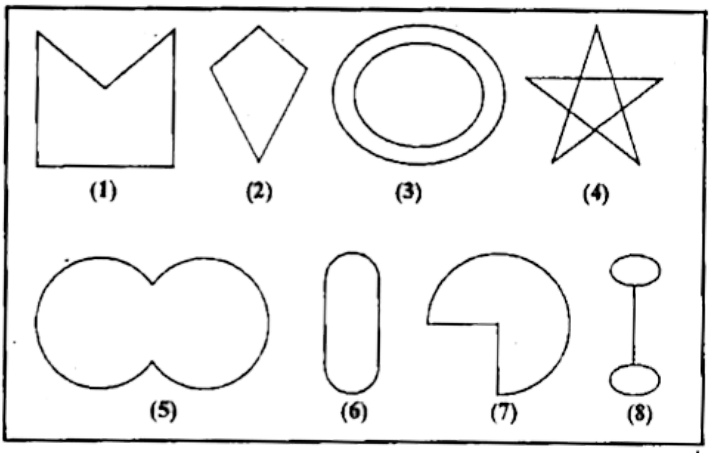
MATHS

BOOKS - SWAN PUBLICATION

UNDERSTANDING QUADRILATERALS

Exercise 3 1

1. Given here are some figures:



Classify each of them on the basis of the following:

Simple curve

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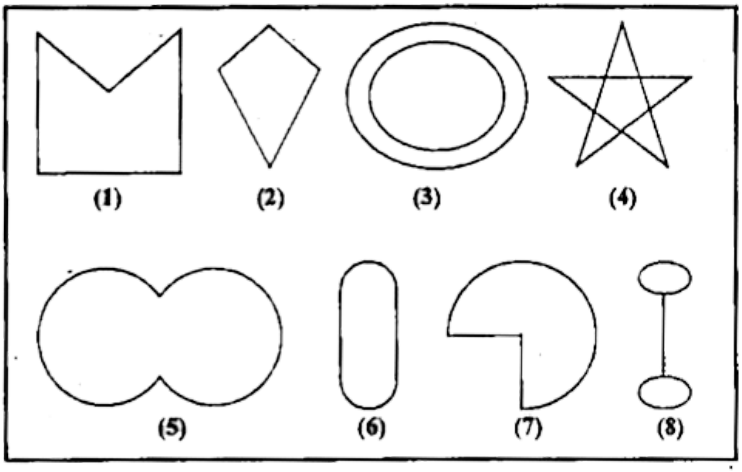
2. Given here are some figures:



Classify each of them on the basis of the following:

Simple closed curve

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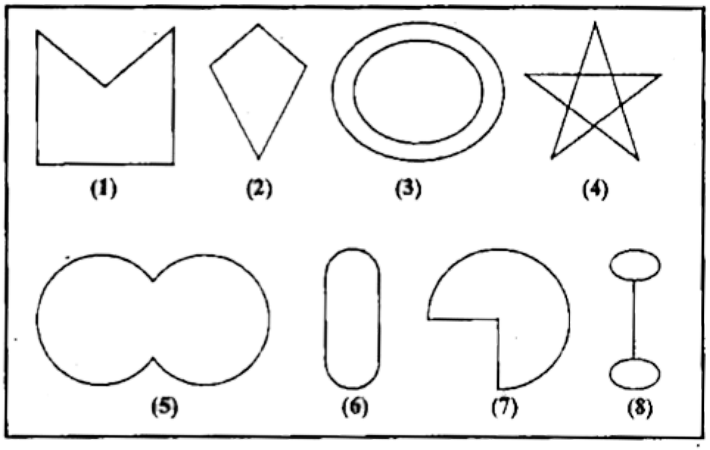
3. Given here are some figures:



Classify each of them on the basis of the following:

Polygon

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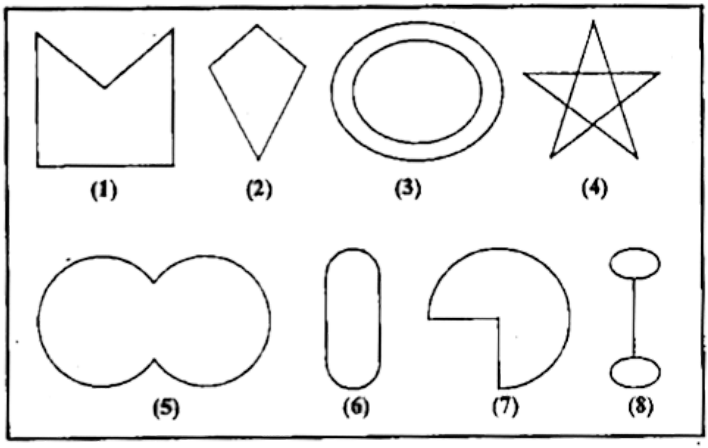
4. Given here are some figures:



Classify each of them on the basis of the following:

Convex polygon

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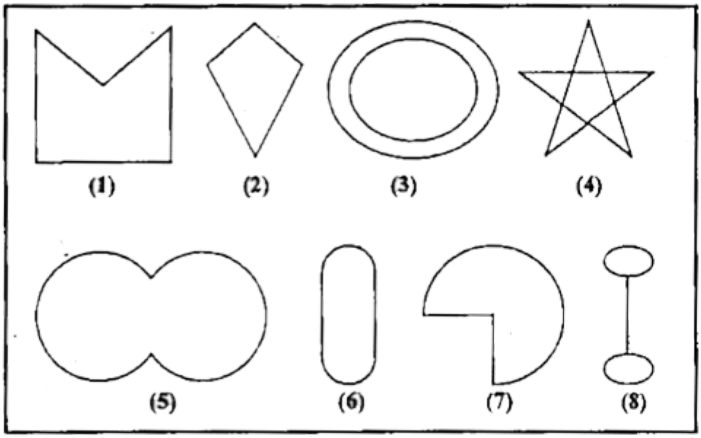
5. Given here are some figures:



Classify each of them on the basis of the following:

Concave polygon

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6. How many diagonals does each of the following have? A convex quadrilateral

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7. How many diagonals does each of the following have? A regular hexagon

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8. How many diagonals does each of the following have? A triangle

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9. What is the sum of the measures of the angles of a convex quadrilateral? Will this property hold if the quadrilateral is not convex? (Make a non-convex quadrilateral and try!)

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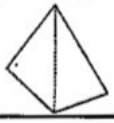
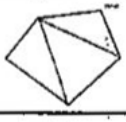
10. Examine the table:

Figure				
Side	3	4	5	6
Angle sum	$180°$	$2 \times 180° = (4-2) \times 180°$	$3 \times 180° = (5-2) \times 180°$	$4 \times 180° = (6-2) \times 180°$

What can you say about the angle sum of a convex polygon with number of sides?

7

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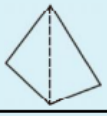
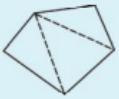
11. Examine the table. (Each figure is divided into triangles and the sum of the angles deduced from that.)

