ExamPath

CLASS 9 MATHEMATICS · FBISE · UNIT 6

Unit 6: Trigonometry and Bearing — Advanced Practice

20 multiple-choice questions Suggested time: **20 minutes** 1 mark each

Name: Date: Score: / 20

Circle one answer for each question. The answer key with explanations is on the last pages, so try every question before you check. These are practice questions, not official FBISE papers.

1. Why can sin θ never be greater than 1?

(A) The hypotenuse is the shortest side
(B) It is the y-coordinate of a point on a unit circle, so it lies between −1 and 1
(C) θ must be less than 90°
(D) It is a reciprocal

2. Find the length of an arc of a circle of radius 6 cm with a central angle of 120°.

(A) 720 cm
(B) 8π cm
(C) 4π cm
(D) 2π cm

3. One radian is approximately equal to:

(A) 3.1416°
(B) 180°
(C) 57°17′45″
(D) 0.0175°

4. A student says "$\sin^2\theta + \cos^2\theta = 1$ is true only for acute angles". What is wrong with this?

(A) It is an identity, true for every angle, because $x^2 + y^2 = 1$ on the unit circle
(B) It is true only in the first quadrant
(C) It is false for all angles
(D) It is true only for 45°

5. The length of an arc of a circle of radius r with central angle θ (in radians) is:

(A) $l = \theta/r$
(B) $l = r\theta$
(C) $l = \frac{1}{2}r^2\theta$
(D) $l = 2\pi r$

6. The value of cosec 30° is:

(A) √3
(B) 2
(C) 2/√3
(D) 1/2

7. The angle of depression of a boat from the top of a tower is 30°. What is the angle of elevation of the top of the tower from the boat?

(A) 60°
(B) 150°
(C) 90°
(D) 30°, because alternate angles are equal

8. Two sectors have the same radius, but the central angle of the first is twice that of the second. How do their areas compare?

(A) The first is half the second
(B) They are equal
(C) The first is four times the second
(D) The first is twice the second

9. Why is tan 90° undefined?

(A) Because 90° is too large an angle
(B) Because sin 90° = 0
(C) The x-coordinate of the point on the unit circle is 0, and division by 0 is impossible
(D) Because cos 90° = 1

10. Why do the bearing of B from A and the bearing of A from B differ by 180°?

(A) The two distances are different
(B) Both are measured anticlockwise
(C) The two north lines are parallel, so the direction reverses by a half turn
(D) Bearings are measured from the east

11. If $\cos\theta = -3/5$ and θ lies in the second quadrant, find $\tan\theta$.

(A) 4/5
(B) −3/4
(C) 4/3
(D) −4/3

12. Why do co-terminal angles have the same trigonometric ratios?

(A) They lie in different quadrants
(B) Their measures are equal
(C) They share a terminal ray, so they give the same point on the unit circle
(D) They are both acute

13. The area of a sector of a circle with radius r and central angle θ radians is:

(A) $\frac{1}{2}r^2\theta$
(B) $\frac{1}{2}r\theta$
(C) $r\theta$
(D) $\pi r^2\theta$

14. Which value of θ shows that $\sin\theta + \cos\theta = 1$ is NOT an identity?

(A) 30°
(B) 360°
(C) 0°
(D) 90°

15. The correct Pythagorean identity involving sec θ is:

(A) $\sec^2\theta - \tan^2\theta = 0$
(B) $\sec^2\theta + \tan^2\theta = 1$
(C) $\sec\theta - \tan\theta = 1$
(D) $\sec^2\theta - \tan^2\theta = 1$

16. The value of sin 270° is:

(A) undefined
(B) −1
(C) 0
(D) 1

17. From the top of a 60 m tower, the angle of depression of a car on level ground is 60°. How far is the car from the foot of the tower?

(A) 60 m
(B) $20\sqrt{3}$ m
(C) $30\sqrt{3}$ m
(D) $60\sqrt{3}$ m

18. Find the area of a sector of radius 12 cm and central angle π/3.

(A) 24π cm^2
(B) 12π cm^2
(C) 48π cm^2
(D) 4π cm^2

19. Why is sin θ positive but cos θ negative in the second quadrant?

(A) The x-coordinate is positive and the y-coordinate is negative
(B) Both coordinates are negative
(C) Both coordinates are positive
(D) The y-coordinate is positive and the x-coordinate is negative

20. Why does the arc length formula $l = r\theta$ work only when θ is in radians?

(A) A radian is defined as arc length divided by radius
(B) The radius must be in radians
(C) Degrees cannot measure any angle
(D) Radians are bigger than degrees

Answer key

Unit 6 · Advanced Practice

1 B	**2** C	**3** C	**4** A	**5** B
6 B	**7** D	**8** D	**9** C	**10** C
11 D	**12** C	**13** A	**14** A	**15** D
16 B	**17** B	**18** A	**19** D	**20** A

Explanations

1. B. It is the y-coordinate of a point on a unit circle, so it lies between −1 and 1
A point on the unit circle cannot be farther than 1 unit from the x-axis.

2. C. 4π cm
θ = 120° = 2π/3 rad. l = rθ = 6 × 2π/3 = 4π cm.

3. C. 57°17′45″
1 radian = (180/π)° ≈ 57.2958° ≈ 57°17′45″. The value 0.0175 is 1° in radians.

4. A. It is an identity, true for every angle, because $x^2 + y^2 = 1$ on the unit circle
The identity comes from the unit circle equation, so it holds for every angle.

5. B. l = rθ
Arc length is the product of the radius and the central angle in radians.

6. B. 2
cosec 30° = 1 / sin 30° = 1 / (1/2) = 2.

7. D. 30°, because alternate angles are equal
The horizontal lines are parallel, so the alternate angles are equal.

8. D. The first is twice the second
A = ½r^2θ, so for a fixed radius the area is directly proportional to θ.

9. C. The x-coordinate of the point on the unit circle is 0, and division by 0 is impossible
tan θ = y/x. At 90° the point is (0, 1), so tan 90° = 1/0.

10. C. The two north lines are parallel, so the direction reverses by a half turn
The line AB reverses direction when seen from the other end, which is a turn of 180°.

11. D. −4/3
sin θ = 4/5, which is positive in quadrant II. tan θ = sin θ / cos θ = (4/5) ÷ (−3/5) = −4/3.

12. C. They share a terminal ray, so they give the same point on the unit circle
The ratios depend only on the point where the terminal ray meets the unit circle.

13. A. ½r^2θ
A = ½r^2θ, where θ is in radians.

14. A. 30°
At 30°: 1/2 + √3/2 ≈ 1.37, not 1. At 0°, 90° and 360° the sum happens to equal 1, so they prove nothing.

15. D. $\sec^2\theta - \tan^2\theta = 1$
Dividing $\sin^2\theta + \cos^2\theta = 1$ by $\cos^2\theta$ gives $\tan^2\theta + 1 = \sec^2\theta$.

16. **B. −1**
The point on the unit circle at 270° is (0, −1), so sin 270° = −1.

17. **B. $20\sqrt{3}$ m**
tan 60° = 60 / d, so d = 60 / √3 = $20\sqrt{3}$ m.

18. **A. 24π cm^2**
A = ½$r^2\theta$ = ½ × 144 × π/3 = 24π cm^2.

19. **D. The y-coordinate is positive and the x-coordinate is negative**
sin θ = y and cos θ = x on the unit circle. In quadrant II, $y > 0$ and $x < 0$.

20. **A. A radian is defined as arc length divided by radius**
The radian is the ratio of arc to radius, so arc = radius × angle holds only in that unit.

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