EXPRESSWALA ACADEMY

Maths 1A: Properties of Triangles

MCQ Test, Set 06

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 $a = 6\sqrt{3}$ and $A = 60^\circ$, then $R =$

A. 3 **B.** 12 **C.** 6 **D.** 9

2. In triangle ABC, if $a = 9$ and $A = 120^\circ$, then $R =$

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

3. In triangle ABC with $a = 25$, $b = 30$ and $c = 25$, $\cos A =$

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

4. In triangle ABC with $a = 3$, $b = 10$ and $c = 8$, $\cos B =$

A. $-\frac{9}{16}$ **B.** $\frac{9}{16}$ **C.** $\frac{3}{4}$ **D.** $\frac{31}{32}$

5. In triangle ABC with $a = 11$, $b = 12$, $c = 3$, $c\cos A + a\cos C =$

A. 3 **B.** 12 **C.** 13 **D.** 11

6. In triangle ABC with $a = 24$, $b = 18$, $c = 30$, given $\cos\frac{C}{2} = \frac{\sqrt{2}}{2}$, Mollweide's rule gives $\sin\frac{A-B}{2} =$

A. $\frac{7\sqrt{2}}{10}$ **B.** $-\frac{\sqrt{2}}{10}$ **C.** $\frac{\sqrt{2}}{10}$ **D.** $\frac{\sqrt{2}}{5}$

7. In triangle ABC with $a = 10$, $b = 39$, $c = 35$, $\sin\frac{C}{2} =$

A. $\frac{\sqrt{65}}{65}$ **B.** $\frac{16}{65}$ **C.** $\frac{7\sqrt{65}}{65}$ **D.** $\frac{4\sqrt{65}}{65}$

8. In triangle ABC with $a = 17$, $b = 17$, $c = 30$, $\tan\frac{A}{2} =$

A. $\frac{1}{16}$ **B.** 4 **C.** $\frac{1}{4}$ **D.** $\frac{1}{2}$

9. The area of the triangle with sides 28, 30, 26 is

A. 168 **B.** 420 **C.** 336 **D.** 672

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

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

11. In the triangle with $a = 25$, $b = 11$, $c = 30$ and area 132, $\sin C =$

A. $\frac{44}{125}$ **B.** $-\frac{7}{25}$ **C.** $\frac{24}{25}$ **D.** $\frac{12}{25}$

12. If $a + c = \frac{19}{5}b$ in triangle ABC, then $\tan\frac{A}{2}\tan\frac{C}{2} =$

A. $\frac{12}{7}$ **B.** $\frac{14}{19}$ **C.** $\frac{5}{19}$ **D.** $\frac{7}{12}$

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13. In triangle ABC, $a = 19$, $b = 5$, $c = 21$. Then the angle A is

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

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14. In the triangle with $a = 35$, $b = 34$, $c = 15$ and area 252, the altitude from C is

A. $\frac{15}{2}$ **B.** $\frac{84}{5}$ **C.** $\frac{72}{5}$ **D.** $\frac{168}{5}$

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15. In triangle ABC, $\cot B = \frac{21}{20}$, $\cot C = \frac{17}{144}$ and D on BC has $BD : DC = 3 : 2$. If $\theta = \angle ADC$, then $\cot\theta =$

A. $\frac{589}{1200}$ **B.** $\frac{419}{1200}$ **C.** $-\frac{419}{1200}$ **D.** $\frac{1049}{1800}$

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16. In triangle ABC, $A = 60^\circ$, $B = 90^\circ$ and $c = 1$. Then $a =$

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

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17. The number of triangles with $a = 30$, $b = 20\sqrt{2}$ and $A = 45^\circ$ is

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

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18. The number of triangles with $a = 9$, $b = 6\sqrt{3}$ and $A = 60^\circ$ is

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

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19. In an equilateral triangle of side $2\sqrt{3}$, $r_1 =$

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

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20. In a triangle, $r = 3$ and $R = 8$. Then $\cos A + \cos B + \cos C =$

A. $\frac{11}{8}$ **B.** $\frac{5}{8}$ **C.** $\frac{3}{8}$ **D.** $\frac{11}{3}$

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21. If $r_1 = 40$, $r_2 = \frac{45}{2}$, $r_3 = 18$, then the semi-perimeter $s =$

A. 2025 **B.** 45 **C.** $\frac{161}{2}$ **D.** 90

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22. In the triangle with $a = 17$, $b = 8$, $c = 15$, $r_1 + r_2 + r_3 - r =$

A. $\frac{17}{2}$ **B.** 20 **C.** 17 **D.** 34

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23. For the triangle with $a = 30$, $b = 30$, $c = 36$ (so $R = \frac{75}{4}$), the circumradius of the excentral triangle is

A. $\frac{75}{8}$ **B.** $\frac{75}{2}$ **C.** 75 **D.** $\frac{75}{4}$

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24. The area of a regular hexagon of side 12 is

A. $432\sqrt{3}$ **B.** 864 **C.** $36\sqrt{3}$ **D.** $216\sqrt{3}$

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25. A quadrilateral with sides 2, 7, 8, 3 is cyclic and has an incircle. Its area is

A. $4\sqrt{21}$ **B.** $\frac{2\sqrt{21}}{5}$ **C.** $\sqrt{38}$ **D.** $2\sqrt{21}$

Key sheet

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

Solutions

1. In triangle ABC, if $a = 6\sqrt{3}$ and $A = 60^\circ$, then $R =$

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

$R = 6$

Ans: (C) 6

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2. In triangle ABC, if $a = 9$ and $A = 120^\circ$, then $R =$

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

$R = 3\sqrt{3}$

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

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3. In triangle ABC with $a = 25$, $b = 30$ and $c = 25$, $\cos A =$

