

Oblique Triangles MCQs for Entry Test - Exercise 12.6

1 Introduction

This document contains 20 multiple-choice questions based on Exercise 12.6 of the Application of Trigonometry chapter, designed for entry test preparation. Questions test solving oblique triangles using half-angle formulas and the Law of Cosines when all three sides are given, covering all angles, smallest/greatest angles, and specific angle proofs. Solutions provide detailed explanations. Notation: In $\triangle ABC$, angles α, β, γ are opposite sides a, b, c . Angles are in degrees and minutes, sides exact or to two decimal places.

2 Multiple-Choice Questions

1. In $\triangle ABC$, $a = 7$, $b = 7$, $c = 9$. What is α ?
 - A) 50°
 - B) 80°
 - C) 90°
 - D) 120°
2. In $\triangle ABC$, $a = 7$, $b = 7$, $c = 9$. What is γ ?
 - A) 50°
 - B) 80°
 - C) 90°
 - D) 120°
3. In $\triangle ABC$, $a = 32$, $b = 40$, $c = 66$. What is α ?
 - A) $20^\circ 56'$
 - B) $26^\circ 30'$
 - C) $132^\circ 34'$
 - D) 150°
4. In $\triangle ABC$, $a = 32$, $b = 40$, $c = 66$. What is β ?
 - A) $20^\circ 56'$
 - B) $26^\circ 30'$
 - C) $132^\circ 34'$

- D) 150°
5. In $\triangle ABC$, $a = 28.3$, $b = 31.7$, $c = 42.8$. What is α ?
- A) $41^\circ 23'$
B) $47^\circ 46'$
C) $90^\circ 51'$
D) 100°
6. In $\triangle ABC$, $a = 28.3$, $b = 31.7$, $c = 42.8$. What is γ ?
- A) $41^\circ 23'$
B) $47^\circ 46'$
C) $90^\circ 51'$
D) 100°
7. In $\triangle ABC$, $a = 31.9$, $b = 56.31$, $c = 40.27$. What is β ?
- A) $30^\circ 43'$
B) $33^\circ 39'$
C) $115^\circ 38'$
D) 150°
8. In $\triangle ABC$, $a = 31.9$, $b = 56.31$, $c = 40.27$. What is γ ?
- A) $30^\circ 43'$
B) $33^\circ 39'$
C) $115^\circ 38'$
D) 150°
9. In $\triangle ABC$, $a = 4584$, $b = 5140$, $c = 3624$. What is α ?
- A) $43^\circ 17'$
B) $60^\circ 9'$
C) $76^\circ 34'$
D) 90°
10. In $\triangle ABC$, $a = 4584$, $b = 5140$, $c = 3624$. What is γ ?
- A) $43^\circ 17'$
B) $60^\circ 9'$
C) $76^\circ 34'$
D) 90°
11. In $\triangle ABC$, $a = 37.34$, $b = 3.24$, $c = 35.06$. What is the smallest angle?
- A) $3^\circ 39'$

