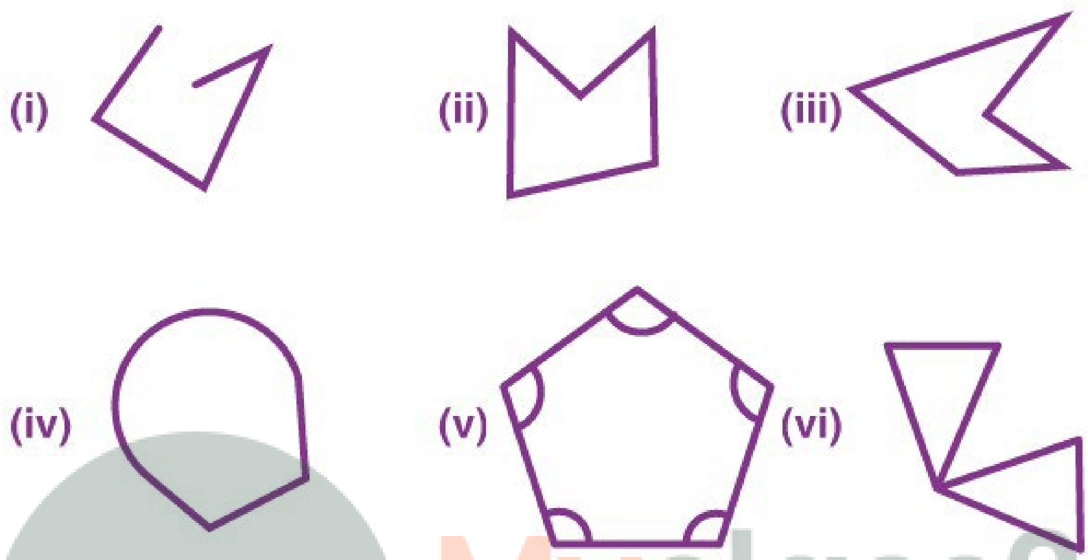
Exercise

Question 1.

State which of the following are polygons:



If the given figure is a polygon, name it as convex or concave.

Solution:

In given Fig. (ii), (iii) and (v) are polygons.

Fig. (ii) and (iii) are concave polygons while

Fig. (v) is convex.

Question 2.

Calculate the sum of angles of a polygon with:

(i) 10 sides

Solution:-

No. of sides n=10

Sum of angles of polygon $= (n-2) \times 180^{\circ} = (10-2) \times 180^{\circ} = 1440^{\circ}$

(ii) 12 sides

Solution:-

No. of sides n=12

Sum of angles $= (n-2) \times 180^{\circ} = (12-2) \times 180^{\circ} = 10 \times 180^{\circ} = 1800^{\circ}$

(iii) 20 sides

Solution:-

n =20

Sum of angles of Polygon $= (n-2) \times 180^{\circ} = (20-2) \times 180^{\circ} = 3240^{\circ}$

(iv) 25 sides

Solution:-

n = 25

Sum of angles of polygon $= (n-2) \times 180^{\circ} = (25-2) \times 180^{\circ} = 4140^{\circ}$

Question 3.

Find the number of sides in a polygon if the sum of its interior angles is:

(i) 900°

Solution:-

Let no. of sides = n

Sum of angles of polygon= 900°

$(n-2) \times 180^{\circ} = 900$

$n-2 = \frac{900}{180}$

n-2=5

n=5+2

n=7

(ii) 1620°

Solution:-

Let no. of sides = n

Sum of angles of polygon = 1620°

$(n-2) \times 180^{\circ} = 1620^{\circ}$

$n-2 = \frac{1620}{180}$

n-2=9

n=9+2

n=11

(iii) 16 right-angles

Solution:-

Let no. of sides =n

Sum of angles of polygon =16

$$rightangles = 16 \times 90 = 1440^{\circ}$$

$$(\mathrm{n}-2) \times 180^{\circ} = 1440^{\circ}$$

$$\mathrm{n}-2 = \frac{1440}{180}$$

n-2=8

n=8+2

n=10

(iv) 32 right-angles.

Solution:-

Let no. of sides =n

Sum of angles of polygon =32

$$rightangles = 32 \times 90 = 2880^{\circ}$$

$$(n-2) \times 180^{\circ} = 2880$$

$$n-2 = \frac{2880}{180}$$

n-2=16

n=16+2

n=18

Question 4.

