

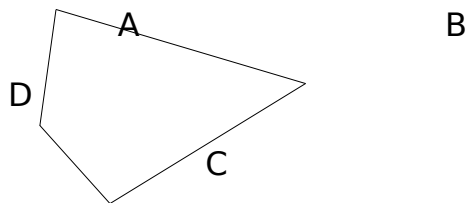


Polygons

Definition A polygon is a simple closed plane figure formed by three or more line segments joined end to end

- The line segments forming the polygons are called sides and the common end points of any two sides is called vertex of the polygon
- The vertex of a polygon is a point where two sides meet (connected) each other

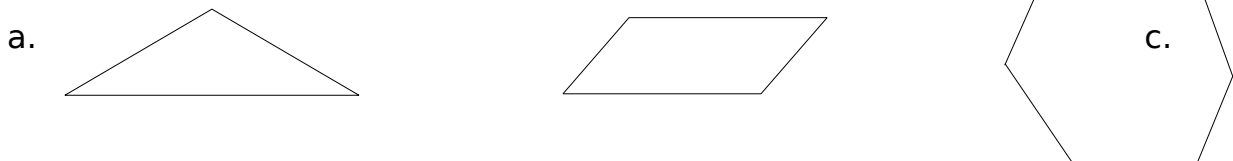
Examples



- Point A,B,C and D are vertices of the polygon ABCD.
- $\overline{AB}, \overline{BC}, \overline{CD} \wedge \overline{DA}$ are sides of the polygon ABCD

A. convex and concave polygons

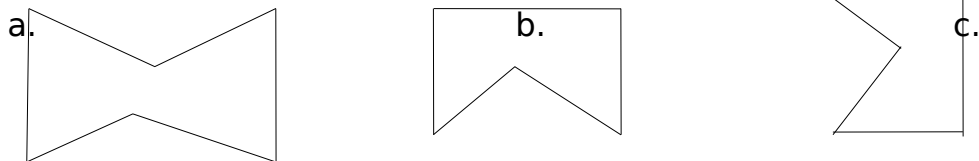
definition 5.8 A convex polygon is a simple polygon in all of its interior angles measures less than 180° each



- The figures given above are example of convex polygons
- Additional example of convex polygons are
- Triangle
- Trapezium
- Square
- Rectangle
- Parallelogram
- Rhombus

Definition 5.9 A concave polygon is a simple polygon which has at least one interior angle measures greater than 180° .

Example

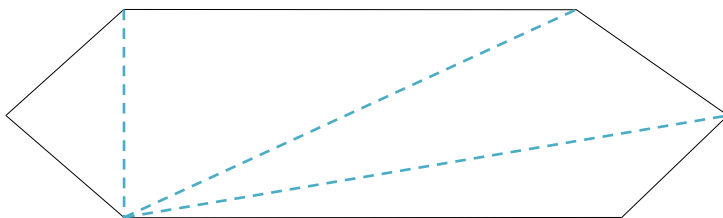


- The figure given above are example of concave polygon

Definition 5.10 A diagonal of a convex polygon is a line segment whose end points are non consecutive vertices of the polygon.

Example

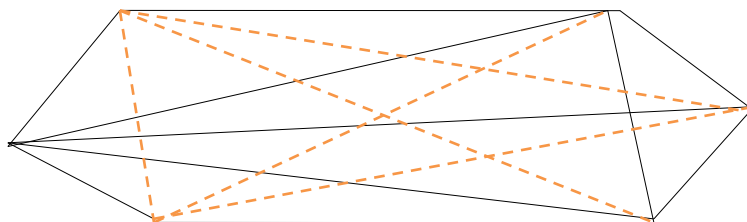
A



- The figure above shows number of diagonals that can be drawn from one vertex.

i.e $\overline{AE}$, $\overline{AD}$, $\wedge$ $\overline{AC}$ diagonals drawn from vertex A

B.



- the figure above shows the number of diagonals from all possible vertices i.e $\overline{AE}$, $\overline{AD}$, $\overline{AC}$, $\overline{BF}$, $\overline{BE}$, $\overline{BD}$, $\overline{CF}$, $\overline{CE}$, $\overline{DF}$, are diagonals that can be drawn all possible vertices

formula for determining diagonals

1. the number of diagonals of a convex polygon from one vertex is given by

No of diagonals= $n-3$ where

N is number of sides of polygons

No of diagonal

1. how many diagonals are there in a polygon of

a. 32 sides

b. 20 sides

c. 40 sides

Solution

a. No of diagonals= $n-3$

$$\begin{aligned} &32-3 \\ &=29 \end{aligned}$$

b. no of diagonals= $n-3$

$$\begin{aligned} &20-3 \\ &=17 \end{aligned}$$

c. No of diagonals = $n-3$

$$\begin{aligned} &40-3 \\ &=37 \end{aligned}$$

2. Number of diagonals from all possible vertices of a convex polygon is given by:

- No of diagonals = $\frac{n(n-3)}{2}$ where n is number of sides of polygons

Example

1. How many diagonals are there in a polygon of:

- a. 32 sides b. 40 sides c. 52 sides d.
100 sides

Solution

a. No of diagonals $\frac{n(n-3)}{2}$
 $\frac{32(32-3)}{2} = \frac{32 \times 29}{2} = 928$

b. Number of diagonals $\frac{n(n-3)}{2}$
 $\frac{52 \times (52-3)}{2} = \frac{52 \times 49}{2} = 1274$

