DELHI PUBLIC SCHOOL RUBY PARK KOLKATA

REVISION WORKSHEET

CLASS XI (2018-19)

MATHEMATICS

TRIGONOMETRY

1. Simplify the following expression :
$$\frac{\sec(270°-A)\ \sec(90°-A) - \tan(270°-A)\ \tan(90°+A)}{\cot A + \tan(180°+A) + \tan(90°+A) + \tan(360°-A) + \cos(180°)}$$

2. Evaluate the value : $3\left[\sin^4\left(\frac{3\pi}{2} - \theta\right) + [\sin^4(3\pi + \theta)\,]\right] - 2\left[\sin^6\left(\frac{\pi}{2} + \theta\right) + \sin^6(5\pi - \theta)\right]$

An angle θ is divided into two parts such that the ratio of the tangents of the parts is k; if the difference between them be φ , then prove that $\sin\varphi = \frac{k-1}{k+1}\sin\theta$

3. If $\cos x + \cos y + \cos z = 0$; $\sin x + \sin y + \sin z = 0$, then find the value of $\cos(x-y) + \cos(y-z) + \cos(z-x)$.
4. If $\frac{a\cos\theta\sec\varphi - x}{a\sin(\theta+\varphi)} = \frac{y - b\sin\theta\sec\varphi}{b\cos(\theta+\varphi)} = \tan\varphi$, evaluate the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2}$.
5. If $\sin\theta = k\sin(\theta+\varphi)$, show that $\tan(\theta+\varphi) = \frac{\sin\varphi}{\cos\varphi - k}$.
6. If $\tan\theta = \frac{x\sin\alpha + y\sin\beta}{x\cos\alpha + y\cos\beta}$ and $x\sin(\theta-\alpha) = k\,y\sin(\theta-\beta)$, find k.
7. If $\frac{\cot(\alpha-\beta)}{\cot\alpha} + \frac{\cos^2\gamma}{\cos^2\alpha}\ 1$, then find the value of $\tan^2\gamma + \tan\alpha\cot\beta$.
8. If $13\,\theta = \pi$, find the value of $\cos 3\theta + \cos 5\theta + 2\cos\theta\cos 9\theta$
9. The equation $\sin(\theta+\varphi) = \frac{1}{2}\sin 2\varphi$ is satisfied for two different values of θ , say θ_1 and θ_2 and $\frac{\sin\theta_1 + \sin\theta_2}{\cos\theta_1 + \cos\theta_2} = k\cot\varphi$. Find the value of k.
10. Evaluate : $16\cos\left(\frac{2\pi}{15}\right)\cos\left(\frac{4\pi}{15}\right)\cos\left(\frac{8\pi}{15}\right)\cos\left(\frac{16\pi}{15}\right)$
11. If $\cot\frac{\theta}{2} = \cot^3\frac{\varphi}{2}$ and $2\cot\varphi = \cot\alpha$, prove that $\theta + \varphi = 2\alpha$
12. If in a $\Delta\,ABC$, $cotA + cotB + cotC = 0, find\ the\ value\ of\ cosA\ \ cosB\ \ cosC$
13. Evaluate : $\tan\alpha + 2\tan 2\alpha + 4\tan 4\alpha + 8\cot 8\alpha - \cot\alpha$.
14. If $\theta = \frac{2\pi}{7}$, then find the value of
    (i) $\sec\theta + \sec 2\theta + \sec 4\theta$. (ii) $\cos\theta + \cos 2\theta + \cos 4\theta$ (iii) $\sin\theta + \sin 2\theta + \sin 4\theta$
15. If $\cos\alpha = \cos\beta\cos\varphi = \cos\beta'\cos\varphi'$ and $\sin\alpha = 2\sin\frac{\varphi}{2}\sin\frac{\varphi'}{2}$ and $\tan^2\frac{\alpha}{2} = \lambda\tan^2\frac{\beta}{2}\tan^2\frac{\beta'}{2}$, find λ .
16. Prove that $\frac{\cos 7x - \cos 8x}{1 + 2\cos 5x} = \cos 2x - \cos 3x$.
17. If $\tan\theta\ \tan\varphi = \sqrt{\frac{a-b}{a+b}}$, then prove that $(a - b\cos 2\theta)\,(a - b\cos 2\varphi)$ is independent of θ and φ .
18. If $\cos(\theta-\alpha) = a$; $\cos(\theta-\beta) = b$, then evaluate : $\sin^2(\alpha-\beta) + 2ab\cos(\alpha-\beta)$.
19. Find the general solution for the trigonometric equations :
    (a) $\sec\theta + 1 = (\sqrt{2} - 1)\tan\vartheta$
    (b) $4\sin^4 x + \cos^4 x = 1$
    (c) $4\sin\theta\ \sin 2\theta\sin 4\theta = \sin 3\theta$
    (d) $\tan x + \tan 2x + \tan 3x = \tan x\ \tan 2x\ \tan 3x$
    (e) $4\cos x + 5\sin x = 5$, given $\tan 51°21' = \frac{5}{4}$.

