EXPRESSWALA ACADEMY

Maths 1A: Properties of Triangles

MCQ Test, Set 09

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 $a = 2\sqrt{6}$ and $A = 120^\circ$, then $R =$

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

2. In triangle ABC, if $a = 7\sqrt{6}$ and $A = 120^\circ$, then $R =$

A. $14\sqrt{2}$ **B.** $\frac{7\sqrt{2}}{2}$ **C.** $7\sqrt{2}$ **D.** $\frac{21\sqrt{2}}{2}$

3. In triangle ABC with $a = 14$, $b = 25$ and $c = 25$, $\cos C =$

A. $\frac{527}{625}$ **B.** $\frac{18}{25}$ **C.** $-\frac{7}{25}$ **D.** $\frac{7}{25}$

4. In triangle ABC with $a = 11$, $b = 14$ and $c = 4$, $\cos C =$

A. $\frac{13}{16}$ **B.** $-\frac{59}{88}$ **C.** $-\frac{43}{44}$ **D.** $\frac{43}{44}$

5. In triangle ABC with $a = 12$, $b = 16$, $c = 6$, $(b + c)\cos A + (c + a)\cos B + (a + b)\cos C =$

A. 34 **B.** 17 **C.** 68 **D.** 28

6. In triangle ABC, if $b = 11$, $c = 12$, $A = 60^\circ$, then $\tan\frac{B - C}{2} =$

A. $-\frac{\sqrt{3}}{69}$ **B.** $-23\sqrt{3}$ **C.** $-\frac{\sqrt{3}}{23}$ **D.** $\frac{\sqrt{3}}{23}$

7. In triangle ABC with $a = 10$, $b = 10$, $c = 12$, $\sin\frac{B}{2} =$

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

8. In triangle ABC with $a = 25$, $b = 40$, $c = 39$, $\cos\frac{C}{2} =$

A. $\frac{9\sqrt{10}}{50}$ **B.** $\frac{3\sqrt{10}}{10}$ **C.** $\frac{13\sqrt{10}}{50}$ **D.** $\frac{169}{250}$

9. The area of the triangle with sides 8, 30, 26 is

A. 192 **B.** 48 **C.** 120 **D.** 96

10. A triangle has sides 30, 30, 36 and area 432. Its circumradius R is

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

11. In the triangle with $a = 30$, $b = 36$, $c = 30$ and area 432, $\sin A =$

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

12. If $a + c = 4b$ in triangle ABC, then $\tan\frac{A}{2}\tan\frac{C}{2} =$

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

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13. In triangle ABC, $a = 63$, $b = 57$, $c = 48$. Then the angle B is

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

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14. In the triangle with $a = 30$, $b = 17$, $c = 17$, the median from C is

A. 15 **B.** $\frac{\sqrt{2089}}{2}$ **C.** $\frac{\sqrt{2667}}{2}$ **D.** $\sqrt{2089}$

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15. In triangle ABC, $\cot B = \frac{7}{24}$, $\cot C = \frac{13}{84}$ and D on BC has $BD : DC = 1 : 1$. If $\theta = \angle ADC$, then $\cot\theta =$

A. $\frac{23}{336}$ **B.** $\frac{25}{112}$ **C.** $\frac{23}{168}$ **D.** $-\frac{23}{336}$

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16. In triangle ABC, $A = 30^\circ$, $B = 90^\circ$ and $c = 3\sqrt{2}$. Then $a =$

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

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17. The number of triangles with $a = 8$, $b = 10\sqrt{2}$ and $A = 45^\circ$ is

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

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

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

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19. In an equilateral triangle of side $4\sqrt{3}$, $r_1 =$

A. 6 **B.** 4 **C.** 2 **D.** $12\sqrt{3}$

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20. In a triangle, $r = \frac{7}{3}$ and $R = 12$. Then $\cos A + \cos B + \cos C =$

A. $\frac{43}{7}$ **B.** $\frac{43}{36}$ **C.** $\frac{29}{36}$ **D.** $\frac{7}{36}$

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21. If $r_1 = 30$, $r_2 = \frac{80}{3}$, $r_3 = 30$, then the semi-perimeter $s =$

A. 100 **B.** 50 **C.** $\frac{260}{3}$ **D.** 2500

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22. In the triangle with $a = 26$, $b = 25$, $c = 17$, $r_1 + r_2 + r_3 - r =$

A. $\frac{325}{6}$ **B.** $\frac{325}{24}$ **C.** $\frac{325}{12}$ **D.** 34

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23. A triangle has angles 55°, 81°, 44°. The angles of its pedal triangle are

A. $44^\circ, 55^\circ, 81^\circ$ **B.** $99^\circ, 125^\circ, 136^\circ$

C. $18^\circ, 70^\circ, 92^\circ$ **D.** $9^\circ, 35^\circ, 46^\circ$

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24. Each interior angle of a regular polygon with 18 sides is

A. 2880° **B.** 20° **C.** 162° **D.** 160°

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25. The area of a cyclic quadrilateral with sides 7, 13, 11, 6 is

A. $\frac{5\sqrt{3795}}{8}$ **B.** $\frac{5\sqrt{280830}}{8}$

C. $\sqrt{6006}$ **D.** $\frac{5\sqrt{3795}}{4}$

Key sheet

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

Solutions

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

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

$R = 2\sqrt{2}$

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

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2. In triangle ABC, if $a = 7\sqrt{6}$ and $A = 120^\circ$, then $R =$

$2R = \frac{a}{\sin A} = 14\sqrt{2}$

$R = 7\sqrt{2}$

Ans: (C) $7\sqrt{2}$

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3. In triangle ABC with $a = 14$, $b = 25$ and $c = 25$, $\cos C =$

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

$= \frac{196+625-625}{700} = \frac{7}{25}$

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

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4. In triangle ABC with $a = 11$, $b = 14$ and $c = 4$, $\cos C =$

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

$= \frac{121+196-16}{308} = \frac{43}{44}$

Ans: (D) $\frac{43}{44}$

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5. In triangle ABC with $a = 12$, $b = 16$, $c = 6$, $(b + c)\cos A + (c + a)\cos B + (a + b)\cos C =$

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 $a + b + c = 34$.