Figure				
Side	3	4	5	6
Angle sum	$180°$	$2 \times 180°$ $= (4-2) \times 180°$	$3 \times 180°$ $= (5-2) \times 180°$	$4 \times 180°$ $= (6-2) \times 180°$

What can you say about the angle sum of a convex polygon with number of sides? 8

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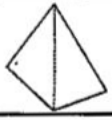
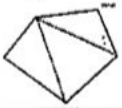
12. Examine the table:

Figure				
Side	3	4	5	6
Angle sum	$180°$	$2 \times 180° = (4-2) \times 180°$	$3 \times 180° = (5-2) \times 180°$	$4 \times 180° = (6-2) \times 180°$

What can you say about the angle sum of a convex polygon with number of sides?

10

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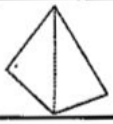
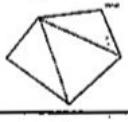
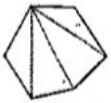
13. Examine the table:

Figure				
Side	3	4	5	6
Angle sum	$180°$	$2 \times 180° = (4-2) \times 180°$	$3 \times 180° = (5-2) \times 180°$	$4 \times 180° = (6-2) \times 180°$

What can you say about the angle sum of a convex polygon with number of sides?

n

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14. What is a regular polygon? State the name of a regular polygon of 3 sides

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15. What is a regular polygon? State the name of a regular polygon of 4 sides

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16. What is a regular polygon? State the name of a regular polygon of 6 sides

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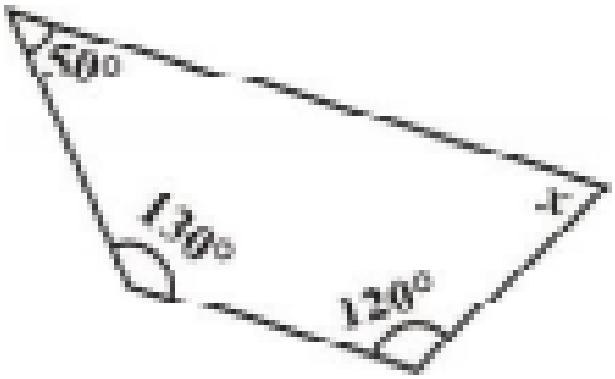
17. Find the angle measure x in the following figures.



(a)

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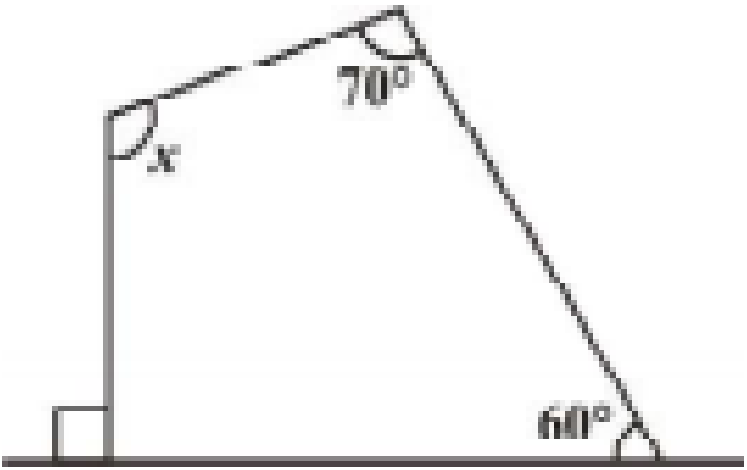
18. Find the angle measure x in the following figures.



(b)

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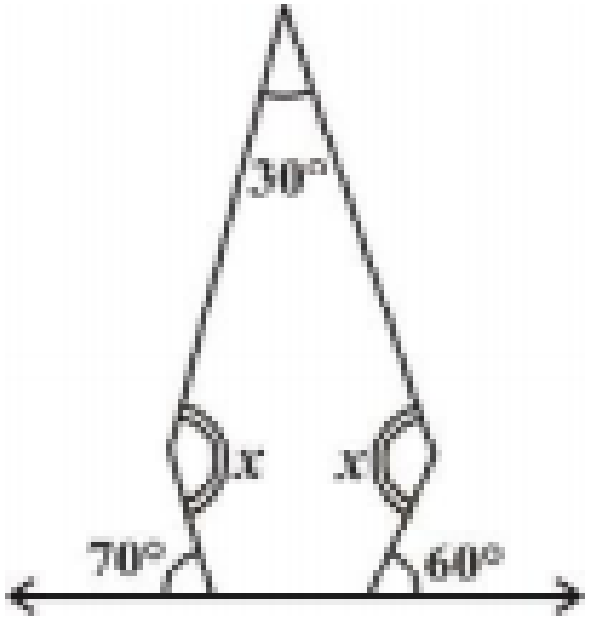
19. Find the angle measure x in the following figures.



(c)

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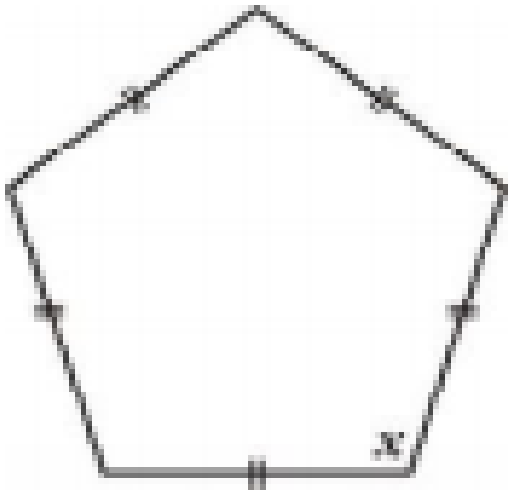
20. Find the angle measure x in the following figures.



(d)

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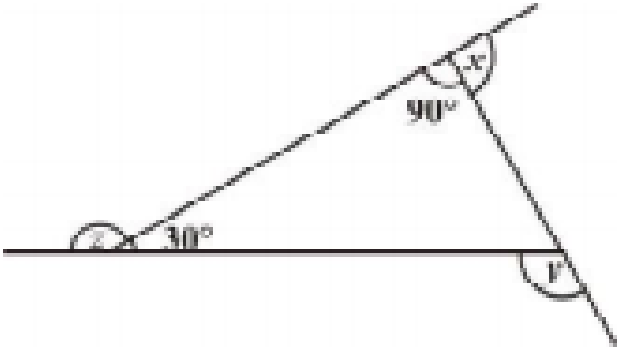
21. Find x+y+z



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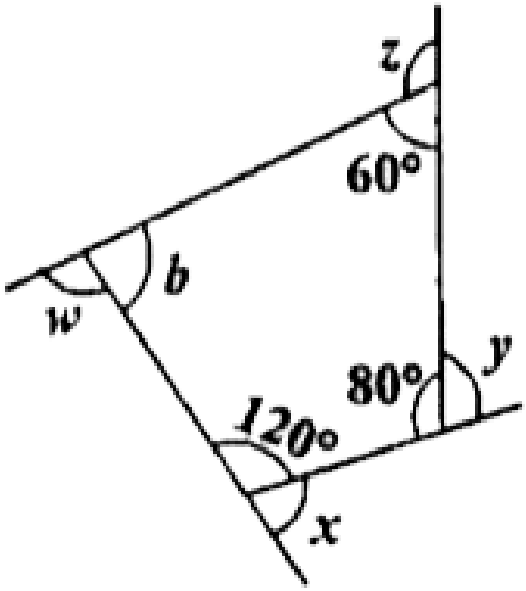
22. Find $x + y + z + w$



