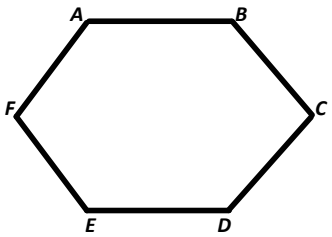
Angles of Polygons

Polygon - A plane figure that meets the following conditions:

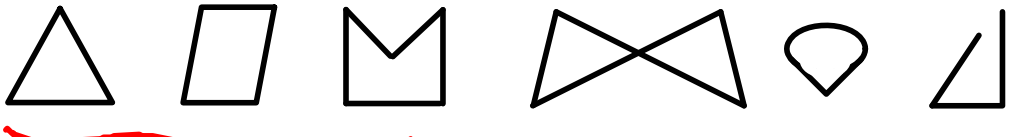
1. It is formed by three or more segments called sides (no two sides with a common endpoint are collinear).
2. Each side intersects exactly two other sides, one at each endpoint.



Polygon ABCDEF, AFEDCB

vertices: A, B, C, D, E, F

sides: $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, $\overline{DE}$, $\overline{EF}$, $\overline{FA}$

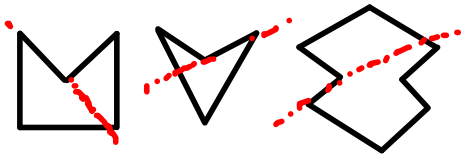


Polygons

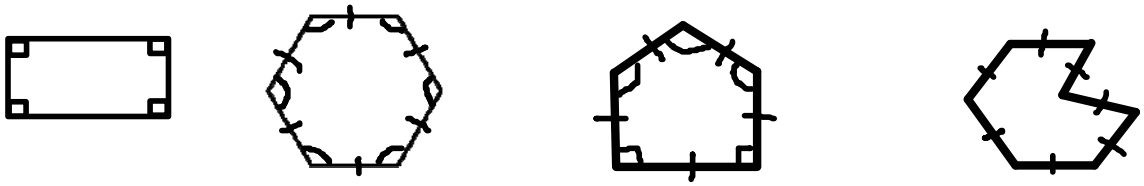
Not polygons

Convex Polygon

Concave Polygon



Regular Polygon - A polygon with congruent sides and congruent angles.



Regular

Number of Sides	Polygon
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon
12	Dodecagon
n	n-gon
20	20-gon

