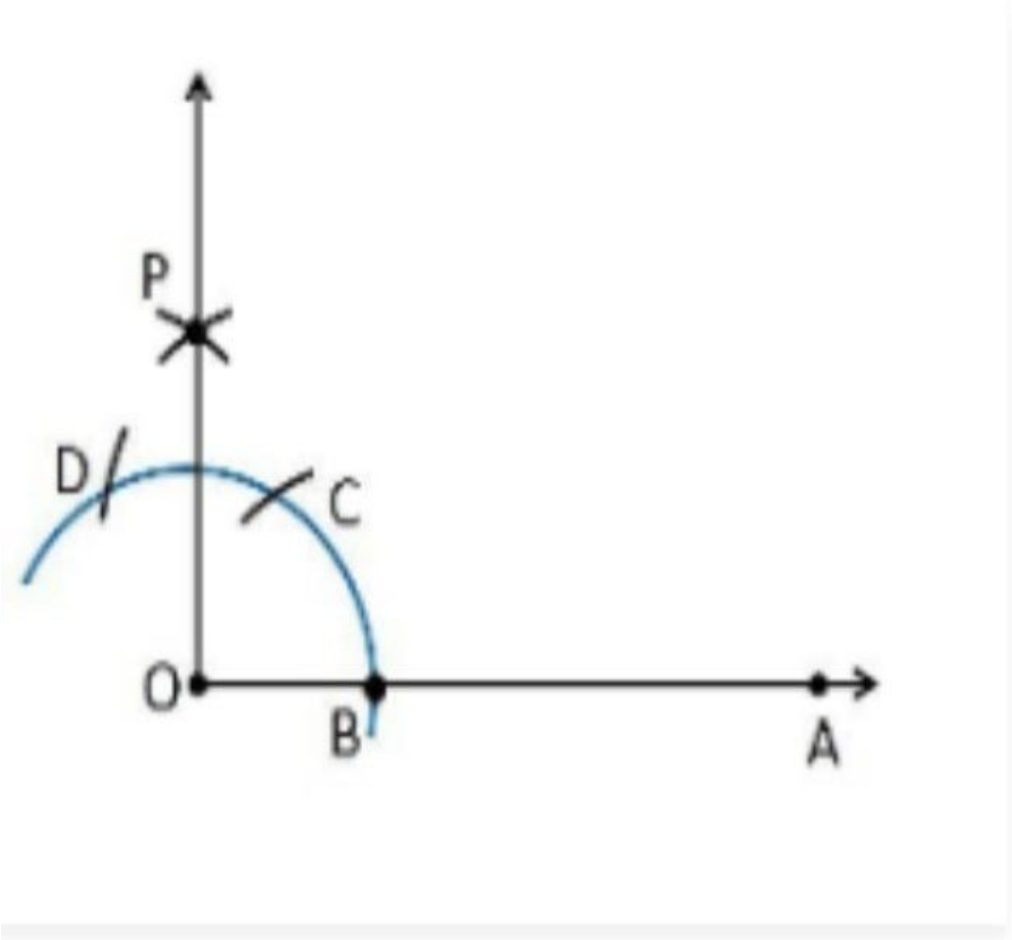
Maths Chapter 11 – Constructions

– Constructions Exercise 11.1

1. Construct an angle of 90° at the initial point of a given ray and justify the construction.

Construction Procedure:



To construct an angle 90°, follow the given steps:

1. Draw a ray OA

2. Take O as a centre with any radius, draw an arc DCB is that cuts OA at B.

3. With B as a centre with the same radius, mark a point C on the arc DCB.

4. With C as a centre and the same radius, mark a point D on the arc DCB.

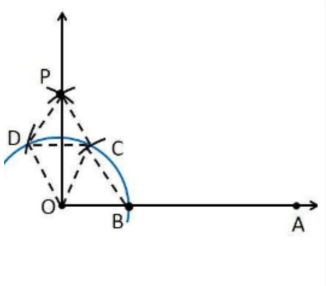
5. Take C and D as centre, draw two arcs which intersect each other with the same radius at P.

6. Finally, the ray OP is joined which makes an angle 90° with OP is formed.

Justification

To prove ∠POA = 90°

In order to prove this, draw a dotted line from the point O to C and O to D and the angles formed are:



From the construction, it is observed that

OB = BC = OC

Therefore, OBC is an equilateral triangle

So that, ∠BOC = 60°.

Similarly,

OD = DC = OC

Therefore, DOC is an equilateral triangle

So that, ∠DOC = 60°.

From SSS triangle congruence rule

△OBC ≅ OCD

So, ∠BOC = ∠DOC [By C.P.C.T]

Therefore, ∠COP = ½ ∠DOC = ½ (60°).

∠COP = 30°

To find the ∠POA = 90°:

∠POA = ∠BOC+∠COP

∠POA = 60°+30°

∠POA = 90°

Hence, justified

2. Construct an angle of 45° at the initial point of a given ray and justify the construction.

Construction Procedure:

1. Draw a ray OA

2. Take O as a centre with any radius, draw an arc DCB is that cuts OA at B.

3. With B as a centre with the same radius, mark a point C on the arc DCB.

4. With C as a centre and the same radius, mark a point D on the arc DCB.

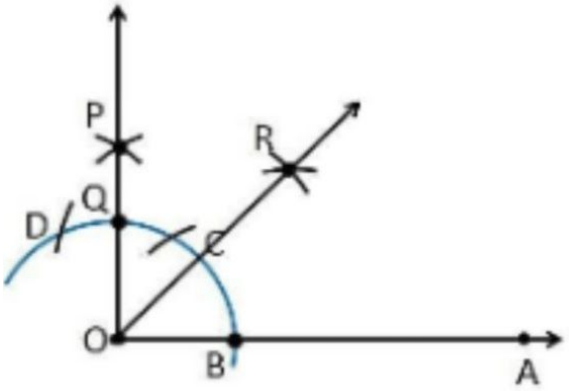
5. Take C and D as centre, draw two arcs which intersect each other with the same radius at P.