- B) $35^{\circ}6'$
- C) $37^{\circ}34'$
- D) 90°

12. In $\triangle ABC$, $a = 16$, $b = 20$, $c = 23$. What is the greatest angle?

- A) 30°
- B) 60°
- C) $84^{\circ}18'$
- D) $132^{\circ}35'$

13. In $\triangle ABC$, sides are $x^2 + x + 1$, $2x + 1$, $x^2 - 1$. What is α ?

- A) 60°
- B) 90°
- C) 120°
- D) 150°

14. In $\triangle ABC$, $a = 413$, $b = 214$, $c = 375$. What is α ?

- A) $31^{\circ}2'$
- B) $64^{\circ}38'$
- C) $84^{\circ}20'$
- D) 90°

15. In $\triangle ABC$, $a = 413$, $b = 214$, $c = 375$. What is β ?

- A) $31^{\circ}2'$
- B) $64^{\circ}38'$
- C) $84^{\circ}20'$
- D) 90°

16. In $\triangle ABC$, $a = 6$, $b = 9$, $c = 13$. What is α ?

- A) $23^{\circ}51'$
- B) $37^{\circ}21'$
- C) $118^{\circ}46'$
- D) 150°

17. In $\triangle ABC$, $a = 6$, $b = 9$, $c = 13$. What is γ ?

- A) $23^{\circ}51'$
- B) $37^{\circ}21'$
- C) $118^{\circ}46'$
- D) 150°

18. In $\triangle ABC$, $a = 10$, $b = 12$, $c = 15$. What is the smallest angle?

- A) $36^\circ 52'$
- B) 45°
- C) $80^\circ 36'$
- D) 90°

19. In $\triangle ABC$, $a = 8$, $b = 15$, $c = 10$. What is the greatest angle?

- A) 30°
- B) $48^\circ 36'$
- C) $97^\circ 36'$
- D) 120°

20. In $\triangle ABC$, $a = 25$, $b = 30$, $c = 40$. What is β ?

- A) $36^\circ 15'$
- B) $50^\circ 28'$
- C) $93^\circ 17'$
- D) 120°

3 Solutions and Explanations

1. **Question 1:**

$$S = \frac{7 + 7 + 9}{2} = 11.5, \quad S - a = 4.5, \quad \cos \frac{\alpha}{2} = \sqrt{\frac{11.5 \cdot 4.5}{7 \cdot 9}} \approx 0.9063, \quad \alpha \approx 2 \cos^{-1}(0.9063) \approx 50^\circ$$

Answer: A) 50°

2. **Question 2:**

$$S = 11.5, \quad S - c = 2.5, \quad \cos \frac{\gamma}{2} = \sqrt{\frac{11.5 \cdot 2.5}{7 \cdot 7}} \approx 0.7659, \quad \gamma \approx 2 \cos^{-1}(0.7659) \approx 80^\circ.$$

Answer: B) 80°

3. **Question 3:**

$$S = \frac{32 + 40 + 66}{2} = 69, \quad S - a = 37, \quad \cos \frac{\alpha}{2} = \sqrt{\frac{69 \cdot 37}{40 \cdot 66}} \approx 0.9836, \quad \alpha \approx 2 \cos^{-1}(0.9836) \approx 20^\circ 56'$$

Answer: A) $20^\circ 56'$

4. **Question 4:**

$$S = 69, \quad S - b = 29, \quad \cos \frac{\beta}{2} = \sqrt{\frac{69 \cdot 29}{32 \cdot 66}} \approx 0.9733, \quad \beta \approx 2 \cos^{-1}(0.9733) \approx 26^\circ 30'.$$

Answer: B) $26^\circ 30'$

5. **Question 5:**

$$S = \frac{28.3 + 31.7 + 42.8}{2} = 51.4, \quad S-a = 23.1, \quad \cos \frac{\alpha}{2} = \sqrt{\frac{51.4 \cdot 23.1}{31.7 \cdot 42.8}} \approx 0.9352, \quad \alpha \approx 2 \cos^{-1}(0.9352) \approx 41^\circ 23'.$$

Answer: A) $41^\circ 23'$

6. **Question 6:**

$$S = 51.4, \quad S-c = 8.6, \quad \cos \frac{\gamma}{2} = \sqrt{\frac{51.4 \cdot 8.6}{28.3 \cdot 31.7}} \approx 0.7020, \quad \gamma \approx 2 \cos^{-1}(0.7020) \approx 90^\circ 51'.$$

Answer: C) $90^\circ 51'$

7. **Question 7:**

$$S = \frac{31.9 + 56.31 + 40.27}{2} = 64.24, \quad S-b = 7.93, \quad \cos \frac{\beta}{2} = \sqrt{\frac{64.24 \cdot 7.93}{31.9 \cdot 40.27}} \approx 0.6298, \quad \beta \approx 2 \cos^{-1}(0.6298) \approx 115^\circ 38'.$$

Answer: C) $115^\circ 38'$

8. **Question 8:**

$$S = 64.24, \quad S-c = 23.97, \quad \cos \frac{\gamma}{2} = \sqrt{\frac{64.24 \cdot 23.97}{31.9 \cdot 56.31}} \approx 0.9256, \quad \gamma \approx 2 \cos^{-1}(0.9256) \approx 30^\circ 43'.$$

Answer: A) $30^\circ 43'$

9. **Question 9:**

$$S = \frac{4584 + 5140 + 3624}{2} = 6674, \quad S-a = 2090, \quad \cos \frac{\alpha}{2} = \sqrt{\frac{6674 \cdot 2090}{5140 \cdot 3624}} \approx 0.8660, \quad \alpha \approx 2 \cos^{-1}(0.8660) \approx 60^\circ 9'.$$