Is it possible to have a polygon; whose sum of interior angles is?

(i) 870°

Solution:-

(i) Let no. of sides = n

Sum of angles =870°

$$(n-2)\times 180^\circ = 870^\circ$$

$$n-2=\frac{870}{180}$$

$$n-2=\frac{20}{6}$$

$$n=\frac{29}{6}+2$$

$$n=\frac{41}{6}$$

Which is not a whole number.

Hence it is not possible to have a polygon, the sum of whose interior angles is 870°

(ii) 2340°

Solution:

Let no. of sides =n

Sum of angles =2340°

$$(n-2)\times 180^\circ = 2340^\circ$$

$$n-2=\frac{2340}{180}$$

n-2=13

n=13+2=15

Which is a whole number.

Hence it is possible to have a polygon, the sum of whose interior angles is 2340°.

(iii) 7 right-angles

Solution:-

Let no. of sides =n

Sum of angles= $7 right angles = 7\times 90 = 630^\circ$

$$(n-2)\times 180^\circ = 630^\circ$$

$$n-2=\frac{630}{180}$$

$$n - 2 = \frac{7}{2}$$

$$n = \frac{7}{2} + 2$$

$$n = \frac{11}{2}$$

Which is not a whole number. Hence it is not possible to have a polygon, the sum of whose interior angles is 7 right-angles.

(iv) 4500°

Solution:-

Let no. of sides = n

$$(n - 2) \times 180^\circ = 4500^\circ$$

$$n - 2 = \frac{4500}{180}$$

n-2=25

n=25+2

n=27

Which is a whole number.

Hence it is possible to have a polygon, the sum of whose interior angles is 4500°.

Question 5.

(i) If all the angles of a hexagon are equal; find the measure of each angle.

Solution:-

No. of sides of hexagon, n=6

Let each angle be =x°

Sum of angles =6x°

$(n - 2) \times 180^\circ$ = Sum of angles

$$(6 - 2) \times 180^\circ = 6x^\circ$$

$$4 \times 180 = 6x$$

$$x = \frac{4 \times 180}{6}$$

x=120°

∴ Each angle of hexagon =120°

(ii) If all the angles of a 14 – sided figure are equal; find the measure of each angle.

Solution:-

No. of sides of polygon, n=14

Let each angle =x°

Sum of angles =14x°

$\because (n-2)\times 180^{\circ}$=Sum of angles of polygon

$\because (14-2)\times 180^{\circ} = 14x$

$12\times 180^{\circ} = 14x$

$x = \frac{12\times 180}{14}$

$x = \frac{1080}{7}$

$x = \left(154\frac{2}{7}\right)^{\circ}$

Question 6.

Find the sum of exterior angles obtained on producing, in order, the sides of a polygon with:

(i) 7 sides

(ii) 10 sides

(iii) 250 sides.

(i) Solution:

No. of sides n=7

Sum of interior exterior angles at one vertex =180°

Sum of all interior exterior angles $= 7\times 180^{\circ}$

=1260°

Sum of interior angles $= (n-2)\times 180^{\circ} = (7-2)\times 180^{\circ} = (7-2)\times 180^{\circ}$
=900°

∴Sum of exterior angles =1260°-900°

=360°

(ii) Solution

No. of sides n=10

Sum of interior and exterior angles $= 10^{\circ} \times 180^{\circ}$

=1800°

But sum of interior angles $= (n-2) \times 180^{\circ} = (10-2) \times 180^{\circ}$
=1440°

∴Sum of exterior angles = 1800 – 1440

Sum of exterior angles = 360°

(iii) Solution:

No. of side n=250

Sum of all interior and exterior angles

$= 250 \times 180^{\circ}$
=45000°

But sum of interior angles $= (n-2) \times 180^{\circ} = (250-2) \times 180^{\circ} = 248 \times 180^{\circ}$
=44640°

∴ Sum of exterior angles =45000-44640

=360°

Question 7 :

The sides of a hexagon are produced in order. If the measures of exterior angles so obtained are (6x-1)° , (10 x+2)°,(8 x+2)°(9 x-3)°,(5 x+4)° and (12 x+6)°;Find each exterior angle.

