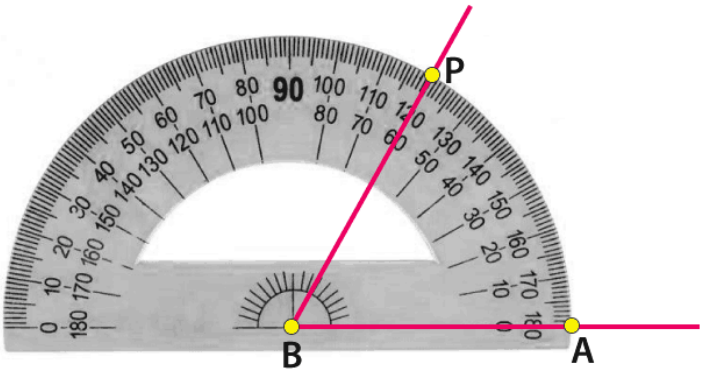
Exercise 14

Page No: 516

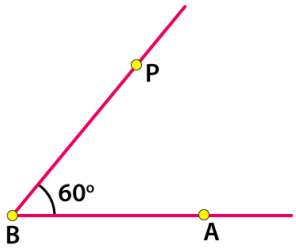
Question 1: Using a protector, draw each of the following angles.
(i) 60^0 (ii) 130^0 (iii) 300^0 (iv) 430^0

Solution:
(i)
Step 1: Draw a line AB.
Step 2: Place the baseline of the protractor along BA and make sure centre of the protractor lie at point B.
Step 3: Find 60^0 on the scale of the protractor and mark a small dot at the edge and named as P as shown below:



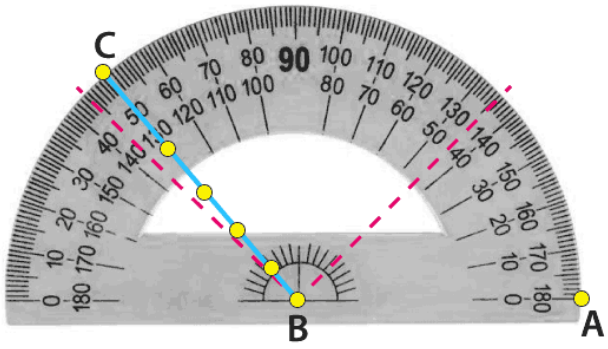
Step 4: Join P to B with a ruler to form the second arm, BP, of the angle.

Mark the angle with a small arc as shown below:



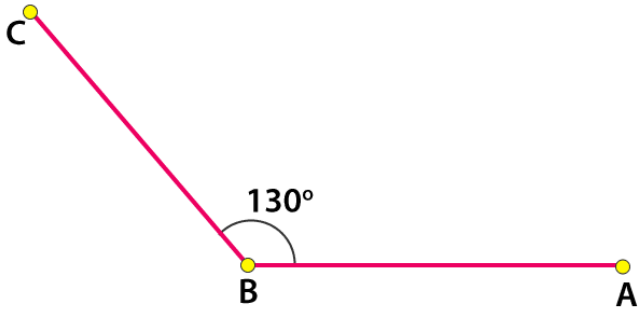
(ii) 130^0

Step 1: Draw a line AB.
Step 2: Place the baseline of the protractor along BA and make sure centre of the protractor lie at point B.
Step 3: Find 130^0 on the scale of the protractor and mark a small dot at the edge and named as C as shown below:



Step 4: Join C to B with a ruler to form the second arm, BC, of the angle.

