MATHEMATICS ACTIVITIES FOR S6

1.Solve : a) $3^{2x+1} - 3^{x+1} - 3^x + 1 = 0$

b) Use matrix inverse method to solve the following systems

$$\begin{cases} 4x + y - z = 1 \\ x - 3y + z = 2 \\ 5x - 2y = 4 \end{cases}$$

2.Solve the simultaneous equations : $\begin{cases} z_1 + z_2 = 8 \\ 4z_1 - 3iz_2 = 26 + 8i \end{cases}$

Using values of $z_1$and z_2,Find the modulus and argument of $z_1 + z_{2-}z_1z_2$

3.Differentiate $y = \left[2x^2 + \sqrt[3]{(3x-1)^4}\right]^n$, n is any constant.

4.Find the first derivative of $f(x) = (sinx)^{logx}$

5.Event A and B are such that $P(A) = 0.3$,$P(B) = 0.8$ and $P(A \cap B) = 0.4$ State ,giving a reason in each case whether events A and B are **: a)** independent
b) mutually exclusive.

6.Let the binary operation *be defined on Z (ring of integers) by $x * y = x + xy + y$

a) Calculate 2*(-1), (-1) *9, and 6*1

b) Determine whether * is commutative, associative or neither.

c)Determine whether or not there exist an identity for * /1Mrk

7.A and B are points whose position vectors are $a = 2i + k$ and $b = i - j + 3k$ respectively, Determine the position vector of the point p that divided AB in the ratio 4:1

8.Given that $sinx + siny = \omega_1$ and $cosx + cosy = \omega_2$.show that

$$\tan\left(\frac{x+y}{2}\right) = \frac{w_1}{w_2}$$

9. The line x+2y intersects the curve xy+18=0 at the points A and B. Find the coordinates of A and B. 10.Find the angle between planes $\pi \equiv x + y + z = 1$ and $\beta \equiv x - 2y + 3z = 1$ 11.a) Let $f(x) = \frac{4x}{(3x+1)\,(x+1)^2}$

i) Express $f(x)$ in partial fractions.

12.Obtain the regression equation of x on y and y on x taking the origin as 2 and 200 for x and y respectively:/15Marks

X	1	2	3	4	5
Y	166	184	142	180	338

13.Let f be be a linear transformation so that $f(x) = (x + 2y, 3x - 3y)$ and $g(x) = (x + y, y)$ find:

i) $fg(x, y)$

ii) $gof(x, y)gf(x, y)$

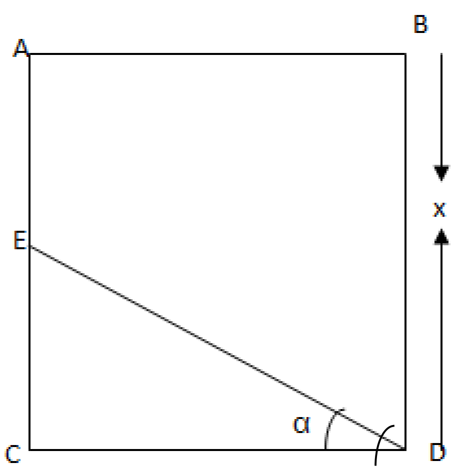
ii) $f^{-}(x, y)f^{-}(x, y)$

14.a) Determine the domain of the function $f(x) = \sqrt{4 - x^2}+\frac{1}{x}$

b) Find the period of the function $f(x) = tna(4\pi^2 - \frac{\pi}{3})$

15. Solve in ℝ the following equation :$(x + \sqrt{x})^4$-$(x + \sqrt{x})^2$=159600 16. a) Find the Cartesian equation of the plane α which passes through the plane p= (2, -3,4) and perpendicular to the line defined by the points a= (1,5,7) and b= (-2,2,3) b) for what value of λ are the vectors $\vec{\imath} + 2\vec{\jmath} - 3\vec{k}$, $\overrightarrow{3\imath} + \lambda\vec{\jmath} + \vec{k}$ and $\vec{\imath} + \overrightarrow{2\jmath} + 3\vec{k}$ coplanar?

17.Consider the following figure



ABCD is a square, CE=AE,$\overline{BD}$=X.Find $sin\alpha, cos\alpha$ and $tan\alpha$.

18.a) show that $c_{n-1,p-1}+c_{n-1,p}=c_{n,p}$ o≤p≤n

b) Solve the equation $c_{n-1,n-5} = 3c_{n-3,n-7}$ in the set of positive integers.

19.Evaluate the following limits:

a) $\lim\limits_{x\to\pm\infty} \sqrt{x^2 + x + 2}$-$\sqrt{x^2 - x + 3}$

b)$\lim\limits_{x\to 0} \frac{x^2 - xsinx}{x^2 - sin^2 x}$

20. Consider the vectors $\vec{u} = (1, -3, 2)$ $\vec{v} = (2, -1, 1)$ of $\mathbb{R}^3$

a) If $\vec{w} = (1, 7, -4)$ is $\{\vec{u}, \vec{v}, \vec{w}\}$ a $basis$ of $\mathbb{R}^3$?

b) For what value of real number k, the vector (1,k,5) is a linear combination of $\vec{u}\ and\ \vec{v}$? s

21. Consider the following linear mapping defined on $\mathbb{R}^3$ by $f(x,y,z) = (4x - 2z, 2x + y, z + y)$.Calculate its matrix relative to the basis $(\{\overrightarrow{e_1} = (1,1,1), \overrightarrow{e_2} = (-1,0,1) and\ \overrightarrow{e_3} = (0,1,1)\}$

22. Use matrix inverse method to solve this system

$$\begin{cases} 4x + y - z = 1 \\ x - 3y + z = 2 \\ 5x - 2y = 4 \end{cases}$$

23.a) Find the equation of sphere which passes through the points (1,2,3), (0,-2,4), (4,-4,2) and (3,1,4)

b) Find the center and radius of the sphere:

$$x^2 + y^2 + z^2 - 22x - 6y + 66$$

24. The coefficient of x^5 in the expansion of $(1 + 5x)^5$ is equal to the coefficient of x^4 in the expansion of $(a + 5x)^7$.Find the value of .

25. the perimeter of rectangle is36cm.

a) What are the dimensions (length and width) of that rectangle?

b) What is its greatest possible area?

26. In a physics experiment, a bottle of milk was brought from a cool room into a warm room. Its temperature y^0c,was recorded at t minutes after it was brought in ,for 11 different values of t.the results are summarized as: $\sum t = 44$, $\sum y = 205$, $\sum t^2 = 180.4$, $\sum ty = 824.5$

(i) Calculate the equation of the line of regression of y on t in the form $y = a + bt$.

(ii) Explain the practical significance of the value of$a$.

(iii) Use your equation to estimate the values of $y\ at\ t = 4.5$

GOOD-LUCK