BE – Alg. 2 | Tuesday 10-4-11

ACT ① THE SIDES OF A SQUARE ARE 3 cm long. ONE VERTEX of the SQUARE is AT (2,0) ON A SQUARE COORDINATE grid marked in centimeter UNITS. Which OF THE following points could ALSO be A VERTEX of THE SQUARE?

Ⓐ (−4, 0)
Ⓑ (0, 1)
Ⓒ (1, −1)
Ⓓ (4, 1)
Ⓔ (5, 0)

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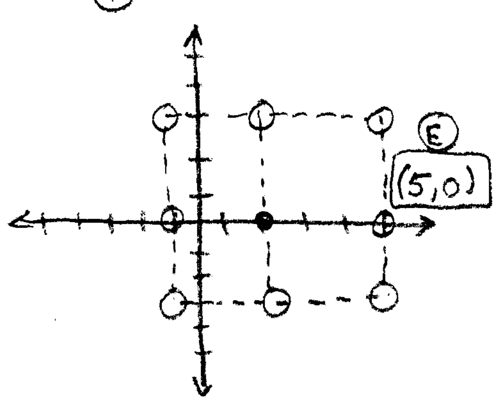
② WHAT is THE LEAST COMMON MULTIPLE OF 70, 60, AND 50?

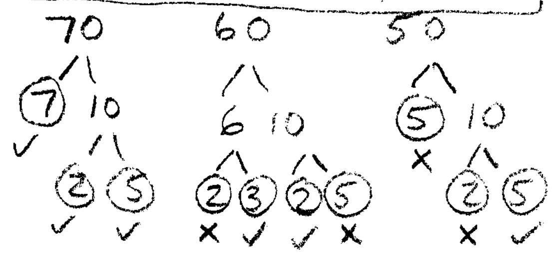
Ⓐ 60 Ⓑ 180 Ⓒ 210 Ⓓ 2100 Ⓔ 210,000

ANS

①



② USE PRIME FACTORIZATIONS



LCM ⇒ $7 \cdot 2 \cdot 5 \cdot 3 \cdot 2 \cdot 5$

$7 \cdot 2 \cdot (10)(15) = 150$

$7 \cdot 300 = \boxed{2100}$

Ch. 4-6 Solving Systems of Linear Equations using Determinants

Pg 189 Given a system of linear equations where a, b, c, d, e, f = any real number, solve by EBA:

$$\begin{aligned} ax+by&=e \xrightarrow{(-d)} -adx-bdy=-de \\ cx+dy&=f \xrightarrow{(b)} bcx+bdy=bf \end{aligned}$$

Eliminate y ⇒ $(bc-ad)x = bf-de$

$$\boxed{x=\frac{bf-de}{bc-ad}=\frac{de-bf}{ad-bc}}$$

$$\begin{aligned} ax+by&=e \xrightarrow{(-c)} -acx-bcy=-ce \\ cx+dy&=f \xrightarrow{(a)} acx+ady=af \end{aligned}$$

Eliminate x ⇒ $(ad-bc)y = af-ce$

$$\boxed{y=\frac{af-ce}{ad-bc}}$$

* $\therefore \boxed{(x,y)=\left(\frac{de-bf}{ad-bc}, \frac{af-ce}{ad-bc}\right)}$

As determinants:

$(de-bf)$ ⇓ $\begin{vmatrix} e & b \\ f & d \end{vmatrix}$ $(af-ce)$ ⇓ $\begin{vmatrix} a & e \\ c & f \end{vmatrix}$ denominator $(ad-bc)$ ⇓ $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$

Cramer's Rule: $\begin{cases} ax+by=e \\ cx+dy=f \end{cases}$ Solution (x,y) is:

$$\boxed{x=\frac{\begin{vmatrix} e & b \\ f & d \end{vmatrix}}{\begin{vmatrix} a & b \\ c & d \end{vmatrix}}, \quad y=\frac{\begin{vmatrix} a & e \\ c & f \end{vmatrix}}{\begin{vmatrix} a & b \\ c & d \end{vmatrix}}} \quad \text{where } \begin{vmatrix} a & b \\ c & d \end{vmatrix} \neq 0$$

