Access answers to RD Sharma Solutions for Class 11 Maths Chapter 4 – Measurement of Angles

1. Find the degree measure corresponding to the following radian measures (Use π = 22/7)
(i) 9π/5 (ii) -5π/6 (iii) $(18\pi/5)^c$ (iv) $(-3)^c$ (v) 11^c (vi) 1^c

Solution:

We know that π rad = 180° ⇒ 1 rad = 180°/ π

(i) 9π/5

$[(180/\pi) \times (9\pi/5)]^\circ$

Substituting the value of π = 22/7
[180/22 × 7 × 9 × 22/(7×5)]
(36 × 9) °

324°

∴ Degree measure of 9π/5 is 324°

(ii) -5π/6

$[(180/\pi) \times (-5\pi/6)]^\circ$

Substituting the value of π = 22/7
[180/22 × 7 × -5 × 22/(7×6)]
(30 × -5) °

– (150) °

∴ Degree measure of -5π/6 is -150°

(iii) (18π/5)

$[(180/\pi) \times (18\pi/5)]^\circ$

Substituting the value of π = 22/7
[180/22 × 7 × 18 × 22/(7×5)]
(36 × 18) °

648°

∴ Degree measure of 18π/5 is 648°

(iv) $(-3)^c$

$[(180/\pi) \times (-3)]^\circ$
Substituting the value of π = 22/7

$[180/22 \times 7 \times -3]^\circ$
$(-3780/22)^\circ$

$(-171\ 18/22)^\circ$

$(-171^\circ(18/22 \times 60)')$

$(-171^\circ\ (49\ 1/11)')$

$(-171^\circ\ 49'\ (1/11 \times 60)')$

– (171° 49′ 5.45”)

≈ – (171° 49′ 5”)

∴ Degree measure of $(-3)^c$ is -171° 49′ 5”

(v) 11^c

$(180/\ \pi \times 11)^\circ$

Substituting the value of π = 22/7

$(180/22 \times 7 \times 11)^\circ$

$(90 \times 7)°$

630°

∴ Degree measure of 11^c is 630°

(vi) 1^c

$(180/\ \pi \times 1)^\circ$

Substituting the value of π = 22/7

$(180/22 \times 7 \times 1)^\circ$

$(1260/22)^\circ$

$(57\ 3/11)^\circ$

$(57^\circ\ (3/11 \times 60)')$

$(57^\circ\ (16\ 4/11)')$

$(57^\circ\ 16'\ (4/11 \times 60)')$

$(57^\circ\ 16'\ 21.81'')$

≈ $(57^\circ\ 16'\ 21'')$

∴ Degree measure of 1^c is $57^\circ\ 16'\ 21''$

2. Find the radian measure corresponding to the following degree measures:
(i) 300° (ii) 35° (iii) -56° (iv)135° (v) -300°
(vi) $7^\circ\ 30'$ (vii) $125^\circ\ 30'$ (viii) $-47^\circ\ 30'$

Solution:

We know that 180° = π rad ⇒ 1° = π/ 180 rad

(i) 300°

(300 × π/180) rad

5π/3

∴ Radian measure of 300° is 5π/3

(ii) 35°

(35 × π/180) rad

7π/36

∴ Radian measure of 35° is 7π/36

(iii) -56°

(-56 × π/180) rad

-14π/45

∴ Radian measure of -56° is -14π/45

(iv) 135°

(135 × π/180) rad

3π/4

∴ Radian measure of 135° is 3π/4

(v) -300°

(-300 × π/180) rad

-5π/3

∴ Radian measure of -300° is -5π/3

(vi) 7° 30′

We know that, 30′ = (1/2) °

7° 30′ = (7 1/2) °

= (15/2)°

= (15/2 × π/180) rad

= π/24

∴ Radian measure of 7° 30′ is π/24

(vii) 125° 30′

We know that, 30′ = (1/2) °

125° 30’ = (125 1/2) °

= (251/2)°

= (251/2 × π/180) rad

= 251π/360

∴ Radian measure of 125° 30′ is 251π/360

(viii) -47° 30′

We know that, 30′ = (1/2) °

-47° 30’ = – (47 1/2) °

= – (95/2)°

= – (95/2 × π/180) rad

= – 19π/72

∴ Radian measure of -47° 30′ is – 19π/72

3. The difference between the two acute angles of a right-angled triangle is 2π/5 radians. Express the angles in degrees.

