EXPRESSWALA ACADEMY

Maths 1A: Properties of Triangles

MCQ Test, Set 04

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 $1:4:7$, then $a:b:c=$

A. $1:\frac{\sqrt{6}+3\sqrt{2}}{2}:\sqrt{3}+2$ **B.** $1:\frac{-\sqrt{2}+\sqrt{6}}{2}:\sqrt{3}-2$

C. $1:4:7$ **D.** $1:\frac{-\sqrt{6}+3\sqrt{2}}{2}:2-\sqrt{3}$

2. In triangle ABC, if $a=10\sqrt{6}$ and $A=60^\circ$, then $R=$

A. $10\sqrt{2}$ **B.** $20\sqrt{2}$ **C.** $5\sqrt{2}$ **D.** $15\sqrt{2}$

3. In triangle ABC with $a=26$, $b=26$ and $c=20$, $\cos B=$

A. $-\frac{5}{13}$ **B.** $\frac{5}{13}$ **C.** $\frac{8}{13}$ **D.** $\frac{119}{169}$

4. In triangle ABC with $a=12$, $b=10$ and $c=13$, $\cos C=$

A. $-\frac{5}{16}$ **B.** $\frac{25}{52}$ **C.** $\frac{71}{104}$ **D.** $\frac{5}{16}$

5. In triangle ABC with $a=13$, $b=11$, $c=14$, $a\cos B+b\cos A=$

A. 11 **B.** 13 **C.** 19 **D.** 14

6. In triangle ABC with $a=30$, $b=14$, $c=40$, given $\cos\frac{B}{2}=\frac{7\sqrt{2}}{10}$, Mollweide's rule gives $\sin\frac{C-A}{2}=$

