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Class: 11
Subject: Math's
Topic: Trigonometry
No. of Questions: 20
Duration: 60 Min
Maximum Marks: 60

Q1. In a Δ ABC if a = 20, b = 10 and B = 30^0, then C =

A. 60^0
B. 60^0 or 120^0
C. 30^0
D. 90^0

Sol: A

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$
$$\Rightarrow \frac{20}{\sin A} = \frac{10}{\sin 30} = 20$$
$$\sin A = 1$$
$$A = 90$$
$$C = 180 - (90 + 30) = 60$$

Q2. In a ΔABC if b+c = 3a, $\cot\frac{B}{2}\cot\frac{C}{2} =$

A. 1
B. 2
C. $\frac{1}{2}$
D. None of these

Sol: B

Semi perimeter s=(a+b+c)/2=2a
$$\cot\frac{B}{2}\cot\frac{C}{2} = \frac{s(s-b)}{\Delta}\frac{s(s-c)}{\Delta} = \frac{ss(s-b)(s-c)}{s(s-a)(s-b)(s-c)} = \frac{s}{s-a} = \frac{2a}{2a-a} = 2$$

Q3. In ΔABC, $(a^2-b^2-c^2)\tan A + (a^2-b^2+c^2)\tan B$ equals

A. 0
B. $b^2+c^2-a^2$
C. $(a^2+b^2+c^2)$
D. $2(a^2+b^2+c^2)$

Sol: A

$$(a^2 - b^2 - c^2)\tan A + (a^2 - b^2 + c^2)\tan B$$
$$= \frac{a^2-b^2-c^2}{\frac{b^2+c^2-a^2}{2bc}}\frac{a}{2R} + \frac{a^2-b^2+c^2}{\frac{a^2+c^2-b^2}{2ac}}\frac{b}{2R}$$
$$= 0$$

Q4. The sides of a traingle are 3 consecutive natural numbers and its largest angle is twice the smaller one. Then the smallest side is

A. 4
B. 5
C. 6
D. 7

Sol: A

Let the length of the sides be x-1, x, x+1 x must be greater than zero. Then largest side = x+1 Let y be the largest angle

$$\cos y = \frac{(x-1)^2 + x^2 - (x-1)^2}{2(x-1)x} = \frac{x^2-4x}{2x(x-1)} = \frac{(x-1)-3}{2(x-1)}$$
$$for..\max..y..the..value..of$$
$$x-1..should..be...\min = 4[options..are..4,5,6,7]$$
Length of the smallest side = 4

Q5. The perimeter of Δ ABC with $a = 2\sqrt{3}$, $b = 4$ and $A = 60^0$ IS

A. $6+2\sqrt{3}$
B. $4+3\sqrt{3}$
C. $9+2\sqrt{3}$
D. None of these

Sol: A

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

$$\frac{2\sqrt{3}}{\sin 60} = \frac{4}{\sin B}$$

$$\sin B = \frac{4\sin 60}{2\sqrt{3}} = \frac{4\frac{\sqrt{3}}{2}}{2\sqrt{3}} = 1$$

$$B = 90$$

$$then C = 30$$

$$c = 2$$

$$perimeter = 2\sqrt{3} + 4 + 2 = 6 + 2\sqrt{3}$$

Q6. The area of Δ ABC where b = 30, c=20 and $A = 120^0$ is

A. 150
B. $75\sqrt{3}$
C. $150\sqrt{3}$
D. $300\sqrt{3}$

Sol: C

$$= \frac{1}{2} bc \sin A = 150\sqrt{3}$$

Q7. If $c^2=a^2+b^2$ and $2s = a+b+c$, then $4s(s-a)(s-b)(s-c) =$

A. S^4
B. a^2b^2
C. b^2c^2
D. none of these

Sol: B

Here the triangle is right angled triangle its area =ab/2 s.units

$$area..of..the..triangle = \frac{ab}{2} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$s(s-a)(s-b)(s-c) = \frac{a^2b^2}{4}$$

$$4s(s-a)(s-b)(s-c) = a^2b^2$$

Q8. If the circum-radius of an isosceles Δ PQR is equal to PQ (=PR), then the the angle P is

A. 120^0
B. 90^0
C. 60^0
D. 30^0

Sol: A

$$\frac{PR}{\sin\ Q} = 2PR$$

$$\sin\ Q = \frac{1}{2}$$

$$Q = 30$$

$$then..R = 30$$

$$[\because PQ = PR]$$

$$P = 120$$

Q9. In a Δ ABC if b = 3, c=$3\sqrt{3}$ and B = 30^0, then A =

A. 90^0
B. 60^0
C. 60^0 or 120^0
D. 30^0 or 90^0

Sol: D

$$\cos B = \frac{a^2 + 27 - 9}{\sqrt{3}a} = \cos 30 = \frac{\sqrt{3}}{2}$$

$$a = 3{,}6$$

$$\frac{a}{\sin\ A} = \frac{b}{\sin\ B}$$

$$a = 3..then..A = 30$$

$$a = 6..then..A = 90$$

Q10. In a Δ ABC if $\frac{\sin A}{\sin C} = \frac{\sin(A-B)}{\sin(B-C)}$, then a^2, b^2, c^2 are

A. A.P
B. G.P
C. H.P
D. None of these

Sol: A

$$\frac{\sin A}{\sin C} = \frac{\sin(A-B)}{\sin(B-C)}$$

$$\frac{a}{c} = \frac{\sin A\cos B - \cos A\sin B}{\sin B\cos C - \cos B\sin C} = \frac{a\frac{a^2+c^2-b^2}{2ac} - b\frac{b^2+c^2-a^2}{2bc}}{b\frac{a^2+b^2-c^2}{2ab} - c\frac{a^2+c^2-b^2}{2ac}}$$

$$\Rightarrow \frac{a}{c} = \frac{a(a^2-b^2)}{c(b^2-c^2)} \Rightarrow a^2 + c^2 = 2b^2$$

Then a^2, b^2, c^2 are in A.P.

