MATHS

BOOKS - ML KHANNA

PROPERTIES OF TRIANGLES

Problem Set 1 Multiple Choice Questions

1. If $a=3, b=4, c=5$, then the value of $\sin 2B$ is

A. $\frac{24}{25}$

B. $\frac{25}{24}$

C. $\frac{1}{25}$

D. none

Answer: A

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2. The perimeter of a triangle ABC is saix times the arithmetic mean of the sines of its angles. If the side $a is 1$ then find angle A.

A. 30°

B. 60°

C. 90°

D. 120°

Answer: A

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3. In a ΔABC, if $\frac{\cos A}{a}=\frac{\cos B}{b}=\frac{\cos C}{c}$ and the side a = 2, then area of the triangle is

A. 1

B. 2

C. $\sqrt{3}/2$

D. $\sqrt{3}$

Answer: D

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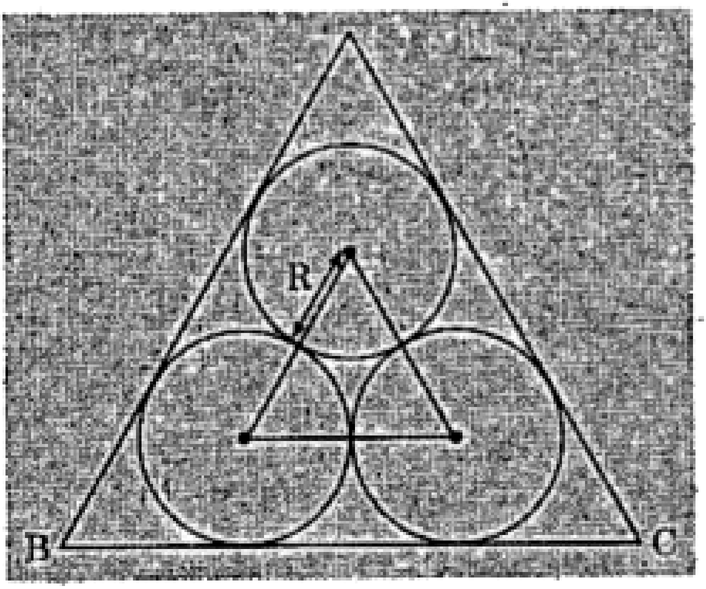
4. The area of the equilateral triangle which containing three coins of unity radius is



A. $6 + 4\sqrt{3}$ sq.units

B. $8 + \sqrt{3}$ sq.units

C. $4 + \frac{7\sqrt{3}}{2}$ sq.units

D. $12 + 2\sqrt{3}$ sq.units

Answer: A

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5. Blank.

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6. If in a $!ABC$, $\tan\frac{A}{2}$ and $\tan\frac{B}{2}$ are the roots of the equation $6x^2 - 5x + 1 = 0$, then

A. $a^2 + b^2 > c^2$

B. $a^2 + b^2 = c^2$

C. $a^2 - b^2 = c^2$

D. none

Answer: B

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7. If $a \cos A = b \cos B, \quad \text{then} \quad \Delta ABC$ is

A. isosceles

B. right angled

C. equilateral

D. right angled isosceles

Answer: D

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8. If $A = 75^{\circ}, B = 45^{\circ}, \quad \text{then} \quad b + c\sqrt{2} =$

A. a

B. $a + b + c$

C. $2a$

D. $\frac{1}{2}(a + b + c)$

Answer: C

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9. The angles of a triangle ABC are in the ratio $3:5:4 \quad \text{then} \quad a + b + c\sqrt{2} =$

A. 2b

B. 3b

C. 2c

D. 3a

Answer: B

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10. If the angles of a triangle are in the ratio $4:1:1$, then the ratio of the longest side to the perimeter is

A. $1:1+\sqrt{3}$

B. $2:3$

C. $\sqrt{3}:2+\sqrt{3}$

D. $1:2+\sqrt{3}$

Answer: C

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11. If the base angles of triangle are $\frac{22}{12} and 112 \frac{1}{2^0}$, then prove that the altitude of the triangle is equal to $\frac{1}{2}$ of its base.

A. base

B. $\frac{1}{3}$rd of base

C. $\frac{1}{2}$ of base

D. $\frac{1}{4}$ th of base

Answer: C

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12. If the angles of a triangle are in the ratio 1:2:3,the corresponding sides are in the ratio

A. $2:3:1$

B. $\sqrt{3}:2:1$

C. $2:\sqrt{3}:1$

D. $1:\sqrt{3}:2$

Answer: D

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13. The sides of a triangle are in the ratio $1:\sqrt{3}:2$ then the angles of the triangle are in the ratio

A. $1:3:5$

B. $2:3:4$

C. $3:2:1$

D. $1:2:3$

Answer: D

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14. In ΔABC if $\frac{\sin A}{\sin C}=\frac{\sin(A-B)}{\sin(B-C)}$, then a^2, b^2, c^2 are in :

A. A.P.

B. G.P.

C. H.P.

D. None

Answer: A

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15. If Δ stands for the area of a triangle ABC , then $a^2 \sin 2B + b^2 \sin 2A =$

A. 3Δ

B. 2Δ

C. 4Δ

D. -4Δ

Answer: C

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16. In ΔABC, a = 3, b = 4 and $\sin A = \frac{3}{4}$, find $\angle B$.

A. 60°

B. 90°

C. 45°

D. 30°

Answer: B

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17. If in a triangle ABC, $\cos A \sin B = \sin C$, then the value of $\tan \frac{A}{2}$ when $3b - 5c = 0$ is

A. $\frac{1}{2}$

B. $\frac{3}{4}$

C. $\frac{1}{\sqrt{3}}$

D. 0.33

Answer: A

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18. $\dfrac{\sin(B-C)}{\sin(B+C)} =$

A. $\dfrac{c^2}{a^2-b^2}$

B. $\dfrac{b^2}{c^2-a^2}$

C. $\dfrac{a^2}{b^2-c^2}$

D. $\dfrac{b^2+c^2}{a^2}$

Answer: D

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19. In any triangle, $\dfrac{1+\cos(A-B)\cos C}{1+\cos(A-C)\cos B} =$

A. $\dfrac{a^2+b^2}{a^2+c^2}$

B. $\frac{b^2 + c^2}{b^2 - c^2}$

C. $\frac{c^2 - a^2}{a^2 + b^2}$

D. none

Answer: A

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20. Which of the following is true in a triangle ABC

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

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

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

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

Answer: C

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21. If a^2, b^2, c^2 are in A.P.,then which of the following is also in A.P.?

A. $\sin A, \sin B, \sin C$

B. $\tan A, \tan B, \tan C$

C. $\cot A, \cot B, \cot C$

D. none

Answer: C

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22. In triangle ABC, if $\cot A, \cot B, \cot C$ are in $A\dot{P};$ then a^2, b^2, c^2 are in __________ progression.

A. A.P.

B. G.P.

C. H.P.

D. None

Answer: A

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23. If the sides a,b,c of ΔABC are in A.p., then $\cot\frac{1}{2}A, \cot\frac{1}{2}B, \cot\frac{1}{2}C$ are in

A. A.P.

B. G.P.

C. H.P.

D. None

Answer: A

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24. If the sides a,b,c of ΔABC are in A.p., then $\cos A \cot\frac{1}{2}A, \cos B \cot\frac{1}{2}B, \cos C \cot\frac{1}{2}C$ are in

A. A.P.

B. G.P.

C. H.P.

D. None

Answer: A

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25. In any triangle ABC, prove that: $a^3\cos(B-C)+b^3\cos(C-A)+c^3\cos(A-B)=3abc$

A. $3abc$

B. $3(a+b+c)$

C. $abc(a+b+c)$

D. 0

Answer: A

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26. If in ΔABC, $a\tan A+b\tan B=(a+b)\tan\frac{1}{2}(A+B)$, then

A. $A=B$

B. $B=C$

C. $C=A$

D. $A=B=C$

Answer: A

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27. If $\cot\frac{A}{2}=\frac{b+c}{a}$, then ΔABC is

A. isosceles

B. equilateral

C. right angled

D. none of these

Answer: C

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28. In a triangle ABC, a (b cos C - c cos B) =

A. a^2

B. $b^2 - c^2$

C. 0

D. none of these

Answer: B

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29. In any triangle ABC, $\sum \frac{\sin^2 A + \sin A + 1}{\sin A}$ is always greater than

A. 9

B. 3

C. 27

D. none of these

Answer: A

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30. In any $!ABC, (\Sigma)\left(\frac{\sin^2 A + \sin A + 1}{\sin A}\right)$ is always greater than

A. 9

B. 3

C. 27

D. 10

Answer: C

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31. In a right angled $!ABC \sin^2 A + \sin^2 B + \sin^2 C$=

A. 0

B. 1

C. -1

D. 2

Answer: D

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32. If a triangle ABC, $\sin A = \sin^2 B$ and $2\cos^2 A = 3\cos^2 B$, then the ΔABC is :

A. right angled

B. obtuse angled

C. isosceles

D. equilateral

Answer: B

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33. In the triangle ABC, if $(a^2 + b^2)\sin(A - B) = (a^2 - b^2)\sin(A + B)$, then the triangle is

A. right angled or isosceles

B. right angled and isosceles

C. equilatreral

D. none of these

Answer: A

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34. Blank.