A. $\frac{\sqrt{2}}{2}$ **B.** $-\frac{\sqrt{2}}{2}$ **C.** $\frac{25\sqrt{2}}{49}$ **D.** $\frac{7\sqrt{2}}{2}$

7. In triangle ABC with $a=10$, $b=10$, $c=16$, $\cos\frac{B}{2}=$

A. $\frac{3}{5}$ **B.** $\frac{\sqrt{10}}{10}$ **C.** $\frac{9}{10}$ **D.** $\frac{3\sqrt{10}}{10}$

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

A. $\frac{4}{5}$ **B.** $\frac{2\sqrt{13}}{13}$ **C.** $\frac{9}{13}$ **D.** $\frac{3\sqrt{13}}{13}$

9. The area of the triangle with sides 32, 20, 20 is

A. 96 **B.** 320 **C.** 192 **D.** 384

10. A triangle has sides 40, 37, 13 and area 240. Its circumradius R is

A. $\frac{481}{6}$ **B.** $\frac{481}{12}$ **C.** $\frac{481}{24}$ **D.** $\frac{481}{48}$

11. In the triangle with $a=21$, $b=20$, $c=29$ and area 210, $\sin B=$

A. 1 **B.** $\frac{20}{29}$ **C.** $\frac{21}{29}$ **D.** $\frac{10}{29}$

12. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 4:5:8$, then $a:b:c =$

A. $4:5:8$ **B.** $8:4:5$ **C.** $13:12:9$ **D.** $9:7:1$

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

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

14. In the triangle with $a = 18$, $b = 20$, $c = 34$ and area 144, the altitude from B is

A. 16 **B.** 10 **C.** $\frac{72}{5}$ **D.** $\frac{36}{5}$

15. In the triangle with $a = 24$, $b = 30$, $c = 18$, the incentre I divides the bisector AD so that $AI : ID =$

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

16. In triangle ABC, $A = 120^\circ$, $B = 15^\circ$ and $c = 4$. Then $a =$

A. $2\sqrt{3}$ **B.** $2\sqrt{6}$ **C.** $2\sqrt{3} - 2$ **D.** $4\sqrt{2}$

17. The number of triangles with $a = 5\sqrt{3}$, $b = 10$ and $A = 60^\circ$ is

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

18. The number of triangles with $a = 14$, $b = 14$ and $A = 30^\circ$ is

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

19. For the triangle with $a = 8$, $b = 30$, $c = 26$, $r_2 =$

A. 48 **B.** 3 **C.** 16 **D.** 4

20. In an equilateral triangle of side $11\sqrt{3}$, $r =$

A. $\frac{33}{2}$ **B.** 11 **C.** $\frac{363\sqrt{3}}{4}$ **D.** $\frac{11}{2}$

21. If $r_1 = 6$, $r_2 = 24$, $r_3 = 6$, then $r =$

A. 24 **B.** 12 **C.** $\frac{8}{3}$ **D.** 36

22. If $r_1 = \frac{44}{3}$, $r_2 = 66$, $r_3 = 12$, then the semi-perimeter $s =$

A. $\frac{278}{3}$ **B.** 44 **C.** 88 **D.** 1936

23. For the triangle with $a = 13$, $b = 10$, $c = 13$ (so $R = \frac{169}{24}$, $s = 18$), the area of the excentral triangle is

A. $\frac{507}{4}$ **B.** $\frac{171}{2}$ **C.** $\frac{507}{2}$ **D.** 507

24. The area of a regular hexagon of side 6 is

A. 216 **B.** $54\sqrt{3}$ **C.** $9\sqrt{3}$ **D.** $108\sqrt{3}$

25. A quadrilateral with sides 11, 9, 3, 5 is cyclic and has an incircle. Its area is

A. $\frac{3\sqrt{165}}{14}$ **B.** $\sqrt{114}$ **C.** $3\sqrt{165}$ **D.** $\frac{3\sqrt{165}}{2}$

Key sheet

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

Solutions

1. If the angles of a triangle are in the ratio $1:4:7$, then $a:b:c=$

Angles: $15^\circ, 60^\circ, 105^\circ$.

$a:b:c=\sin A:\sin B:\sin C=1:\frac{\sqrt{6}+3\sqrt{2}}{2}:\sqrt{3}+2$

Ans: (A) $1:\frac{\sqrt{6}+3\sqrt{2}}{2}:\sqrt{3}+2$

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2. In triangle ABC, if $a=10\sqrt{6}$ and $A=60^\circ$, then $R=$

$2R=\frac{a}{\sin A}=20\sqrt{2}$

$R=10\sqrt{2}$

Ans: (A) $10\sqrt{2}$

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3. In triangle ABC with $a=26$, $b=26$ and $c=20$, $\cos B=$

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

$=\frac{400+676-676}{1040}=\frac{5}{13}$

Ans: (B) $\frac{5}{13}$

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4. In triangle ABC with $a=12$, $b=10$ and $c=13$, $\cos C=$

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

$=\frac{144+100-169}{240}=\frac{5}{16}$

Ans: (D) $\frac{5}{16}$

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5. In triangle ABC with $a=13$, $b=11$, $c=14$, $a\cos B+b\cos A=$

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

$c=14$

Ans: (D) 14

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6. In triangle ABC with $a=30$, $b=14$, $c=40$, given $\cos\frac{B}{2}=\frac{7\sqrt{2}}{10}$, Mollweide's rule gives $\sin\frac{C-A}{2}=$

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

$\sin\frac{C-A}{2}=\frac{10}{14}\cdot\frac{7\sqrt{2}}{10}=\frac{\sqrt{2}}{2}$

Ans: (A) $\frac{\sqrt{2}}{2}$

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7. In triangle ABC with $a=10$, $b=10$, $c=16$, $\cos\frac{B}{2}=$

$s=18,\ \Delta=48$

$\cos\frac{B}{2}=\sqrt{\frac{s(s-b)}{ac}}=\sqrt{\frac{18\cdot 8}{10\cdot 16}}=\frac{3\sqrt{10}}{10}$

Ans: (D) $\frac{3\sqrt{10}}{10}$

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

$s=34,\ \Delta=204$

$\cos\frac{C}{2}=\sqrt{\frac{s(s-c)}{ab}}=\sqrt{\frac{34\cdot 9}{26\cdot 17}}=\frac{3\sqrt{13}}{13}$

Ans: (D) $\frac{3\sqrt{13}}{13}$

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9. The area of the triangle with sides 32, 20, 20 is

