EXPRESSWALA ACADEMY

Maths 1A: Properties of Triangles

MCQ Test, Set 07

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. If the angles of a triangle are in the ratio $2:3:3$, then $a:b:c=$

A. $2:3:3$

B. $1:\frac{\sqrt{4-2\sqrt{2}}}{2}:\frac{\sqrt{4-2\sqrt{2}}}{2}$

C. $1:\frac{\sqrt{2\sqrt{2}+4}}{2}:\frac{\sqrt{2\sqrt{2}+4}}{2}$

D. $1:1:-\left(1-\sqrt{2}\right)\sqrt{\sqrt{2}+2}$

2. In triangle ABC, if $a=7\sqrt{3}$ and $A=120^\circ$, then $R=$

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

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

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

4. In triangle ABC with $a=3$, $b=11$ and $c=9$, $\cos B=$

A. $\frac{49}{66}$ **B.** $\frac{193}{198}$ **C.** $\frac{31}{54}$ **D.** $-\frac{31}{54}$

5. In triangle ABC with $a=10$, $b=15$, $c=11$, $(b+c)\cos A+(c+a)\cos B+(a+b)\cos C=$

A. 18 **B.** 25 **C.** 36 **D.** 72

6. In triangle ABC, if $b=8$, $c=3$, $A=30^\circ$, then $\tan\frac{B-C}{2}=$

A. $\frac{11\sqrt{3}}{5}+\frac{22}{5}$ **B.** $\frac{5\sqrt{3}}{11}+\frac{10}{11}$

C. $\frac{10}{11}-\frac{5\sqrt{3}}{11}$ **D.** $-\frac{10}{11}-\frac{5\sqrt{3}}{11}$

7. In triangle ABC with $a=13$, $b=37$, $c=30$, $\cot\frac{C}{2}=$

A. $\frac{20}{9}$ **B.** 6 **C.** $\frac{400}{81}$ **D.** $\frac{9}{20}$

8. In triangle ABC with $a=32$, $b=20$, $c=20$, $\cot\frac{C}{2}=$

A. 9 **B.** $\frac{3}{4}$ **C.** 3 **D.** $\frac{1}{3}$

9. The area of the triangle with sides 15, 18, 15 is

A. 135 **B.** 54 **C.** 216 **D.** 108

10. A triangle has sides 26, 37, 15 and area 156. Its circumradius R is

A. $\frac{185}{16}$ **B.** $\frac{185}{2}$ **C.** $\frac{185}{8}$ **D.** $\frac{185}{4}$

11. In the triangle with $a = 39$, $b = 40$, $c = 25$ and area 468, $\sin A =$

A. $\frac{3}{5}$ **B.** $\frac{117}{125}$ **C.** $\frac{44}{125}$ **D.** $\frac{117}{250}$

12. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 6 : 7 : 4$, then $a : b : c =$

A. $11 : 10 : 13$ **B.** $6 : 7 : 4$ **C.** $4 : 6 : 7$ **D.** $5 : 3 : 9$

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

A. $\frac{11}{12}$ **B.** $\frac{1}{12}$ **C.** $\frac{11}{13}$ **D.** $\frac{13}{11}$

14. In the triangle with $a = 39$, $b = 30$, $c = 39$, the median from B is

A. 36 **B.** $3\sqrt{194}$ **C.** 72 **D.** $\frac{3\sqrt{238}}{2}$

15. In the triangle with $a = 6$, $b = 25$, $c = 29$, the incentre I divides the bisector AD so that $AI : ID =$

A. $\frac{6}{25} : 1$ **B.** $\frac{1}{9} : 1$ **C.** $\frac{29}{25} : 1$ **D.** $9 : 1$

16. In triangle ABC, $A = 30^\circ$, $B = 60^\circ$ and $c = 2\sqrt{6}$. Then $a =$

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

17. The number of triangles with $a = 13$, $b = 14\sqrt{2}$ and $A = 45^\circ$ is

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

18. The number of triangles with $a = 27$, $b = 18\sqrt{3}$ and $A = 60^\circ$ is

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

19. For the triangle with $a = 24$, $b = 32$, $c = 40$, $r_2 =$

A. 8 **B.** 24 **C.** 48 **D.** 16

20. In an equilateral triangle of side 12, $r =$

A. $2\sqrt{3}$ **B.** $6\sqrt{3}$ **C.** $4\sqrt{3}$ **D.** $36\sqrt{3}$

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

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

22. If $r_1 = 10$, $r_2 = 15$, $r_3 = 30$, then the semi-perimeter $s =$

A. 30 **B.** 55 **C.** 60 **D.** 900

23. In a triangle $R = \frac{75}{8}$ and $r = \frac{9}{2}$. Then $IS =$

A. $\frac{15}{8}$ **B.** $\frac{15\sqrt{13}}{8}$ **C.** $\frac{3}{8}$ **D.** $\frac{105}{8}$

24. Each interior angle of a regular polygon with 5 sides is

A. 72° **B.** 108° **C.** 540° **D.** $\frac{900}{7}^\circ$

25. The area of a cyclic quadrilateral with sides 4, 8, 9, 13 is

A. $12\sqrt{26}$ **B.** $6\sqrt{26}$ **C.** $12\sqrt{442}$ **D.** $24\sqrt{26}$

Key sheet

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

Solutions

1. If the angles of a triangle are in the ratio $2:3:3$, then $a:b:c=$

Angles: $45^\circ, \frac{135}{2}^\circ, \frac{135}{2}^\circ$.