Solution:

Given the difference between the two acute angles of a right-angled triangle is 2π/5 radians.

We know that π rad = 180° ⇒ 1 rad = 180°/ π

Given:

2π/5

(2π/5 × 180/ π)°

Substituting the value of π = 22/7

(2×22/(7×5) × 180/22 × 7)

(2/5 × 180) °

72°

Let one acute angle be x° and the other acute angle be 90° – x°.

Then,

x° – (90° – x°) = 72°

2x° – 90° = 72°

2x° = 72° + 90°

2x° = 162°

x° = 162°/ 2

x° = 81° and

90° – x° = 90° – 81°

= 9°

∴ The angles are 81° and 9°

4. One angle of a triangle is 2/3x grades, and another is 3/2x degrees while the third is πx/75 radians. Express all the angles in degrees.

Solution:

Given:

One angle of a triangle is 2x/3 grades and another is 3x/2 degree while the third is πx/75 radians.

We know that, 1 grad = $(9/10)^\circ$

2/3x grad = $(9/10)\ (2/3x)^\circ$

= $3/5x^\circ$

We know that, π rad = 180° ⇒ 1 rad = 180°/ π

Given: πx/75

$(\pi x/75 \times 180/\pi)^\circ$

$(12/5x)^\circ$

We know that, the sum of the angles of a triangle is 180°.

$3/5x^\circ + 3/2x^\circ + 12/5x^\circ = 180^\circ$

$(6+15+24)/10x^\circ = 180^\circ$

Upon cross-multiplication we get,

$45x^\circ = 180^\circ \times 10^\circ$

$= 1800^\circ$

$x^\circ = 1800^\circ/45^\circ$

$= 40^\circ$

∴ The angles of the triangle are:

$3/5x^\circ = 3/5 \times 40^\circ = 24^\circ$

$3/2x^\circ = 3/2 \times 40^\circ = 60^\circ$

$12/5\ x^\circ = 12/5 \times 40^\circ = 96^\circ$

5. Find the magnitude, in radians and degrees, of the interior angle of a regular:
(i) Pentagon (ii) Octagon (iii) Heptagon (iv) Duodecagon.

Solution:

We know that the sum of the interior angles of a polygon = (n – 2) π

And each angle of polygon = sum of interior angles of polygon / number of sides

Now, let us calculate the magnitude of

(i) Pentagon

Number of sides in pentagon = 5

Sum of interior angles of pentagon = (5 – 2) π = 3π

∴ Each angle of pentagon = $3\pi/5 \times 180^\circ/\ \pi = 108^\circ$

(ii) Octagon

Number of sides in octagon = 8

Sum of interior angles of octagon = (8 – 2) π = 6π

∴ Each angle of octagon = $6\pi/8 \times 180^\circ/\ \pi = 135^\circ$

(iii) Heptagon

Number of sides in heptagon = 7

Sum of interior angles of heptagon = (7 – 2) π = 5π

∴ Each angle of heptagon = $5\pi/7 \times 180^\circ/\pi = 900^\circ/7 = 128^\circ\, 34'\, 17''$

(iv) Duodecagon

Number of sides in duodecagon = 12

Sum of interior angles of duodecagon = (12 – 2) π = 10π

∴ Each angle of duodecagon = $10\pi/12 \times 180^\circ/\pi = 150^\circ$

6. The angles of a quadrilateral are in A.P., and the greatest angle is 120°. Express the angles in radians.

Solution:

Let the angles of quadrilateral be (a – 3d) °, (a – d) °, (a + d) ° and (a + 3d) °.

We know that, the sum of angles of a quadrilateral is 360°.

$a - 3d + a - d + a + d + a + 3d = 360^\circ$

$4a = 360^\circ$

$a = 360/4$

$= 90^\circ$

Given:

The greatest angle = 120°

$a + 3d = 120^\circ$

$90^\circ + 3d = 120^\circ$

$3d = 120^\circ - 90^\circ$

$3d = 30^\circ$

$d = 30^\circ/3$

$= 10^\circ$

∴ The angles are:

$(a - 3d)^\circ = 90^\circ - 30^\circ = 60^\circ$

$(a - d)^\circ = 90^\circ - 10^\circ = 80^\circ$

$(a + d)^\circ = 90^\circ + 10^\circ = 100^\circ$

$(a + 3d)^\circ = 120^\circ$

Angles of quadrilateral in radians:

$(60 \times \pi/180)$ rad = $\pi/3$

$(80 \times \pi/180)$ rad = $4\pi/9$

$(100 \times \pi/180)$ rad = $5\pi/9$

$(120 \times \pi/180)$ rad = $2\pi/3$

7. The angles of a triangle are in A.P., and the number of degrees in the least angle is to the number of degrees in the mean angle as 1:120. Find the angle in radians.