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35. In a ΔABC, If tan A/2, tan B/2, tan C/2 are in A.P. then cos A. cos B, cos C are in

A. A.P.

B. G.P.

C. H.P.

D. None

Answer: A

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36. If in a ΔABC, $\cos A + 2\cos B + \cos C = 2, \quad \text{then} \quad a, b, c$ are in

A. A.P.

B. G.P.

C. H.P.

D. None

Answer: A

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37. In a $\Delta ABC, \angle B = \frac{\pi}{3}$ and $\angle C = \frac{\pi}{4}$ let D divide BC internally in the ratio $1:3$, then $\frac{\sin(\angle BAD)}{\sin(\angle CAD)}$ is equal to :

A. $\frac{1}{\sqrt{6}}$

B. $\frac{1}{3}$

C. $\frac{1}{3}$

D. $\sqrt{\frac{2}{3}}$

Answer: A

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38. If, in a $\triangle PQR$, sin P, sin Q, sin R are in the A.P, then its altitudes are in

A. the altitudes are in A.P.

B. the altitudes are in H.P.

C. the altitudes are in G.P.

D. the altitudes are in A.P.

Answer: B

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39. If in a $!ABC$, the altitudes from the vertices A , B , C on the opposite sides are in H.P., then sin A, sin B , sin C are in

A. A.P.

B. G.P.

C. H.P.

D. None

Answer: A

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40. If $\tan A, \tan B$ are the roots of the quadratic $abx^2 - c^2x + ab = 0$, where a,b,c are the sides of a triangle , then

A. $\tan A = \frac{a}{b}$

B. $\tan B = \frac{b}{a}$

C. $\cos C = 0$

D. $\tan A + \tan B = \frac{c^2}{ab}$

Answer: A::B::C::D

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41. In a triangle , $a^2+b^2+c^2=ca+ab\sqrt{3}$. Then the triangle is

A. equilateral

B. right-angled and isosceles

C. right -angled with $A=90^\circ$, $B=60^\circ$, $C=30^\circ$

D. None

Answer: C

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42. There exists triangle ABC satisfying

A. $\tan A+\tan B+\tan C=0$

B. $\dfrac{\sin A}{2}=\dfrac{\sin B}{3}=\dfrac{\sin C}{7}$

C. $(a+b)^2=c^2+ab$ and $\sqrt{2}(\sin A+\cos A)=\sqrt{3}$

D. $\sin A+\sin B=\dfrac{\sqrt{3}+1}{2}$, $\cos A\cos B=\dfrac{\sqrt{3}}{4}=\sin A\sin B$

Answer: C::D

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43. CF is the internal bisector of angle C of ΔABC then CF is equal to

A. $\frac{2ab}{a+b}\cos\frac{C}{2}$

B. $\frac{a+b}{2ab}\cos\frac{C}{2}$

C. $\frac{b\sin A}{\sin\left(B+\frac{C}{2}\right)}$

D. none of these

Answer: A:C

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44. AD is internal angle bisector of ΔABC at $\angle A$ and DE perpendicular to AD which intersects AC at E and meets AB in F, then:

A. $EF = \frac{4bc}{b+c}\sin\frac{A}{2}$

B. $AD = \frac{2bc}{b+c}\cos\frac{A}{2}$

C. AE is harmonic mean of b and c

D. ΔAEF is an isosceles triangle

Answer: A::B::C::D

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45. Given an isoceles triangle, whose one angle is 120° and radius of its incircle = $\sqrt{3}$. Then the area of the triangle in sq. units is

A. 4π sq. units

B. $(12 - 7\sqrt{3})$ sq. units

C. $(12 + 7\sqrt{3})$sq.units

D. $(7 + 12\sqrt{3})$ sq. units

Answer: C

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46. Can there exist triangles ABC satisfying the following relation? Write yes or no giving reasons:

$\tan A + \tan B + \tan C = 0$

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47. Let in a triangle ABC sides opposite to vertices A B&C be a b&c then there exists a triangle satisfying

(1) tan A+tan B+tan C=0

(2) $\frac{\sin A}{2} = \frac{\sin B}{3} = \frac{\sin C}{7}$

(3)$(a+b)^2 = c^2 + ab$

(4) Not possible

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48. Can there exist triangles ABC satisfying the following relation? Write yes or no giving reasons:

$(a+b)^2 = c^2 + ab$ and $\sqrt{2}(\sin A + \cos A) = \sqrt{3}$.

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49. Can there exist triangles ABC satisfying the following relation? Write yes or no giving reasons:

$\sin A + \sin B = \frac{\sqrt{3}+1}{2}, \cos A \cos B = \frac{\sqrt{3}}{4} = \sin A \sin B.$

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Problem Set 1 True And False

1.

$a(\cos B \cos C + \cos A) = b(\cos C \cos A + \cos B) = c(\cos A \cos B + \cos C)$

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2. Prove that $\dfrac{a\sin(B-C)}{b^2-c^2}=\dfrac{b\sin(C-A)}{c^2-a^2}=\dfrac{c\sin(A-B)}{a^2-b^2}$

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3. In a triangle ABC, the side c has two values , then $\dfrac{(a+b)^2}{1+\cos C}+\dfrac{(b-a)^2}{1-\cos C}=\dfrac{2a^2}{\sin^2 A}$ True or false ?

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Problem Set 1 Fill In The Blanks

1. $\dfrac{\cos^2\frac{B-C}{2}}{(b+c)^2}+\dfrac{\sin^2\frac{B-C}{2}}{(b-c)^2}=\dots\dots\dots.$

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2. In any ΔABC , find the value of $\frac{a^2\sin(B-C)}{\sin B+\sin C}+\frac{b^2\sin(C-A)}{\sin C+\sin A}+\frac{c^2\sin(A-B)}{\sin A+\sin B}$

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3. In ΔABC, prove that:

$a\sin(B-C)+b\sin(C-A)+c\sin A-B)=0$

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4.

$a\sin\frac{1}{2}A\sin\frac{1}{2}(B-C)+b\sin\frac{1}{2}B\sin\frac{1}{2}(C-A)+c\sin\frac{1}{2}C\sin\frac{1}{2}(A-B$

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5. In any $\Delta ABC,$ prove that :

$a^2(\cos^2 B-\cos^2 C)+b^2(\cos^2 C-\cos^2 A)+c^2(\cos^2 A-\cos^2 B)=0$

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6. $(b-c)\cot\frac{1}{2}A+(c-a)\cot\frac{1}{2}B+(a-b)\cot\frac{1}{2}C=\ldots\ldots$

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7. In any triangle ABC, prove that: $a^3\sin(B-C)+b^3\sin(C-A)+c^3\sin(A-B)=0$

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8. $\frac{b^2-c^2}{\cos B+\cos C}+\frac{c^2-a^2}{\cos C+\cos A}+\frac{a^2-b^2}{\cos A+\cos B}=\ldots\ldots$

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9. In a $\Delta ABC, AD$ is the altitude from A. Given $b>, c\angle C=23^\circ$ and $AD=\frac{abc}{b^2-c^2}$, then $\angle B=$ ....

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10. In a triangle $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 0 \text{ then } \sin^3 A + \sin^3 B + \sin^3 C = \ldots.$

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Problem Set 2 Multiple Choice Questions

1. If $a = \sqrt{3}, b = \frac{1}{2}(\sqrt{6} + \sqrt{2}), \text{ and } c = \sqrt{2}$, then find $\angle A$

A. 30°

B. 60°

C. 75°

D. none

Answer: B

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2. The sides of a triangle are a,b and $\sqrt{a^2+b^2+ab}$ then the greatest angle is

A. 120°

B. 90°

C. 75°

D. 60°

Answer: A

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3. The sides of the triangle are sinα , cosα and $\sqrt{1+\sin\alpha\cos\alpha}$ for some $0<\alpha<\frac{\pi}{2}$. Then the greatest angle of the triangle is

A. 60°

B. 90°

C. 120°

D. 150°

Answer: C

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4. $(b+c)\cos A + (c+a)\cos B + (a+b)\cos C =$

A. $b+c-a$

B. $c+a-b$

C. $a+b-c$

D. $a+b+c$

Answer: D

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5. In a triangle $\Sigma(b+c)\cos A = 3\sqrt[3]{abc}$, then the triangle is

A. right angled

B. isosceles

C. equilateral

D. none

Answer: C

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6. $(a+b+c)(\cos A+\cos B+\cos C) =$

A. $\Sigma a \sin^2 \frac{A}{2}$

B. $\Sigma a \cos^2 \frac{A}{2}$

C. $2\Sigma a \sin^2 \frac{A}{2}$

D. $2\Sigma a \cos^2 \frac{A}{2}$

Answer: D

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7. In a triangle ABC, A = 8, b = 10 and c = 12. What is the angle C equal to ?

