In this chapter we will work with convex quadrilaterals.

Ex₁:

1- What is a quadrilateral? …….

2- Name 5 quadrilaterals that you already know. …….

……..

3- Are these quadrilaterals CONVEX?

What is a convex quadrilateral? (Go-ggb)

To test if a quadrilateral is ***convex***:

Extend any of the sides of this quadrilateral:

If all other sides are located on same side of the extend side, then quadrilateral is convex.

If not then quadrilateral is not convex.

4- Consider the following figures:

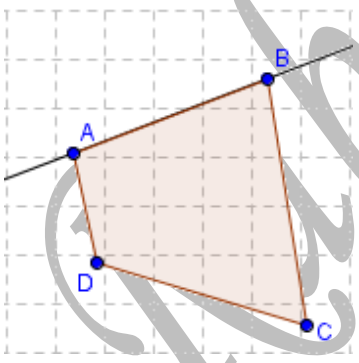


Fig-1.

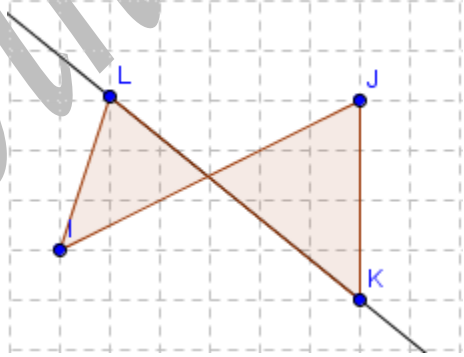


Fig-2.

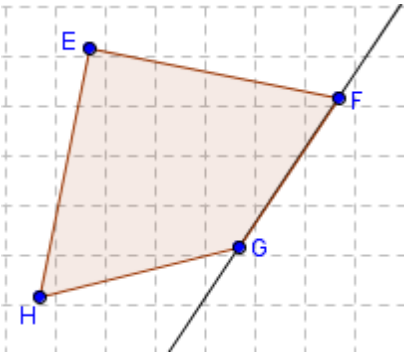


Fig-3

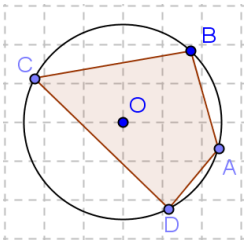
a. Which of the above quadrilaterals is (are) convex?

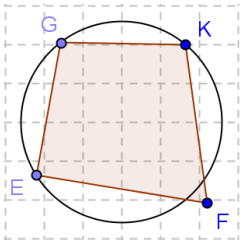
……

b. Justify, why the other is not convex.

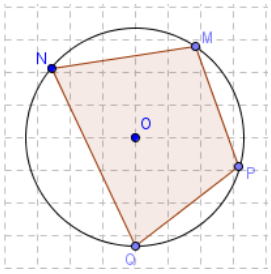
……

Ex₂: Tick the figure that has all of its vertices on the circle?



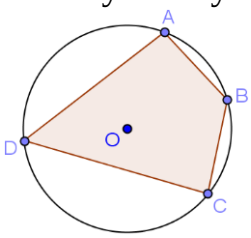


A. <u>Def</u>: A convex quadrilateral is said to be ***inscribed*** in a circle (or we say ***cyclic***); if its four vertices belong to this circle.

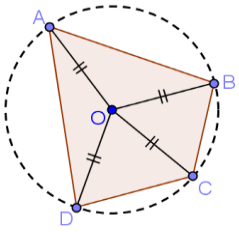


B. How to prove a convex quadrilateral to be inscribed?

Ex₃: Justify briefly why each of the following quadrilaterals is cyclic?



1-
2-



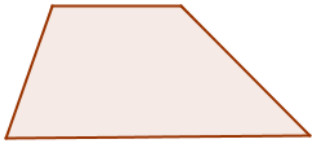
Ex₄: Consider the following quadrilaterals:

a) Which of the given quadrilaterals is(are) inscribed? Justify. (don't use angles)
……

b) Find the sum of opposite angles in each figure.
…… ……
…… ……

c) What do you notice? ……

d) Can you determine if a trapezoid is an inscribed quadrilateral?



……..

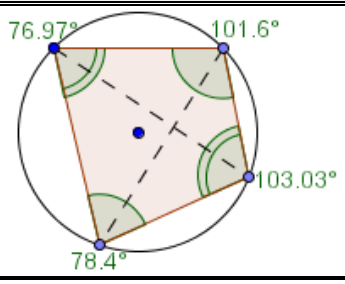
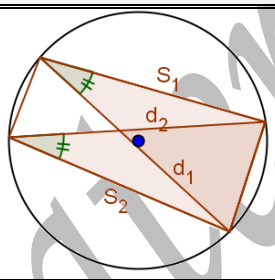
e) Can you find a trapezoid which is inscribed? Justify your choice.

……

Conclusions

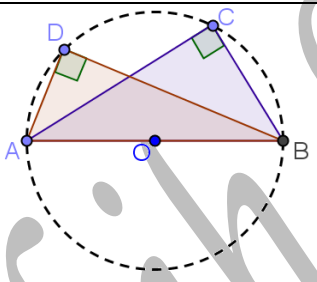
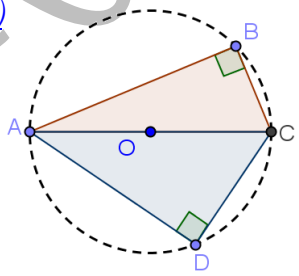
I. *General cases:* A quadrilateral is inscribed in a circle:

1. If its four vertices belong to this circle. (Ex_3: Fig-1)
2. If there exists a point that is equidistant from all four vertices of a quadrilateral. (Fig-2)

3. If it has two opposite supplementary angles.	4. If the angles formed by the diagonals and the opposite sides are equal. *(Go-ggb)*
	

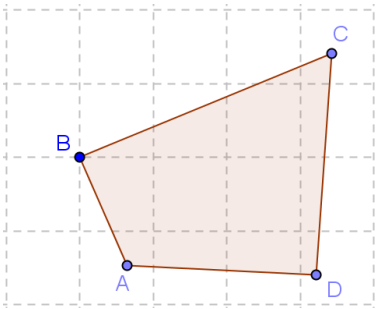
II. *Special case:* A convex quadrilateral is ***cyclic***

4. If a quadrilateral is formed of two right triangles:

Sharing the same hypotenuse from the same side	Sharing the same hypotenuse from opposite sides
(Go-ggb-1) 	*(Go-ggb-2)* 
In this case, the diameter of the circle circumscribed about this quadrilateral is formed of the common ***hypotenuse***	

How to find the circumcenter of an inscribed quadrilateral in general?

Device a two steps procedure to locate the circumcenter of the following quadrilateral: (ggb)



1st-step: ……

……

2nd-step: ……

……