$s = \frac{32+20+20}{2} = 36$

$\Delta = \sqrt{36 \cdot 4 \cdot 16 \cdot 16} = 192$

Ans: (C) 192

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10. A triangle has sides 40, 37, 13 and area 240. Its circumradius R is

$R = \frac{abc}{4\Delta} = \frac{19240}{960} = \frac{481}{24}$

Ans: (C) $\frac{481}{24}$

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11. In the triangle with $a = 21$, $b = 20$, $c = 29$ and area 210, $\sin B =$

$\sin B = \frac{2\Delta}{ac} = \frac{20}{29}$

Ans: (B) $\frac{20}{29}$

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12. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 4 : 5 : 8$, then $a : b : c =$

$s - a : s - b : s - c = 4 : 5 : 8$ and $a = (s-b) + (s-c)$.

$a : b : c = 13 : 12 : 9 = 13 : 12 : 9$

Ans: (C) $13 : 12 : 9$

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

$\tan\frac{A}{2}\tan\frac{C}{2} = \frac{s-b}{s} = \frac{n-1}{n+1} = \frac{1}{5}$

Ans: (A) $\frac{1}{5}$

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14. In the triangle with $a = 18$, $b = 20$, $c = 34$ and area 144, the altitude from B is

$\frac{2\Delta}{b} = \frac{288}{20} = \frac{72}{5}$

Ans: (C) $\frac{72}{5}$

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15. In the triangle with $a = 24$, $b = 30$, $c = 18$, the incentre I divides the bisector AD so that $AI : ID =$

$AI : ID = (b + c) : a = 48 : 24$

Ans: (D) $2 : 1$

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16. In triangle ABC, $A = 120^\circ$, $B = 15^\circ$ and $c = 4$. Then $a =$

$C = 45^\circ$, $2R = \frac{c}{\sin C} = 4\sqrt{2}$

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

Ans: (B) $2\sqrt{6}$

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17. The number of triangles with $a = 5\sqrt{3}$, $b = 10$ and $A = 60^\circ$ is

$b\sin A = 5\sqrt{3}$

Compare $a = 5\sqrt{3}$ with $b\sin A$ and b: one triangle.

Ans: (A) 1

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18. The number of triangles with $a = 14$, $b = 14$ and $A = 30^\circ$ is

$b \sin A = 7$

Compare $a = 14$ with $b \sin A$ and b: one triangle.

Ans: (B) 1

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19. For the triangle with $a = 8$, $b = 30$, $c = 26$, $r_2 =$

$s = \frac{8+30+26}{2} = 32$

$\Delta = \sqrt{32 \cdot 24 \cdot 2 \cdot 6} = 96$

$r_2 = 48$

Ans: (A) 48

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20. In an equilateral triangle of side $11\sqrt{3}$, $r =$

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

$r = \frac{11}{2}$

Ans: (D) $\frac{11}{2}$

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21. If $r_1 = 6$, $r_2 = 24$, $r_3 = 6$, then $r =$

$\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} = \frac{3}{8}$

$r = \frac{8}{3}$

Ans: (C) $\frac{8}{3}$

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22. If $r_1 = \frac{44}{3}$, $r_2 = 66$, $r_3 = 12$, then the semi-perimeter $s =$

$s^2 = r_1 r_2 + r_2 r_3 + r_3 r_1 = 1936$

$s = 44$

Ans: (B) 44

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23. For the triangle with $a = 13$, $b = 10$, $c = 13$ (so $R = \frac{169}{24}$, $s = 18$), the area of the excentral triangle is

Area of the excentral triangle $= 2Rs$.

$2 \cdot \frac{169}{24} \cdot 18 = \frac{507}{2}$

Ans: (C) $\frac{507}{2}$

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24. The area of a regular hexagon of side 6 is

$\frac{1}{4} \cdot 6 \cdot 36 \cdot \cot 30^\circ = \frac{3\sqrt{3}}{2} \cdot 36 = 54\sqrt{3}$

Ans: (B) $54\sqrt{3}$

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25. A quadrilateral with sides 11, 9, 3, 5 is cyclic and has an incircle. Its area is

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

$\sqrt{1485} = 3\sqrt{165}$

Ans: (C) $3\sqrt{165}$
