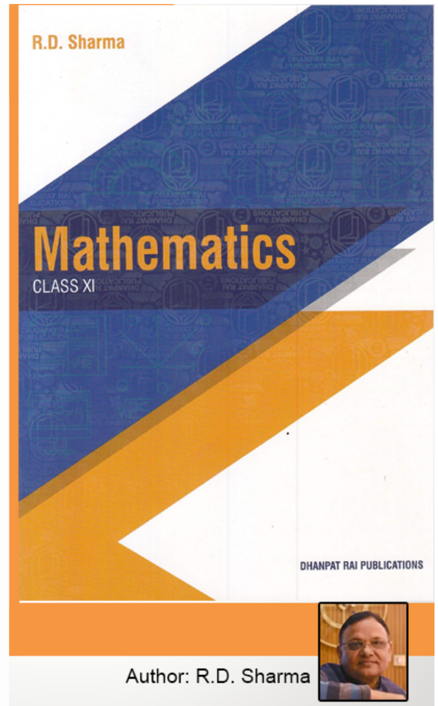
Class 11 - Chapter 4 Measurement of Angles



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

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1. Find the degree measure corresponding to the following radian measures (Use π = 22/7)

(i) 9π/5 (ii) -5π/6 (iii) $(18π/5)^c$ (iv) $(-3)^c$ (v) 11^c (vi) 1^c

Solution:

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

(i) 9π/5$[(180/π) × (9π/5)]^{\circ}$

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 $[(180/π) × (-5π/6)]^{\circ}$

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)$[(180/π) × (18π/5)]^{\circ}$

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) $(-3)^c$ $[(180/π) × (-3)]^{\circ}$

Substituting the value of π = 22/7$[180/22 × 7 × -3]^{\circ}$

$(-3780/22)^{\circ}$

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

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

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

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

$-(171^{\circ}\ 49'\ 5.45'')$

$\approx -(171^{\circ}\ 49'\ 5'')$

∴ Degree measure of $(-3)^{c}$ is $-171^{\circ}\ 49'\ 5''$

(v) 11^{c}

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

Substituting the value of $\pi = 22/7$

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

$(90 \times 7)^{\circ}$

630°

∴ Degree measure of 11^{c} is 630°

(vi) 1^{c}

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

Substituting the value of $\pi = 22/7$

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

$(1260/22)^{\circ}$

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

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

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

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

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

≈ ($57^\circ\ 16'\ 21''$)

∴ 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° 30′ (vii) 125° 30’ (viii) -47° 30′

Solution:

We know that $180^\circ = \pi$ rad ⇒ $1^\circ = \pi/180$ rad

(i) 300°

$(300 \times \pi/180)$ rad

$5\pi/3$

∴ Radian measure of 300° is $5\pi/3$

(ii) 35°

$(35 \times \pi/180)$ rad

$7\pi/36$

∴ Radian measure of 35° is $7\pi/36$

(iii) -56°

$(-56 \times \pi/180)$ rad

$-14\pi/45$

∴ Radian measure of -56° is $-14\pi/45$

(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, $30' = (1/2)^\circ$

$-47^\circ\ 30' = -(47\ 1/2)^\circ$

$= -(95/2)^\circ$

$= -(95/2 \times \pi/180)$ rad

$= -19\pi/72$

∴ Radian measure of $-47^\circ\ 30'$ is $-19\pi/72$

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:

$2\pi/5$

$(2\pi/5 \times 180/\pi)^\circ$

Substituting the value of π = 22/7

$(2\times22/(7\times5) \times 180/22 \times 7)$

$(2/5 \times 180)^\circ$

72°

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

Then,

$x^\circ - (90^\circ - x^\circ) = 72^\circ$

$2x^\circ - 90^\circ = 72^\circ$

$2x^\circ = 72^\circ + 90^\circ$

$2x° = 162°$

$x° = 162°/ 2$

$x° = 81°$ 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,

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

$= 1800^o$

$x^o = 1800^o/45^o$

$= 40^o$

∴ The angles of the triangle are:

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

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

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

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 = $(n - 2)\ \pi$

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 = $(5 - 2)\ \pi = 3\pi$

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

(ii) Octagon

Number of sides in octagon = 8

Sum of interior angles of octagon = $(8 - 2)\ \pi = 6\pi$

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

(iii) Heptagon

Number of sides in heptagon = 7

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

∴ Each angle of heptagon = 5π/7 × 180°/ π = 900°/7 = 128° 34′ 17”

(iv) Duodecagon

Number of sides in duodecagon = 12

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

∴ Each angle of duodecagon = 10π/12 × 180°/ π = 150°

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°

4a = 360°

a = 360/4

= 90°

Given:

The greatest angle = 120°

a + 3d = 120°

90° + 3d = 120°

3d = 120° – 90°

3d = 30°

d = 30°/3

= 10°

∴ The angles are:

(a – 3d) ° = 90° – 30° = 60°

(a – d) ° = 90° – 10° = 80°

(a + d) ° = 90° + 10° = 100°

(a + 3d) ° = 120°

Angles of quadrilateral in radians:

(60 × π/180) rad = π/3

(80 × π/180) rad = 4π/9

(100 × π/180) rad = 5π/9

(120 × π/180) rad = 2π/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°

3a = 180°

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:

$(0.5 \times \pi/180)$ rad = $\pi/360$

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

$(119.5 \times \pi/180)$ 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 $(a – d)°$, $a°$ and $(a + d)°$.

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 9º. 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] 180º

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

Thus,[(5x-2)/5x] 180º – [(4x-1)/4x] 180º = 9

180º [(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 = $4x = 4(2) = 8$

Chapterwise RD Sharma Solutions for Class 11 Maths :

About RD Sharma

RD Sharma i*sn't the kind of author you'd bump into at lit fests. But his bestselling books have helped many* CBSE *students lose their dread of* maths. *Sunday Times profiles the tutor turned internet star*

He dreams of algorithms that would give most people nightmares. And, spends every waking hour thinking of ways to explain concepts like 'series solution of linear differential equations'. Meet Dr Ravi Dutt Sharma — mathematics teacher and author of 25 reference books — whose name evokes as much awe as the subject he teaches. And though students have used his thick tomes for the last 31 years to ace the dreaded maths exam, it's only recently that a spoof video turned the tutor into a YouTube star.

R D Sharma had a good laugh but said he shared little with his on-screen persona except for the love for maths. "I like to spend all my time thinking and writing about maths problems. I find it relaxing," he says. When he is not writing books explaining mathematical concepts for classes 6 to 12 and engineering students, Sharma is busy dispensing his duty as vice-principal and head of department of science and humanities at Delhi government's Guru Nanak Dev Institute of Technology.