EXPRESSWALA ACADEMY

Maths 1A: Properties of Triangles

MCQ Test, Set 05

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 $a = 24$ and $A = 60^\circ$, then $R =$

A. $16\sqrt{3}$ **B.** $8\sqrt{3}$ **C.** $12\sqrt{3}$ **D.** $4\sqrt{3}$

2. If the angles of a triangle are in the ratio $1 : 5 : 6$, then $a : b : c =$

A. $1 : 5 : 6$ **B.** $1 : 2 - \sqrt{3} : 0$

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

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

A. $\frac{3}{5}$ **B.** $\frac{18}{25}$ **C.** $\frac{7}{25}$ **D.** $-\frac{7}{25}$

4. In triangle ABC with $a = 12$, $b = 8$ and $c = 6$, $\cos A =$

A. $\frac{11}{24}$ **B.** $\frac{29}{36}$ **C.** $\frac{43}{48}$ **D.** $-\frac{11}{24}$

5. In triangle ABC with $a = 13$, $b = 11$, $c = 4$, $(b + c)\cos A + (c + a)\cos B + (a + b)\cos C =$

A. 14 **B.** 24 **C.** 28 **D.** 56

6. In triangle ABC, if $b = 2$, $c = 11$, $A = 60^\circ$, then $\tan\frac{B-C}{2} =$

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

7. In triangle ABC with $a = 15$, $b = 7$, $c = 20$, $\cot\frac{C}{2} =$

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

8. In triangle ABC with $a = 8$, $b = 15$, $c = 17$, $\cot\frac{B}{2} =$

A. $\frac{5}{3}$ **B.** $\frac{25}{9}$ **C.** 1 **D.** $\frac{3}{5}$

9. The area of the triangle with sides 17, 12, 25 is

A. 102 **B.** 180 **C.** 45 **D.** 90

10. A triangle has sides 25, 6, 29 and area 60. Its circumradius R is

A. $\frac{145}{8}$ **B.** $\frac{145}{2}$ **C.** $\frac{145}{16}$ **D.** $\frac{145}{4}$

11. In the triangle with $a = 17$, $b = 25$, $c = 26$ and area 204, $\sin A =$

A. $\frac{253}{325}$ **B.** $\frac{102}{325}$ **C.** $\frac{24}{25}$ **D.** $\frac{204}{325}$

12. In triangle ABC, $a = 76$, $b = 20$, $c = 84$. Then the angle A is

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

13. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 8 : 7 : 5$, then $a : b : c =$