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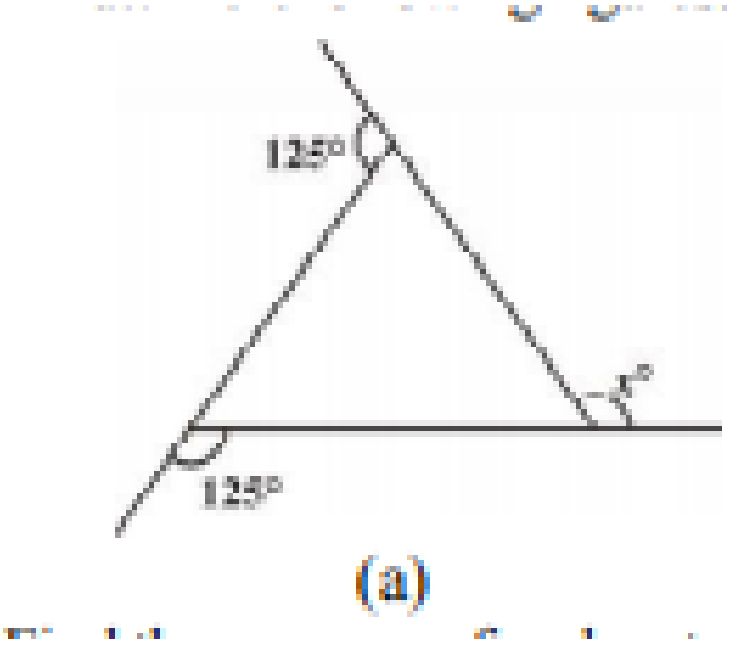
Exercise 3 2

1. Find x in the following figures.



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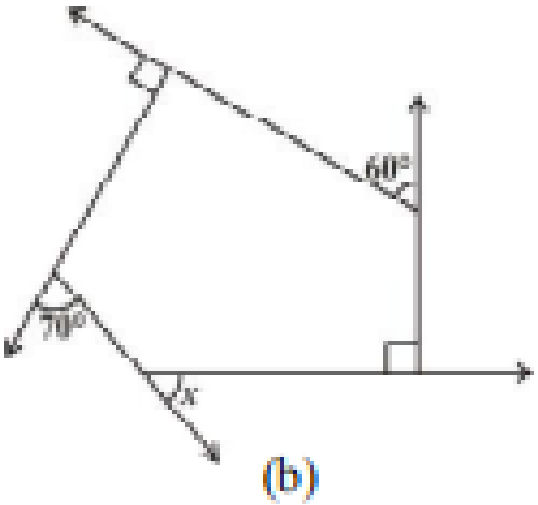
2. Find x in the following figures.



(b)

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3. Find the measure of each exterior angle of a regular polygon of 9 sides

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4. Find the measure of each exterior angle of a regular polygon of 15 sides

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5. How many sides does a regular polygon have if the measure of an exterior angle is 24° ?

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6. How many sides does a regular polygon have if each of its interior angles is 165°?

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7. Is it possible to have a regular polygon with measure of each exterior angle as 22°?

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8. Can 22° be an interior angle of a regular polygon ? Why ?

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9. What is the minimum interior angle possible for a regular polygon? Why?

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10. What is the maximum exterior angle possible for a regular polygon?

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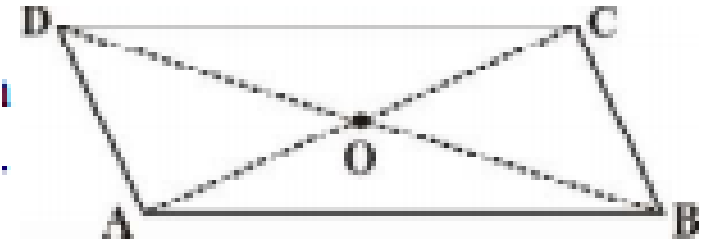
Exercise 3 3

1. Given a parallelogram ABCD. Complete each statement along with the definition or

property used AD = ...



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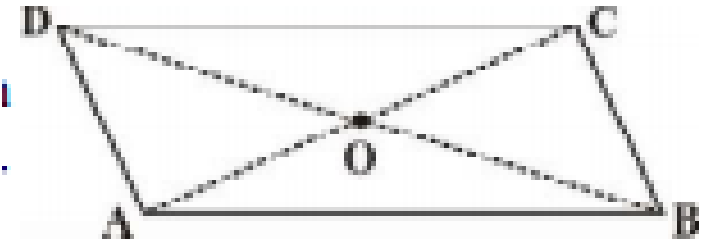
2. Given a parallelogram ABCD. Complete each statement along with the definition or

property used $\angle DCB$ = ...



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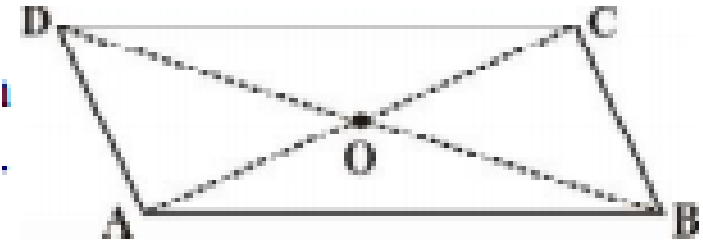
3. Given a parallelogram ABCD. Complete each statement along with the definition or

property used OC = ...



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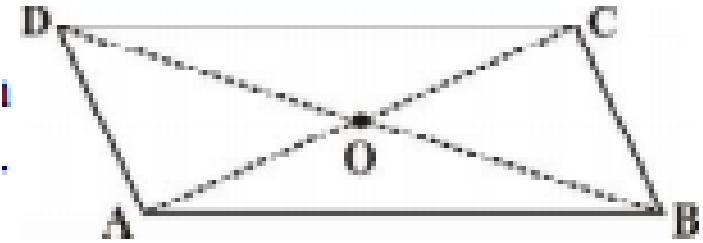
4. Given a parallelogram ABCD. Complete each statement along with the definition or

property used $m\angle DCB + m\angle CDA$ = ...



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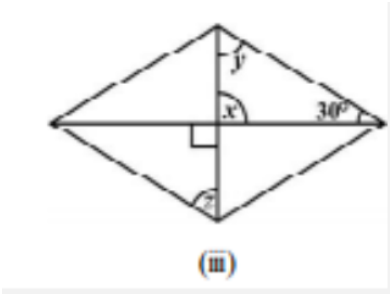
5. Consider the following parallelograms. Find the values of the unknowns x, y, z.



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6. Consider the following parallelograms. Find the values of the unknowns x, y, z.

(iv)

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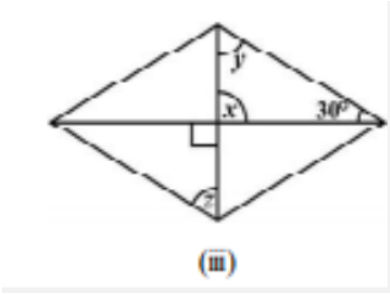
7. Consider the following parallelograms. Find the values of the unknowns x, y, z.



