Matrix assignment

July 31, 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.

Figure 1: trophies

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 Δ denotes the area of $\triangle ABC$, then

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

   is equal to

   (a) $2\Delta^2$

   (b) $4\Delta^2$

   (c) 2Δ

   (d) 2Δ

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

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

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

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

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

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

$$x - 2y = 3 \tag{2}$$
$$2x - y - z = 2 \tag{3}$$
$$-2y + z = 3 \tag{4}$$

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

$$f(\alpha).f(-\beta) = f((\alpha - \beta)).\qquad(5)$$