EXPRESSWALA ACADEMY

Maths 1A: Properties of Triangles

MCQ Test, Set 02

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. In triangle ABC, if $a = 10\sqrt{3}$ and $A = 120^\circ$, then $R =$

A. 15 **B.** 5 **C.** 10 **D.** 20

2. If the angles of a triangle are in the ratio $1 : 1 : 2$, then $a : b : c =$

A. $1 : 1 : 2$ **B.** $1 : 1 : 0$

C. $1 : \frac{\sqrt{2}}{2} : \frac{\sqrt{2}}{2}$ **D.** $1 : 1 : \sqrt{2}$

3. In triangle ABC with $a = 20$, $b = 20$ and $c = 24$, $\cos A =$

A. $-\frac{3}{5}$ **B.** $\frac{7}{25}$ **C.** $\frac{2}{5}$ **D.** $\frac{3}{5}$

4. In triangle ABC with $a = 7$, $b = 3$ and $c = 6$, $\cos C =$

A. $\frac{11}{21}$ **B.** $-\frac{1}{9}$ **C.** $\frac{19}{21}$ **D.** $-\frac{11}{21}$

5. In triangle ABC with $a = 6$, $b = 16$, $c = 19$, $a\cos B + b\cos A =$

A. $\frac{41}{2}$ **B.** 16 **C.** 6 **D.** 19

6. In triangle ABC with $a = 25$, $b = 14$, $c = 25$, given $\cos\frac{C}{2} = \frac{4}{5}$, Mollweide's rule gives $\sin\frac{A-B}{2} =$

A. $\frac{156}{125}$ **B.** $\frac{44}{125}$ **C.** $\frac{11}{20}$ **D.** $-\frac{44}{125}$

7. In triangle ABC with $a = 10$, $b = 26$, $c = 24$, $\tan\frac{A}{2} =$

A. 1 **B.** $\frac{1}{5}$ **C.** $\frac{1}{25}$ **D.** 5

8. In triangle ABC with $a = 32$, $b = 40$, $c = 24$, $\cot\frac{C}{2} =$

A. $\frac{1}{3}$ **B.** 2 **C.** 9 **D.** 3

9. The area of the triangle with sides 28, 17, 25 is

A. 238 **B.** 105 **C.** 210 **D.** 420

10. A triangle has sides 8, 30, 26 and area 96. Its circumradius R is

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

11. In the triangle with $a = 18$, $b = 15$, $c = 15$ and area 108, $\sin B =$

A. $\frac{4}{5}$ **B.** $\frac{2}{5}$ **C.** $\frac{3}{5}$ **D.** $\frac{8}{5}$

12. In triangle ABC, $a = 63$, $b = 27$, $c = 72$. Then the angle A is

A. 120° **B.** 60° **C.** 45° **D.** 30°

13. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 4 : 9 : 7$, then $a : b : c =$

