EXPRESSWALA ACADEMY

Maths 1A: Properties of Triangles

MCQ Test, Set 03

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 $a = 2\sqrt{3}$ and $A = 60^\circ$, then $R =$

A. 4 **B.** 2 **C.** 1 **D.** 3

2. In triangle ABC, if $a = 6\sqrt{6}$ and $A = 120^\circ$, then $R =$

A. $6\sqrt{2}$ **B.** $9\sqrt{2}$ **C.** $3\sqrt{2}$ **D.** $12\sqrt{2}$

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

A. $\frac{119}{169}$ **B.** $-\frac{119}{169}$ **C.** $\frac{50}{169}$ **D.** $\frac{5}{13}$

4. In triangle ABC with $a = 3$, $b = 10$ and $c = 12$, $\cos A =$

A. $-\frac{7}{12}$ **B.** $-\frac{47}{48}$ **C.** $\frac{53}{72}$ **D.** $\frac{47}{48}$

5. In triangle ABC with $a = 19$, $b = 16$, $c = 11$, $(b + c)\cos A + (c + a)\cos B + (a + b)\cos C =$

A. 92 **B.** 23 **C.** 46 **D.** 35

6. In triangle ABC, if $b = 5$, $c = 2$, $A = 60^\circ$, then $\tan\frac{B - C}{2} =$

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

7. In triangle ABC with $a = 40$, $b = 29$, $c = 29$, $\cos\frac{A}{2} =$

A. $\frac{7\sqrt{58}}{58}$ **B.** $\frac{441}{841}$ **C.** $\frac{21}{29}$ **D.** $\frac{20}{29}$

8. In triangle ABC with $a = 24$, $b = 13$, $c = 13$, $\cos\frac{C}{2} =$

A. $\frac{25}{26}$ **B.** $\frac{5\sqrt{26}}{26}$ **C.** $\frac{\sqrt{26}}{26}$ **D.** $\frac{5}{13}$

9. The area of the triangle with sides 30, 40, 14 is

A. 336 **B.** 84 **C.** 600 **D.** 168

10. A triangle has sides 24, 13, 13 and area 60. Its circumradius R is

A. $\frac{169}{10}$ **B.** $\frac{169}{20}$ **C.** $\frac{169}{5}$ **D.** $\frac{338}{5}$

11. In the triangle with $a = 24$, $b = 15$, $c = 15$ and area 108, $\sin C =$

A. $\frac{3}{10}$ **B.** $\frac{4}{5}$ **C.** $\frac{6}{5}$ **D.** $\frac{3}{5}$

12. If $a + c = \frac{17}{3}b$ in triangle ABC, then $\tan\frac{A}{2}\tan\frac{C}{2} =$

A. $\frac{10}{7}$ **B.** $\frac{14}{17}$ **C.** $\frac{3}{17}$ **D.** $\frac{7}{10}$

13. In triangle ABC, $a = 120$, $b = 111$, $c = 21$. Then the angle B is

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

14. In the triangle with $a = 17$, $b = 10$, $c = 9$, the median from A is

A. $3\sqrt{3}i$ **B.** $\frac{\sqrt{651}}{2}$ **C.** $\sqrt{73}$ **D.** $\frac{\sqrt{73}}{2}$

15. In triangle ABC, $\cot B = \frac{16}{63}$, $\cot C = \frac{4}{3}$ and D on BC has $BD : DC = 2 : 3$. If $\theta = \angle ADC$, then $\cot\theta =$