6. Finally, the ray OP is joined which makes an angle 90° with OP is formed.

7. Take B and Q as centre draw the perpendicular bisector which intersects at the point R

8. Draw a line that joins the point O and R

9. So, the angle formed ∠ROA = 45°



Justification

From the construction,

∠POA = 90°

From the perpendicular bisector from the point B and Q, which divides the ∠POA into two halves. So it becomes

∠ROA = ½ ∠POA

∠ROA = (½)×90° = 45°

Hence, verified

3. Construct the angles of the following measurements:

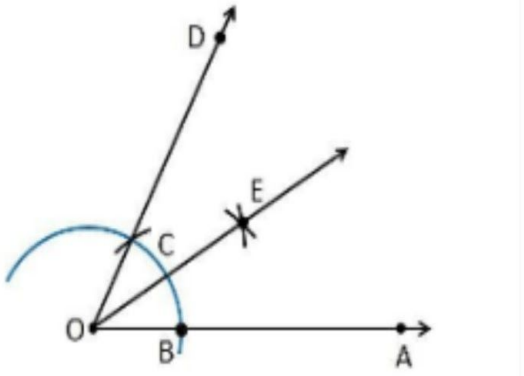
(i) 30° (ii) $22\frac{1}{2}^{\circ}$ (iii) 15°

Solution:

Solution:

(i) 30°

Construction Procedure:



1. Draw a ray OA

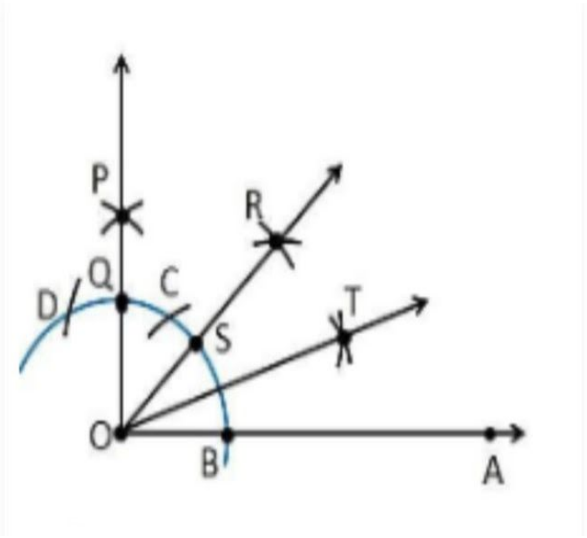
2. Take O as a centre with any radius, draw an arc BC which cuts OA at B.

3. With B and C as centres, draw two arcs which intersect each other at the point E and the perpendicular bisector is drawn.

4. Thus, ∠EOA is the required angle making 30° with OA.

(2.)22.5°

Construction Procedure:



1. Draw an angle ∠POA = 90°

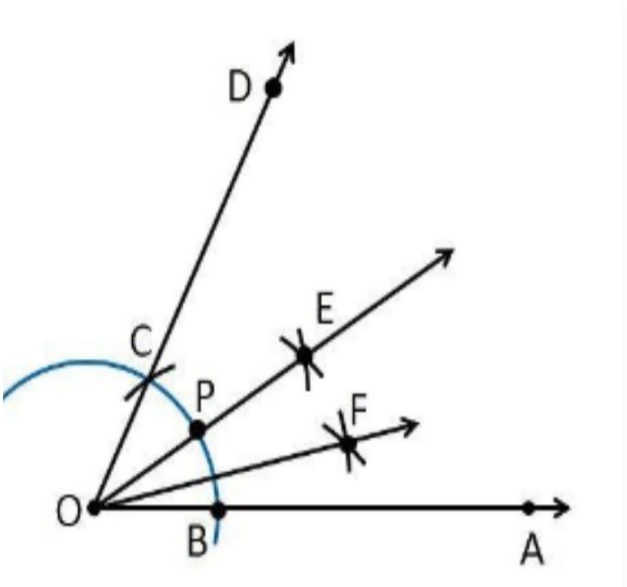
2. Take O as a centre with any radius, draw an arc BC which cuts OA at B and OP at Q

3. Now, draw the bisector from the point B and Q where it intersects at the point R such that it makes an angle ∠ROA = 45°.

4. Again, ∠ROA is bisected such that ∠TOA is formed which makes an angle of 22.5° with OA

(3).15°

Construction Procedure:



1. An angle ∠DOA = 60° is drawn.

2. Take O as centre with any radius, draw an arc BC which cuts OA at B and OD at C

3. Now, draw the bisector from the point B and C where it intersects at the point E such that it makes an angle ∠EOA = 30°.

4. Again, ∠EOA is bisected such that ∠FOA is formed which makes an angle of 15° with OA.

5. Thus, ∠FOA is the required angle making 15° with OA.