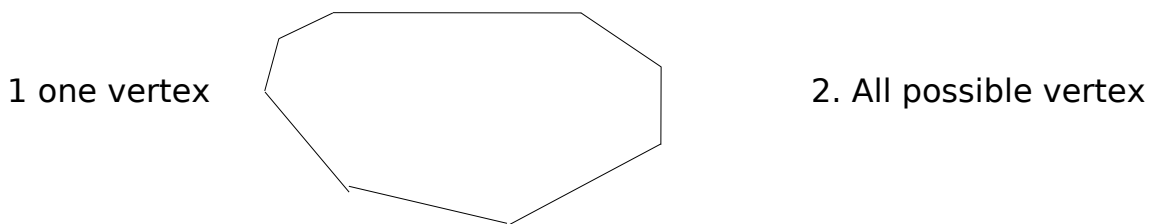
- Use the same formula for C and D

Activity 1

I. Define the following terms

1. Polygon
2. Convex polygon
3. Concave polygon

II. Determine the number of diagonals drawn from:



III. Find the number of diagonals from all possible vertices in a polygon of:

- a. 43 sides b. 1003 sides c. 4 sides
d. hexagon (6 sides) e. octagon (8 sides) f. decagon
(10 sides)

IV. Find the number diagonals from one vertex in a polygon of:

- a. 486 sides

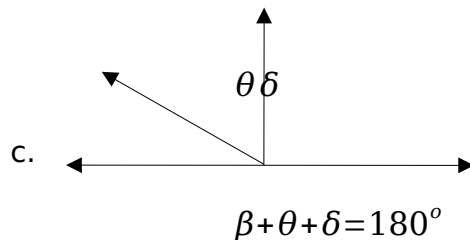
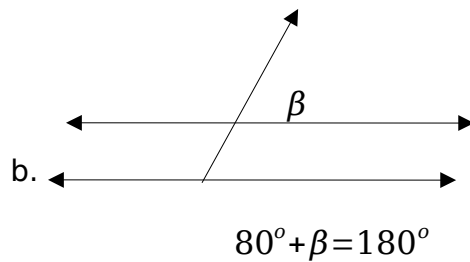
b. b. 700 sides

c. c. 45 sides

5.2 Theorems of triangles

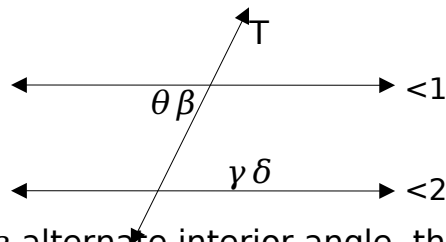
Note:- the angles on a straight line add up to 180°

a.



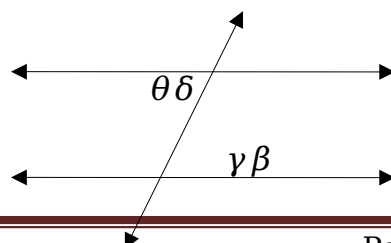
Theorems s.1 if two parallel lines are cut by a transversal line “T” then, the alternate interior angles are formed and equal.

Example



- $\theta \wedge \delta$ are alternate interior angle this $\theta = \delta$
- $\gamma \wedge \beta$ are alternative interior angles and $\gamma = \beta$

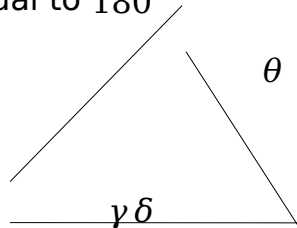
Theorem S.2 If two parallel lines are cut by a transversal line then interior angles on the same side of the transversal line are supplementary



$$1. \delta + \beta = 180^\circ \text{ and } 2 \quad \theta + \gamma = 180^\circ$$

Theorems S.4 (angle sum theorem)