Solution:-

Sum of exterior angles of hexagon formed by producing sides of order =360°

∴(6x-1)°+(10x+2)°+(8x+2)°+(9x-3)° +(5x+4)°+(12x+6)°=360°

50x+10°=360°

50x=360°-10°

50x=350°

$x = \frac{350}{50}$
x=7

∴ Angles are (6x-1)°:(10x+2)°:(8x+2)°;(9x-3)° (5x+4)° and (12x+6)°

i.e., (6×7-1)° ; (10×7+2)° ; (8×7+2)° ; (9×7-3)° ; (5×7+4)°; (12×7+6)°)

41° ; 72° ; 58° ; 60° ; 39° and 90°

Question 8.

The interior angles of a pentagon are in the ratio 4:5:6:7:5. Find each angle of the pentagon.

Solution:-

Let the interior angles of the pentagon be 4 x, 5 x, 6 x, 7 x, 5 x

Their sum = 4 x+5 x+6 x+7 x+5 x=27 x

Sum of interior angles of polygon $= (n-2) \times 180^{\circ} = (5-2) \times 180^{\circ} = 540^{\circ}$

27x = 540

$x = \frac{540}{27} = 20^{\circ}$

∴ Angles are

$4 \times 20^{\circ} = 80^{\circ}$

$5 \times 20^{\circ} = 100^{\circ}$

$6 \times 20^{\circ} = 120^{\circ}$

$7 \times 20^{\circ} = 140^{\circ}$

$5 \times 20^{\circ} = 100^{\circ}$

Question 9

Two angles of a hexagon are 120°and 160°. If the remaining four angles are equal, find each equal angle.

Solution:-

Two angles of a hexagon are 120°, 160°

Let remaining four angles be x, x, x and x.

Their sum = 4 x+280°

But sum of all the interior angles of a hexagon $= (6-2) \times 180^{\circ} = 4 \times 180^{\circ} = 720^{\circ}$

∴ 4x+280°=720°

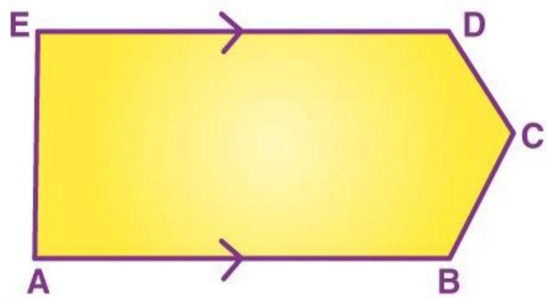
⇒ 4x=720°-280°=440° ⇒ x=110°

∴Equal angles are 110° (each)

Question 10

The figure, given below, shows a pentagon ABCDE with sides AB and ED parallel to each other, and

<B : <C : <D:5:6:7.



(i) Using formula, find the sum of interior angles of the pentagon.

(ii) Write the value of ∠A+∠E

(iii) Find angles B, C and D .

Solution:-

(i) Sum of interior angles of the pentagon $= (5-2) \times 180^{\circ}$
$= 3 \times 180^{\circ} = 540^{\circ} (\because sum for a polygon of x sides = (x-2) \times 180^{\circ}$

(ii) Since AB || ED

∴∠A+∠E=180°

(iii) Let ∠B=5 x ∠C=6 x ∠D=7x

∴5x+6x+7x+180°=540°

∠A+ ∠E=180° Proved in (ii)

18x=540°-180°

⇒ 18x=360° ⇒ x=20°

$\because \angle B = 5 \times 20^{\circ} = 100^{\circ}, \angle C = 6 \times 20 = 120^{\circ}\ \angle D = 7 \times 20 = 140^{\circ}$

Question 11.

Two angles of a polygon are right angles and the remaining are 120° each. Find the number of sides in it.

Solution:-

Let number of sides = n

Sum of interior angles $= (n-2) \times 180^\circ$

=180n-360°

Sum of 2 right angles $= 2 \times 90^\circ$

=180°

∴ Sum of other angles =180n-360°-180°

=180 n-540

No. of vertices at which these angles are formed

=n-2

∴ Each interior angle $= \frac{180n-540}{n-2} \because \quad \frac{180n-540}{n-2} = 120^\circ$

180 n-540=120 n-240

180 n-120 n=-240+540

60 n=300

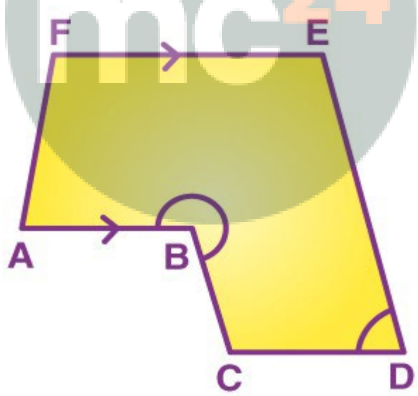
n = 300/60

n = 5

Question 12.