Sum of the measures of the interior angles of a convex polygon: $(n-2)180^\circ$

Each interior angle of a regular polygon: $\dfrac{(n-2)180^\circ}{n}$

Sum of the measures of the exterior angles of a convex polygon: 360°

Each exterior angle of a regular polygon: $\dfrac{360^\circ}{n}$

1. Find the sum of the measures of the interior angles of each convex polygon.

a) 8-gon $n = 8$

$(n-2)\,180$

$(8-2)\,180$

$6 \times 180 = 1080^\circ$

b) $2m$-gon $n = 2m$

$(n-2)180$

$(2m-2)180$

$360m - 360$

2. The sum of the measures of the interior angles of a convex polygon is 720°. Find the number of sides.

$(N-2)180 = 720$

$180N - 360 = 720$

$+360 \quad +360$

$\frac{180N}{180} = \frac{1080}{180}$

$\boxed{N = 6}$

3. The measure of each exterior angle of a regular polygon is given. Find the number of sides of the polygon.

a) 72°

$\frac{360}{N} = \frac{72}{1}$

$\frac{72N}{72} = \frac{360}{72}$

$\boxed{N = 5}$

b) 14.4°

$\frac{360}{N} = \frac{14.4}{1}$

$\frac{14.4N}{14.4} = \frac{360}{14.4}$

$\boxed{N = 25}$ 25-gon

4. The measure of each interior angle of a regular polygon is given. Find the number of sides in each polygon.

a) 144°

$\frac{(N-2)180}{N} = \frac{144°}{1}$

$144N = 180(N-2)$

$144N = 180N - 360$

$-180N \quad -180N$

$\frac{-36N}{-36} = \frac{-360}{-36}$

$\boxed{N = 10}$

b) 176.4°

$\frac{(N-2)180}{N} = \frac{176.4}{1}$

$176.4N = (N-2)180$

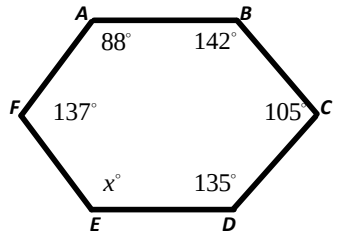
$176.4N = 180N - 360$

$-180N \quad -180N$

$\frac{-3.6N}{-3.6} = \frac{-360}{-3.6}$

$\boxed{N = 100}$

5. Find the value of x.



Sum of interior $\angle$s: $(n-2)180$

$n=6$

$(6-2)180$

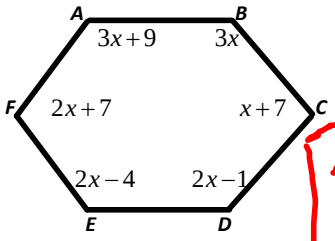
$4\times180=720$

$137+98+142+105+135=607$

$720-607=113$

$\boxed{x=113^\circ}$

6. Find the measure of each angle.



Sum of interior $\angle$s $= 720^\circ$

A: $3(54)+9=171^\circ$

B: $3(54)=162^\circ$

C: $54+7=61^\circ$

D: $2(54)-1=107^\circ$

E: $2(54)-4=104^\circ$

F: $2(54)+7=115^\circ$

$3x+9+3x+x+7+2x-1+2x-4+2x+7=720$

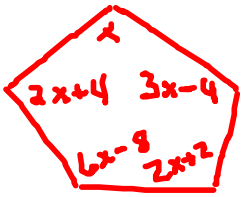
$13x+18=720$

$-18\quad-18$

$\frac{13x}{13}=\frac{702}{13}$

$x=54$

7. The measures of the interior angles of a pentagon are x, $3x-4$, $2x+2$, $6x-8$ and $2x+4$. Find the measure of each angle.



$(N-2)180°$

$N=5$

$(5-2)180$

$3\cdot 180 = 540$

$x+3x-4+2x+2+6x-8+2x+4=540$

$14x-6=540$

$+6 \quad +6$

$\frac{14x}{14}=\frac{546}{14}$

$x=39$

$x: 39°$

$2x+4: 2(39)+4 = 82°$

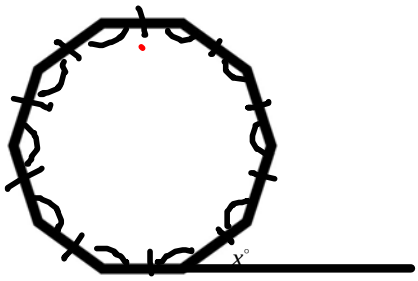
$3x-4: 3(39)-4 = 113°$

$2x+2: 2(39)+2 = 80°$

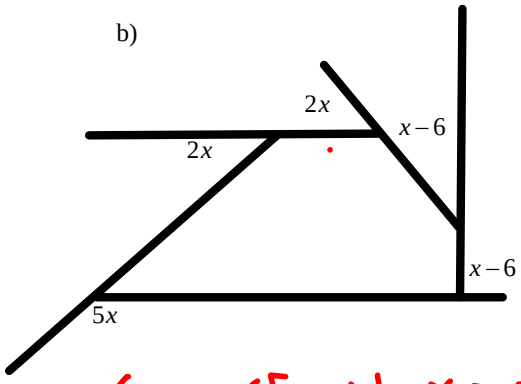
$6x-8: 6(39)-8 = 226°$

8. Find the value of x.

a)



b)



Each exterior $\angle = \frac{360}{N}$

$N=10$

$\frac{360}{10} = 36°$ | $x=36°$

Sum of ext. $\angle$s $=360°$

$2x+2x+x-6+x-6+5x=360$

$11x-12=360$

$+12 \quad +12$

$\frac{11x}{11}=\frac{372}{11}$

$x=\frac{372}{11}$ OR $33\frac{9}{11}$

$11\overline{)372}$

33

42

33

9