(coefficients) $\begin{pmatrix} e \\ f \end{pmatrix}$ ← constants

SOLVE USING CRAMER'S RULE:

$$\begin{cases} 5x + 4y = 28 \\ 3x - 2y = 8 \end{cases}$$

The determinant of the x & y coefficient matrix

is: $\begin{vmatrix} 5 & 4 \\ 3 & -2 \end{vmatrix} = (-10) - (12) = -22$

$$X = \frac{\overset{\text{CONSTANTS}}{\begin{vmatrix} 28 & 4 \\ 8 & -2 \end{vmatrix}}}{-22} = \frac{-56-(32)}{-22} = \frac{-88}{-22} = 4 = X$$

$$Y = \frac{\begin{vmatrix} 5 & \overset{\text{CONSTANTS}}{28} \\ 3 & 8 \end{vmatrix}}{-22} = \frac{40-84}{-22} = \frac{-44}{-22} = 2 = Y$$

$$\boxed{(X, Y) = (4, 2)}$$

CK. $5x + 4y \overset{?}{=} 28$; $3x - 2y \overset{?}{=} 8$

$5(4) + 4(2) \overset{?}{=} 28$ ✓ ; $3(4) - 2(2) \overset{?}{=} 8$ ✓

Ex 1 pg. 190 Solve using Cramer's Rule:

$$\begin{cases} 5x + 7y = 13 \\ 2x - 5y = 13 \end{cases} \qquad \begin{vmatrix} 5 & 7 \\ 2 & -5 \end{vmatrix} = -25 - 14 = -39$$

$$x = \frac{\begin{vmatrix} 13 & 7 \\ 13 & -5 \end{vmatrix}}{-39} = \frac{-65 - 91}{-39} = \frac{-156}{-39} = 4$$

$$y = \frac{\begin{vmatrix} 5 & 13 \\ 2 & 13 \end{vmatrix}}{-39} = \frac{65 - 26}{-39} = \frac{+39}{-39} = -1$$

$$\boxed{(4, -1)}$$

Summary: $5x + 7y = 13$

$2x - 5y = 13$

COEFFICIENTS OF X — COEFFICIENTS OF Y — CONSTANTS

$$x = \frac{\begin{vmatrix} \text{CONSTANTS} & \text{COEFFICIENTS OF Y} \end{vmatrix}}{\begin{vmatrix} \text{Coefficients OF X} & \text{COEFFICIENTS OF Y} \end{vmatrix}} \qquad y = \frac{\begin{vmatrix} \text{COEFFICIENTS OF X} & \text{CONSTANTS} \end{vmatrix}}{\begin{vmatrix} \text{COEFFICIENTS OF X} & \text{COEFFICIENTS OF Y} \end{vmatrix}}$$

Can you guess how to solve a system of 3 Lin. Equations?

Cramers Rule for a 3×3:

Ex 3 Pg 191

CONSTANTS

$$\begin{aligned} 3x + y + z &= -1 \\ -6x + 5y + 3z &= -9 \\ 9x - 2y - z &= 5 \end{aligned}$$

CONSTANTS

$$x = \frac{\begin{vmatrix} -1 & 1 & 1 \\ -9 & 5 & 3 \\ 5 & -2 & -1 \end{vmatrix}}{\begin{vmatrix} 3 & 1 & 1 \\ -6 & 5 & 3 \\ 9 & -2 & -1 \end{vmatrix}} \qquad = -9$$

CONSTANTS

$$y = \frac{\begin{vmatrix} 3 & -1 & 1 \\ -6 & -9 & 3 \\ 9 & 5 & -1 \end{vmatrix}}{-9}$$

CONSTANTS

$$z = \frac{\begin{vmatrix} 3 & 1 & -1 \\ -6 & 5 & -9 \\ 9 & -2 & 5 \end{vmatrix}}{-9}$$

$$\boxed{\left(\frac{2}{9}, -\frac{4}{3}, -\frac{1}{3}\right)}$$

- Homework: Pg. 192 #4, 6, 12, 13. Pg. 193 #26