EXPRESSWALA ACADEMY

Maths 1A: Properties of Triangles

MCQ Test, Set 10

Time: 30 minutes | Maximum marks: 25

Name: _____ Class: _____ Date: _____

1. There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
2. Each correct answer carries 1 mark. There is no negative marking.
3. The key sheet and worked solutions are at the end of this test.

1. If the angles of a triangle are in the ratio $1:1:4$, then $a:b:c=$

A. $1:1:-\frac{\sqrt{3}}{3}$ **B.** $1:1:4$

C. $1:\frac{\sqrt{3}}{3}:\frac{\sqrt{3}}{3}$ **D.** $1:1:\sqrt{3}$

2. In triangle ABC, if $a=9$ and $A=60^\circ$, then $R=$

A. $3\sqrt{3}$ **B.** $6\sqrt{3}$ **C.** $\frac{9\sqrt{3}}{2}$ **D.** $\frac{3\sqrt{3}}{2}$

3. In triangle ABC with $a=15$, $b=17$ and $c=8$, $\cos C=$

A. $\frac{15}{17}$ **B.** 0 **C.** $\frac{8}{17}$ **D.** $-\frac{15}{17}$

4. In triangle ABC with $a=13$, $b=12$ and $c=3$, $\cos B=$

A. $-\frac{2}{9}$ **B.** $\frac{17}{39}$ **C.** $\frac{38}{39}$ **D.** $-\frac{17}{39}$

5. In triangle ABC with $a=15$, $b=4$, $c=17$, $b\cos C+c\cos B=$

A. 15 **B.** 17 **C.** 4 **D.** 18

6. In triangle ABC with $a=25$, $b=30$, $c=25$, given $\cos\frac{A}{2}=\frac{2\sqrt{5}}{5}$, Mollweide's rule gives $\sin\frac{B-C}{2}=$