A. $12 : 2 : 6$ **B.** $7 : 4 : 9$ **C.** $4 : 9 : 7$ **D.** $16 : 11 : 13$

14. In the triangle with $a = 15$, $b = 36$, $c = 39$ and area 270, the altitude from B is

A. 15 **B.** 36 **C.** 18 **D.** $\frac{15}{2}$

15. In triangle ABC, $a = 15$, $b = 14$, $c = 2$. The bisector of A meets BC at D. Then $BD =$

A. $\frac{28}{15}$ **B.** $\frac{15}{2}$ **C.** $\frac{105}{8}$ **D.** $\frac{15}{8}$

16. In triangle ABC, $A = 60^\circ$, $B = 90^\circ$ and $c = 2$. Then $a =$

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

17. The number of triangles with $a = 7$, $b = 8$ and $A = 60^\circ$ is

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

18. The number of triangles with $a = 9$, $b = 6$ and $A = 30^\circ$ is

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

19. In a triangle, $r = 7$ and $R = 17$. Then $\cos A + \cos B + \cos C =$

A. $\frac{7}{17}$ **B.** $\frac{24}{17}$ **C.** $\frac{24}{7}$ **D.** $\frac{10}{17}$

20. For the triangle with $a = 10$, $b = 17$, $c = 9$, $r_3 =$

A. 4 **B.** 2 **C.** $\frac{9}{2}$ **D.** 36

21. In the triangle with $a = 8$, $b = 30$, $c = 26$, $r_1 + r_2 + r_3 - r =$

A. $\frac{65}{4}$ **B.** 65 **C.** 32 **D.** $\frac{65}{2}$

22. If $r_1 = 12$, $r_2 = 28$, $r_3 = 6$, then $r =$

A. $\frac{1008}{23}$ **B.** $\frac{7}{2}$ **C.** $\frac{46}{3}$ **D.** 46

23. For the triangle with $a = 25$, $b = 39$, $c = 40$ (so $R = \frac{125}{6}$), the circumradius of the excentral triangle is

A. $\frac{125}{12}$ **B.** $\frac{125}{6}$ **C.** $\frac{125}{3}$ **D.** $\frac{250}{3}$

24. The area of a regular hexagon of side 8 is

A. $96\sqrt{3}$ **B.** $16\sqrt{3}$ **C.** $192\sqrt{3}$ **D.** 384

25. A quadrilateral with sides 6, 12, 9, 3 is cyclic and has an incircle. The radius of the incircle is

A. $\frac{6\sqrt{6}}{5}$ **B.** $18\sqrt{6}$ **C.** $\frac{3\sqrt{6}}{5}$ **D.** $\frac{12\sqrt{6}}{5}$

Key sheet

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

Solutions

1. In triangle ABC, if $a = 10\sqrt{3}$ and $A = 120^\circ$, then $R =$

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

$R = 10$

Ans: (C) 10

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2. If the angles of a triangle are in the ratio $1 : 1 : 2$, then $a : b : c =$

Angles: $45^\circ, 45^\circ, 90^\circ$.

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

Ans: (D) $1 : 1 : \sqrt{2}$

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3. In triangle ABC with $a = 20$, $b = 20$ and $c = 24$, $\cos A =$

$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

$= \frac{400 + 576 - 400}{960} = \frac{3}{5}$

Ans: (D) $\frac{3}{5}$

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4. In triangle ABC with $a = 7$, $b = 3$ and $c = 6$, $\cos C =$

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

$= \frac{49 + 9 - 36}{42} = \frac{11}{21}$

Ans: (A) $\frac{11}{21}$

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5. In triangle ABC with $a = 6$, $b = 16$, $c = 19$, $a\cos B + b\cos A =$

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

$c = 19$

Ans: (D) 19

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6. In triangle ABC with $a = 25$, $b = 14$, $c = 25$, given $\cos\frac{C}{2} = \frac{4}{5}$, Mollweide's rule gives $\sin\frac{A-B}{2} =$

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

$\sin\frac{A-B}{2} = \frac{11}{25} \cdot \frac{4}{5} = \frac{44}{125}$

Ans: (B) $\frac{44}{125}$

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7. In triangle ABC with $a = 10$, $b = 26$, $c = 24$, $\tan\frac{A}{2} =$

$s = 30,\ \Delta = 120$

$\tan\frac{A}{2} = \frac{(s-b)(s-c)}{\Delta} = \frac{4 \cdot 6}{120} = \frac{1}{5}$

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

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8. In triangle ABC with $a = 32$, $b = 40$, $c = 24$, $\cot\frac{C}{2} =$

$s = 48,\ \Delta = 384$

$\cot\frac{C}{2} = \frac{s(s-c)}{\Delta} = \frac{48 \cdot 24}{384} = 3$

Ans: (D) 3

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9. The area of the triangle with sides $28, 17, 25$ is

$s = \frac{28+17+25}{2} = 35$

$\Delta = \sqrt{35 \cdot 7 \cdot 18 \cdot 10} = 210$

Ans: (C) 210

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10. A triangle has sides $8, 30, 26$ and area 96. Its circumradius R is

