CBSE Maths Questions 2007

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Get latex-tikz codes from

https://github.com/PeriPriyanka/cbsemathsquestions/2007_question2

1 Problem

(CBSE 2007-Question 2) solve the values of X and Y.

$$X + \frac{6}{Y} = 6 \tag{1.0.1}$$

$$3X - \frac{8}{Y} = 5 \tag{1.0.2}$$

2 Solution

Consider the equations 1.0.1 and 1.0.2 given in the problem statement.

$$X + \frac{6}{Y} = 6 \tag{2.0.1}$$

$$3X - \frac{8}{Y} = 5 \tag{2.0.2}$$

The solution can be found by solving the above system of linear equations.
System of linear equations are defined as

$$\mathbf{AX} = \mathbf{B} \tag{2.0.3}$$

From the equations 2.0.1 and 2.0.2,

$$\mathbf{A} = \begin{pmatrix} 1 & 6 \\ 3 & -8 \end{pmatrix} \tag{2.0.4}$$

$$\mathbf{X} = \begin{pmatrix} X \\ \frac{1}{Y} \end{pmatrix} \tag{2.0.5}$$

$$\mathbf{B} = \begin{pmatrix} 6 \\ 5 \end{pmatrix} \tag{2.0.6}$$

Substituting the values of **A**, **X** and **B** in the equation 2.0.3 We get,

$$\begin{pmatrix} 1 & 6 \\ 3 & -8 \end{pmatrix} \begin{pmatrix} X \\ \frac{1}{Y} \end{pmatrix} = \begin{pmatrix} 6 \\ 5 \end{pmatrix} \tag{2.0.7}$$

Considering the augmented matrix **AB**

$$\mathbf{AB} = \begin{pmatrix} 1 & 6 & 6 \\ 3 & -8 & 5 \end{pmatrix} \tag{2.0.8}$$

Performing the row operation on **AB**

$$R_2 \to R_2 - 3R_1$$

$$\mathbf{AB} = \begin{pmatrix} 1 & 6 & 6 \\ 0 & -26 & -13 \end{pmatrix} \tag{2.0.9}$$

$$\begin{pmatrix} 1 & 6 \\ 0 & -26 \end{pmatrix} \begin{pmatrix} X \\ \frac{1}{Y} \end{pmatrix} = \begin{pmatrix} 6 \\ -13 \end{pmatrix} \tag{2.0.10}$$

$$X + \frac{6}{Y} = 6 \tag{2.0.11}$$

$$\frac{-26}{Y} = -13 \tag{2.0.12}$$

By solving equations 2.0.12 we get,

$$Y = 2 \tag{2.0.13}$$

and by solving equation 2.0.11 we get ,

$$X = 3 \tag{2.0.14}$$

Therefore, X=3 and Y= 2 are solutions to the given equations 1.0.1 and 1.0.2