A. $-\frac{2\sqrt{5}}{25}$ **B.** $\frac{2\sqrt{5}}{25}$ **C.** $\frac{22\sqrt{5}}{25}$ **D.** $\frac{\sqrt{5}}{10}$

7. In triangle ABC with $a=25$, $b=17$, $c=26$, $\cos\frac{C}{2}=$

A. $\frac{3}{5}$ **B.** $\frac{3\sqrt{13}}{13}$ **C.** $\frac{16}{25}$ **D.** $\frac{4}{5}$

8. In triangle ABC with $a=8$, $b=26$, $c=30$, $\cos\frac{C}{2}=$

A. $\frac{3\sqrt{13}}{13}$ **B.** $\frac{2\sqrt{13}}{13}$ **C.** $\frac{4}{13}$ **D.** $\frac{8\sqrt{65}}{65}$

9. The area of the triangle with sides 28, 35, 21 is

A. 490 **B.** 294 **C.** 588 **D.** 147

10. A triangle has sides 29, 21, 20 and area 210. Its circumradius R is

A. $\frac{29}{4}$ **B.** 29 **C.** $\frac{29}{2}$ **D.** 58

11. In the triangle with $a=18$, $b=24$, $c=30$ and area 216, $\sin B=$

A. $\frac{2}{5}$ **B.** $\frac{3}{5}$ **C.** 1 **D.** $\frac{4}{5}$

12. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 5:9:8$, then $a:b:c =$

A. $12:4:6$ **B.** $8:5:9$ **C.** $17:13:14$ **D.** $5:9:8$

---

13. If $a + c = 3b$ in triangle ABC, then $\tan\frac{A}{2}\tan\frac{C}{2} =$

A. 2 **B.** $\frac{1}{3}$ **C.** $\frac{1}{2}$ **D.** $\frac{2}{3}$

---

14. In the triangle with $a = 6$, $b = 29$, $c = 25$ and area 60, the altitude from A is

A. 3 **B.** 10 **C.** $\frac{120}{29}$ **D.** 20

---

15. In the triangle with $a = 40$, $b = 25$, $c = 25$, the incentre I divides the bisector AD so that $AI : ID =$

A. $1:1$ **B.** $\frac{8}{5}:1$ **C.** $\frac{4}{5}:1$ **D.** $\frac{5}{4}:1$

---

16. In triangle ABC, $A = 30^\circ$, $B = 60^\circ$ and $c = 4$. Then $a =$

A. 4 **B.** 2 **C.** 8 **D.** $2\sqrt{3}$

---

17. The number of triangles with $a = 15$, $b = 10\sqrt{3}$ and $A = 60^\circ$ is

A. 1 **B.** 2 **C.** 0 **D.** 3

---

18. The number of triangles with $a = 18$, $b = 18$ and $A = 30^\circ$ is

A. 2 **B.** 3 **C.** 1 **D.** 0

---

19. For the triangle with $a = 17$, $b = 30$, $c = 17$, $r_3 =$

A. 8 **B.** 60 **C.** $\frac{289}{16}$ **D.** $\frac{15}{4}$

---

20. In an equilateral triangle of side 6, $r =$

A. $\sqrt{3}$ **B.** $3\sqrt{3}$ **C.** $9\sqrt{3}$ **D.** $2\sqrt{3}$

---

21. If $r_1 = 5$, $r_2 = 8$, $r_3 = 120$, then $r =$

A. 133 **B.** $\frac{133}{3}$ **C.** $\frac{4800}{133}$ **D.** 3

---

22. If $r_1 = \frac{63}{2}$, $r_2 = \frac{28}{3}$, $r_3 = 36$, then the semi-perimeter $s =$

A. 1764 **B.** $\frac{461}{6}$ **C.** 84 **D.** 42

---

23. For the triangle with $a = 34$, $b = 34$, $c = 32$ (so $R = \frac{289}{15}$), the circumradius of the excentral triangle is

A. $\frac{1156}{15}$ **B.** $\frac{578}{15}$ **C.** $\frac{289}{30}$ **D.** $\frac{289}{15}$

---

24. The area of a regular hexagon of side 9 is

A. $243\sqrt{3}$ **B.** $\frac{81\sqrt{3}}{4}$ **C.** $\frac{243\sqrt{3}}{2}$ **D.** 486

---

25. A quadrilateral with sides 10, 6, 3, 7 is cyclic and has an incircle. Its area is

A. 9 **B.** $\frac{6\sqrt{35}}{13}$ **C.** $6\sqrt{35}$ **D.** $3\sqrt{35}$

Key sheet

1. D	**2.** A	**3.** A	**4.** B	**5.** A
6. B	**7.** D	**8.** B	**9.** B	**10.** C
11. D	**12.** C	**13.** C	**14.** D	**15.** D
16. B	**17.** A	**18.** C	**19.** A	**20.** A
21. D	**22.** D	**23.** B	**24.** C	**25.** C

Solutions

1. If the angles of a triangle are in the ratio $1:1:4$, then $a:b:c=$

Angles: $30^\circ, 30^\circ, 120^\circ$.

$a:b:c=\sin A:\sin B:\sin C=1:1:\sqrt{3}$

Ans: (D) $1:1:\sqrt{3}$

---

2. In triangle ABC, if $a=9$ and $A=60^\circ$, then $R=$

$2R=\frac{a}{\sin A}=6\sqrt{3}$

$R=3\sqrt{3}$

Ans: (A) $3\sqrt{3}$

---

3. In triangle ABC with $a=15$, $b=17$ and $c=8$, $\cos C=$

$\cos C=\frac{a^2+b^2-c^2}{2ab}$

$=\frac{225+289-64}{510}=\frac{15}{17}$

Ans: (A) $\frac{15}{17}$

---

4. In triangle ABC with $a=13$, $b=12$ and $c=3$, $\cos B=$

$\cos B=\frac{c^2+a^2-b^2}{2ca}$

$=\frac{9+169-144}{78}=\frac{17}{39}$

Ans: (B) $\frac{17}{39}$

---

5. In triangle ABC with $a=15$, $b=4$, $c=17$, $b\cos C+c\cos B=$

By the projection rule, $b\cos C+c\cos B=a$.

$a=15$

Ans: (A) 15

---

6. In triangle ABC with $a=25$, $b=30$, $c=25$, given $\cos\frac{A}{2}=\frac{2\sqrt{5}}{5}$, Mollweide's rule gives $\sin\frac{B-C}{2}=$

$\frac{b-c}{a}=\frac{\sin\frac{B-C}{2}}{\cos\frac{A}{2}}$

$\sin\frac{B-C}{2}=\frac{5}{25}\cdot\frac{2\sqrt{5}}{5}=\frac{2\sqrt{5}}{25}$

Ans: (B) $\frac{2\sqrt{5}}{25}$

---

7. In triangle ABC with $a=25$, $b=17$, $c=26$, $\cos\frac{C}{2}=$

$s=34,\ \Delta=204$

$\cos\frac{C}{2}=\sqrt{\frac{s(s-c)}{ab}}=\sqrt{\frac{34\cdot 8}{25\cdot 17}}=\frac{4}{5}$

Ans: (D) $\frac{4}{5}$

---

8. In triangle ABC with $a=8$, $b=26$, $c=30$, $\cos\frac{C}{2}=$

$s=32,\ \Delta=96$

$\cos\frac{C}{2}=\sqrt{\frac{s(s-c)}{ab}}=\sqrt{\frac{32\cdot 2}{8\cdot 26}}=\frac{2\sqrt{13}}{13}$