A. 2A

B. 3A

C. A/2

D. none

Answer: A

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8. In a $\Delta ABC, a, b, A$ are given and c_1, c_2 are two valus of the third side c. The sum of the areas two triangles with sides a,b,c_1 $\text{ and } a, b, c_2$ is

A. $\frac{1}{2}a^2 \sin 2A$

B. $\frac{1}{2}b^2 \sin 2A$

C. $b^2 \sin 2A$

D. $a^2 \sin 2A$

Answer: B

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9. In a triangle ABC, a= 4, b = 3, $\angle A = 60^\circ$. Then, c is the root of the equation

A. $c^2 - 3c - 7 = 0$

B. $c^2 + 3c + 7 = 0$

C. $c^2 - 3c + 7 = 0$

D. $c^2 + 3c - 7 = 0$

Answer: A

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10. If in a triangle ABC $\angle B = 60^\circ$ then

A. $(a-b)^2 + ab = c^2$

B. $(b-c)^2 + bc = a^2$

C. $(c-a)^2 + ca = b^2$

D. $a^2 + b^2 + c^2 = 2b^2 + ac$

Answer: C

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11. If, in a ΔABC, $b^2 + c^2 = 3a^2$,

then : $\cot B + \cot C - \cot A$ =

A. 1

B. $\dfrac{ab}{4\Delta}$

C. 0

D. $\frac{ac}{4\Delta}$

Answer: C

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12. If the sides a triangle are in the ratio $2:\sqrt{6}:\left(\sqrt{3}+1\right)$, then the largest angle of the triangle will be

A. 60°

B. 75°

C. 90°

D. 120°

Answer: B

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13. The sides of a triangle are in the ratio $2 : \sqrt{6} : \sqrt{3} + 1$, then its angles are

A. $45^{\circ}, 45^{\circ}, 90^{\circ}$

B. $60^{\circ}, 30^{\circ}, 90^{\circ}$

C. $45^{\circ}, 60^{\circ}, 75^{\circ}$

D. none

Answer: C

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14. The sides of a triangle are in the ratio $1 : \sqrt{3} : 2$ then the angles of the triangle are in the ratio

A. $1 : 3 : 5$

B. $2 : 3 : 4$

C. $3 : 2 : 1$

D. $1:2:3$

Answer: D

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15. The sides a,b,c of a triangle ABC are the roots of $x^3 - 11x^2 + 38x - 40 = 0$, then $\Sigma \frac{\cos A}{a} =$

A. $\frac{3}{4}$

B. 1

C. $\frac{9}{16}$

D. none

Answer: C

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16. If x, $y > 0$, then prove that the triangle whose sides are given by $3x + 4y, 4x + 3y, \text{ and } 5x + 5y$ units is obtuse angled.

A. right angled

B. obtuse angled

C. acute angled

D. none of these

Answer: B

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17. In $\triangle ABC$, if $a^2 + c^2 - b^2 = ac$, then $\angle B =$

A. $\frac{\pi}{3}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{6}$

D. none

Answer: A

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18. If the angles A, B, C of the triangle ABC be in A.P., then

$$\frac{a+c}{\sqrt{(a^2-ac+c^2)}}=$$

A. $2\cos\frac{A+C}{2}$

B. $2\sin\frac{A+C}{2}$

C. $2\cos\frac{A-C}{2}$

D. $2\sin\frac{A-C}{2}$

Answer: C

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19. In a $!ABC$, if $\frac{1}{b+c}+\frac{1}{c+a}=\frac{3}{a+b+c}$, then $\angle C$=

A. 90°

B. 60°

C. 45°

D. 30°

Answer: B

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20. If $\cos A = \frac{\sin B}{2\sin C}, \quad \text{then} \quad \Delta ABC$ is

A. rt, angled

B. isosceles

C. equilateral

D. none

Answer: B

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21. In a triangle $ABC, \dfrac{a\sin B + b\sin A}{\sqrt{\sin A \sin B}} = 4, \angle C = \dfrac{\pi}{3}$ then $a^2 + b^2 - c^2 =$

A. 4

B. 6

C. 8

D. 10

Answer: A

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22. In a triangle, the lengths of the two larger sides are 10 and 9, respectively. If the angles are in A.P., then the length of the third side can be $5 - \sqrt{6}$ (b) $3\sqrt{3}$ (c) 5 (d) $5 + \sqrt{6}$

A. $5 - \sqrt{6}$

B. $3\sqrt{3}$

C. 5

D. $5 + \sqrt{6}$

Answer: A::D

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23. With usual notations, if in a triangle ABC $\frac{b+c}{11} = \frac{c+a}{12} = \frac{a+b}{13}$, then cos A : cos B : cos C is :

A. $7:19:25$

B. $19:7:25$

C. $12:14:20$

D. $19:25:20$

Answer: A

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24. In a triangle ABC, $a^4+b^4+c^4=2(a^2+c^2)b^2$ then the angle B is

A. $45^\circ, 135^\circ$

B. $45^\circ, 45^\circ$

C. $45^\circ, 90^\circ$

D. none of these

Answer: A

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25. In a triangle ABC, $a^2\cos^2 A=b^2+c^2$, then

A. $A>\frac{\pi}{2}$

B. $A<\frac{\pi}{4}$

C. $\frac{\pi}{4}<A<\frac{\pi}{2}$

D. $A=\frac{\pi}{2}$

Answer: A

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26. If in a triangle $\sin^4 A + \sin^4 B + \sin^4 C = \sin^2 B \sin^2 C + 2 \sin^2 C \sin^2 A + 2 \sin^2 A \sin^2 B$ then its angle A is equal to

A. $45^\circ, 135^\circ$

B. $30^\circ, 150^\circ$

C. $60^\circ, 120^\circ$

D. none of these

Answer: B

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27. If $A = 60^\circ$, then $\frac{b}{c+a} + \frac{c}{a+b} =$

A. 0

B. 1

C. 2

D. 3

Answer: B

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28. The sides of a triangle are three consecutive natural numbers and its largest angle is twice the smallest one. Determine the sides of the triangle.

A. 1,2,3

B. 2,3,4

C. 3,4,5

D. 4,5,6

Answer: D

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29. If D id the mid-point of the side BC of a triangle ABC and AD is perpendicular to AC , then

A. $a^2+b^2+c^2=4b^2$

B. $a^2+b^2-c^2=4b^2$

C. $a^2-b^2+c^2=4b^2$

D. $a^2-b^2-c^2=4b^2$

Answer: B

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30. Prove that $\frac{(a+b+c)(b+c-a)(c+a-b)(a+b-c)}{4b^2c^2}=\sin^2 A$

A. $\cos 2A$

B. $1 + \cos A$

C. $1 - \cos A$

D. $\sin^2 A$

Answer: D

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31. Let 'l' is the length of median from the vertex A to the side BC of a ΔABC. Then

A. $4l^2 = b^2 + 4ac \cos B$

B. $4l^2 = a^2 + 4bc \cos A$

C. $4l^2 = c^2 + 4ab \cos C$

D. $4l^2 = b^2 + 2c^2 - 2a^2$

Answer: B

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32. If a triangle ABC, D is the mid point of side BC and $\angle ADB = \theta$ then $\cot \theta =$

A. $\dfrac{b^2 + c^2}{4\Delta}$

B. $\dfrac{b^2 - c^2}{4\Delta}$

C. $\dfrac{b^2 + c^2 - a^2}{4\Delta}$

D. none

Answer: B

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33. The straight roads intersect at an angle of 60º. A bus on one road is 2 km away from the intersection and a car on tire other road is 3 km away from the intersection. Then, the direct distance between the two vehicles, is

A. $1km$

B. $\sqrt{2}km$

C. $4km$

D. $\sqrt{7}km$

Answer: D

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34. If the angles A,B,C of a triangle are in A.P. and sides a,b,c, are in G.P., then prove that a^2, b^2, c^2 are in A.P.