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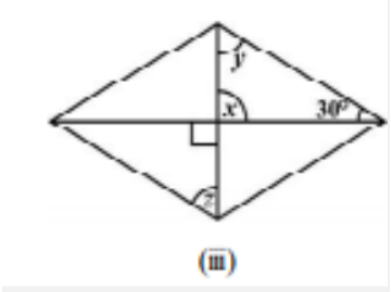
8. Consider the following parallelograms. Find the values of the unknowns x, y, z.



(iii)

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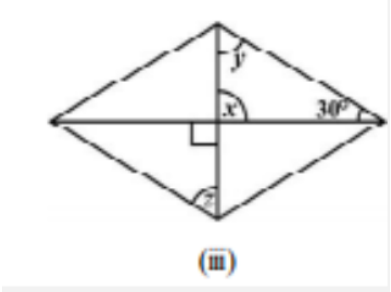
9. Consider the following parallelograms. Find the values of the unknowns x, y, z.



(iii)

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10. Can a quadrilateral ABCD be a parallelogram if : $\angle D + \angle B = 180^\circ$?

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11. Can a quadrilateral ABCD be a parallelogram if :AB=DC=8cm,AD=4cm and BC =4.4cm?

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12. Can a quadrilateral ABCD be a parallelogram if : $\angle A = 70^\circ$ and $\angle C = 65^\circ$?

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13. Draw a rough figure of a quadrilateral that is not a parallelogram but has exactly two opposite angles of equal measure.

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14. The measures of two adjacent angles of a parallelogram are in the ratio 3 : 2. Find the measure of each of the angles of the parallelogram.

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15. Two adjacent angles of a parallelogram have equal measure. Find the measure of each of the angles of the parallelogram.

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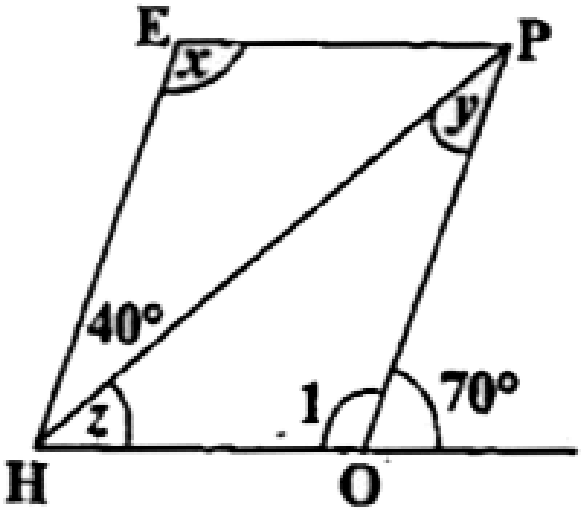
16. The adjacent figure HOPE is a parallelogram. Find the angle measure x, y and z. State the properties you use to find them.



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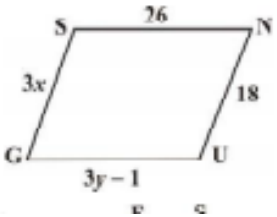
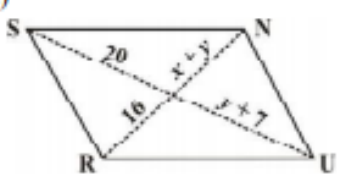
17. The following figures GUNS and RUNS are parallelograms. Find x and y. (Lengths are in cm)

(i)



(ii)



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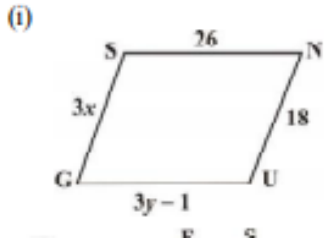
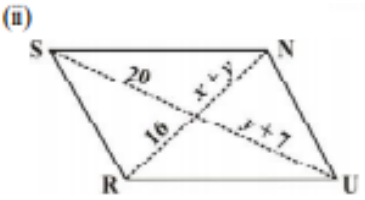
18. The following figures GUNS and RUNS are parallelograms. Find x and y. (Lengths are in

cm)





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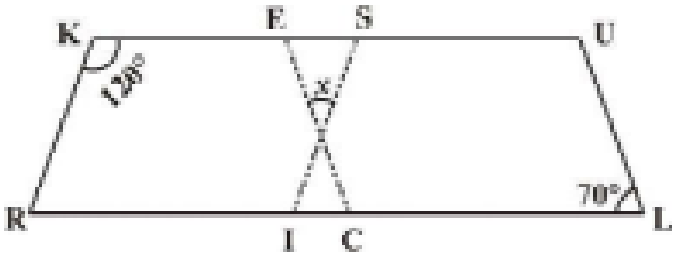
19.



In the above figure both RISK and CLUE are parallelograms. Find the value of x.

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20. Explain how this figure is a trapezium. Which of its two sides are parallel? (Fig 3.32)

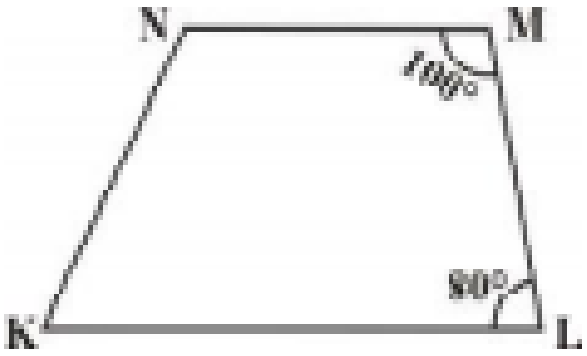

Fig 3.32

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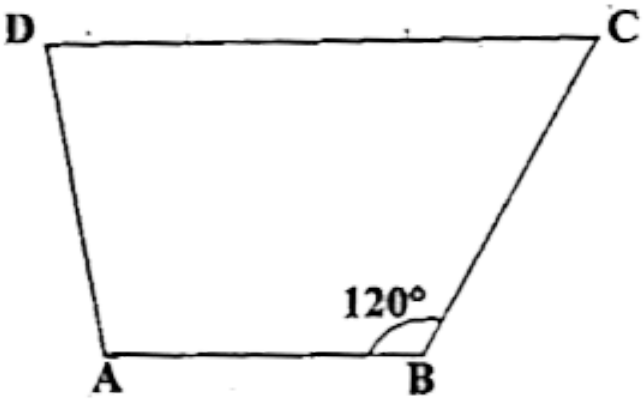
21. Find $m\angle C$ in Fig. if $\overline{AB} \mid\mid \overline{DC}$.



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22. Find the measure of $\angle P$ and $\angle S$ ifSP||RQ in Fig.(If you find m angle R, is there more than

one method to find m angle P ?).

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Exercise 3 4

1. State whether True or False. All rectangles are squares

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2. State whether True or False. All rhombuses are parallelograms

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3. State whether True or False. All squares are rhombuses and also rectangles

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4. State whether True or False. All squares are not parallelograms.

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5. State whether True or False. All kites are rhombuses.

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6. State whether True or False. All rhombuses are kites.

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7. State whether True or False. All parallelograms are trapeziums.