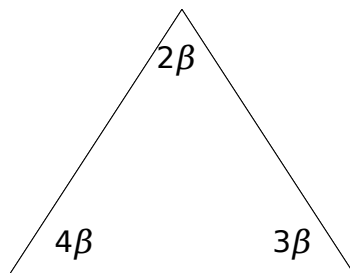
- The sum of the degree measure of the interior angle of a triangle is equal to 180°



$$\rightarrow \delta + \theta + \gamma = 180^\circ$$

Example

1. Find the measure of each angle



by using angle sum theorem : $2\beta + 4\beta + 3\beta = 180^\circ$

$$\frac{9\beta}{9} = \frac{180^\circ}{9}$$

$\beta = 20^\circ$ now the measure

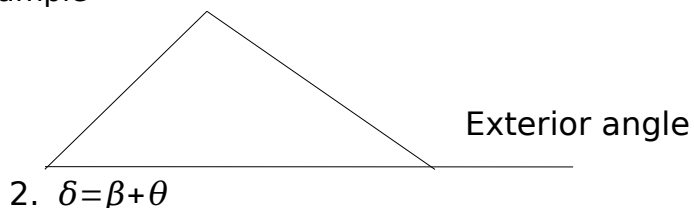
Of each angles are $1 \ 2\beta = 2 \times 20^\circ = 40^\circ$

$$3\beta = 3 \times 20^\circ = 60^\circ$$

$$4\beta = 4 \times 20^\circ = 80^\circ$$

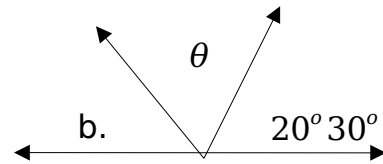
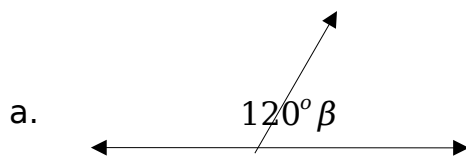
Theorem S.5 the measure of an exterior angle of a triangle is equal to the sum of the measure of the two remote (non adjacent) interior angles

Example

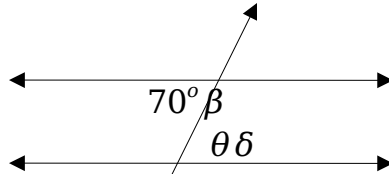


Activity 2

1. Find the value of β in the following figures



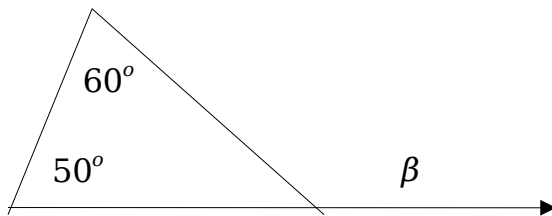
2. By using theorem 5.1 find the value of δ in the following figures.



3. Find the value of β in the following triangle

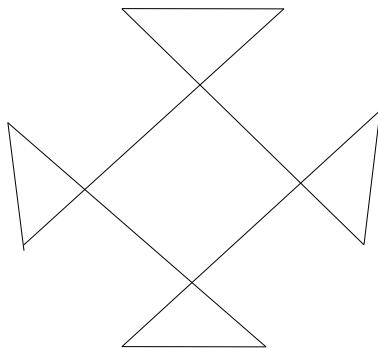
a.

b.

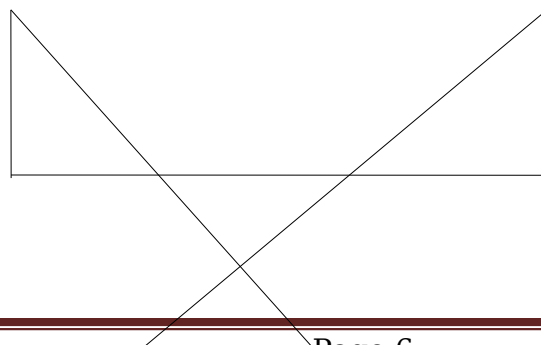


4. The two angles of a triangle are 45° and 30° , find the third angle of a triangle

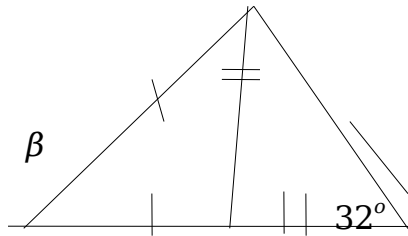
5. In the figure below show the sum of the measure of the angles given by a, b, c, d, e, f, g and h is 360°



6. What is the sum of the measure of angles given by a, b, c, d, e and f

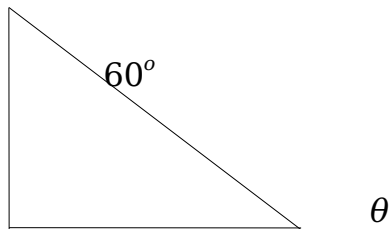


7. Find the degree measure of β in the following triangle



8. If the two remote interior angles of a triangles are 36° $\wedge$ 74° what is the measure of its external angle?

9. Find the value of θ in the following right angle triangle



10. Fill in the following blank space in the appropriate answer

- a. The polygon which has nine (9) sides is called _____
- b. The polygon which has eleven (11) sides is called _____