A. A.P.

B. H.P.

C. G.P.

D. none of these

Answer: A

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35. If the anngle A,B,C of a ΔABC are in A.P then :-

A. $c^2 = a^2 + b^2 - ab$

B. $b^2 = a^2 + c^2 - ac$

C. $c^2 = a^2 + b^2$

D. none of these

Answer: B

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36. If in a triangles $a\cos^2\left(\frac{C}{2}\right) + c\cos^2\left(\frac{A}{2}\right) = \frac{3b}{2}$, then the sides of the triangle are in

A. A.P.

B. H.P.

C. G.P.

D. none of these

Answer: A

Watch Video Solution

37. In any ΔABC, prove that $(a-b)^2\cos^2\frac{C}{2}+(a+b)^2\sin^2\frac{C}{2}=c^2.$

A. a^2

B. b^2

C. c^2

D. none

Answer: C

Watch Video Solution

38. If $\cos A + \cos B + 2\cos C = 2$ then the sides of the ABC are in A.P.

(b) G.P. (c) H.P. (d) none

A. A.P.

B. H.P.

C. G.P.

D. none of these

Answer: A

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39. In a triangle ABC with fixed base BC, the vertex A moves such that

$\cos B + \cos C = 4\sin^2 A/2$

If a, b and c denote the lengths of the sides of the triangle opposite to the angles A,B and C respectively, then

A. $b + c = 4a$

B. $b + c = 2a$

C. locus of point A is an ellipse

D. locus of point A is a pair of straight lines

Answer: B::C

Watch Video Solution

40. If in a triangle ABC, $2\frac{\cos A}{a}$+(cos B)/(b)+2(cos C)/c=(a)/(bc)+b/(ca)`

then the value of the angle A is

A. 90°

B. 135°

C. 45°

D. none

Answer: A

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41. In ΔABC, $(a+b+c)(b+c-a)=kbc$ if

A. $k<0$

B. $k>0$

C. $0<k<4$

D. $k>4$

Answer: C

Watch Video Solution

42. In a triangle ABC, 2ac sin $\left(\frac{A-B+C}{2}\right)$ =

A. $a^2+b^2-c^2$

B. $c^2+a^2-b^2$

C. $b^2-c^2-a^2$

D. $c^2-a^2-b^2$

Answer: B

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43. In a ABC, prove that: $\left(b^2-c^2\right)\cot A+\left(c^2-a^2\right)\cot B+\left(a^2-b^2\right)\cot C=0$

A. a^2

B. b^2

C. c^2

D. 0

Answer: D

Watch Video Solution

44. In any ΔABC, prove that $\frac{\left(b^2-c^2\right)}{a^2}\sin 2a+\frac{\left(c^2-a^2\right)}{b^2}$ sin 2B+$\frac{\left(a^2-b^2\right)}{c^2}$sin 2C=0

A. 0

B. $\Sigma \cos A$

C. $\Sigma \sin A$

D. `none

Answer: A

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45. The sides of a triangle ABC are 6 , 7 , 8 and the smallest angle being C then the length of altitude from C is

A. $\frac{7}{2}\sqrt{15}$

B. $\frac{7}{3}\sqrt{15}$

C. $\frac{7}{4}\sqrt{15}$

D. none

Answer: C

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46. The sides of a triangle ABC are 6, 7, 8, the smallest angle being C then

The length of the median from C is

A. $\sqrt{\frac{95}{1}}$

B. $\sqrt{\frac{95}{2}}$

C. $\sqrt{\frac{95}{3}}$

D. none

Answer: B

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47. The sides of a triangle ABC are 6, 7, 8, the smallest angle being C then

The length of internal bisector of angle C is ...

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48. In a triangle $\cot A : \cot B : \cot C = 30 : 19 : 16$ then $a : b : c$

A. $5 : 6 : 7$

B. $6 : 7 : 5$

C. $7 : 6 : 5$

D. none

Answer: A

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49. The sids of a triangle are $\sqrt{(b^2 + c^2)}, \sqrt{(c^2 + a^2)}, \sqrt{(a^2 + b^2)}$ where $a, b, c > 0$. The area of the triangle is given by

A. $\frac{1}{2}\sqrt{\Sigma b^2 c^2}$

B. $\frac{1}{2}\sqrt{\Sigma a^4}$

C. $\frac{\sqrt{3}}{2}\sqrt{\Sigma b^2 c^2}$

D. $\frac{\sqrt{3}}{2}(\Sigma bc)$

Answer: A

Watch Video Solution

Problem Set 2 True And False

1. $(b^2 + c^2 - a^2)\tan A = (c^2 + a^2 - b^2)\tan B = (a^2 + b^2 - c^2)\tan C$

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2. Let ABC be a triangle such that $\angle A = 45^\circ, \angle B = 75^\circ$, then $a + c\sqrt{2}$ is equal to

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Problem Set 2 Fill In The Blanks

1. The sides of a triangle are $x^2+x+1, 2x+1$ and x^2-1. Prove that the greatest angle is 120^0

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2. If $\cos 3A+\cos 3B+\cos 3C=1$ then one of the angles of the triangle ABC is

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3. If the sines of the angles of a triangle are in the ratio $3:5:7$ their cotangents are in the ratio .....

Watch Video Solution

Problem Set 3 Multiple Choice Questions

1. If: $\frac{\cos A}{2} = \sqrt{\frac{b+c}{2c}}$, then $c^2 =$

A. $a^2 + b^2 = c^2$

B. $b^2 + c^2 = a^2$

C. $c^2 + a^2 = b^2$

D. none

Answer: A

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2. In ΔABC, if $b + c = 3a$, then prove that:

$\frac{\cot B}{2} \cdot \frac{\cot C}{2} = 2$

A. 1

B. 2

C. $\sqrt{3}$

D. $\sqrt{2}$

Answer: B

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3. In ΔABC if a= 16 , b= 24 and c = 20 then $\cos\left(\frac{B}{2}\right)$

A. $\frac{3}{4}$

B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. $\frac{1}{3}$

Answer: A

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4. If the hypotenuse of a right-angled triangle is four times the length of the perpendicular drawn from the opposite vertex to it, then the difference of the two acute angles will be 60^0 (b) 15^0 (c) 75^0 (d) 30^0

A. 75°

B. 15°

C. 60°

D. 30°

Answer: C

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5. Prove that $bc\cos^2.\frac{A}{2} + ca\cos^2.\frac{B}{2} + ab\cos^2.\frac{C}{2} = s^2$

A. $(s-a)^2$

B. $(s-b)^2$

C. $(s-c)^2$

D. s^2

Answer:

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6. If the sides of a triangle a,b,c be in A.P., then $a\cos^2\frac{C}{2}+c\cos^2\frac{A}{2}=$

A. $\frac{3a}{2}$

B. $\frac{3b}{2}$

C. $\frac{3c}{2}$

D. $\frac{\Sigma a}{2}$

Answer: B

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7. $\frac{b-c}{a}\cos^2\frac{1}{2}A+\frac{c-a}{b}\cos^2\frac{1}{2}B+\frac{a-b}{c}\cos^2\frac{1}{2}C=$

A. $(s-a)(s-b)$

B. $(s-b)(s-c)$

C. $(s-c)(s-a)$

D. 0

Answer: D

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8. $2abc.\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}=$

A. aS

B. bS

C. cS

D. $2sS$

Answer: D

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9. In a triangle ABC,

abc s $\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2} =$

A. Δ^2

B. $3\Delta^2$

C. Δ^3

D. none

Answer: A

Watch Video Solution

10. $1-\tan\frac{A}{2}.\tan\frac{B}{2} =$

A. $\frac{2a}{\Sigma a}$

B. $\frac{2b}{\Sigma a}$

C. $\frac{2c}{\Sigma a}$

D. 0

Answer: C

Watch Video Solution

11. If the sides of triangle a,b,c be is A.P. then $\tan\frac{A}{2}+\tan\frac{C}{2}=$

A. $\frac{2}{3}\cot\frac{A}{2}$

B. $\frac{2}{3}\cot\frac{B}{2}$

C. $\frac{2}{3}\cot\frac{C}{2}$

D. none

Answer: B

Watch Video Solution

12. If in a triangle ABC, $S=a^2-(b-c)^2$ then tan A is equal to

A. $\frac{1}{2}$

B. $\frac{8}{17}$

C. $\frac{8}{15}$

D. $\frac{15}{16}$

Answer: C

Watch Video Solution

13. If $c^2 = a^2 + b^2$, then $4s(s-a)(s-b)(s-c)$ is equal to

A. s^4

B. b^2c^2

C. c^2a^2

D. a^2b^2

Answer: D

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14. If in a triangle $ABC \cos A \cos B + \sin A \sin B \sin C = 1$, then the sides are proportional to

A. $1:1:\sqrt{2}$

B. $1:\sqrt{2}:1$

C. $\sqrt{2}:1:1$

D. none

Answer: A

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15. If in a triangle $ABC \cos A \cos B + \sin A \sin B \sin C = 1$, then the triangle is

A. isosceles

B. right angled

C. isosceles right angled

D. equilateral

Answer: C

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16. If in a $!ABC$, a = 6 , b = 3 and cos (A -B) = $\frac{4}{5}$,then its area in square units, is

A. 3

B. 6

C. 9

D. 12

Answer: C

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17. In a triangle ABC we define $x=\tan\frac{B-C}{2}\tan\frac{A}{2}, y=\tan\frac{C-A}{2}\tan\frac{B}{2}$ and $z=\tan\frac{A-B}{2}\tan\frac{C}{2}$ then the value of $x+y+z$ (in terms of x, y, z) is

A. xyz

B. $-xyz$

C. $2xyz$

D. none

Answer: B

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18. In a triangle ABC if $a=5, b=4, \cos(A-B)=\frac{31}{32}$, then the third side c =

A. 4

B. 6

C. 8

D. 10

Answer: B

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19. In a triangle $\cot A \cot B \cot C > 0$, then the triangle is

A. acute angled

B. rt. angled

C. obtuse angled

D. none

Answer: A

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20. If $\cos B \cos C + \sin B \sin C \sin^2 A = 1$, then the triangle ABC is

A. isosceles and right angled

B. equilateral

C. isosceles whose equal angles are greater than $\pi / 4$

D. none

Answer: A

Watch Video Solution

21. If $\cos A + \cos B + \cos C = 3/2, \quad \text{then} \quad \Delta ABC$ is

A. right angled

B. isosceles

C. equilateral

D. none

Answer: C

Watch Video Solution

22. The two adjacent sides of a cyclic quadrilateral are $2 and 5$ and the angle between them is 60^0. If the area of the quadrilateral is $4\sqrt{3}$, find the remaining two sides.