$a:b:c=\sin A:\sin B:\sin C=1:\frac{\sqrt{2\sqrt{2}+4}}{2}:\frac{\sqrt{2\sqrt{2}+4}}{2}$

Ans: (C) $1:\frac{\sqrt{2\sqrt{2}+4}}{2}:\frac{\sqrt{2\sqrt{2}+4}}{2}$

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2. In triangle ABC, if $a=7\sqrt{3}$ and $A=120^\circ$, then $R=$

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

$R=7$

Ans: (D) 7

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

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

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

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

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4. In triangle ABC with $a=3$, $b=11$ and $c=9$, $\cos B=$

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

$=\frac{81+9-121}{54}=-\frac{31}{54}$

Ans: (D) $-\frac{31}{54}$

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5. In triangle ABC with $a=10$, $b=15$, $c=11$, $(b+c)\cos A+(c+a)\cos B+(a+b)\cos C=$

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 $a+b+c=36$.

Ans: (C) 36

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6. In triangle ABC, if $b=8$, $c=3$, $A=30^\circ$, then $\tan\frac{B-C}{2}=$

$\tan\frac{B-C}{2}=\frac{b-c}{b+c}\cot\frac{A}{2}=\frac{5\sqrt{3}}{11}+\frac{10}{11}$

Ans: (B) $\frac{5\sqrt{3}}{11}+\frac{10}{11}$

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7. In triangle ABC with $a=13$, $b=37$, $c=30$, $\cot\frac{C}{2}=$

$s=40,\ \Delta=180$

$\cot\frac{C}{2}=\frac{s(s-c)}{\Delta}=\frac{40\cdot10}{180}=\frac{20}{9}$

Ans: (A) $\frac{20}{9}$

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8. In triangle ABC with $a=32$, $b=20$, $c=20$, $\cot\frac{C}{2}=$

$s=36,\ \Delta=192$

$\cot\frac{C}{2}=\frac{s(s-c)}{\Delta}=\frac{36\cdot16}{192}=3$

Ans: (C) 3

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9. The area of the triangle with sides $15, 18, 15$ is

$s = \frac{15+18+15}{2} = 24$

$\Delta = \sqrt{24 \cdot 9 \cdot 6 \cdot 9} = 108$

Ans: (D) 108

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10. A triangle has sides $26, 37, 15$ and area 156. Its circumradius R is

$R = \frac{abc}{4\Delta} = \frac{14430}{624} = \frac{185}{8}$

Ans: (C) $\frac{185}{8}$

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11. In the triangle with $a = 39$, $b = 40$, $c = 25$ and area 468, $\sin A =$

$\sin A = \frac{2\Delta}{bc} = \frac{117}{125}$

Ans: (B) $\frac{117}{125}$

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12. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 6 : 7 : 4$, then $a : b : c =$

$s - a : s - b : s - c = 6 : 7 : 4$ and $a = (s-b) + (s-c)$.

$a : b : c = 11 : 10 : 13 = 11 : 10 : 13$

Ans: (A) $11 : 10 : 13$

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

$\tan\frac{A}{2}\tan\frac{C}{2} = \frac{s-b}{s} = \frac{n-1}{n+1} = \frac{11}{13}$

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

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14. In the triangle with $a = 39$, $b = 30$, $c = 39$, the median from B is

$\frac{1}{2}\sqrt{2a^2 + 2c^2 - b^2} = \frac{1}{2}\sqrt{5184} = 36$

Ans: (A) 36

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15. In the triangle with $a = 6$, $b = 25$, $c = 29$, the incentre I divides the bisector AD so that $AI : ID =$

$AI : ID = (b + c) : a = 54 : 6$

Ans: (D) $9 : 1$

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16. In triangle ABC, $A = 30^\circ$, $B = 60^\circ$ and $c = 2\sqrt{6}$. Then $a =$

$C = 90^\circ,\ 2R = \frac{c}{\sin C} = 2\sqrt{6}$

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

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

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17. The number of triangles with $a = 13$, $b = 14\sqrt{2}$ and $A = 45^\circ$ is

$b\sin A = 14$

Compare $a = 13$ with $b\sin A$ and b: no triangle.

Ans: (D) 0

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18. The number of triangles with $a = 27$, $b = 18\sqrt{3}$ and $A = 60^\circ$ is

$b \sin A = 27$

Compare $a = 27$ with $b \sin A$ and b: one triangle.

Ans: (C) 1

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19. For the triangle with $a = 24$, $b = 32$, $c = 40$, $r_2 =$

$s = \frac{24+32+40}{2} = 48$

$\Delta = \sqrt{48 \cdot 24 \cdot 16 \cdot 8} = 384$

$r_2 = 24$

Ans: (B) 24

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20. In an equilateral triangle of side 12, $r =$

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

$r = 2\sqrt{3}$

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

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

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

$r = 3$

Ans: (D) 3

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22. If $r_1 = 10$, $r_2 = 15$, $r_3 = 30$, then the semi-perimeter $s =$

$s^2 = r_1 r_2 + r_2 r_3 + r_3 r_1 = 900$

$s = 30$

Ans: (A) 30

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23. In a triangle $R = \frac{75}{8}$ and $r = \frac{9}{2}$. Then $IS =$

$IS^2 = R^2 - 2rR = \frac{5625}{64} - \frac{675}{8}$

$IS = \frac{15}{8}$

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

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24. Each interior angle of a regular polygon with 5 sides is

$\frac{(n-2)\cdot 180^\circ}{n} = \frac{3 \cdot 180^\circ}{5} = 108^\circ$

Ans: (B) 108°

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25. The area of a cyclic quadrilateral with sides 4, 8, 9, 13 is

$s = 17$

$\sqrt{(s-a)(s-b)(s-c)(s-d)} = 12\sqrt{26}$

Ans: (A) $12\sqrt{26}$