A. $\frac{8}{21}$ **B.** $-\frac{8}{21}$ **C.** $\frac{24}{35}$ **D.** $-\frac{44}{63}$

16. In triangle ABC, $A = 60^\circ$, $B = 75^\circ$ and $c = 4$. Then $a =$

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

17. The number of triangles with $a = 2\sqrt{3} - 2$, $b = 4$ and $A = 60^\circ$ is

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

18. The number of triangles with $a = 6$, $b = 16$ and $A = 30^\circ$ is

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

19. In an equilateral triangle of side $2\sqrt{3}$, $r =$

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

20. In a triangle, $r = \frac{7}{4}$ and $R = 15$. Then $\cos A + \cos B + \cos C =$

A. $\frac{67}{60}$ **B.** $\frac{53}{60}$ **C.** $\frac{7}{60}$ **D.** $\frac{67}{7}$

21. If $r_1 = 42$, $r_2 = 21$, $r_3 = 14$, then the semi-perimeter $s =$

A. 77 **B.** 42 **C.** 84 **D.** 1764

22. In the triangle with $a = 15$, $b = 7$, $c = 20$, $r_1 + r_2 + r_3 - r =$

A. 25 **B.** 50 **C.** $\frac{25}{2}$ **D.** 21

23. In a triangle $R = \frac{841}{42}$ and $r = \frac{60}{7}$. Then $IS =$

A. $\frac{319}{42}$ **B.** $\frac{29\sqrt{481}}{42}$
C. $\frac{121}{42}$ **D.** $\frac{29\sqrt{1561}}{42}$

24. Each interior angle of a regular polygon with 36 sides is

A. 6120° **B.** 10° **C.** 170° **D.** $\frac{3240}{19}^\circ$

25. The area of a cyclic quadrilateral with sides $6, 5, 14, 11$ is

A. $2\sqrt{273}$ **B.** $12\sqrt{546}$ **C.** $2\sqrt{1155}$ **D.** $4\sqrt{273}$

Key sheet

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

Solutions

1. In triangle ABC, if $a = 2\sqrt{3}$ and $A = 60^\circ$, then $R =$

$2R = \frac{a}{\sin A} = 4$

$R = 2$

Ans: (B) 2

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2. In triangle ABC, if $a = 6\sqrt{6}$ and $A = 120^\circ$, then $R =$

$2R = \frac{a}{\sin A} = 12\sqrt{2}$

$R = 6\sqrt{2}$

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

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

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

$= \frac{676+676-400}{1352} = \frac{119}{169}$

Ans: (A) $\frac{119}{169}$

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4. In triangle ABC with $a = 3$, $b = 10$ and $c = 12$, $\cos A =$

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

$= \frac{100+144-9}{240} = \frac{47}{48}$

Ans: (D) $\frac{47}{48}$

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5. In triangle ABC with $a = 19$, $b = 16$, $c = 11$, $(b + c)\cos A + (c + a)\cos B + (a + b)\cos C =$

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 $a + b + c = 46$.

Ans: (C) 46

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6. In triangle ABC, if $b = 5$, $c = 2$, $A = 60^\circ$, then $\tan\frac{B-C}{2} =$

$\tan\frac{B-C}{2} = \frac{b-c}{b+c}\cot\frac{A}{2} = \frac{3\sqrt{3}}{7}$

Ans: (B) $\frac{3\sqrt{3}}{7}$

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7. In triangle ABC with $a = 40$, $b = 29$, $c = 29$, $\cos\frac{A}{2} =$

$s = 49,\ \Delta = 420$

$\cos\frac{A}{2} = \sqrt{\frac{s(s-a)}{bc}} = \sqrt{\frac{49\cdot 9}{29\cdot 29}} = \frac{21}{29}$

Ans: (C) $\frac{21}{29}$

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8. In triangle ABC with $a = 24$, $b = 13$, $c = 13$, $\cos\frac{C}{2} =$

$s = 25,\ \Delta = 60$

$\cos\frac{C}{2} = \sqrt{\frac{s(s-c)}{ab}} = \sqrt{\frac{25\cdot 12}{24\cdot 13}} = \frac{5\sqrt{26}}{26}$

Ans: (B) $\frac{5\sqrt{26}}{26}$

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9. The area of the triangle with sides 30, 40, 14 is

$s = \frac{30+40+14}{2} = 42$

$\Delta = \sqrt{42 \cdot 12 \cdot 2 \cdot 28} = 168$

Ans: (D) 168

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10. A triangle has sides 24, 13, 13 and area 60. Its circumradius R is