A. $2, 3$

B. $1, 2$

C. $3, 4$

D. $2, 2$

Answer: A

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23. The two adjacent sides of a cyclic quadrilateral are 2 cm and 5 cm and the angle between them is 60°. If the third side is 3 cm, then the fourth side is of length

A. 2

B. 3

C. 4

D. 5

Answer: A

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24. If a,b,c,d are the side of a quadrilateral, then find the the minimuym value of $\frac{a^2+b^2+c^2}{d^2}$

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. 1

Answer: B

Watch Video Solution

25. There can exist a triangle ABC satisfying the conditions :

A. $b \sin A = a, A < \pi/2$

B. $b \sin A > a, A > \pi/2$

C. $b \sin A > a, A < \pi/2$

D. $b \sin A < a, A < \pi/2, b > a$

Answer: A::D

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26. If the sides of a triangle are $17, 25 and 28,$ then find the greatest length of the altitude.

A. $420 / 17$

B. $84 / 5$

C. 15

D. none of these

Answer: A

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27. In a $\Delta ABC, \tan 4 - , \tan,$ then

A. ac,b are in A.P.

B. a,b,c are in A. P.

C. b, a, care in A, P.

D. a,b,c are in G. P.

Answer: A

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28. If the cotangents of half the angles of a triangle are in A.P., then prove that the sides are in A.P.

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: A

Watch Video Solution

29. If the roots of the equation $c^2x^2 - c(a+b)x + ab = 0$ are sin A, sin B where A, B and C are the angles and a, b, c are the opposite sides of a triangle, then the triangle is :

(i) right angled

(ii) acute angled

(iii) obtuse angled

(iv) $\sin A+\cos A=\frac{a+b}{c}$

A. right angled

B. acute angled

C. obtuse angled

D. $\sin A+\cos A=\frac{a+b}{c}$

Answer: A::D

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30. Which of the following holds goods for any triangle ABC ?

A. $\frac{\cos A}{a}+\frac{\cos B}{b}+\frac{\cos C}{c}=\frac{a^2+b^2+c^2}{2abc}$

B. $\frac{\sin A}{a}+\frac{\sin B}{b}+\frac{\sin C}{c}=\frac{3}{2R}$

C. $\dfrac{\cos A}{a}+\dfrac{\cos B}{b}+\dfrac{\cos C}{c}$

D. $\dfrac{\sin 2A}{a^2}+\dfrac{\sin 2B}{b^2}+\dfrac{\sin 2C}{c^2}$

Answer: A::B

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Problem Set 3 True And False

1. $\dfrac{\cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}}{\cot A+\cot B+\cot C}=\dfrac{(a+b+c)^2}{a^2+b^2+c^2}$

A. True

B. False

C.

D.

Answer: T

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2. If p_1, p_2, p_3 are the altitues of a triangle from the vertieces A,B,C and Δ is the area of the triangle then prove that

$$\frac{1}{p_1} + \frac{1}{p_2} + \frac{1}{p_3} = \frac{2ab}{(a+b+c+)\Delta}\cos^2\frac{C}{2}$$

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3. If one side of a triangle is double the other, and the angles opposite to these sides differ by 60°, show that the triangle is right-angled.

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Problem Set 3 Fill In The Blanks

1. In a triangle the maximum value of $\cos A + \cos B + \cos C$ is.....

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2. In a triangle ABC, $\angle C = 60^\circ$ and $\angle A = 75^\circ$ If D is a point on AC such that the area of the ΔBAD is $\sqrt{3}$ times the area of the ΔBCD, then the $\angle ABD$ is

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Problem Set 4 Multiple Choice Questions

1. If the area os a triangle is 81 square cm and its perimeter is 27 cm, then find its in-radius in centi-metres.

A. 6

B. 3

C. 1.5

D. none

Answer: A

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2. If the lengths of the side of a triangle are 3,4 and 5 units, then find the circum radius R.

A. 2.0

B. 2.5

C. 3.0

D. 3.5

Answer: B

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3. If the sides of a triangle be 18, 24, 30 cms, then radius of the in-circle is

A. 2

B. 4

C. 6

D. 9

Answer: C

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4. The sides of a triangle are 13,14,15, then the radius of its in-circle is

A. $\frac{67}{8}$

B. $\frac{65}{4}$

C. 4

D. 24

Answer: C

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5. $rr_1r_2r_3 =$

A. R^2

B. S^2

C. s^2

D. none

Answer: B

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6. Given an isoceles triangle, whose one angle is 120° and radius of its incircle = $\sqrt{3}$. Then the area of the triangle in sq. units is

A. 4π sq. units

B. $(12 - 7\sqrt{3})$ sq. units

C. $(12 + 7\sqrt{3})$sq.units

D. $(7 + 12\sqrt{3})$ sq. units

Answer: C

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7. In an equilateral triangle the in-radius and the circum-radius are connected by

A. $r = 4R$

B. $r = \frac{R}{2}$

C. $r = \frac{R}{3}$

D. none

Answer: B

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8. In an equilaterial triangle of side $2\sqrt{3}$ cms, the circum-radius ,is

A. $1cm$

B. $\sqrt{3}cm$

C. $2cm$

D. $2\sqrt{3}cm$

Answer: C

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9. If the sides of a triangles are $3:7:8,$ then ratio R:r

A. $2:7$

B. $7:2$

C. $3:7$

D. $7:3$

Answer: B

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10. In $\triangle ABC$, if $r_1 = 2r_2 = 3r_3$, then

A. $\frac{a}{b} = \frac{4}{5}$

B. $\frac{a}{b} = \frac{5}{4}$

C. $\frac{a}{c} = \frac{3}{5}$

D. $\frac{a}{c} = \frac{-5}{3}$

Answer: B::D

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11. If the triangle be equilateral, then $R : r : r_1 =$

A. $1 : 1 : 1$

B. $2 : 1 : 3$

C. $1 : 2 : 3$

D. $3 : 2 : 4$

Answer: B

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12. If the radius of the circum-circle of an isosceles triangle ABC is equal to $AB(=AC)$, then angle A is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. $\frac{2\pi}{3}$

Answer: D

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13. $r_2r_3+r_3r_1+r_1r_2=$

A. s^2

B. S^2

C. S^2 / r^2

D. R^2

Answer: A::C

Watch Video Solution

14. $r_2 r_3 =$

A. $S \tan \frac{A}{2}$

B. $S \cot \frac{A}{2}$

C. $S \sin \frac{A}{2}$

D. $S \frac{\cos A}{2}$

Answer: B

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15. $rr_1 \cot(A/2) =$

A. Δ

B. Δ^2

C. $\frac{\Delta}{2}$

D. 2Δ

Answer: A

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16. $r_1 + r_2 + r_3 - r =$

A. R

B. 2R

C. 3R

D. 4R

Answer: D

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17. $(r_1 - r)(r_2 - r)(r_3 - r) =$

A. R/r

B. $4R^2r$

C. $4Rr^2$

D. $4R$

Answer: C

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18. $\left(\frac{1}{r} - \frac{1}{r_1}\right)\left(\frac{1}{r} - \frac{1}{r_2}\right)\left(\frac{1}{r} - \frac{1}{r_3}\right) =$

A. $\frac{16R}{r^2(\Sigma a)^2}$

B. $\frac{R}{(\Sigma a)^2}$

C. $\frac{4R}{(\Sigma a)^2}$

D. $\frac{16R}{(\Sigma a)^2}$

Answer: A

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19. $\frac{1}{r_1^2} + \frac{1}{r_2^2} + \frac{1}{r_3^2} + \frac{1}{r^2} =$