Solution:

Let the angles of the triangle be (a – d) °, a° and (a + d) °.

We know that, the sum of the angles of a triangle is 180°.

$a - d + a + a + d = 180^\circ$

$3a = 180^\circ$

$a = 60°$

Given:

Number of degrees in the least angle / Number of degrees in the mean angle = 1/120

$(a-d)/a = 1/120$

$(60-d)/60 = 1/120$

$(60-d)/1 = 1/2$

$120-2d = 1$

$2d = 119$

$d = 119/2$

$= 59.5$

∴ The angles are:

$(a – d)° = 60° – 59.5° = 0.5°$

$a° = 60°$

$(a + d)° = 60° + 59.5° = 119.5°$

Angles of triangle in radians:

$(0.5 × \pi/180)$ rad $= \pi/360$

$(60 × \pi/180)$ rad $= \pi/3$

$(119.5 × \pi/180)$ rad $= 239\pi/360$

8. The angle in one regular polygon is to that in another as 3:2 and the number of sides in first is twice that in the second. Determine the number of sides of two polygons.

Solution:

Let the number of sides in the first polygon be 2x and

The number of sides in the second polygon be x.

We know that, angle of an n-sided regular polygon = $[(n-2)/n]\ \pi$ radian

The angle of the first polygon = $[(2x-2)/2x]\ \pi = [(x-1)/x]\ \pi$ radian

The angle of the second polygon = $[(x-2)/x]\ \pi$ radian

Thus,

$[(x-1)/x]\ \pi / [(x-2)/x]\ \pi = 3/2$

$(x-1)/(x-2) = 3/2$

Upon cross-multiplication we get,

$2x – 2 = 3x – 6$

$3x-2x = 6-2$

$x = 4$

∴ Number of sides in the first polygon = $2x = 2(4) = 8$

Number of sides in the second polygon = $x = 4$

9. The angles of a triangle are in A.P. such that the greatest is 5 times the least. Find the angles in radians.

Solution:

Let the angles of the triangle be $(a – d)^{\circ}$, a° and $(a + d)^{\circ}$.

We know that, the sum of angles of triangle is 180°.

$a – d + a + a + d = 180°$

$3a = 180°$

$a = 180°/3$

$= 60°$

Given:

Greatest angle = 5 × least angle

Upon cross-multiplication,

Greatest angle / least angle = 5

$(a+d)/(a-d) = 5$

$(60+d)/(60-d) = 5$

By cross-multiplying we get,

$60 + d = 300 – 5d$

$6d = 240$

$d = 240/6$

$= 40$

Hence, angles are:

$(a – d)° = 60° – 40° = 20°$

$a° = 60°$

$(a + d)° = 60° + 40° = 100°$

∴ Angles of triangle in radians:

$(20 × π/180)$ rad $= π/9$

$(60 × π/180)$ rad $= π/3$

$(100 × π/180)$ rad $= 5π/9$

10. The number of sides of two regular polygons is 5:4 and the difference between their angles is 9°. Find the number of sides of the polygons.

Solution:

Let the number of sides in the first polygon be 5x and

The number of sides in the second polygon be 4x.

We know that, angle of an n-sided regular polygon = $[(n-2)/n]\ π$ radian

The angle of the first polygon = $[(5x-2)/5x]\ 180°$

The angle of the second polygon = $[(4x-1)/4x]\ 180°$

Thus,

$[(5x-2)/5x]\ 180° – [(4x-1)/4x]\ 180° = 9$

$180° [(4(5x-2) – 5(4x-2))/20x] = 9$

Upon cross-multiplication we get,

$(20x – 8 – 20x + 10)/20x = 9/180$

$2/20x = 1/20$

$2/x = 1$

$x = 2$

∴Number of sides in the first polygon = $5x = 5(2) = 10$

Number of sides in the second polygon = $4x = 4(2) = 8$