Mark the angle with a small arc as shown below:

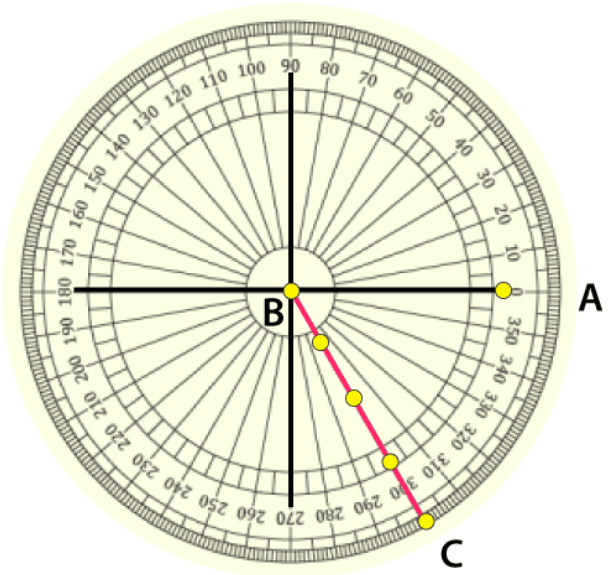


(iii) 300^0

Step 1: Draw a line AB.

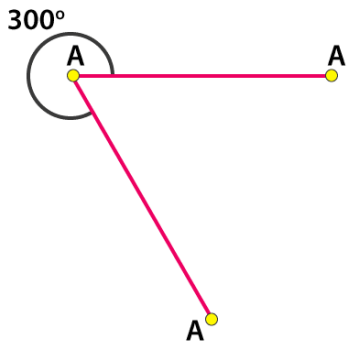
Step 2: Place the baseline of the protractor along BA and make sure centre of the protractor lie at point B.

Step 3: Find 300^0 on the scale of the protractor and mark a small dot at the edge and named as C as shown below:



Step 4: Join C to B with a ruler to form the second arm, BC, of the angle.

Mark the angle with a small arc as shown below:



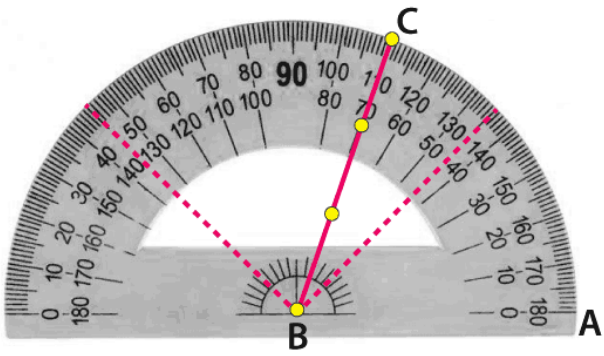
(iv) 430^0

We know, adding or subtracting 360^0 from a particular angle does not changes its position.
Therefore, given angle can also be written as:

$430^0 – 360^0 = 70^0$

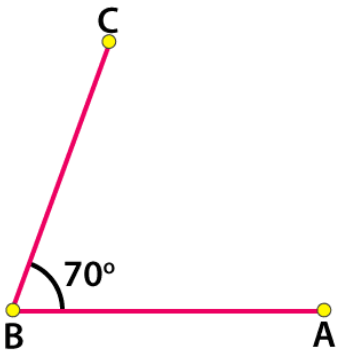
Now, we have to draw an angle for 70^0

Step 1: Draw a line AB.
Step 2: Place the baseline of the protractor along BA and make sure centre of the protractor lie at point B.
Step 3: Find 430^0 on the scale of the protractor and mark a small dot at the edge and named as C as shown below:



Step 4: Join C to B with a ruler to form the second arm, BC, of the angle.

Mark the angle with a small arc as shown below:



Question 2: Express each of the following angles in radians.
(i) 36^0 (ii) 120^0 (iii) 225^0 (iv) 330^0

(v) 400^0 (vi) $7^0\ 30'$ (vii) -270^0 (viii) $-(22^0\ 30')$

Solution:

We know, Angle in radians = Angle in degrees x $\pi/180^0$

(i) 36^0

Angle in radians = $36^0 \times \pi/180^0$

= $\pi/5$

(ii) 120^0

Angle in radians = $120^0 \times \pi/180^0$

= $2\pi/3$

(iii) 225^0

Angle in radians = $225^0 \times \pi/180^0$

= $5\pi/4$

(iv) 330^0

Angle in radians = $330^0 \times \pi/180^0$

= $11\pi/6$

(v) 400^0

Angle in radians = $400^0 \times \pi/180^0$

= $20\pi/9$

(vi) 7^0 30'