A. $\frac{a^2 + b^2 + c^2}{s^2}$

B. $\frac{\Sigma a^2}{S^2}$

C. $4R$

D. $4R$

Answer: B

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20. $\left(\frac{1}{r_1}+\frac{1}{r_2}\right)\left(\frac{1}{r_2}+\frac{1}{r_3}\right)\left(\frac{1}{r_3}+\frac{1}{r_1}\right)=$

A. $\frac{16R}{abc}$

B. $\frac{R^3}{4abc}$

C. $\frac{64R^3}{a^2b^2c^2}$

D. $\frac{R^3}{abc}$

Answer: C

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21. $provet\hat{?}\ \triangle\ ABC, \frac{1}{r_1}+\frac{1}{r_2}+\frac{1}{r_3}=\frac{1}{r}$

A. $\frac{3}{r}$

B. $\frac{2}{r}$

C. $\frac{1}{r}$

D. none

Answer: C

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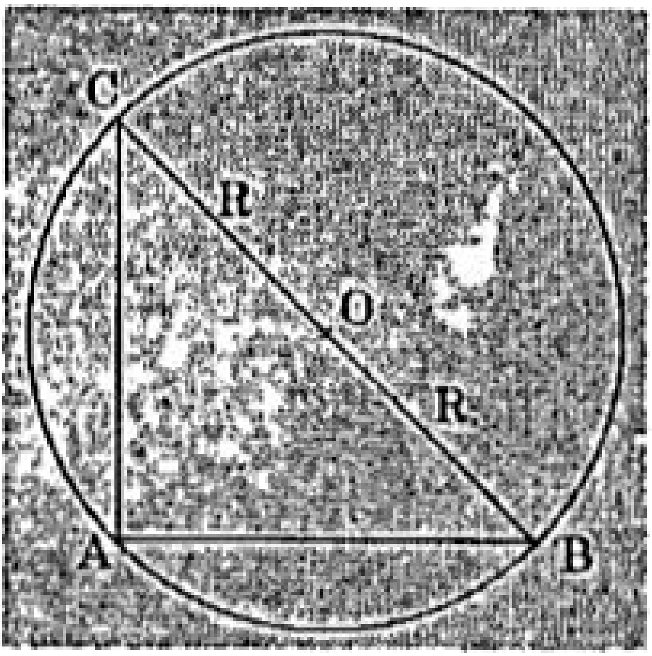
22. If a triangle of maximum area is inscribed within a circle of radius R, then



A. $S = 2R^2$

B. $\frac{1}{r_1}+\frac{1}{r_2}+\frac{1}{r_3}=\frac{\sqrt{2}+1}{R}$

C. $r=\left(\sqrt{2}-1\right)R$

D. $s=\left(1+\sqrt{2}\right).2R$

Answer: B

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23. Prove that : $\frac{r_1-r}{a}+\frac{r_2-r}{b}=\frac{c}{r_3}$.

A. $\frac{a}{r_1}$

B. $\frac{b}{r_2}$

C. $\frac{c}{r_3}$

D. none

Answer: C

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24. $(r_1 + r_2)(r_2 + r_3)(r_3 + r_1) =$

A. Rs^2

B. $2Rs^2$

C. $3Rs^2$

D. $4Rs^2$

Answer: D

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25. $\frac{1}{bc} + \frac{1}{ca} + \frac{1}{ab} =$

A. $\frac{1}{Rr}$

B. $\frac{R}{r}$

C. $\frac{1}{2Rr}$

D. $\frac{R}{2r}$

Answer: C

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26. $\frac{r_1}{(s-b)(s-c)}+\frac{r_2}{(s-c)(s-a)}+\frac{r_3}{(s-a)(s-b)}=$

A. $\frac{1}{r}$

B. $\frac{2}{r}$

C. $\frac{3}{r}$

D. $\frac{4}{r}$

Answer: C

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27. In $ABC, \frac{ab-r_1r_2}{r_3}, wherea, b, r_1r_2, r_3, R$ and r have usual meanings, is equal to (A)R (B) $2R$ (C) r (D) none of these

A. R

B. r

C. r_2

D. r_3

Answer: B

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28. Value of the expression $\frac{b-c}{r_1}+\frac{c-a}{r_2}+\frac{a-b}{r_3}$ is equal to 1 (b) 2 (c) 3 (d) 0

A. ab

B. bc

C. ca

D. 0

Answer: D

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29. If in a triangle $\left(1-\frac{r_1}{r_2}\right)\left(1-\frac{r_1}{r_3}\right)=2$, then the triangle is

A. equilateral

B. isosceles

C. right. angled

D. none

Answer: C

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30. If the sides of a triangle are in A.P. as well as in G.P. then the value of $\frac{r_1}{r_2}-\frac{r_2}{r_3}$ is

A. 1

B. 0

C. 2r

D. none

Answer: B

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31. If $r_1 = r_2 + r_3 + r$ prove that the triangle is right angled .

A. equilateral

B. isosceles

C. right. angled

D. none

Answer: C

Watch Video Solution

32. If in $\Delta ABC, 8R^2 = a^2 + b^2 + c^2$, then the triangle ABC is

A. equilateral

B. isosceles

C. rt. angled

D. none

Answer: C

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33. In a triangle ABC, if $\frac{a-b}{b-c} = \frac{s-a}{s-c}$, then r_1, r_2, r_3 are in

A. H.P.

B. G.P.

C. A.P.

D. none

Answer: C

Watch Video Solution

34. If r_1, r_2, r_3 in a triangle be in H.P. then the sides are

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: A

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35. The hormonic mean of r_1, r_2, r_3 is

A. $3r$

B. $2R$

C. $R + r$

D. none

Answer: A

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36. In a triangle if $\angle C = 90^\circ \text{ then } R + r =$

A. $a + b$

B. $b + c$

C. $c + a$

D. $(a + b)/2$

Answer: D

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37. In ΔABC, if $\angle C = 90^\circ$, then $\frac{a+c}{b} + \frac{b+c}{a}$ is equal to :

A. $\frac{a}{r}$

B. $\frac{b}{r}$

C. $\frac{c}{r}$

D. $\frac{s}{r}$

Answer: C

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38. The in- radius of the triarigle formed by the axes and the line $4x + 3y - 12 = 0$ is

A. $r = 2$

B. $r = \frac{1}{2}$

C. $r = 1$

D. $r = \frac{1}{4}$

Answer: C

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39. In a triangle ABC , let $\angle C = \frac{\pi}{2}$. If r is the in-radius and R is the circum-radius of the triangle , then 2 (r + R) is equal to

A. $a + b$

B. $b + c$

C. $c + a$

D. $a + b + c$

Answer: A

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40. In a triangle ABC right angled at B, the inradius r is equal to

A. $c+b-a$

B. $a+b+c$

C. $\dfrac{a+c-b}{2}$

D. none

Answer: C

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41. In an acute angled triangle which one of the following is true

A. $\dfrac{a\sec A+b\sec B+c\sec C}{\tan A.\tan B.\tan C}=2R$

B. $\dfrac{\cos A}{\sqrt{4R^2-a^2}}=\dfrac{\cos B}{\sqrt{4R^2-b^2}}=\dfrac{\cos C}{\sqrt{4R^2-c^2}}$

C. $b^2=a^2\cos^2 C+c^2\cos^2 A+2ac\cos A.\cos C$

D. $r\cot\dfrac{A}{2}+a=r\cot\dfrac{B}{2}+b=r\cot\dfrac{C}{2}+c$

Answer: A::B::C::D

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42. Two sides of a triangle are 2 and $\sqrt{3}$ and the included angle is 30° then the in-radius r of the triangle is equal to

A. $\frac{1}{4}(\sqrt{3}-1)$

B. $\frac{1}{2}(\sqrt{3}+1)$

C. $\frac{1}{2}(\sqrt{3}-1)$

D. $\frac{1}{4}(\sqrt{3}+1)$

Answer: C

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43. Two sides of a triangle are the roots of the equation $x^2-5x+6=0.$ If the angle between the sides is $\frac{\pi}{3}, \quad \text{then} \quad r.R=$

A. $\frac{4}{3}$

B. $\frac{2}{3}$

C. $\frac{2\sqrt{2}}{3}$

D. $\frac{4\sqrt{2}}{3}$

Answer: B

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44. In a triangle ABC if $r_1 = R$, then

A. $\cos A + \cos B = \cos C$

B. $\cos B + \cos C = \cos A$

C. $\cos C + \cos A = \cos B$

D. $\cos A + \cos B + \cos C = 1$

Answer: B

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45. In a ΔABC, show that $\dfrac{a\cos A + b\cos B + c\cos C}{a+b+c} = \dfrac{r}{R}$

A. $\dfrac{R}{r}$

B. $\dfrac{r}{R}$

C. $\dfrac{R}{2r}$

D. $\dfrac{2r}{R}$

Answer: B

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46. Which of the following pieces of data does not uniquely determine an acute-angled triangle ABC (R being the radius of the circumcircle)?