$R = \frac{abc}{4\Delta} = \frac{6240}{384} = \frac{65}{4}$

Ans: (C) $\frac{65}{4}$

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11. In the triangle with $a = 18$, $b = 15$, $c = 15$ and area 108, $\sin B =$

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

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

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12. In triangle ABC, $a = 63$, $b = 27$, $c = 72$. Then the angle A is

$\cos A = \frac{b^2+c^2-a^2}{2bc} = \frac{1}{2}$

$A = 60^\circ$

Ans: (B) 60°

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13. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 4 : 9 : 7$, then $a : b : c =$

$s-a : s-b : s-c = 4 : 9 : 7$ and $a = (s-b) + (s-c)$.

$a : b : c = 16 : 11 : 13 = 16 : 11 : 13$

Ans: (D) $16 : 11 : 13$

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14. In the triangle with $a = 15$, $b = 36$, $c = 39$ and area 270, the altitude from B is

$\frac{2\Delta}{b} = \frac{540}{36} = 15$

Ans: (A) 15

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15. In triangle ABC, $a = 15$, $b = 14$, $c = 2$. The bisector of A meets BC at D. Then $BD =$

$BD : DC = c : b = 2 : 14$

$BD = \frac{2}{16} \times 15 = \frac{15}{8}$

Ans: (D) $\frac{15}{8}$

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16. In triangle ABC, $A = 60^\circ$, $B = 90^\circ$ and $c = 2$. Then $a =$

$C = 30^\circ,\ 2R = \frac{c}{\sin C} = 4$

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

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

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17. The number of triangles with $a = 7$, $b = 8$ and $A = 60^\circ$ is

$b\sin A = 4\sqrt{3}$

Compare $a = 7$ with $b\sin A$ and b: two triangles.

Ans: (B) 2

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18. The number of triangles with $a = 9$, $b = 6$ and $A = 30^\circ$ is

$b \sin A = 3$

Compare $a = 9$ with $b \sin A$ and b: one triangle.

Ans: (C) 1

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19. In a triangle, $r = 7$ and $R = 17$. Then $\cos A + \cos B + \cos C =$

$\cos A + \cos B + \cos C = 1 + \frac{r}{R} = 1 + \frac{7}{17} = \frac{24}{17}$

Ans: (B) $\frac{24}{17}$

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20. For the triangle with $a = 10$, $b = 17$, $c = 9$, $r_3 =$

$s = \frac{10+17+9}{2} = 18$

$\Delta = \sqrt{18 \cdot 8 \cdot 1 \cdot 9} = 36$

$r_3 = 4$

Ans: (A) 4

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21. In the triangle with $a = 8$, $b = 30$, $c = 26$, $r_1 + r_2 + r_3 - r =$

$r_1 + r_2 + r_3 - r = 4R$ and $R = \frac{abc}{4\Delta} = \frac{65}{4}$.

$4R = 65$

Ans: (B) 65

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22. If $r_1 = 12$, $r_2 = 28$, $r_3 = 6$, then $r =$

$\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} = \frac{2}{7}$

$r = \frac{7}{2}$

Ans: (B) $\frac{7}{2}$

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23. For the triangle with $a = 25$, $b = 39$, $c = 40$ (so $R = \frac{125}{6}$), the circumradius of the excentral triangle is

The excentral triangle has circumradius $2R$.

$2R = \frac{125}{3}$

Ans: (C) $\frac{125}{3}$

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24. The area of a regular hexagon of side 8 is

$\frac{1}{4} \cdot 6 \cdot 64 \cdot \cot 30^\circ = \frac{3\sqrt{3}}{2} \cdot 64 = 96\sqrt{3}$

Ans: (A) $96\sqrt{3}$

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25. A quadrilateral with sides $6, 12, 9, 3$ is cyclic and has an incircle. The radius of the incircle is

$\text{Area} = \sqrt{abcd} = 18\sqrt{6},\ s = 15$

$r = \frac{\text{Area}}{s} = \frac{6\sqrt{6}}{5}$

Ans: (A) $\frac{6\sqrt{6}}{5}$
