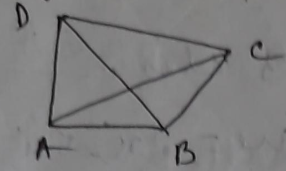
Chapter - 17 / Quadrilaterals

A closed figure bounded by four line-segments is called a quadrilateral.



Here, (i) (AB, BC), (BC, CD), (CD, DA) and (DA, AB) are four pairs of adjacent sides.

(ii) (AB, DC) and (BC, AD) are two pairs of opposite sides.

(iii) (∠A, ∠C) and (∠B, ∠D) are two pairs of opposite ∠les.

(iv) (∠A, ∠B), (∠B, ∠C), (∠C, ∠D) and (∠D, ∠A) are four pairs of adjacent ∠les.

(v) AC and BD are the two diagonals.

(2) Theorem 1 :- The sum of all (4 ∠les) angles of a quadrilateral = 360°

Exercise - 17A

Q.1. Given: Three ∠les of a quadrilater are: 68°, 74°, 108° respectively.

To find: 4th ∠le.

Solⁿ :- $68° + 74° + 108° + 4\text{th} \angle le = 360°$

[∵ sum of all ∠les of a quad. = 360°]

$\Rightarrow 250° + 4\text{th} \angle le = 360°$

$\Rightarrow 4\text{th} \angle le = 360° - 250° = 110°$

(3)

Q. 3. Given: ratio of 3 angles of a quad.

$= 2:5:6$

and 4th ∠le $= 100°$

To find: The measure of 3 ∠les.

Sol^n:- Let the three ∠les are $= 2x°, 5x°, 6x°$

So, $2x° + 5x° + 6x° + 100° = 360°$ [∵ Sum of all ∠les of a quad. $= 360°$]

$\Rightarrow 13x° = 260°$

$\Rightarrow x° = 20°$

∴ 1st ∠le $= 2 \times 20° = 40°$

2nd ∠le $= 5 \times 20° = 100°$

3rd ∠le $= 6 \times 20° = 120°$

(4) Q. 7. Given: The ∠les of a quad. are

$= (5x)°, (3x+10)°, (6x-20)°, (x+25)°$

To find:- (i) The value of x

(ii) measure of each ∠le.

Sol^n:- $(5x)° + (3x+10)° + (6x-20)° + (x+25)° = 360°$

[∵ The sum of all ∠les of a quad. $= 360°$]

$\Rightarrow (5x + 3x + 6x + x)° + (10 - 20 + 25)° = 360°$

$\Rightarrow 15x° + 15° = 360°$

$\Rightarrow 15x° = 345°$

$\Rightarrow x° = 23° \Rightarrow x = 23.$

∴ 1st ∠le $= 5 \times 23° = 115°$

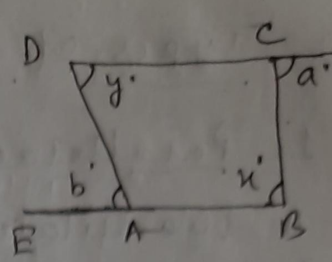
2nd ∠le $= (3 \times 23 + 10)° = (69 + 10)° = 79°$

3rd ∠le $= (6 \times 23 - 20)° = (138 - 20)° = 118°$

4th ∠le $= (23 + 25)° = 48°$

⑥

Q. 9. Given: ABCD is a quad.
BA is extended to E
and DC is extended to F



To Prove :- $a+b = x+y$.

Proof :- We have, $b^\circ + \angle A = 180^\circ$ ($\because$ straight $\angle$le)

$\Rightarrow \angle A = 180^\circ - b^\circ$ —— ①

Similarly, $a^\circ + \angle C = 180^\circ$ —— ②

$\Rightarrow \angle C = 180^\circ - a^\circ$ —— ②

Now, we know that, sum of 4 $\angle$les of a quad. $= 360^\circ$

$\Rightarrow \angle A + x^\circ + \angle C + y^\circ = 360^\circ$

$\Rightarrow (180^\circ - b^\circ) + x^\circ + (180^\circ - a^\circ) + y^\circ = 360^\circ$

$\Rightarrow 360^\circ - a^\circ - b^\circ + x^\circ + y^\circ = 360^\circ$

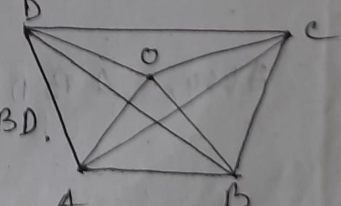
$\Rightarrow x^\circ + y^\circ = a^\circ + b^\circ$

$\Rightarrow (x+y)^\circ = (a+b)^\circ$

$\Rightarrow (x+y) = (a+b)$

⑦

Q. 10. Given: ABCD is a quad.



To Prove: $OA + OB + OC + OD > AC + BD$.

Proof:-

In $\triangle AOC$, $AO + OC > AC$ —— ① ($\because$ sum of two sides of a $\triangle$le is greater than the 3rd side)

Similarly, in $\triangle BOD$,

$BO + OD > BD$ —— ②

① + ② $\Rightarrow AO + OB + OC + OD > AC + BD$