A. a,sin A, sin B

B. a,b,c

C. a, sin B, R

D. a, sin A,R

Answer: D

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47. If twice the square on the diameter of a circle is equal to sum of the squares on the sides of the inscribed triangle ABC, then $\sin^2 A + \sin^2 B + \sin^2 C$ is equal to

A. 2

B. 3

C. 4

D. 1

Answer: A

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48. $(r_1 - r)(r_2 + r_3) = ?$

A. a^2

B. b^2

C. c^2

D. none

Answer: A

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49. Show that, $4Rr\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}=S$

A. s

B. s^2

C. S^2

D. S

Answer: D

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50. if $\cos A+\cos B+\cos C=1+4\sin\left(\frac{A}{2}\right).\sin\left(\frac{B}{2}\right).\sin\left(\frac{C}{2}\right)$

then $\cos A+\cos B+\cos C=$

A. $1-\frac{r}{R}$

B. $1+\frac{r}{R}$

C. $2-\frac{r}{2R}$

D. $2-\frac{2r}{R}$

Answer: B

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51. In a $!ABC\frac{\cos^2 A}{2}+\frac{\cos^2 B}{2}+\frac{\cos^2 C}{2}=$

A. $2-\frac{r}{2R}$

B. $2+\frac{r}{2R}$

C. $2-\frac{r}{R}$

D. none

Answer: B

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52. $\frac{r_1}{bc} + \frac{r_2}{ca} + \frac{r_3}{ab} =$

A. $\frac{1}{2R} - \frac{1}{r}$

B. $2R - r$

C. $r - 2R$

D. $\frac{1}{r} - \frac{1}{2R}$

Answer: D

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53. Three circles whose radii are 2, 3, 4 units and having centres as C_1, C_2, C_3 respectively touch each other externally at D,E,F. The circumradius of triangle DEF is :

A. $\frac{2\sqrt{6}}{3}$

B. $\frac{4\sqrt{6}}{3}$

C. $\frac{\sqrt{6}}{3}$

D. None

Answer: A

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54. If $r_1, < r_2, < r_3$ are the ex-radii of a right angled triangle and $r_1 = 1, r_2 = 2, \text{ then } r_3 = ...$

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55. For a regular polygon , let r and R be the radii of the inscribed and circumscribed circles. A false statement among the following is

A. These is a regular polygon with $\frac{r}{R}=\frac{1}{\sqrt{2}}$

B. There is a regular polygon with $\frac{r}{R}=\frac{2}{3}$

C. There is a regular polygon with $\frac{r}{R}=\frac{\sqrt{3}}{2}$

D. There is a regular polygon with $\frac{r}{R}=\frac{1}{2}$

Answer: B

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Problem Set 4 True And False

1. $r_1 \cot\frac{A}{2}=r_2\cot\frac{B}{2}=r_3\cot\frac{C}{2}=S$

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2. Prove that : $(r_1 + r_2)\frac{\tan(C)}{2} = (r_3 - r)\frac{\cot(C)}{2} = c$

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3. Prove the questions

$a(rr_1 + r_2r_3) = b(rr_2 + r_3r_1) = c(rr_3 + r_1r_2)$

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4. $\frac{r_1(r_2 + r_3)}{a} = \frac{r_2(r_3 + r_1)}{b} = \frac{r_3(r_1 + r_2)}{c}$

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5. $\frac{r_2 + r_3}{1 + \cos A} = \frac{r_3 + r_1}{1 + \cos B} = \frac{r_1 + r_2}{1 + \cos C}$

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6. $r_1 + r_2 - r_3 + r = 4R\sin C$

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7. $\frac{S}{Rr} = (\sin A + \sin B + \sin C) = \frac{s}{R}$

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8. Prove that $a\cos A + b\cos B + c\cos C = 4R\sin A\sin B\sin C$.

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9. $\Sigma(b+c)\tan\frac{A}{2} = 4R\Sigma\cos A = 4(R+r)$

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Problem Set 4 Fill In The Blanks

1. If the sides be 13, 14 , 15, then $r_1 =$ ......

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2. $r_2 = \ldots\ldots r_3 = \ldots\ldots$

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3. Prove that

$$(r + r_1)\tan\left(\frac{B-C}{2}\right) + (r + r_2)\tan\left(\frac{C-A}{2}\right) + (r + r_3)\tan\left(\frac{A-B}{2}\right)$$

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Problem Set 5 Multiple Choice Questions

1. The area of the circle and the area of a regular polygon of n sides and the perimeter equal to the circle are in the ratio of

A. $\tan\frac{\pi}{n}:\frac{\pi}{n}$

B. $\cos\frac{\pi}{n}:\frac{\pi}{n}$

C. $\sin\frac{\pi}{n}:\frac{\pi}{n}$

D. $\cot\frac{\pi}{n}:\frac{\pi}{n}$

Answer: A

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2. Find the sum of the radii of the fcircles, which are respectively inscribed and circumscribed about the a regular polygon of n sides.

A. $\frac{a}{2}\tan\frac{\pi}{n}$

B. $\frac{a}{2}\cot\frac{\pi}{2n}$

C. $\frac{a}{2}\sin\frac{\pi}{n}$

D. $\frac{a}{2}\cos\frac{\pi}{n}$

Answer: B

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3. In a triangle, with usual notations, the length of the bisector of angle A is

A. $2\frac{bc}{b+c}\sin\frac{A}{2}$

B. $2\frac{bc}{b+c}\cos\frac{A}{2}$

C. $\frac{abc}{2R(b+c)}\cos ec\frac{A}{2}$

D. $\frac{4A}{b+c}\cos ec\frac{A}{2}$

Answer: B::C

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4. H is orthocenter of the triangle ABC, then AH is equal to :

A. $a\cot A$

B. $a\cot B$

C. $b \cot A$

D. $c \cot A$

Answer: A

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5. AD is internal angle bisector of ΔABC at $\angle A$ and DE perpendicular to AD which intersects AC at E and meets AB in F, then:

A. $AF = \frac{4bc}{b+c} \sin \frac{A}{2}$

B. $AD = \frac{2bc}{b+c} \cos \frac{A}{2}$

C. AE is harmonic mean of b and c

D. ΔAEF is an isosceles triangle

Answer: A::B::C::D

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Problem Set 5 True And False

1. $\frac{\text{Area of the incircle}}{\text{Area of triangle}} = \frac{\pi}{\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}}$

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2. If the number of sides of two regular polygons having the same perimeter be n and $2n$ respectiely, prove that their areas are in the ratio $2\frac{\cos\pi}{n}:\left(1+\frac{\cos\pi}{n}\right)$

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Problem Set 5 Fill In The Blanks

1. If O is the circum-centre of triangle ABC and R_1, R_2 and R_3 respectively the radii of circumcircles of the triangles OBC, OCA and OAB, then $\frac{a}{R_1}+\frac{b}{R_2}+\frac{c}{R_3}=\ldots\ldots.$

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2. If I is the incenter of ΔABC and $R_1, R_2,$ and R_3 are, respectively, the radii of the circumcircle of the triangle IBC, ICA, and IAB, then prove that $R_1R_2R_3 = 2rR^2$

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3. Three circles touch one-anothet externally and tangent at their point of contact meet at a point. If their radii be r_1, r_2, r_3 then the distance of this point from eithet ot their points of contact is ......

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Self Assessment Test Multiple Choise Questions

1. If in $\Delta ABC, (a-b)(s-c) = (b-c)(s-a)$, prove that r_1, r_2, r_3 are in A.P.

Watch Video Solution

2. If r_1, r_2, r_3 are in H.P. then the sides are in

A. G.P.

B. H.P

C. A.P.

D. none

Answer: C

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3. If P_1, P_2, P_3 be the perpendiculars from the vertices of a triangle to the opposite sidės then are the following statements true or false ? If not true, write the corrrect answer.

$$\frac{1}{p_1}+\frac{1}{p}+\frac{1}{p_3}=\frac{1}{R}$$

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4. If p_2, p_2, p_3 are the perpendiculars from the vertices of a triangle to the opposite sides, then prove that

$$p_1p_2p_3 = \frac{a^2b^2c^2}{8R^3}$$

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5. Prove that $a\cos A + b\cos B + c\cos C = 4R\sin A\sin B\sin C$.

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6. $r_2r_3 + r_3r_1 + r_1r_2 = S^2/r^2$, true or false?