STRAIGHT LINES

1. Two consecutive sides of a parallelogram are $4x + 5y = 0$ and $7x + 2y = 0$. If the equation of one diagonal
   is $11x + 7y = 9$, find the equation of the other diagonal.
2. . If the straight line $x/a + y/b = 1$ passes through the point of intersection of the lines $x + y = 3$ and
   $2x - 3y = 1$ and is parallel to $x - y - 6 = 0$, find a and b.

3. . If the image of the point (2 , 1) with respect to a line mirror is (5, 2), find the equation of the mirror.

4. . The hypotenuse of a right isosceles triangle has its ends at the points (1, 3) and (-4, 1). Find the equations of the
   legs of the triangle.

5. . Find the equation of the line mid way between the parallel lines $9x + 6y - 7 = 0$ and $3x + 2y + 6 = 0$.

6. . Prove that the line $5x - 2y - 1 = 0$ is mid-parallel to the lines $5x - 2y - 9 = 0$ and $5x - 2y + 7 = 0$.

7. . A vertex of an equilateral triangle is (2, 3) and the opposite side is $x + y = 2$. Find the equations of the other
   sides.

7. . If two opposite vertices of a square are (1, 2) and (5, 8) , find the coordinates of its other two vertices and the
   equations of its sides.

8. . The vertex A of a triangle ABC is given to be (1 , 3) and the medians BE and CF are $x - 2y + 1 = 0$ and $y - 1 = 0$.
   Determine the equations of its sides.

9. . Find the equation of the line equidistant from the point (-2, 3) and the line $8y = 9x - 12$.

10. .A line L through P(1, 2) intersect line L_{1}: $x+2y+5=0$ at the point A and L_2 : $2x-y+7=0$ at the point B such that P
    divides AB in the ratio 2: 3 internally.Find the equation of the line L.

11. .Let a line makes angle 60^0 with +ve direction of X axis and passes through the point A(4 , 7) .If it intersects another
    line $x+y+2=0$ at Q then find length AQ.

12. .Let a line $y = 2x$ intersects the curve $x^3 - 4y^3 - 3x^2y - 7 = 0$ at A , B and C then find (OA .OB .OC), where O is the
    origin.

13. .Find α if the point $(0 , \alpha)$ lies within the triangle with sides as $3x+4y=12$, $4x+3y=12$ and $x-2y+10=0$.

14. . A straight line passes through the point $(4,2)$ and is such that the sum of its intercepts on the coordinate axes is 12
    units. Then find the equation of the line.

15. . Find the coordinate of in - centre of the triangle having vertices (- 36, 7) , (20 , 7) , (0 , - 8) .

16. .The coordinate of a movable point is given by P $[3 (\cot\theta + \tan\theta) , 4 (\cot\theta - \tan\theta)]$, where θ is a variable
    parameter . Find the locus of the point P .

17. . The equation of two sides of a square are $3x + 4y - 5 = 0$ and $3x + 4y - 15 = 0$. If P (6 , 5) be a point on the third
    side of the triangle . Find the equation of remaining sides of the triangle

18. .Show that the circles $x^2 + y^2 + 2x - 2y + 1 = 0$ and $x^2 + y^2 - 2x - 2y + 1 = 0$ touch each other externally at (0, 1)

19. . Find the coordinates of the points on the line $3x + 2y = 5$ which are equidistant from the lines $4x + 3y = 7$ and $2y - 5 = 0$.