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

$= \frac{900+625-625}{1500} = \frac{3}{5}$

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

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4. In triangle ABC with $a = 3$, $b = 10$ and $c = 8$, $\cos B =$

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

$= \frac{64+9-100}{48} = -\frac{9}{16}$

Ans: (A) $-\frac{9}{16}$

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5. In triangle ABC with $a = 11$, $b = 12$, $c = 3$, $c\cos A + a\cos C =$

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

$b = 12$

Ans: (B) 12

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6. In triangle ABC with $a = 24$, $b = 18$, $c = 30$, given $\cos\frac{C}{2} = \frac{\sqrt{2}}{2}$, Mollweide's rule gives $\sin\frac{A-B}{2} =$

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

$\sin\frac{A-B}{2} = \frac{6}{30}\cdot\frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{10}$

Ans: (C) $\frac{\sqrt{2}}{10}$

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7. In triangle ABC with $a = 10$, $b = 39$, $c = 35$, $\sin\frac{C}{2} =$

$s = 42,\ \Delta = 168$

$\sin\frac{C}{2} = \sqrt{\frac{(s-a)(s-b)}{ab}} = \sqrt{\frac{32\cdot 3}{10\cdot 39}} = \frac{4\sqrt{65}}{65}$

Ans: (D) $\frac{4\sqrt{65}}{65}$

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8. In triangle ABC with $a = 17$, $b = 17$, $c = 30$, $\tan\frac{A}{2} =$

$s = 32,\ \Delta = 120$

$\tan\frac{A}{2} = \frac{(s-b)(s-c)}{\Delta} = \frac{15\cdot 2}{120} = \frac{1}{4}$

Ans: (C) $\frac{1}{4}$

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9. The area of the triangle with sides 28, 30, 26 is

$s = \frac{28+30+26}{2} = 42$

$\Delta = \sqrt{42 \cdot 14 \cdot 12 \cdot 16} = 336$

Ans: (C) 336

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

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

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

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11. In the triangle with $a = 25$, $b = 11$, $c = 30$ and area 132, $\sin C =$

$\sin C = \frac{2\Delta}{ab} = \frac{24}{25}$

Ans: (C) $\frac{24}{25}$

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12. If $a + c = \frac{19}{5}b$ in triangle ABC, then $\tan\frac{A}{2}\tan\frac{C}{2} =$

$\tan\frac{A}{2}\tan\frac{C}{2} = \frac{s-b}{s} = \frac{n-1}{n+1} = \frac{7}{12}$

Ans: (D) $\frac{7}{12}$

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13. In triangle ABC, $a = 19$, $b = 5$, $c = 21$. Then the angle A is

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

$A = 60^\circ$

Ans: (C) 60°

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14. In the triangle with $a = 35$, $b = 34$, $c = 15$ and area 252, the altitude from C is

$\frac{2\Delta}{c} = \frac{504}{15} = \frac{168}{5}$

Ans: (D) $\frac{168}{5}$

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15. In triangle ABC, $\cot B = \frac{21}{20}$, $\cot C = \frac{17}{144}$ and D on BC has $BD : DC = 3 : 2$. If $\theta = \angle ADC$, then $\cot\theta =$

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

$5\cot\theta = 2 \cdot \frac{21}{20} - 3 \cdot \frac{17}{144} \Rightarrow \cot\theta = \frac{419}{1200}$

Ans: (B) $\frac{419}{1200}$

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16. In triangle ABC, $A = 60^\circ$, $B = 90^\circ$ and $c = 1$. Then $a =$

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

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

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

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17. The number of triangles with $a = 30$, $b = 20\sqrt{2}$ and $A = 45^\circ$ is

$b\sin A = 20$

Compare $a = 30$ with $b\sin A$ and b: one triangle.

Ans: (A) 1

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18. The number of triangles with $a = 9$, $b = 6\sqrt{3}$ and $A = 60^\circ$ is

$b \sin A = 9$

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

Ans: (B) 1

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19. In an equilateral triangle of side $2\sqrt{3}$, $r_1 =$

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

$r_1 = 3$

Ans: (A) 3

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20. In a triangle, $r = 3$ and $R = 8$. Then $\cos A + \cos B + \cos C =$

$\cos A + \cos B + \cos C = 1 + \frac{r}{R} = 1 + \frac{3}{8} = \frac{11}{8}$

Ans: (A) $\frac{11}{8}$

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21. If $r_1 = 40$, $r_2 = \frac{45}{2}$, $r_3 = 18$, then the semi-perimeter $s =$

$s^2 = r_1 r_2 + r_2 r_3 + r_3 r_1 = 2025$

$s = 45$

Ans: (B) 45

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22. In the triangle with $a = 17$, $b = 8$, $c = 15$, $r_1 + r_2 + r_3 - r =$

$r_1 + r_2 + r_3 - r = 4R$ and $R = \frac{abc}{4\Delta} = \frac{17}{2}$.

$4R = 34$

Ans: (D) 34

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23. For the triangle with $a = 30$, $b = 30$, $c = 36$ (so $R = \frac{75}{4}$), the circumradius of the excentral triangle is

The excentral triangle has circumradius $2R$.

$2R = \frac{75}{2}$

Ans: (B) $\frac{75}{2}$

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24. The area of a regular hexagon of side 12 is

$\frac{1}{4} \cdot 6 \cdot 144 \cdot \cot 30^\circ = \frac{3\sqrt{3}}{2} \cdot 144 = 216\sqrt{3}$

Ans: (D) $216\sqrt{3}$

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25. A quadrilateral with sides 2, 7, 8, 3 is cyclic and has an incircle. Its area is

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

$\sqrt{336} = 4\sqrt{21}$

Ans: (A) $4\sqrt{21}$