A. $8 : 7 : 5$ **B.** $12 : 13 : 15$ **C.** $4 : 6 : 10$ **D.** $5 : 8 : 7$

14. In the triangle with $a = 5$, $b = 5$, $c = 6$, the median from A is

A. $\frac{7\sqrt{3}}{2}$ **B.** $\frac{\sqrt{97}}{2}$ **C.** 3 **D.** $\sqrt{97}$

15. In triangle ABC, $a = 4$, $b = 3$, $c = 5$. The bisector of A meets BC at D. Then $BD =$

A. 2 **B.** $\frac{3}{2}$ **C.** $\frac{5}{2}$ **D.** $\frac{15}{4}$

16. In triangle ABC, $A = 45^\circ$, $B = 15^\circ$ and $c = \sqrt{6}$. Then $a =$

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

17. The number of triangles with $a = 5\sqrt{3} - 1$, $b = 10$ and $A = 60^\circ$ is

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

18. The number of triangles with $a = 10\sqrt{2}$, $b = 20$ and $A = 45^\circ$ is

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

19. In a triangle, $r = 2$ and $R = 11$. Then $\cos A + \cos B + \cos C =$

A. $\frac{13}{11}$ **B.** $\frac{2}{11}$ **C.** $\frac{9}{11}$ **D.** $\frac{13}{2}$

20. For the triangle with $a = 25$, $b = 26$, $c = 3$, $r_2 =$

A. $\frac{3}{2}$ **B.** 18 **C.** 36 **D.** $\frac{4}{3}$

21. In the triangle with $a = 12$, $b = 35$, $c = 37$, $r_1 + r_2 + r_3 - r =$

A. 37 **B.** 42 **C.** $\frac{37}{2}$ **D.** 74

22. If $r_1 = 16$, $r_2 = 4$, $r_3 = 48$, then $r =$

A. $\frac{768}{17}$ **B.** 3 **C.** 68 **D.** $\frac{68}{3}$

23. A triangle has angles 46°, 48°, 86°. The angles of its pedal triangle are

A. $8^\circ, 84^\circ, 88^\circ$ **B.** $46^\circ, 48^\circ, 86^\circ$

C. $4^\circ, 42^\circ, 67^\circ$ **D.** $94^\circ, 132^\circ, 134^\circ$

24. Each interior angle of a regular polygon with 24 sides is

A. 15° **B.** $\frac{2160}{13}^\circ$ **C.** 165° **D.** 3960°

25. The area of a cyclic quadrilateral with sides 12, 9, 7, 13 is

A. $6\sqrt{273}$ **B.** $\frac{9\sqrt{1955}}{4}$

C. $\frac{9\sqrt{1955}}{8}$ **D.** $\frac{9\sqrt{160310}}{8}$

Key sheet

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

Solutions

1. In triangle ABC, if $a = 24$ and $A = 60^\circ$, then $R =$

$2R = \frac{a}{\sin A} = 16\sqrt{3}$

$R = 8\sqrt{3}$

Ans: (B) $8\sqrt{3}$

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2. If the angles of a triangle are in the ratio $1 : 5 : 6$, then $a : b : c =$

Angles: $15^\circ, 75^\circ, 90^\circ$.

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

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

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

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

$= \frac{400 + 400 - 576}{800} = \frac{7}{25}$

Ans: (C) $\frac{7}{25}$

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4. In triangle ABC with $a = 12$, $b = 8$ and $c = 6$, $\cos A =$

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

$= \frac{64 + 36 - 144}{96} = -\frac{11}{24}$

Ans: (D) $-\frac{11}{24}$

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5. In triangle ABC with $a = 13$, $b = 11$, $c = 4$, $(b + c)\cos A + (c + a)\cos B + (a + b)\cos C =$

Regroup: $(b\cos C + c\cos B) + (c\cos A + a\cos C) + (a\cos B + b\cos A)$.

By the projection rule this is $a + b + c = 28$.

Ans: (C) 28

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6. In triangle ABC, if $b = 2$, $c = 11$, $A = 60^\circ$, then $\tan\frac{B - C}{2} =$

$\tan\frac{B - C}{2} = \frac{b - c}{b + c}\cot\frac{A}{2} = -\frac{9\sqrt{3}}{13}$

Ans: (A) $-\frac{9\sqrt{3}}{13}$

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7. In triangle ABC with $a = 15$, $b = 7$, $c = 20$, $\cot\frac{C}{2} =$

$s = 21,\ \Delta = 42$

$\cot\frac{C}{2} = \frac{s(s - c)}{\Delta} = \frac{21 \cdot 1}{42} = \frac{1}{2}$

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

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8. In triangle ABC with $a = 8$, $b = 15$, $c = 17$, $\cot\frac{B}{2} =$

$s = 20,\ \Delta = 60$

$\cot\frac{B}{2} = \frac{s(s - b)}{\Delta} = \frac{20 \cdot 5}{60} = \frac{5}{3}$

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

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9. The area of the triangle with sides $17, 12, 25$ is

$s = \frac{17+12+25}{2} = 27$

$\Delta = \sqrt{27 \cdot 10 \cdot 15 \cdot 2} = 90$

Ans: (D) 90

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10. A triangle has sides $25, 6, 29$ and area 60. Its circumradius R is

$R = \frac{abc}{4\Delta} = \frac{4350}{240} = \frac{145}{8}$

Ans: (A) $\frac{145}{8}$

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11. In the triangle with $a = 17$, $b = 25$, $c = 26$ and area 204, $\sin A =$

$\sin A = \frac{2\Delta}{bc} = \frac{204}{325}$

Ans: (D) $\frac{204}{325}$

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12. In triangle ABC, $a = 76$, $b = 20$, $c = 84$. Then the angle A is

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

$A = 60^\circ$

Ans: (D) 60°

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13. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 8 : 7 : 5$, then $a : b : c =$

$s - a : s - b : s - c = 8 : 7 : 5$ and $a = (s - b) + (s - c)$.