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8. State whether True or False. All squares are trapeziums.

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9. Identify all the quadrilaterals that have. four sides of equal length

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10. Identify all the quadrilaterals that have. four right angles

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11. Explain how a square is. a quadrilateral

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12. Explain how a square is. a parallelogram

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13. Explain how a square is. a rhombus

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14. Explain how a square is. a rectangle

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15. Name the quadrilaterals whose diagonals. bisect each other

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16. Name the quadrilaterals whose diagonals. are perpendicular bisectors of each other

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17. Name the quadrilaterals whose diagonals. are equal

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18. Explain why a rectangle is a convex quadrilateral.

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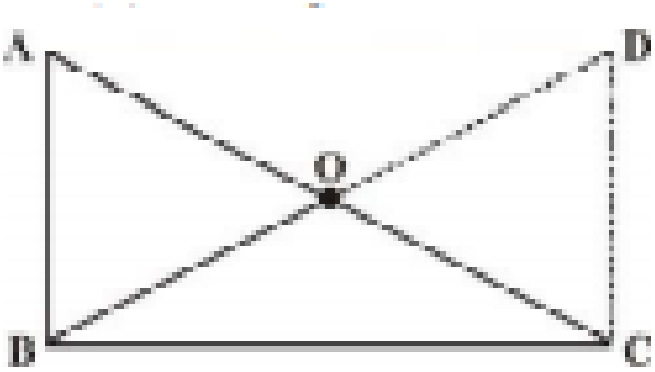
19. ABC is a right-angled triangle and O is the mid point of the side opposite to the right angle. Explain why O is equidistant from A, B and C. (The dotted lines are drawn additionally

to help you).



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Try These

1. Try to give few more examples and non - example for a polygon .

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2. Draw any polygon and shade its interior.

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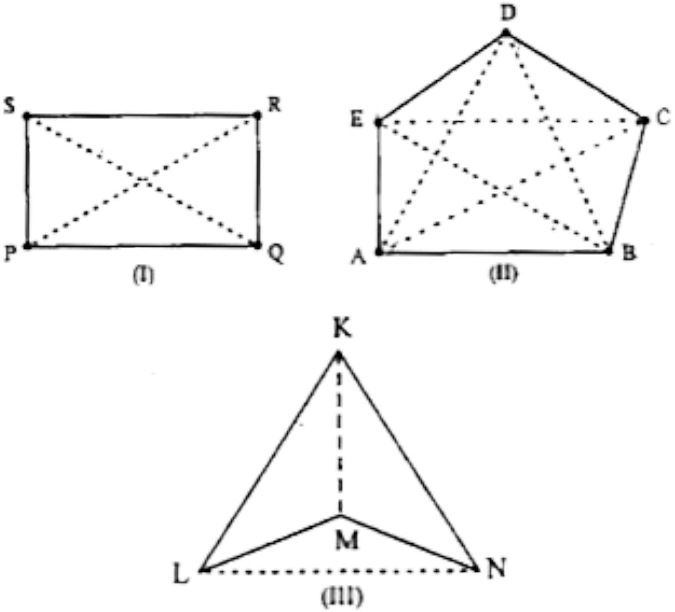
3. A diagonal is a line segment connecting two non-consecutive vertices of a polygon.



Can you name the diagonals in each of the above figures ?

is $\overline{PQ}$ a diagonal? How about $\overline{LN}$?

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4. Have you heard about hypoxia? Try to gather information about it, and discuss with your friends.

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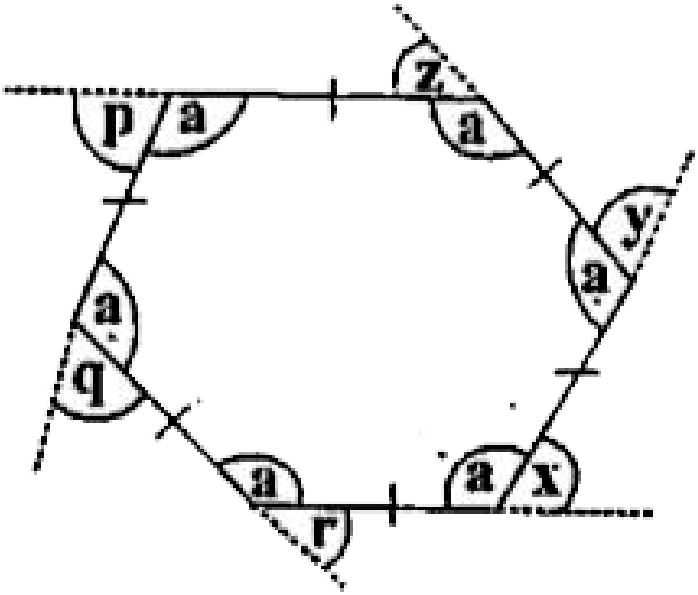
5. Take a regular hexagon Fig.



What is the sum of the measures of its exterior angles x, y, z, p, q, r ?.

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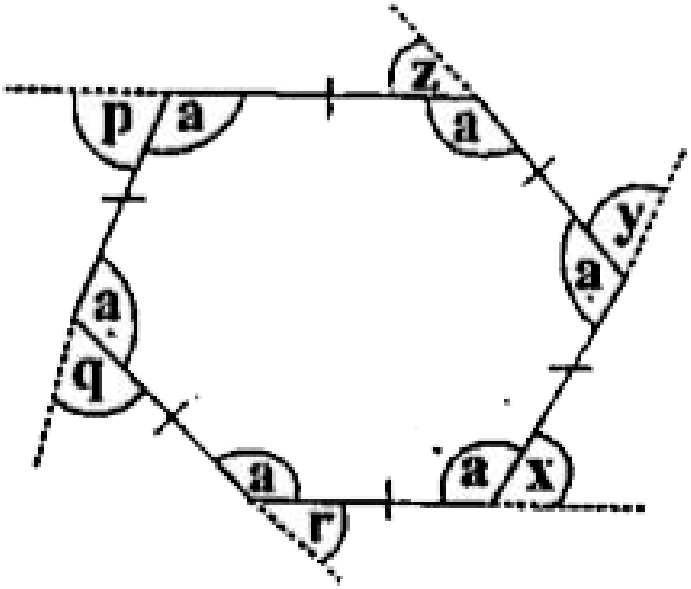
6. Take a regular hexagon Fig.



Is $x = y = z = p = q = r$? Why ?

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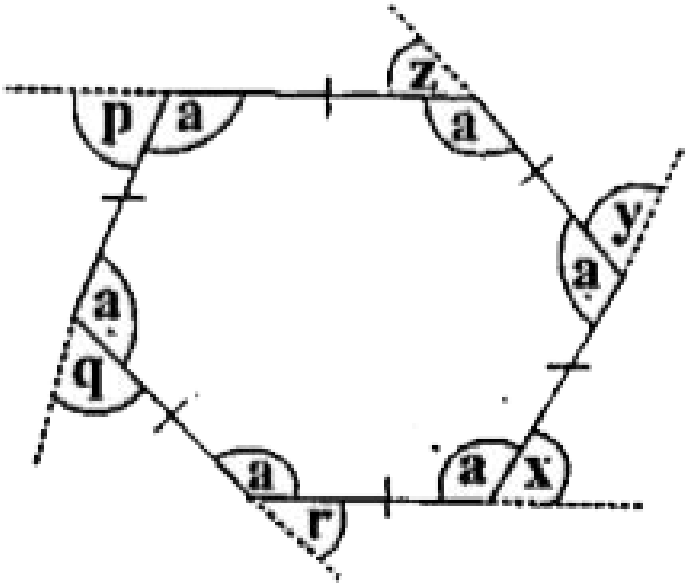
7. Take a regular hexagon Fig.