Ans: (B) $\frac{2\sqrt{13}}{13}$

---

9. The area of the triangle with sides $28, 35, 21$ is

$s = \frac{28+35+21}{2} = 42$

$\Delta = \sqrt{42 \cdot 14 \cdot 7 \cdot 21} = 294$

Ans: (B) 294

---

10. A triangle has sides $29, 21, 20$ and area 210. Its circumradius R is

$R = \frac{abc}{4\Delta} = \frac{12180}{840} = \frac{29}{2}$

Ans: (C) $\frac{29}{2}$

---

11. In the triangle with $a = 18$, $b = 24$, $c = 30$ and area 216, $\sin B =$

$\sin B = \frac{2\Delta}{ac} = \frac{4}{5}$

Ans: (D) $\frac{4}{5}$

---

12. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 5 : 9 : 8$, then $a : b : c =$

$s - a : s - b : s - c = 5 : 9 : 8$ and $a = (s-b) + (s-c)$.

$a : b : c = 17 : 13 : 14 = 17 : 13 : 14$

Ans: (C) $17 : 13 : 14$

---

13. If $a + c = 3b$ in triangle ABC, then $\tan\frac{A}{2}\tan\frac{C}{2} =$

$\tan\frac{A}{2}\tan\frac{C}{2} = \frac{s-b}{s} = \frac{n-1}{n+1} = \frac{1}{2}$

Ans: (C) $\frac{1}{2}$

---

14. In the triangle with $a = 6$, $b = 29$, $c = 25$ and area 60, the altitude from A is

$\frac{2\Delta}{a} = \frac{120}{6} = 20$

Ans: (D) 20

---

15. In the triangle with $a = 40$, $b = 25$, $c = 25$, the incentre I divides the bisector AD so that $AI : ID =$

$AI : ID = (b + c) : a = 50 : 40$

Ans: (D) $\frac{5}{4} : 1$

---

16. In triangle ABC, $A = 30^\circ$, $B = 60^\circ$ and $c = 4$. Then $a =$

$C = 90^\circ,\ 2R = \frac{c}{\sin C} = 4$

$a = 2R\sin A = 2$

Ans: (B) 2

---

17. The number of triangles with $a = 15$, $b = 10\sqrt{3}$ and $A = 60^\circ$ is

$b\sin A = 15$

Compare $a = 15$ with $b\sin A$ and b: one triangle.

Ans: (A) 1

---

18. The number of triangles with $a = 18$, $b = 18$ and $A = 30^\circ$ is

$b \sin A = 9$

Compare $a = 18$ with $b \sin A$ and b: one triangle.

Ans: (C) 1

---

19. For the triangle with $a = 17$, $b = 30$, $c = 17$, $r_3 =$

$s = \frac{17+30+17}{2} = 32$

$\Delta = \sqrt{32 \cdot 15 \cdot 2 \cdot 15} = 120$

$r_3 = 8$

Ans: (A) 8

---

20. In an equilateral triangle of side 6, $r =$

$r = \frac{a}{2\sqrt{3}}$, $R = \frac{a}{\sqrt{3}}$, $r_1 = \frac{\sqrt{3}a}{2}$

$r = \sqrt{3}$

Ans: (A) $\sqrt{3}$

---

21. If $r_1 = 5$, $r_2 = 8$, $r_3 = 120$, then $r =$

$\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} = \frac{1}{3}$

$r = 3$

Ans: (D) 3

---

22. If $r_1 = \frac{63}{2}$, $r_2 = \frac{28}{3}$, $r_3 = 36$, then the semi-perimeter $s =$

$s^2 = r_1 r_2 + r_2 r_3 + r_3 r_1 = 1764$

$s = 42$

Ans: (D) 42

---

23. For the triangle with $a = 34$, $b = 34$, $c = 32$ (so $R = \frac{289}{15}$), the circumradius of the excentral triangle is

The excentral triangle has circumradius $2R$.

$2R = \frac{578}{15}$

Ans: (B) $\frac{578}{15}$

---

24. The area of a regular hexagon of side 9 is

$\frac{1}{4} \cdot 6 \cdot 81 \cdot \cot 30^\circ = \frac{3\sqrt{3}}{2} \cdot 81 = \frac{243\sqrt{3}}{2}$

Ans: (C) $\frac{243\sqrt{3}}{2}$

---

25. A quadrilateral with sides 10, 6, 3, 7 is cyclic and has an incircle. Its area is

$a + c = b + d$, so an incircle exists; the area of such a quadrilateral is $\sqrt{abcd}$.

$\sqrt{1260} = 6\sqrt{35}$

Ans: (C) $6\sqrt{35}$