$R = \frac{abc}{4\Delta} = \frac{4056}{240} = \frac{169}{10}$

Ans: (A) $\frac{169}{10}$

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11. In the triangle with $a = 24$, $b = 15$, $c = 15$ and area 108, $\sin C =$

$\sin C = \frac{2\Delta}{ab} = \frac{3}{5}$

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

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12. If $a + c = \frac{17}{3}b$ in triangle ABC, then $\tan\frac{A}{2}\tan\frac{C}{2} =$

$\tan\frac{A}{2}\tan\frac{C}{2} = \frac{s-b}{s} = \frac{n-1}{n+1} = \frac{7}{10}$

Ans: (D) $\frac{7}{10}$

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13. In triangle ABC, $a = 120$, $b = 111$, $c = 21$. Then the angle B is

$\cos B = \frac{c^2+a^2-b^2}{2ca} = \frac{1}{2}$

$B = 60^\circ$

Ans: (C) 60°

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14. In the triangle with $a = 17$, $b = 10$, $c = 9$, the median from A is

$\frac{1}{2}\sqrt{2b^2 + 2c^2 - a^2} = \frac{1}{2}\sqrt{73} = \frac{\sqrt{73}}{2}$

Ans: (D) $\frac{\sqrt{73}}{2}$

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15. In triangle ABC, $\cot B = \frac{16}{63}$, $\cot C = \frac{4}{3}$ and D on BC has $BD : DC = 2 : 3$. If $\theta = \angle ADC$, then $\cot\theta =$

$(m+n)\cot\theta = n\cot B - m\cot C$

$5\cot\theta = 3 \cdot \frac{16}{63} - 2 \cdot \frac{4}{3} \Rightarrow \cot\theta = -\frac{8}{21}$

Ans: (B) $-\frac{8}{21}$

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16. In triangle ABC, $A = 60^\circ$, $B = 75^\circ$ and $c = 4$. Then $a =$

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

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

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

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17. The number of triangles with $a = 2\sqrt{3} - 2$, $b = 4$ and $A = 60^\circ$ is

$b\sin A = 2\sqrt{3}$

Compare $a = 2\sqrt{3} - 2$ with $b\sin A$ and b: no triangle.

Ans: (A) 0

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18. The number of triangles with $a = 6$, $b = 16$ and $A = 30^\circ$ is

$b \sin A = 8$

Compare $a = 6$ with $b \sin A$ and b: no triangle.

Ans: (C) 0

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19. In an equilateral triangle of side $2\sqrt{3}$, $r =$

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

$r = 1$

Ans: (B) 1

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20. In a triangle, $r = \frac{7}{4}$ and $R = 15$. Then $\cos A + \cos B + \cos C =$

$\cos A + \cos B + \cos C = 1 + \frac{r}{R} = 1 + \frac{7}{60} = \frac{67}{60}$

Ans: (A) $\frac{67}{60}$

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21. If $r_1 = 42$, $r_2 = 21$, $r_3 = 14$, then the semi-perimeter $s =$

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

$s = 42$

Ans: (B) 42

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22. In the triangle with $a = 15$, $b = 7$, $c = 20$, $r_1 + r_2 + r_3 - r =$

$r_1 + r_2 + r_3 - r = 4R$ and $R = \frac{abc}{4\Delta} = \frac{25}{2}$.

$4R = 50$

Ans: (B) 50

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23. In a triangle $R = \frac{841}{42}$ and $r = \frac{60}{7}$. Then $IS =$

$IS^2 = R^2 - 2rR = \frac{707281}{1764} - \frac{16820}{49}$

$IS = \frac{319}{42}$

Ans: (A) $\frac{319}{42}$

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24. Each interior angle of a regular polygon with 36 sides is

$\frac{(n-2)\cdot 180^\circ}{n} = \frac{34 \cdot 180^\circ}{36} = 170^\circ$

Ans: (C) 170°

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25. The area of a cyclic quadrilateral with sides 6, 5, 14, 11 is

$s = 18$

$\sqrt{(s-a)(s-b)(s-c)(s-d)} = 4\sqrt{273}$

Ans: (D) $4\sqrt{273}$