What is the measure of each exterior angle?

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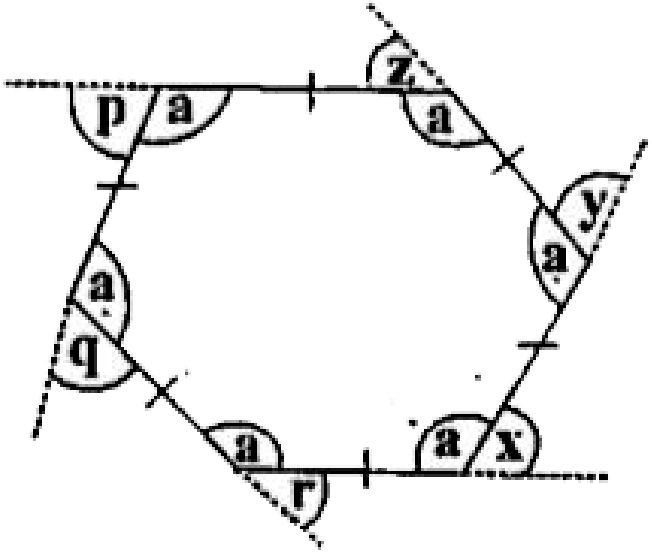
8. Take a regular hexagon Fig.



What is the measure of each interior angle?

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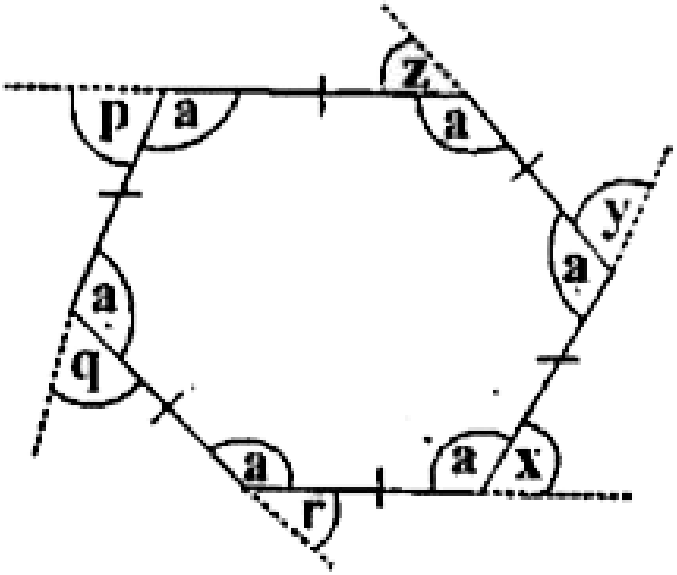
9. Take a regular hexagon Fig.



Repeat this activity for the cases of

a regular octagon

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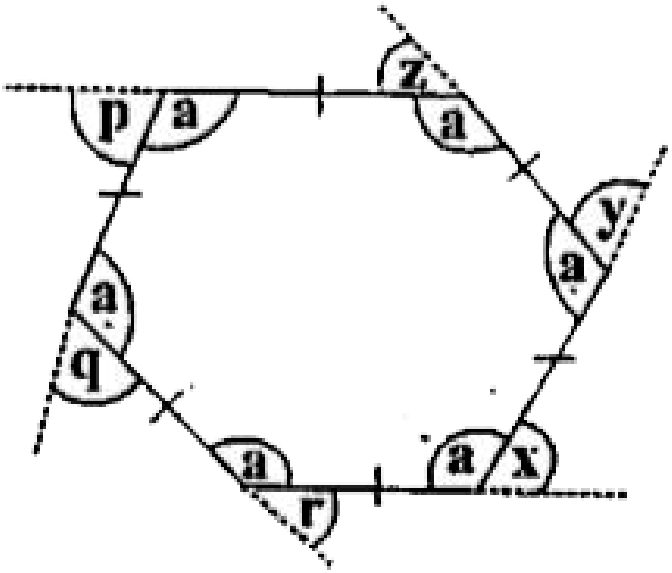
10. Take a regular hexagon Fig.



What is the measure of each exterior angle ?

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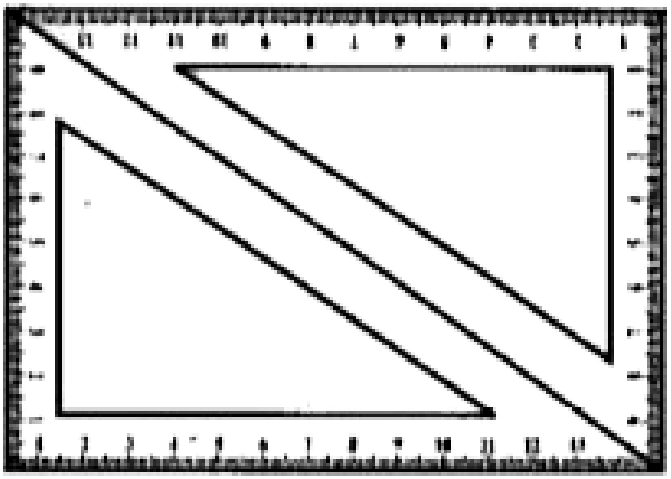
11. Take two identical set squares with angles $30^\circ - 60^\circ - 90^\circ$ and place these adjacently to form a parallelogram as shwon in the fig .

Does this help you to verify the above property

property: The opposite sides of a parallelogram are of equal length.



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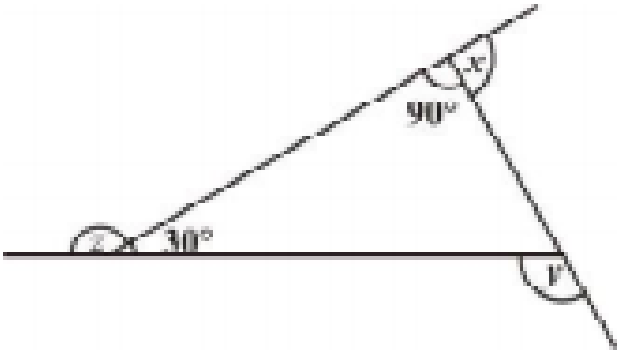
12. Find x+y+z