Answer: B) $60^\circ 9'$

10. **Question 10:**

$$S = 6674, \quad S-c = 3050, \quad \cos \frac{\gamma}{2} = \sqrt{\frac{6674 \cdot 3050}{4584 \cdot 5140}} \approx 0.9295, \quad \gamma \approx 2 \cos^{-1}(0.9295) \approx 43^\circ 17'.$$

Answer: A) $43^\circ 17'$

11. **Question 11:**

$$\cos \beta = \frac{a^2 + c^2 - b^2}{2ac} = \frac{37.34^2 + 35.06^2 - 3.24^2}{2 \cdot 37.34 \cdot 35.06} \approx 0.9982, \quad \beta \approx \cos^{-1}(0.9982) \approx 3^\circ 39'.$$

Answer: A) $3^\circ 39'$

12. **Question 12:**

$$\cos \gamma = \frac{a^2 + b^2 - c^2}{2ab} = \frac{16^2 + 20^2 - 23^2}{2 \cdot 16 \cdot 20} \approx 0.1975, \quad \gamma \approx \cos^{-1}(0.1975) \approx 84^\circ 18'.$$

Answer: C) $84^\circ 18'$

13. **Question 13:**

$$S = \frac{x^2 + x + 1 + 2x + 1 + x^2 - 1}{2} = \frac{2x^2 + 3x + 1}{2}, \quad S-a = \frac{x-1}{2}, \quad \cos \frac{\alpha}{2} = \sqrt{\frac{\frac{2x^2+3x+1}{2} \cdot \frac{x-1}{2}}{(2x+1)(x^2-1)}}$$

Answer: C) 120°

14. **Question 14:**

$$S = \frac{413 + 214 + 375}{2} = 501, \quad S-a = 88, \quad \cos \frac{\alpha}{2} = \sqrt{\frac{501 \cdot 88}{214 \cdot 375}} \approx 0.7412, \quad \alpha \approx 2 \cos^{-1}(0.7412)$$

Answer: C) $84^\circ 20'$

15. **Question 15:**

$$S = 501, \quad S-b = 287, \quad \cos \frac{\beta}{2} = \sqrt{\frac{501 \cdot 287}{413 \cdot 375}} \approx 0.9635, \quad \beta \approx 2 \cos^{-1}(0.9635) \approx 31^\circ 2'.$$

Answer: A) $31^\circ 2'$

16. **Question 16:**

$$S = \frac{6 + 9 + 13}{2} = 14, \quad S-a = 8, \quad \cos \frac{\alpha}{2} = \sqrt{\frac{14 \cdot 8}{9 \cdot 13}} \approx 0.9796, \quad \alpha \approx 2 \cos^{-1}(0.9796) \approx 23^\circ 51'.$$

Answer: A) $23^\circ 51'$

17. **Question 17:**

$$S = 14, \quad S-c = 1, \quad \cos \frac{\gamma}{2} = \sqrt{\frac{14 \cdot 1}{6 \cdot 9}} \approx 0.5092, \quad \gamma \approx 2 \cos^{-1}(0.5092) \approx 118^\circ 46'.$$

Answer: C) $118^\circ 46'$

18. **Question 18:**

$$S = \frac{10 + 12 + 15}{2} = 18.5, \quad \cos \beta = \frac{10^2 + 15^2 - 12^2}{2 \cdot 10 \cdot 15} \approx 0.8033, \quad \beta \approx \cos^{-1}(0.8033) \approx 36^\circ 52'.$$

Answer: A) $36^\circ 52'$

19. **Question 19:**

$$S = \frac{8 + 15 + 10}{2} = 16.5, \quad \cos \beta = \frac{8^2 + 10^2 - 15^2}{2 \cdot 8 \cdot 10} \approx -0.1312, \quad \beta \approx \cos^{-1}(-0.1312) \approx 97^\circ 36'.$$

Answer: C) $97^\circ 36'$

20. **Question 20:**

$$S = \frac{25 + 30 + 40}{2} = 47.5, \quad S-b = 17.5, \quad \cos \frac{\beta}{2} = \sqrt{\frac{47.5 \cdot 17.5}{25 \cdot 40}} \approx 0.9115, \quad \beta \approx 2 \cos^{-1}(0.9115)$$

Answer: B) $50^\circ 28'$