Q11. In a Δ ABC, $\frac{c - b\cos A}{b - c\cos A}$

A. $\frac{\text{COS B}}{\text{COS C}}$
B. $\frac{\text{COS C}}{\text{COS B}}$
C. $\frac{\text{SIN A}}{\text{SIN B}}$
D. $\frac{\text{COS A}}{\text{SIN B}}$

Sol: A

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

Q12. Which of the following pieces of data doesn't uniquely determine an acute angled Δ ABC?

A. a, sin A, sin B
B. a, b, c
C. a, sin B, R
D. a, sin A, R

Sol: D

Here a, sin A, R doesn't uniquely determine an acute angled Ä ABC

Q13. In a Δ ABC if a tan A + b tan B = (a+b) tan $\frac{A+B}{2}$, then the triangle is

A. isosceles
B. right angled
C. equilateral
D. none of these

Sol: A

In a Δ ABC if $a \tan A + b \tan B = (a + b) \tan \frac{A + B}{2}$

This is true for a=b
The triangle is isosceles

Q14. The angles of a Δ are in the ratio 4: 1: 1 then the ratio of the longest side to its perimeter is

A. $\sqrt{3}: 2 + \sqrt{3}$
B. 1: 6
C. 1: 2 +$\sqrt{3}$
D. 2 : $\sqrt{3}$

Sol: A

Let the angles be 4x,x,x

For a triangle 4x+x+x=180

Then x=30

Angles are 30,30,120

$$\frac{a}{\sin 120} = \frac{b}{\sin 30}$$

$$a = \sqrt{3}b$$

$$perimeter = a + b + b = (2+\sqrt{3})b$$

$$reqd..ratio$$

$$\sqrt{3}b : (2+\sqrt{3})b$$

$$= \sqrt{3} : (2+\sqrt{3})$$

Q15. In a ΔABC if cos A + cos B = 4 sin $^2\frac{C}{2}$, which of the following are in A.P. ?

A. a, b, c
B. a, c, b
C. b, a, c
D. a, 2c, b

Sol: B

Here a, c, b are in AP

Q16. If 0 <x< $\frac{\pi}{2}$ the largest angle of Δ with sides 1, sin x, cos x is

A. $\frac{\pi}{2} - x$
B. x
C. $\frac{\pi}{3}$

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

Sol: D

$$here..1 = \sin^2 x + \cos^2 x$$
$$right..angled..triangle$$
$$then..the..l\arg est..angle = \pi / 2$$

Q17. In a Δ ABC if $\begin{vmatrix} 1 & a & b \\ 1 & c & a \\ 1 & b & c \end{vmatrix}$ = 0, then $\sin^2 A + \sin^2 B + \sin^2 C$ =

A. 1
B. $3\sqrt{3}$
C. 9/4
D. 4/9

Sol: C

$\begin{vmatrix} 1 & a & b \\ 1 & c & a \\ 1 & b & c \end{vmatrix}$ = 0,

This implies that the given triangle is equilateral a=b=c Angles are all 60

$\sin^2 A + \sin^2 B + \sin^2 C = 9/4$

Q18. If in a Δ ABC, a = 7, b=a+1, c=b+1 then the length of the median through B is

A. A
B. B
C. C
D. None of these

Sol: A

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Length of the sides of the triangle are 7,8,9

Area

$= 12\sqrt{5} sq.units$

$let..BD..be..the..medians$

$then..the..area...of..the...triangle..BDC = 6\sqrt{5}..sq.units$

$now..let..the..length..of..the..side..be..x$

$then$

$area..of..BDC - \sqrt{\frac{(121-x^2)(x^2-9)}{16}} - 6\sqrt{5}$

$then$

$x = 7 = a$

Q19. The angles A, B, C of a Δ ABC are in A.P., b: c = $\sqrt{3}$: $\sqrt{2}$ Then A =

A. 30^0
B. 15^0
C. 75^0
D. 45^0

Sol: C

$$\frac{b}{c} = \frac{\sqrt{3}}{\sqrt{2}} = \frac{\frac{\sqrt{3}}{2}}{\frac{\sqrt{2}}{2}} = \frac{\sin B}{\sin C}$$

$$\sin B = \frac{\sqrt{3}}{2}$$

$$B = 60$$

$$C = 45$$

$$A, B, C..are..in..AP$$

$$2B = A + C$$

$$A = 75$$

Q20. The circumradius of the Δ with sides 16, 63 and 65 is

A. 32.5
B. 31.5
C. 8
D. None of these

Sol: A

$$area..of..the..triangle = \sqrt{72(72-16)(72-63)(72-65)} = 9.8.7$$

$$if...r = circumradius...we..know$$

$$9.8.7 = \frac{16.63.65}{4R}$$

$$R = 32.5$$