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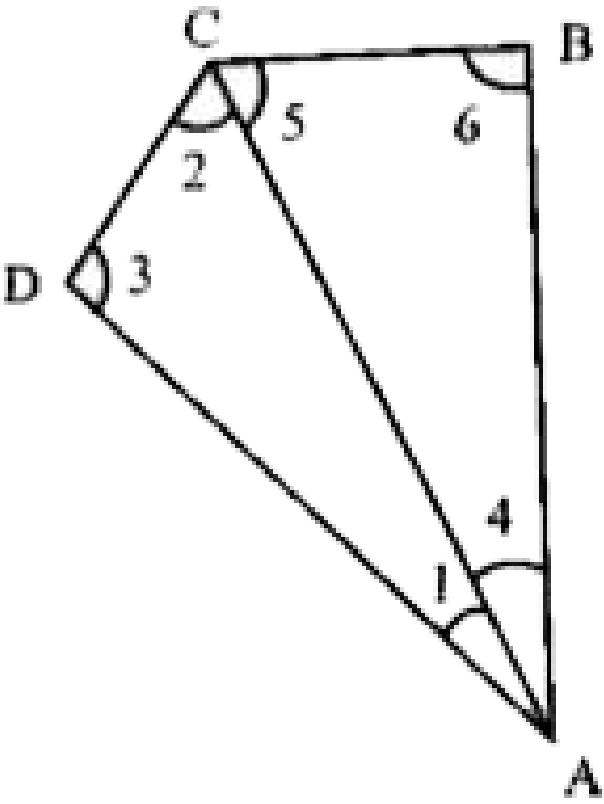
Do This

1. Take any quadrilateral , say ABCD .Divide it into two triangles by drawing a diagonal . You get six angles 1,2,3 ,4,5 and 6 . Use the angles sum property of a triangle and argue how the sum of the measures of $\angle A, \angle B, \angle C \angle D$

amounts to $180^\circ + 180^\circ = 360^\circ$.



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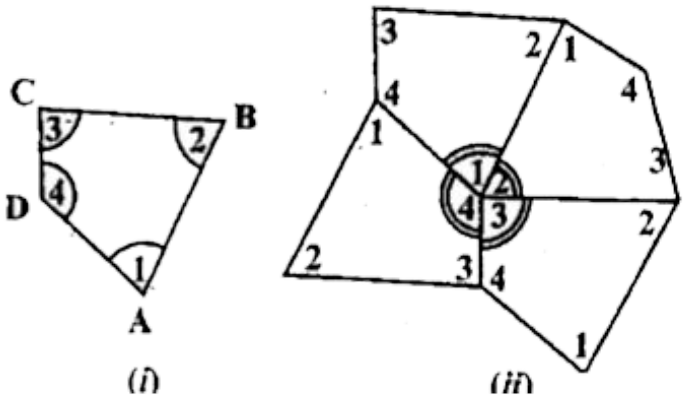
2. Take four congruent card-board copies of any quadrilateral ABCD, with angles as shown (Fig. (i)). Arrange the copies as shown in



the figure, where angles $\angle 1, \angle 2, \angle 3, \angle 4$ meet at a point (Fig. (ii)).

What can you say about the sum of the angles $\angle 1, \angle 2, \angle 3$ and $\angle 4$?

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3. As before consider quadrilateral ABCD Let P . Be any point in its interior .Join P to vertices A,B,C and D . In the figure ,consider ΔPAB .

From this we see $x = 180^\circ - m\angle 2 - m\angle 3.$

Similarly from $\Delta PBC, y = 180^\circ - m\angle 4 - m\angle 5,$ from ΔPCD

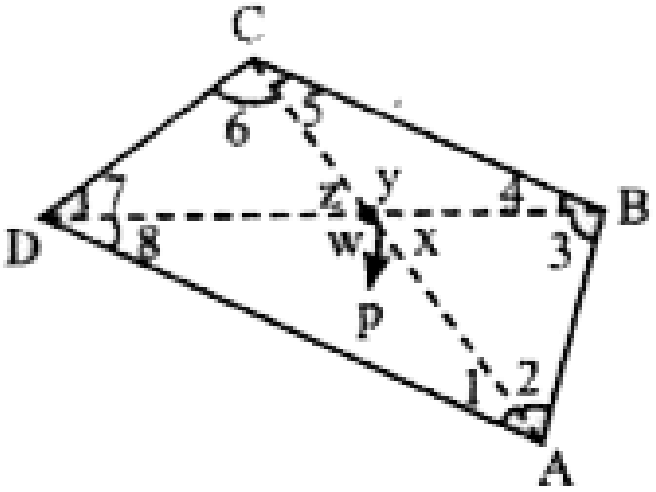
$z = 180^\circ - m\angle 6 - m\angle 7$ and from ΔPDA

$w = 180^\circ - m\angle 8 - m\angle 1$

Use this to find the total measure $m\angle 1 + \angle 2 + \ldots\ldots m\angle 8$, does it help you to

arive at the result ?

Remember $\angle x + \angle y + \angle z + \angle w = 360^\circ$



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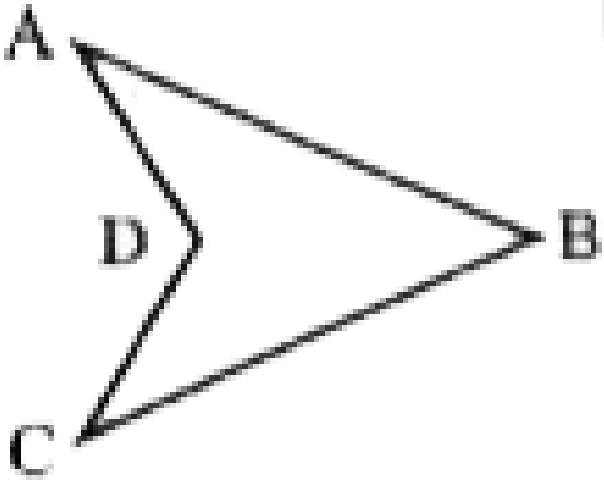
4. Consider quadrilateral ABCD .Split it into two triangles to find the sum of the interior

angles of quadrilateral ABCD



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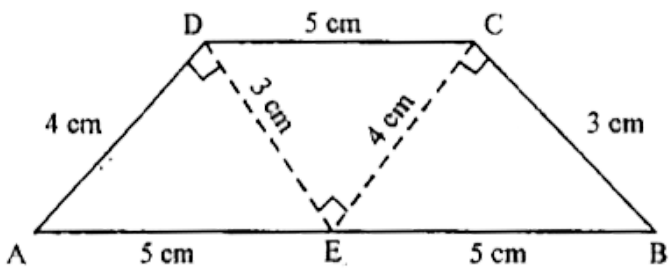
5. Take identical cut-outs of congruent triangles sides 3 cm, 4 cm, 5 cm. Arrange them as shown in figure .



Yoti get a trapezium. (Check it !) Which are the parallel sides here? Should the non-parallel sides be equal?

You can get two more trapeziums using the same set of triangles. Find them out and discuss their shapes.

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6. Take two digits,say2 and 3.From them make four-digit numbers,using both the digits equal number oftimes.

How many different numbers can you make in all?

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7. Take a thick white sheet.

Fold the paper once.