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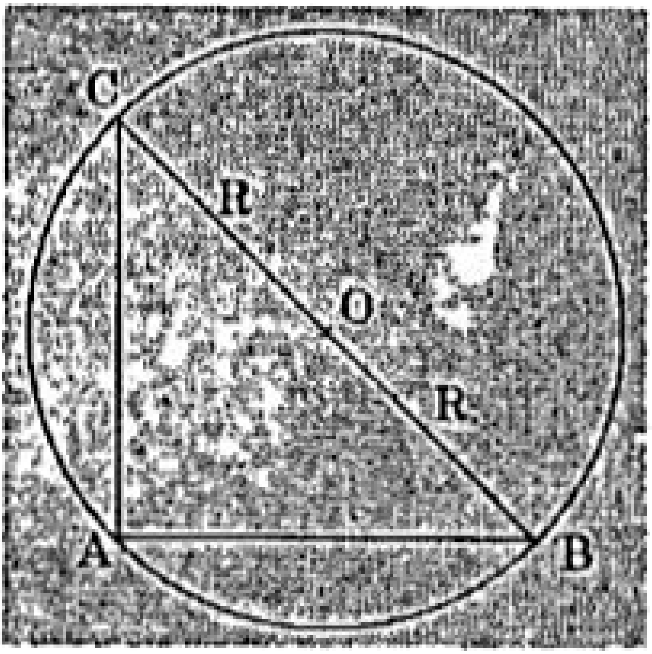
7. If a triangle of maximum area is inscribed within a circle of radius R, then



A. $S = 2R^2$

B. $\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} = \frac{\sqrt{2}+1}{R}$

C. $r = (\sqrt{2} - 1)R$

D. $s = (1 + \sqrt{2}).2R$

Answer: B,C

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8. If the sides of a triangle are in A.P. as well as in G.P., then the value of $\frac{r_1}{r_2} - \frac{r_2}{r_3}$ is

A. 1

B. 0

C. 2r

D. none

Answer: B

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9. Two sides of a triangle are the roots of the equation $x^2 - 5x + 6 = 0$.

If the angle between the sides is $\frac{\pi}{3}$, then $r.\,R =$

A. $\frac{4}{3}$

B. $\frac{2}{3}$

C. $\frac{2\sqrt{2}}{3}$

D. $\frac{4\sqrt{2}}{3}$

Answer: B

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10. If $r_1, < r_2, < r_3$ are the ex-radii of a right angled triangle and $r_1 = 1, r_2 = 2, \text{ then } r_3 = ...$

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11. Given an isoceles triangle, whose one angle is 120° and radius of its incircle = $\sqrt{3}$. Then the area of the triangle in sq. units is

A. 4π sq. units

B. $(12 - 7\sqrt{3})$ sq. units

C. $(12 + 7\sqrt{3})$ sq.units

D. $(7 + 12\sqrt{3})$ sq. units

Answer: C

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12. AD is internal angle bisector of ΔABC at $\angle A$ and DE perpendicular to AD which intersects AC at E and meets AB in F, then:

A. $EF = \frac{4bc}{b+c}\sin\frac{A}{2}$

B. $AD = \frac{2bc}{b+c}\cos\frac{A}{2}$

C. `AE is harmonic mean of b and c

D. ΔAEF is an isosceles triangle

Answer: A::B::C::D

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13. Consider a triangle ABC and let a , b , and c denote the lengths of the sides opposite to vertices A , B and C respectively. suppose a = 6 , b = 10 and the area of the triangle is $15\sqrt{3}$. If $\angle ACB$ is obtuse and if r denotes the radius of the in circle of the triangle , then r^2 is equal to

A. 3

B. 4

C. 5

D. 1

Answer: A

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14. In $\triangle ABC$, if $a^2+c^2-b^2=ac$, then $\angle B=$

A. $\frac{\pi}{4}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{3}$

D. none of these

Answer: C

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15. In ΔABC if a= 16 , b= 24 and c = 20 then $\cos\left(\frac{B}{2}\right)$

A. $\frac{3}{4}$

B. $\frac{1}{2}$

C. $\frac{1}{3}$

D. $\frac{1}{4}$

Answer: A

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16. In $\Delta ABC, \csc A(\sin B \cos C + \cos B \sin C) =$

A. a/c

B. a/c

C. 1

D. 0

Answer: C

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17. If in a triangles $a\cos^2\left(\frac{C}{2}\right)+c\cos^2\left(\frac{A}{2}\right)=\frac{3b}{2}$, then the sides of the triangle are in

A. A.P.

B. G.P.

C. H.P.

D. A.G.

Answer: A

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18. In $\triangle ABC$, If the anlges are in A.P., and $b: c = \sqrt{3}: \sqrt{2}$, then $\angle A, \angle B, \angle C$ are

A. 60°

B. 30°

C. 90°

D. 75°

Answer: D

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19. If the angles of a triangle are in the ratio 2 : 3 : 7 ,then the sides are in the ratio

A. $\sqrt{2}: 2: \sqrt{3}+1$

B. $\sqrt{2}: \sqrt{3}: \sqrt{2}$

C. $\sqrt{2} : \sqrt{2} + 1 : \sqrt{3}$

D. none of these

Answer: A

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20. If in a right angled triangle the hypotenuse is four times as long as the perpendicular drawn to it from opposite vertex, then one of its acute angles is

A. 15°

B. 30°

C. 45°

D. 60°

Answer: A

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21. If the lengths of the sides of a triangle are $3, 5, 7$, then its largest angle of the triangle is

A. $\frac{\pi}{2}$

B. $\frac{5\pi}{6}$

C. $\frac{2\pi}{3}$

D. $\frac{\pi}{4}$

Answer: C

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22. In a triangle ABC, right angled at C, find the value of tan A + tan B in terms of the sides a,b,c.

A. $\frac{a^2}{bc}$

B. $a + b$

C. $\frac{b^2}{ac}$

D. $\frac{c^2}{ab}$

Answer: D

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23. The smallest angle of the ΔABC, when $a = 7, b = 4\sqrt{3}$ and $c = \sqrt{13}$ is

A. 30°

B. 40°

C. 45°

D. 60°

Answer: A

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24. If in a ΔABC, cos B = (sin A)/(2 sin C), then the triangle is

A. equilateral

B. isosceles

C. right angled

D. none of these

Answer: B

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25. Find the value of tan A, if area of $\Delta ABC is a^2 - (b-c)^2$.

A. $\frac{8}{17}$

B. $\frac{8}{15}$

C. $\frac{8}{19}$

D. none of these

Answer: B

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26. If $c^2 = a^2 + b^2$, then $4s(s-a)(s-b)(s-c)$ is equal to

A. b^2c^2

B. c^2a^2

C. s^4

D. a^2b^2

Answer: D

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27. In a triangle PQR, $\angle R = \pi/2$. If tan (P/2) and tan (Q/2) are the roots of the equations $ax^2 + bx + c = 0$ where $a \ne 0$, then

A. $a+b=c$

B. $b+c=a$

C. $a+c=b$

D. none of these

Answer: A

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28. If in a ΔPQR, sin P, sin Q , sin R are in AP, then:

A. the altitudes are in A.P.

B. the altitudes are in H.P.

C. the altitudes are in G.P.

D. none of these

Answer: B

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29. In ΔABC if $\frac{\sin A}{\sin C} = \frac{\sin(A-B)}{\sin(B-C)}$, then a^2, b^2, c^2 are in :

A. A.P.

B. H.P.

C. G.P.

D. none of these

Answer: A

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30. Let PQR be a triangle of ! area with a = 2 , b = $\frac{7}{2}$ and c = $\frac{5}{2}$, where a , b and c are the lengths of the sides of the triangle opposite to the angles P , Q and R respectively. Then , $\frac{2\sin P - \sin 2P}{2\sin P + \sin P}$ equals

A. $\frac{3}{4\Delta}$

B. $\frac{45}{4\Delta}$

C. $\left(\frac{3}{4\Delta}\right)^2$

D. none of these

Answer: C

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31. If R is the radius of the circumcircle of the ΔABC and Δ is its area then

A. $R = \frac{a+b+c}{2}$

B. $R = \frac{a+b+c}{\Delta}$

C. $R = \frac{abc}{4\Delta}$

D. $R = \frac{abc}{\Delta}$

Answer: C

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32. In a triangle ABC if $b=2, B=30^{\circ}$ then the area of the circumcircle of triangle ABC in square units is :

A. π

B. 2π

C. 4π

D. 6π

Answer: C

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33. For a regular polygon let r and R be radii of the inscribed and the circumscribed circles. Which one of the following is not true?

A. there is a regular polygon with $\frac{r}{R}=\frac{1}{2}$

B. there is a regular polygon with $\frac{r}{R}=\frac{\sqrt{3}}{2}$

C. there is a regular polygon with $\frac{r}{R}=\frac{2}{3}$

D. there is a regular polygon with $\frac{r}{R} = \frac{1}{\sqrt{2}}$

Answer: C

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34. The x -coordinate of the incentre of the triangle that has the coordinates of mid-points its sides are (0,1), (1,1) and (1, 0) is

A. $2 + \sqrt{2}$

B. $2 - \sqrt{2}$

C. $1 + \sqrt{2}$

D. $1 - \sqrt{2}$

Answer: B

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