

Radians and the Unit Circle Explained

Grade 11 – Algebra 2 math · Test Answer Key · Standards: F-TF.A.1, F-TF.A.2, F-TF.C.8

Each answer lists the reference angle and quadrant used. Give partial credit for a correct method with a sign or arithmetic slip, and add the points for a total out of 20.

Standards: F-TF.A.1, F-TF.A.2, F-TF.C.8 · **Level:** Grade 11 Algebra 2

Question 1 Convert angle measures (2 points)

- a. $210\pi/180 = \mathbf{7\pi/6}$.
- b. $5 \cdot 180/9 = \mathbf{100^\circ}$.

Scoring: 1 point each.

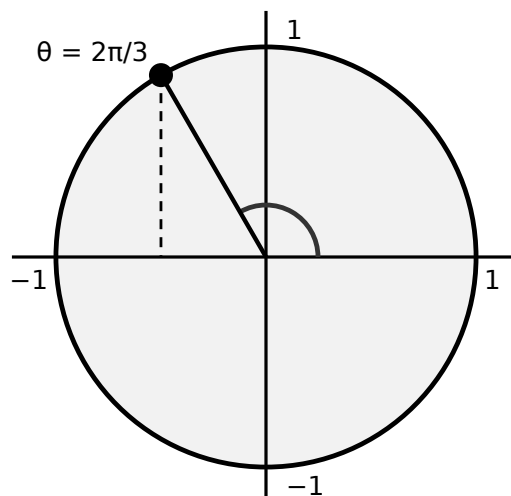
Question 2 Exact values (3 points)

- a. Reference angle $\pi/3$, quadrant II: $\mathbf{\sqrt{3}/2}$.
- b. Reference angle $\pi/4$, quadrant III: $\mathbf{-\sqrt{2}/2}$.
- c. Point $(\sqrt{3}/2, -1/2)$, so $\tan = (-1/2) \div (\sqrt{3}/2) = \mathbf{-\sqrt{3}/3}$.

Scoring: 1 point each.

Question 3 Read the unit circle (3 points)

- a. The reference angle is $\pi/3$ and the point is in quadrant II, so $\mathbf{\theta = 2\pi/3}$.
- b. $\cos = -1/2$, $\sin = \sqrt{3}/2$, $\tan = (\sqrt{3}/2) \div (-1/2) = \mathbf{-\sqrt{3}}$.



The terminal side at $2\pi/3$, or 120° .

Scoring: 1 point for the angle, 1 point for sin and cos, 1 point for tan.

Question 4 Arc length (2 points)

$$s = 14 \cdot 11\pi/18 = 77\pi/9 \approx 26.88. \quad \mathbf{77\pi/9 \text{ ft} \approx 26.88 \text{ ft.}}$$

Scoring: 1 point for the exact value, 1 point for the decimal.

Question 5 Ratios from a given sine (2 points)

$\cos^2 \theta = 1 - 81/1681 = 1600/1681$, so $\cos \theta = -40/41$ in quadrant III. Then $\tan \theta = (-9/41) \div (-40/41)$. **$\cos \theta = -40/41$ and $\tan \theta = 9/40$.**

Scoring: 1 point for cos, 1 point for tan.

Question 6 Ratios from a given cosine (2 points)

$\sin^2 \theta = 1 - 7/16 = 9/16$, so $\sin \theta = 3/4$. Then $\tan \theta = (3/4) \div (-\sqrt{7}/4) = -3/\sqrt{7} = -3\sqrt{7}/7$. **$\sin \theta = 3/4$ and $\tan \theta = -3\sqrt{7}/7$.**

Scoring: 1 point for sin, 1 point for tan.

Question 7 Coterminal angles (2 points)

$19\pi/6 - 2\pi = 7\pi/6$. For $7\pi/6$ the reference angle is $\pi/6$ and the quadrant is III, so cosine is negative. **$\cos(19\pi/6) = -\sqrt{3}/2$.**

Scoring: 1 point for the coterminal angle, 1 point for the value.

Question 8 Verify an identity (2 points)

Multiply: $1 - \cos^2 \theta$. From $\sin^2 \theta + \cos^2 \theta = 1$, we get $1 - \cos^2 \theta = \sin^2 \theta$. **Shown.**

Scoring: 1 point for the product, 1 point for the identity.

Question 9 Ferris wheel (2 points)

$$\text{Height} = 40 \sin(2\pi/3) = 40 \cdot \sqrt{3}/2 = 20\sqrt{3} \approx 34.64. \quad \mathbf{20\sqrt{3} \text{ ft} \approx 34.6 \text{ ft.}}$$

Scoring: 1 point for the exact value, 1 point for the decimal.