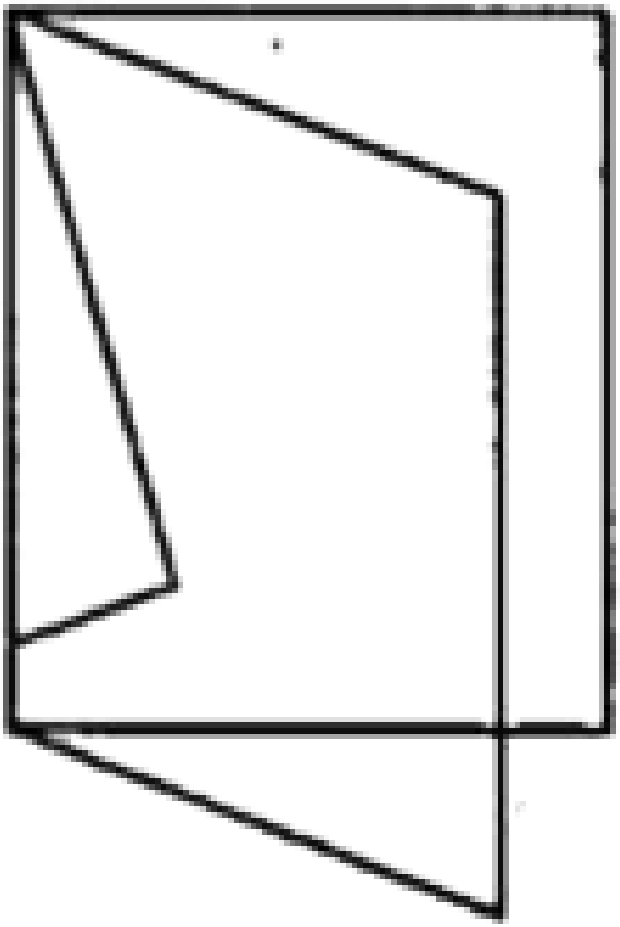
Draw two line segments of different lengths as

shown in the figure.

Cut along the line segments and open up.

You have the shape of a kite.

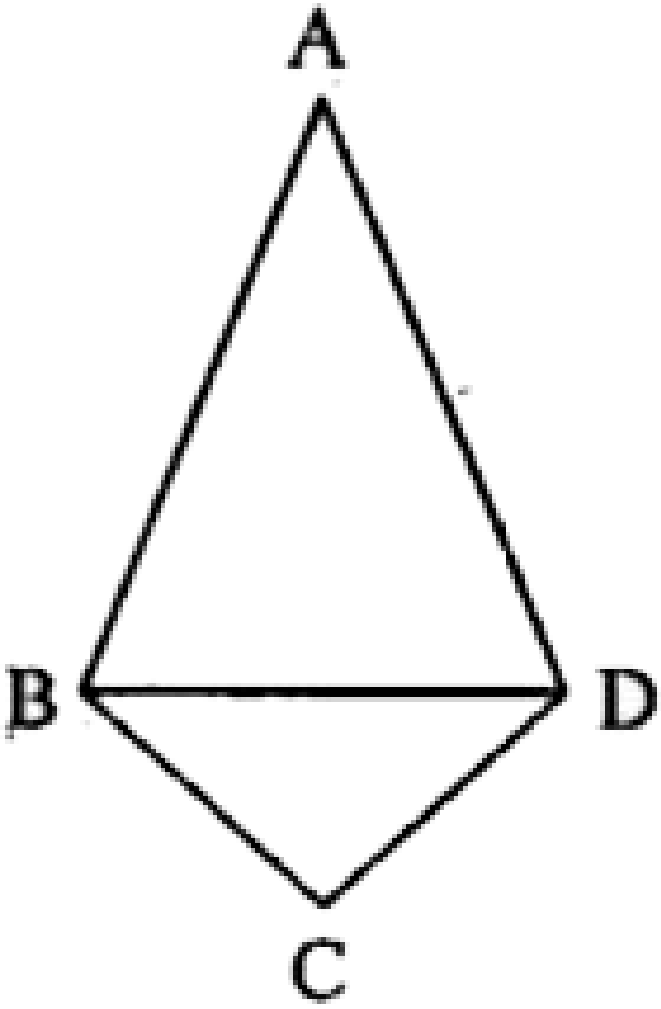
Has the kite any line symmetry ?



Fold both the diagonals of the kite. Use the set-square to check if they cut at right angles.

Are the diagonals equal in length ?

Verify (by paper-folding or measurement) if the diagonals bisect each other.



By folding an angle of the kite. on its opposite check for angles of equal measure. Observe the diagonal folds, do they indicate any diagonal being an angle bisector ?

Share your findings with others and list them. A summary of these results are given elsewhere in the chapter for your reference.

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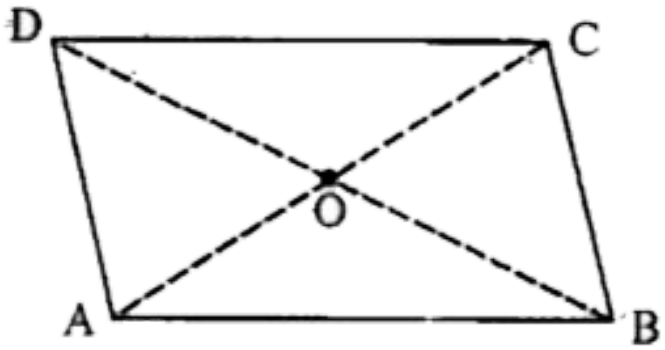
8. Take a cut-out a parallelogram, say, ABCD (see figure). Let its diagonals $\overline{AC}$ and $\overline{DB}$ meet at O.



Find the mid-point of $\overline{AC}$ by a fold, placing C on A. Is the mid-point same as O?

Does this show that diagonal $\overline{DB}$ bisects the diagonal $\overline{AC}$ at the point O ? Discuss it with your friends. Repeat the activity to find where the mid-point of $\overline{DB}$ could lie.

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Think Dlscuss And Write

1. A mason has made a concrete slab .He needs it to be rectangular . In what different ways can he make sure that it is rectangular ?

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2. A square was defined as a rectangle with all sides equal . Can we define it as rhobus with equal angles ? Explain this idea .

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3. Can a trapezium have all angles equal ? Can it have all sides equal ? Explain .

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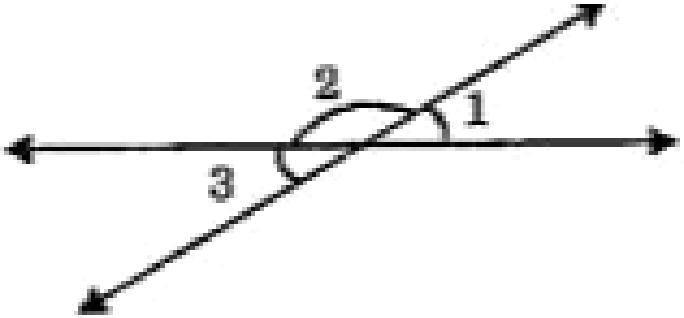
4. In the given if $\angle 1 = 30^\circ$ find $\angle 2$ and $\angle 3$.



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Question

1. Match the following : (Caution! A figure may match to more than one type).

Figure	Type
(1) 	(*a*) Simple closed curve
(2) 	(*b*) A closed curve that is not simple

Figure	Type
(3) 	(*c*) Simple curve that is not closed
(4) 	(*d*) Not a simple curve

Compare your matchings with those of your friends. Do the agree?

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