In a hexagon ABCDEF, side AB is parallel to side FE and ∠B:∠C:∠D:∠E=6:4:2:3.find ∠B and ∠D.

Solution:-



Given: Hexagon ABCDEF in which AB II EF

and ∠B:∠C:∠D:∠E=6:4:2:3

To find : ∠B and ∠D

Proof: No of sides n=6

∴ Sum of interior angles $= (n-2) \times 180^\circ = (6-2) \times 180^\circ = 720^\circ$

∵AB∥EF (Given)

$\because \mathrm{A} + \angle\mathrm{F} = 180^\circ$
But $\angle A + \angle B + \angle C + \angle D + \angle E + \angle F = 720^\circ$

(proved)

$\angle B + \angle C + \angle D + \angle E + \angle 180^\circ = 720^\circ \because \angle B + \angle C + \angle D + \angle E = 720^\circ - 180^\circ = 540^\circ$
Ratio =6:4:2:3

Sum of parts =6+4+2+3=15

$\because \angle B = \frac{6}{15} \times 540 = 216^\circ\ \angle \mathrm{D} = \frac{2}{15} \times 540^\circ = 72^\circ$
Hence $\angle B = 216^\circ : \angle D = 72^\circ$

Question 13.

the angles of a hexagon are x+10°,2x+20°,2x-20°,3x-50°,x+40° and x+20°. Find x.

Solution:-

Angles of a hexagon are x+10°, 2x+20°,

2x-20°, 3x-50°,x+40° and x+20°

∴ But sum of angles of a hexagon $= (x-2) \times 180^\circ = (6-2) \times 180^\circ = 4 \times 180^\circ = 720^\circ$

But sum=x+10+2x+20°+2x-20°+3x-50°+x+40+x+20

=10x+90-70=10x+20

∴10x+20=720°⇒10x=720-20=700

$\Rightarrow x = \frac{700^\circ}{10} = 70^\circ$
∴x=70°

Question 14.

In a pentagon, two angles are 40° and 60° and the rest are in the ratio 1:3:7. Find the biggest angle of the pentagon.

Solution:-

In a pentagon, two angles are 40° and 60° Sum of remaining 3 angles $= 3 \times 180^{\circ}$

=540°-40°-60°=540°-100°=440°

Ratio in these 3 angles =1:3:7

Sum of ratios =1+3+7=11

Biggest angle $= \frac{440 \times 7}{11} = 280^{\circ}$

Question 15

Fill in the blanks:

In case of regular polygon, with:

No. of sides	Each exterior angle	Each interior angle
(i).....8.....	....	....
(ii)....12....	....	....
(iii)...........	......72°.....	....
(iv).......	......45°....	....
(v)........	....	......150°.....
(vi)..........	....	......140°.....

Solution:-

No. Of sides	Each exterior angle	Each interior angle
(i)8	45°	135°
(ii)12	30°	150°
(iii)5	72°	108°
(iv)8	45°	135°
(v)12	30°	150°
(vi)9	40°	140°

Explanation:

(i) Each exterior angle $= \frac{360^{\circ}}{8} = 45^{\circ}$

Each interior angle=180°-45°-135°

(ii) Each exterior angle $= \frac{360^{\circ}}{12} = 30^{\circ}$

Each interior angle =180°-30°=150°

(iii) Since each exterior =72°

∴ Number of sides $= \frac{360^{\circ}}{72^{\circ}} = 5$

Also interior angle =180°-72°=108°

(iv) Since each exterior angle =45°

∴ Number of sides $= \frac{360^{\circ}}{45^{\circ}} = 8$

Interior angle =180°-45°=135°

(v) Since interior angle =150°

∴ Exterior angle =180°-150°=30°

∴ Number of sides $= \frac{360^{\circ}}{30^{\circ}} = 12$

(vi) Since interior angle =140°

∴ Exterior angle =180°-140°=40°

∴ Number of sides $= \frac{360^{\circ}}{40^{\circ}} = 9$