Convert 30' into degrees = (angle in minutes)/60 = (30/60) degrees = 0.5 degrees

Total angle = (7 + 0.5) degrees = 7.5 degrees or 7.5^0

Angle in radians = $7.5^0 \times \pi/180^0$

= $\pi/24$

(vii) -270^0

Angle in radians = $-270^0 \times \pi/180^0$

= $-3\pi/2$

(viii) $-(22^0\ 30')$

Convert 30' into degrees = (angle in minutes)/60 = (30/60) degrees = 0.5 degrees

Total angle = (22 + 0.5) degrees = 22.5 degrees or 22.5^0

Angle in radians = $-22.5^0 \times \pi/180^0$

= $-\pi/8$

Question 3: Express each of the following angles in degrees.

(i) $\left(\frac{5\pi}{12}\right)^c$

(ii) $-\left(\frac{18\pi}{5}\right)^c$

(iii) $\left(\frac{5}{6}\right)^c$

(iv) $(-4)^c$

Solution:
We know that.

$$\text{Angle in degrees} = \text{Angle in radians} \times \frac{180}{\pi}$$

(i) Angle in degrees = $5\pi/ 12 \times 180/\pi = 75$

(ii) Angle in degrees = $-18\pi/5 \times 180/\pi = -648$

(iii) Angle in degrees = $5/6 \times 180/\pi = 47.7272^0$

Write Angle in degrees, minutes and second:

We know,
The angle in minutes = Decimal of angle in radian x 60’

The angle in seconds = Decimal of angle in minutes x 60’’

Therefore, 0.7272^0 = 0.7272 x 60' = 43.632'

Angle in seconds = 0.632 x 60'' = 37.92'' or 38''

Final angle = 47^0 43' 38''

(iv) Angle in degrees = -4 x 180/π = = -229.0909^0

Write Angle in minutes:

We know,
The angle in minutes = Decimal of angle in radian x 60’

The angle in seconds = Decimal of angle in minutes x 60’’

Therefore, 0.0909^0 = 0.0909 x 60' = 5.4545'

Angle in seconds = 0.4545 x 60'' = 27.27''

Final angle = -(229^0 5' 27'')

Question 4: The angles of a triangle are in AP, and the greatest angle is double the least. Find all the angles in degrees and radians.

Solution: Let a - d, a, a + d be the three angles of the triangle that form AP.

Since greatest angle is double the least. …… (given)

So, a + d = 2(a - d)
or a + d = 2a - 2d
or a = 3d ……(1)

Again, by angle sum property, we know
Sum of all the angles = 180 degrees
So, (a - d) + a + (a + d) = 180^0
or 3a = 180^0
or a = 60^0 …… (2)

From (1) and (2), we get

$3d = 60^0$
or $d = 20^0$

Now, the angles are,
$a - d = 60^0 - 20^0 = 40^0$
$a = 60^0$
$a + d = 60^0 + 20^0 = 80^0$.

Therefore the required angles are 40^0, 60^0 and 80^0 .

Question 5: The difference between the two acute angles of a right triangle is (π/5)^c. Find these angles in radians and degrees.

Solution:
Angle in degree = π/5 x 180/π = 36°

Let x and y are two acute angles of a right triangle.

So, x - y= 36° .....(1)

Also we know,
x + y = 90° .....(2)

Solving (1) and (2), we get

2x= 126°

or x = 63°

Form (2), 63° + y = 90°

or y = 27°

Therefore, two acute angles are 63° and 27°.

Represent angle into radian:
We know, Angle in radians = Angle in degrees x $\pi/180^0$

Angle in radians = 63^0 x $\pi/180^0$

= 7π/20

And Angle in radians = 27^0 x π/180^0

= 3π/20

Question 6: Find the radius of a circle in which a central angle of 45^0 intercepts an arc of length 33 cm. (Take π = 22/7)

Solution:
We know,
Central angle (θ) = (length arc)/radius ....(1)

Convert angle in radian:
Angle in radians = Angle in degrees x π/180^0 = 45^0 x π/180^0 = π/4

From (1),
Radius = (length arc)/Central angle

= 33/(π/4)

= 132 x 7/22 = 42

Therefore radius is 42 cm.