$a : b : c = 12 : 13 : 15 = 12 : 13 : 15$

Ans: (B) $12 : 13 : 15$

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14. In the triangle with $a = 5$, $b = 5$, $c = 6$, the median from A is

$\frac{1}{2}\sqrt{2b^2 + 2c^2 - a^2} = \frac{1}{2}\sqrt{97} = \frac{\sqrt{97}}{2}$

Ans: (B) $\frac{\sqrt{97}}{2}$

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15. In triangle ABC, $a = 4$, $b = 3$, $c = 5$. The bisector of A meets BC at D. Then $BD =$

$BD : DC = c : b = 5 : 3$

$BD = \frac{5}{8} \times 4 = \frac{5}{2}$

Ans: (C) $\frac{5}{2}$

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16. In triangle ABC, $A = 45^\circ$, $B = 15^\circ$ and $c = \sqrt{6}$. Then $a =$

$C = 120^\circ,\ 2R = \frac{c}{\sin C} = 2\sqrt{2}$

$a = 2R\sin A = 2$

Ans: (B) 2

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17. The number of triangles with $a = 5\sqrt{3} - 1$, $b = 10$ and $A = 60^\circ$ is

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

Compare $a = 5\sqrt{3} - 1$ with $b\sin A$ and b: no triangle.

Ans: (C) 0

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18. The number of triangles with $a = 10\sqrt{2}$, $b = 20$ and $A = 45^\circ$ is

$b \sin A = 10\sqrt{2}$

Compare $a = 10\sqrt{2}$ with $b \sin A$ and b: one triangle.

Ans: (A) 1

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19. In a triangle, $r = 2$ and $R = 11$. Then $\cos A + \cos B + \cos C =$

$\cos A + \cos B + \cos C = 1 + \frac{r}{R} = 1 + \frac{2}{11} = \frac{13}{11}$

Ans: (A) $\frac{13}{11}$

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20. For the triangle with $a = 25$, $b = 26$, $c = 3$, $r_2 =$

$s = \frac{25+26+3}{2} = 27$

$\Delta = \sqrt{27 \cdot 2 \cdot 1 \cdot 24} = 36$

$r_2 = 36$

Ans: (C) 36

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21. In the triangle with $a = 12$, $b = 35$, $c = 37$, $r_1 + r_2 + r_3 - r =$

$r_1 + r_2 + r_3 - r = 4R$ and $R = \frac{abc}{4\Delta} = \frac{37}{2}$.

$4R = 74$

Ans: (D) 74

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22. If $r_1 = 16$, $r_2 = 4$, $r_3 = 48$, then $r =$

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

$r = 3$

Ans: (B) 3

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23. A triangle has angles 46°, 48°, 86°. The angles of its pedal triangle are

The pedal triangle of an acute triangle has angles $180^\circ - 2A$, $180^\circ - 2B$, $180^\circ - 2C$.

So $8^\circ, 84^\circ, 88^\circ$.

Ans: (A) $8^\circ, 84^\circ, 88^\circ$

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24. Each interior angle of a regular polygon with 24 sides is

$\frac{(n-2)\cdot 180^\circ}{n} = \frac{22 \cdot 180^\circ}{24} = 165^\circ$

Ans: (C) 165°

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25. The area of a cyclic quadrilateral with sides 12, 9, 7, 13 is

$s = \frac{41}{2}$

$\sqrt{(s-a)(s-b)(s-c)(s-d)} = \frac{9\sqrt{1955}}{4}$

Ans: (B) $\frac{9\sqrt{1955}}{4}$
