

# Matrix assignment

July 29, 2023

## Questions

1. The pair of linear equations  $2x = 5y + 6$  and  $15y = 6x - 18$  represents two lines which are :
  - (a) intersecting
  - (b) parallel
  - (c) coincident
  - (d) either intersecting or parallel
2. Two schools  $P$  and  $Q$  decided to award prizes to their students for two games of Hockey ₹ $x$  per students and cricket ₹ $y$  per student. School  $P$  decided to award a total of ₹9,500 for the two games to 5 and 4 students respectively; while school  $Q$  decided to award ₹7,370 for the two games to 4 and 3 students respectively.



Based on the given information, answer the following questions :

- (i) Represent the following information algebraically(in terms of  $x$  and  $y$ ).
- (ii) (a) what is the prize amount for hockey ?  
(b) Prize amount on which game is more and by how much ?
- (iii) what will be the total prize amount if there are 2 students each from two games ?

3. If the pair of equations  $3x - y + 8 = 0$  and  $6x - ry + 16 = 0$  represents coincident lines, then the values of 'r' is :
- (a)  $-\frac{1}{2}$   
 (b)  $\frac{1}{2}$   
 (c) 2  
 (d) -2
4. The pair of equations  $x=a$  and  $y=b$  graphically represents lines which are :
- (a) parallel  
 (b) intersecting at  $(b,a)$   
 (c) coincident  
 (d) intersecting at  $(a,b)$
5. (a) If the system of linear equations  $2x+3y = 7$  and  $2ax+(a+b)y = 28$  have infinite number of solutions, then find the values of  $a$  and  $b$ .  
 (b) If  $217x + 131y = 913$  and  $131x + 217y = 827$ , then solve the equations for the values of  $x$  and  $y$ .
6. Half of the difference between two numbers is 2. The sum of the greater number and twice the smaller number is 3. Find the numbers.
7. If  $(a, b), (c, d)$  and  $(e, f)$  are the vertices of  $\triangle ABC$  and  $\Delta$  denotes the area of  $\triangle ABC$ , then

$$\begin{vmatrix} a & c & e \\ b & d & f \\ 1 & 1 & 1 \end{vmatrix}^2 \quad (1)$$

is equal to

- (a)  $2\Delta^2$   
 (b)  $4\Delta^2$   
 (c)  $2\Delta$   
 (d)  $2\Delta$

8. If  $\begin{pmatrix} 2 & 0 \\ 5 & 4 \end{pmatrix} = P + Q$  is a symmetric and  $Q$  is a skew symmetric matrix, then  $Q$  is equal to

(a)  $\begin{pmatrix} 2 & \frac{5}{2} \\ \frac{5}{2} & 4 \end{pmatrix}$

(b)  $\begin{pmatrix} 0 & -\frac{5}{2} \\ \frac{5}{2} & 0 \end{pmatrix}$

(c)  $\begin{pmatrix} 0 & \frac{5}{2} \\ -\frac{5}{2} & 0 \end{pmatrix}$

(d)  $\begin{pmatrix} 2 & -\frac{5}{2} \\ \frac{5}{2} & 4 \end{pmatrix}$

9. If  $\begin{pmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 3 & a & 1 \end{pmatrix}$  is non-singular matrix and  $a \in A$ , then the set  $A$  is

(a)  $\mathbb{R}$

(b)  $\{0\}$

(c)  $\{4\}$

(d)  $\mathbb{R} - \{4\}$

10. If  $|A| = |kA|$ , where  $A$  is a square matrix of order 2, then sum of all possible values of  $k$  is

(a) 1

(b) -1

(c) 2

(d) 0

11. (a) If  $A = \begin{pmatrix} -3 & -2 & -4 \\ 2 & 1 & 2 \\ 2 & 1 & 3 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{pmatrix}$ , then find  $AB$  and use it to solve the following system of equations :

$$x - 2y = 3 \quad (2)$$

$$2x - y - z = 2 \quad (3)$$

$$-2y + z = 3 \quad (4)$$

(b) If  $f(\alpha) = \begin{pmatrix} \cos \alpha & -\sin \alpha & 0 \\ \sin \alpha & \cos \alpha & 0 \\ 0 & 0 & 1 \end{pmatrix}$ , then prove that  $f(\alpha) \cdot f(-\beta) = f(\alpha - \beta)$ .