Ans: (A) 34

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6. In triangle ABC, if $b = 11$, $c = 12$, $A = 60^\circ$, then $\tan\frac{B-C}{2} =$

$\tan\frac{B-C}{2} = \frac{b-c}{b+c}\cot\frac{A}{2} = -\frac{\sqrt{3}}{23}$

Ans: (C) $-\frac{\sqrt{3}}{23}$

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7. In triangle ABC with $a = 10$, $b = 10$, $c = 12$, $\sin\frac{B}{2} =$

$s = 16,\ \Delta = 48$

$\sin\frac{B}{2} = \sqrt{\frac{(s-a)(s-c)}{ac}} = \sqrt{\frac{6\cdot4}{10\cdot12}} = \frac{\sqrt{5}}{5}$

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

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8. In triangle ABC with $a = 25$, $b = 40$, $c = 39$, $\cos\frac{C}{2} =$

$s = 52,\ \Delta = 468$

$\cos\frac{C}{2} = \sqrt{\frac{s(s-c)}{ab}} = \sqrt{\frac{52\cdot13}{25\cdot40}} = \frac{13\sqrt{10}}{50}$

Ans: (C) $\frac{13\sqrt{10}}{50}$

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9. The area of the triangle with sides 8, 30, 26 is

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

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

Ans: (D) 96

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10. A triangle has sides 30, 30, 36 and area 432. Its circumradius R is

$R = \frac{abc}{4\Delta} = \frac{32400}{1728} = \frac{75}{4}$

Ans: (D) $\frac{75}{4}$

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11. In the triangle with $a = 30$, $b = 36$, $c = 30$ and area 432, $\sin A =$

$\sin A = \frac{2\Delta}{bc} = \frac{4}{5}$

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

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12. If $a + c = 4b$ in triangle ABC, then $\tan\frac{A}{2}\tan\frac{C}{2} =$

$\tan\frac{A}{2}\tan\frac{C}{2} = \frac{s-b}{s} = \frac{n-1}{n+1} = \frac{3}{5}$

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

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13. In triangle ABC, $a = 63$, $b = 57$, $c = 48$. 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 $a = 30$, $b = 17$, $c = 17$, the median from C is

$\frac{1}{2}\sqrt{2a^2 + 2b^2 - c^2} = \frac{1}{2}\sqrt{2089} = \frac{\sqrt{2089}}{2}$

Ans: (B) $\frac{\sqrt{2089}}{2}$

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15. In triangle ABC, $\cot B = \frac{7}{24}$, $\cot C = \frac{13}{84}$ and D on BC has $BD : DC = 1 : 1$. If $\theta = \angle ADC$, then $\cot\theta =$

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

$2\cot\theta = 1 \cdot \frac{7}{24} - 1 \cdot \frac{13}{84} \Rightarrow \cot\theta = \frac{23}{336}$

Ans: (A) $\frac{23}{336}$

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16. In triangle ABC, $A = 30^\circ$, $B = 90^\circ$ and $c = 3\sqrt{2}$. Then $a =$

$C = 60^\circ,\ 2R = \frac{c}{\sin C} = 2\sqrt{6}$

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

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

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17. The number of triangles with $a = 8$, $b = 10\sqrt{2}$ and $A = 45^\circ$ is

$b\sin A = 10$

Compare $a = 8$ with $b\sin A$ and b: no triangle.

Ans: (B) 0

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

$b \sin A = 8$

Compare $a = 18$ with $b \sin A$ and b: one triangle.

Ans: (B) 1

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19. In an equilateral triangle of side $4\sqrt{3}$, $r_1 =$

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

$r_1 = 6$

Ans: (A) 6

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20. In a triangle, $r = \frac{7}{3}$ and $R = 12$. Then $\cos A + \cos B + \cos C =$

$\cos A + \cos B + \cos C = 1 + \frac{r}{R} = 1 + \frac{7}{36} = \frac{43}{36}$

Ans: (B) $\frac{43}{36}$

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21. If $r_1 = 30$, $r_2 = \frac{80}{3}$, $r_3 = 30$, then the semi-perimeter $s =$

$s^2 = r_1 r_2 + r_2 r_3 + r_3 r_1 = 2500$

$s = 50$

Ans: (B) 50

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22. In the triangle with $a = 26$, $b = 25$, $c = 17$, $r_1 + r_2 + r_3 - r =$

$r_1 + r_2 + r_3 - r = 4R$ and $R = \frac{abc}{4\Delta} = \frac{325}{24}$.

$4R = \frac{325}{6}$

Ans: (A) $\frac{325}{6}$

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23. A triangle has angles 55°, 81°, 44°. 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 $18^\circ, 70^\circ, 92^\circ$.

Ans: (C) $18^\circ, 70^\circ, 92^\circ$

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24. Each interior angle of a regular polygon with 18 sides is

$\frac{(n-2)\cdot 180^\circ}{n} = \frac{16 \cdot 180^\circ}{18} = 160^\circ$

Ans: (D) 160°

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25. The area of a cyclic quadrilateral with sides 7, 13, 11, 6 is

$s = \frac{37}{2}$

$\sqrt{(s-a)(s-b)(s-c)(s-d)} = \frac{5\sqrt{3795}}{4}$

Ans: (D) $\frac{5\sqrt{3795}}{4}$
