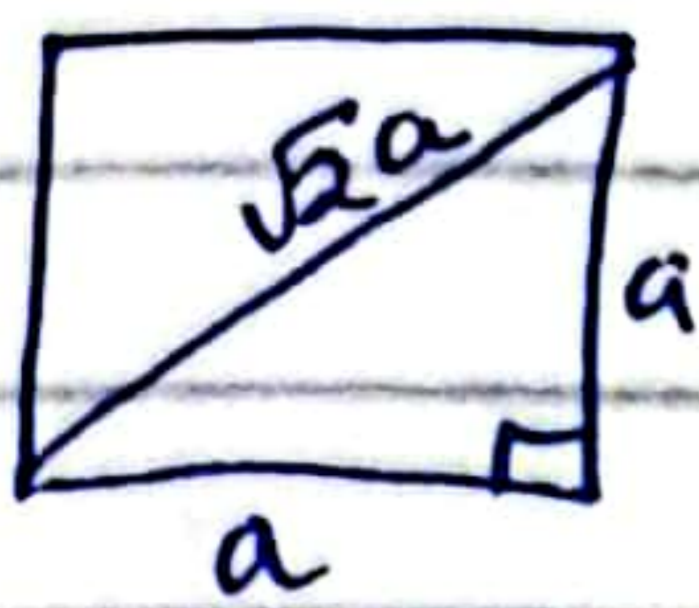
$$7x \times 2 = 70$$

$$x = \frac{70}{7 \times 2} = 5$$

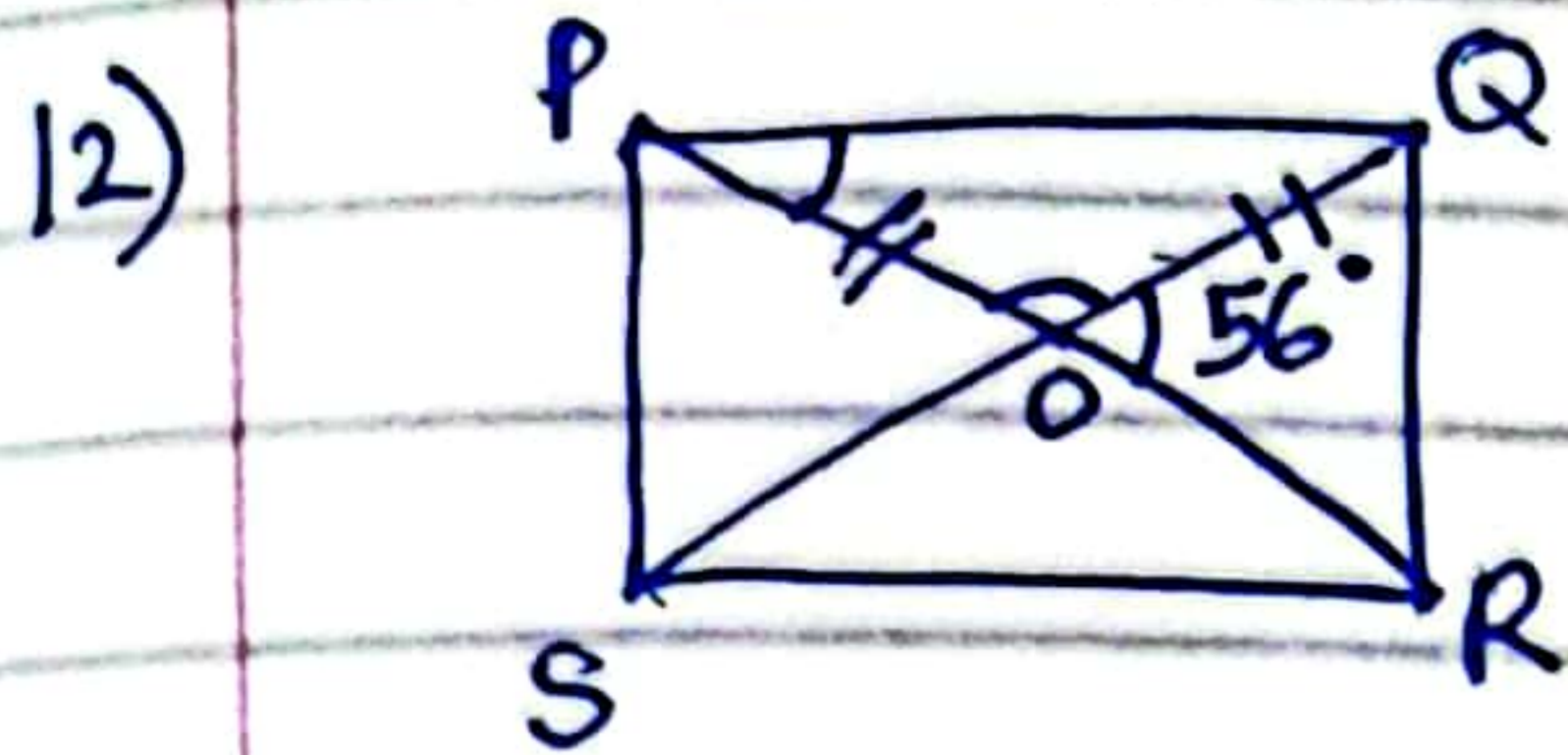
$\therefore$  The sides are 15 cm  
 and 20 cm



11)  $4a = 36$   
 $a = \frac{36}{4} = 9\text{cm}$



diagonal =  $\sqrt{2}a = \underline{\underline{9\sqrt{2}\text{cm}}}$



$\angle ROQ + \angle QOP = 180^\circ$  (linear pair)

Since  $\therefore \angle QOP = 180^\circ - 56^\circ = 124^\circ$

Since diagonals are equal and bisect each other,  $\angle OPQ = \angle OQP$

Using angle sum property in  $\triangle OPQ$ ,  $\angle OPQ + \angle OQP + \angle POQ = 180^\circ$

$2\angle OPQ + 124^\circ = 180^\circ$

$2\angle OPQ = 56^\circ$

$\therefore \angle OPQ = \frac{56^\circ}{2} = \underline{\underline{28^\circ}}$

13) Since  $AD \parallel BC$  and  $AC$  is the transversal,

$y = 45^\circ$  (alternate interior angles)

$\angle ABC + \angle CBE = 180^\circ$  (linear pair)

$\angle ABC = 180^\circ - 80^\circ = 100^\circ$

$x = 100^\circ$  (opposite angles are equal)

Using angle sum property in  $\triangle ABC$ ,

$45^\circ + z + 100^\circ = 180^\circ$

$z = 180^\circ - (145^\circ)$

$= \underline{\underline{35^\circ}}$