20. Find the point to which the origin should be shifted so that the equation $x^2 + y^2 - 5x + 2y - 5 = 0$ will have no first

degree term.

21. .The three sides of a triangle are given by $(x^2 - y^2)(2x + 3y - 6) = 0$. If the point $(-2, a)$ lies inside and $(b, 1)$ lies

outside the triangle , then find the range of a and b.

22. .Two sides of a square are along $5x + 12y = 10$ and $5x + 12y + 29 = 0$. The third side passes through $(3, 5)$. Find the

other two sides.

23. .Show that the distance of the line $ax + by + c = 0$ from the point (x_0, y_0) measured parallel to a line making an angle

θ with the positive direction of $x-$axis is $-\dfrac{ax_0 + by_0 + c}{a\cos\theta + b\sin\theta}$.

24. .Show that the quadrilateral bounded by the lines $y = 0, y = 2, y = \sqrt{3}x$ and $y+3x= 8\sqrt{3}$ is a cyclic trapezium. Find its

vertices and area.

25. . The line $3x + 4y = 24$ meets the axes at A and B.The perpendicular bisectors of AB meets the line $y = -1$ at C.

Prove that $\angle ACB$ is a right angle.

26. An equilateral triangle has a side along $5y = 12x - 3$ and the centroid at $(2, -1)$. Find the length of its side.

27. The corners of the base of an isosceles triangle are $A(2a, 0)$ and $B(0, a)$. If one of the equal sides is along $x = 2a$

then find the equations to its other sides and its area.

26. One diagonal of a square is the portion of the line $\sqrt{3}x + y = 2\sqrt{3}$ intercepted by the axes.

Then find the extremities of the other diagonal.

COMPLEX NUMBER

1. If z= $1 + i\tan\left(\frac{4\pi}{7}\right)$, find |z|.
2. **Express** $\frac{1}{1+\cos\theta+i\sin\theta}$ **in the form *a + ib*.**
3. If $a = \cos\alpha + i\sin\alpha$ and $1 + \sqrt{1 - b^2} = nb$, then find the value of $\frac{b}{2n}(1 + na)\left(1 + \frac{n}{a}\right) - b\cos\alpha$.
4. Convert the complex number $z = \frac{i - 1}{\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}}$ to the polar form.
5. If α *and* β are two different complex numbers with $|\beta| = 1$, then find $\left|\frac{\beta - \alpha}{1 - \bar{\alpha}\beta}\right|$.
6. If $(x + iy))^3 = u + iv$, then prove that $\frac{u}{x} + \frac{v}{y} = 4\,(x^2 - y^2)$.
7. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into polar form.
8. If z = x+iy and $w = \frac{1-iz}{z-1}$ such that |z| =1 , then prove that z is purely real.

DOMAIN AND RANGE

Find the domain and range of the following function

1. $f(x) = \frac{1}{2-\sin 3x}$
2. $f(x) = \frac{x-2}{3-x}$
3. $f(x) = \sqrt{16 - x^2}$
4. $f(x) = \frac{x^2-9}{x-3}$
5. $f(x) = \frac{x}{1+x^2}$
6. $f(x) = \frac{1}{\sqrt{x-[x]}}$

SETS

1. In a survey of 400 students in a school , 110 were listed as taking apple juice , 140 taking orange juice and 85 were listed taking both apple as well as orange juice, find how many students were taking neither apple nor orange juice.
2. A college awarded 38 medals in football , 15 in basketball and 20 in cricket. If these medals went to total of 58 men and only 3 men got medals in all 3. How many received medals in exactly 2 of 3 sports?
3. In a group it was found that 21 liked product A , 26 liked product B and 29 liked product C.If 14 people liked products A and B ; 12 liked C and A ; 14 liked B and C .If 8 liked all 3 products , find how many liked only C .
4. The population of a city is 150000 where 3 news papers A b and c are circulated. It has been found 42% read A, 51% read B and 68% read C. Also 30% read A and B , 28% read B and C , 36% read A and C . 8% read none . Find how many read all 3news papers.
5. State and prove De-morgan's laws
6. For two sets A and B if P(A) = P(B) then prove that A=B .
7. For two sets B and C , if $A \cup B = A \cup C$; $A \cap B = A \cap C$ for any set A, then prove that B = C.