Pre-Calculus
Chapter 7 Review

Name key
Date _____ Hour _____

7.1 SUBSTITUTION

Solve the system by the method of substitution. Show all work.

1. $\begin{cases} x+y=2 \\ x-y=0 \end{cases}$ → $x=y$

$y+y=2$
$2y=2$
$y=1$
$x=1$
$(1,1)$

2. $\begin{cases} x^2-y^2=9 \\ x-y=1 \end{cases}$

$x=y+1$
$(y+1)^2-y^2=9$
$y^2+2y+1-y^2=9$
$2y+1=9$
$2y=8$
$y=4$ $x=5$
$(5,4)$

3. $\begin{cases} y=2x^2 \\ y=x^4-2x^2 \end{cases}$

$2x^2=x^4-2x^2$
$0=x^4-4x^2$
$0=x^2(x^2-4)$
$0=x^2(x-2)(x+2)$
$x=0$ $x=2$ $x=-2$
$y=0$ $y=8$ $y=8$
$(0,0)$ $(2,8)$ $(-2,8)$

4. ***Geometry*** The perimeter of a rectangle is 480 meters and its length is 1.5 times its width. Find the dimensions of the rectangle.

$\begin{cases} 480=2l+2w \\ l=1.5w \end{cases}$

$480=2(1.5w)+2w$
$480=5w$
$96=w$
$144=l$
144 x 96

7.2 ELIMINATION

Solve the systems using elimination. Show all work.

5. $\begin{cases} 2x-y=2 \\ 6x+8y=39 \end{cases}$ ·3

$6x-3y=6$
$-\ 6x+8y=39$
$-11y=-33$
$y=3$
$2x-3=2$
$2x=5$
$x=\frac{5}{2}$
$(\frac{5}{2},3)$

6. $\begin{cases} \frac{1}{5}x+\frac{3}{10}y=\frac{7}{50} \\ \frac{2}{5}x+\frac{1}{2}y=\frac{1}{5} \end{cases}$ ·2

$\frac{2}{5}x+\frac{3}{5}y=\frac{7}{25}$
$-\ \frac{2}{5}x+\frac{1}{2}y=\frac{1}{5}$ $\frac{5}{25}$
$\frac{1}{5}y=\frac{2}{25}$
$y=\frac{10}{25}=\frac{2}{5}$
$(0,\frac{2}{5})$
$\frac{2}{5}x+\frac{1}{2}\cdot\frac{2}{5}=\frac{1}{5} \rightarrow \frac{2}{5}x+\frac{1}{5}=\frac{1}{5}$
$x=0$

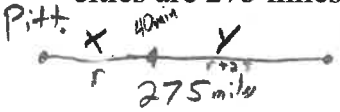
7. $\begin{cases} 3x-2y=0 \\ 3x+2(y+5)=10 \end{cases}$

work on seperate sheet
$(0,0)$

8. $\begin{cases} 1.25x-2y=3.5 \\ 5x-8y=14 \end{cases}$ ·4

$5x-8y=14$
$-\ 5x-8y=14$
$0=0$
Infinite solutions

9. ***Airplane Speed*** Two planes leave Pittsburgh and Philadelphia at the same time, each going to the other city. One plane flies 25 miles per hour faster than the other. Find the airspeed of each plane if the cities are 275 miles apart and the planes pass each other after 40 minutes of flying time.



From Pitt $x = r\cdot\frac{2}{3}$

From Phily $y=(r+25)\frac{2}{3}$

$x+y=275$
$\frac{2}{3}r+(\frac{2}{3}r+\frac{50}{3})=275$

40 minutes = $\frac{2}{3}$ hour

$D=rt$

From Pitt → $r=193.75$ MPH
From Phily → 218.75 MPH

7.3 & 7.4 MULTI-VARIABLE SYSTEMS

Use back substitution to solve the system of equations.

10. $\begin{cases} 3x - y + 5z = -10 \\ 4y - 2z = 16 \\ -3z = 18 \end{cases}$

$z = -6$ $\quad 4y + 12 = 16$, $4y = 4$, $y = 1$ $\quad 3x - 1 - 30 = -10$, $3x = 21$, $x = 7$

$(7, 1, -6)$

Determine the order of the following matrices.

11. $\begin{bmatrix} -9 & 0 \\ 2 & 6 \\ 5 & 2 \\ 7 & 0 \end{bmatrix}$ 4×2

12. $\begin{bmatrix} 7 & 8 & 6 & -8 \\ 1 & 0 & 4 & 0 \end{bmatrix}$ 2×4

Write the augmented matrix for the system.

13. $\begin{cases} 5x + 2y + 3z = 2 \\ 5x + y = 4 \\ 8x + 10z = -1 \end{cases}$

$\left[\begin{array}{ccc|c} 5 & 2 & 3 & 2 \\ 5 & 1 & 0 & 4 \\ 8 & 0 & 10 & -1 \end{array}\right]$

Solve each system using Row Echelon Form or Matrices. Include all notations/necessary steps.

14. $\begin{cases} x - 3y + 2z = 5 \\ x + 2y + z = 7 \rightarrow R_1 - R_2 \\ 2x - y + 5z = 18 \rightarrow 2R_1 - R_3 \end{cases}$

$\begin{cases} x - 3y + 2z = 5 \\ -5y + z = -2 \\ -5y - z = -8 \rightarrow R_2 - R_3 \end{cases}$

$\begin{cases} x - 3y + 2z = 5 \\ -5y + z = -2 \\ 2z = 6 \end{cases}$

$z = 3$ $\quad -5y + 3 = -2$, $-5y = -5$, $y = 1$ $\quad x - 3 + 6 = 5$, $x + 3 = 5$, $x = 2$

$(2, 1, 3)$

15. $\begin{cases} 4x + 2y + 3z = 11 \\ x - 2y + z = 6 \rightarrow R_1 - 4R_2 \\ 2x + y + 2z = 7 \rightarrow R_1 - 2R_3 \end{cases}$

$\begin{cases} 4x + 2y + 3z = 11 \\ 10y - z = -13 \\ -z = -3 \end{cases}$

$z = 3$ $\quad 10y - 3 = -13$, $10y = -10$, $y = -1$ $\quad 4x - 2 + 9 = 11$, $4x = 4$, $x = 1$

$(1, -1, 3)$

7.5 MATRICES

Find x and y.

16. $\begin{bmatrix} x + 3 & 4 & -4y \\ 0 & -3 & 2 \\ -2 & y + 5 & 6x \end{bmatrix} = \begin{bmatrix} 5x - 1 & 4 & -44 \\ 0 & -3 & 2 \\ -2 & 16 & 6 \end{bmatrix}$

$-4y = -44$, $y = 11$

$6x = 6$, $x = 1$

Find, if possible, (a) A + B, (b) A – B, (c) 4A, and (d) A + 3B

17. $A = \begin{bmatrix} 7 & 3 \\ -1 & 5 \end{bmatrix}, B = \begin{bmatrix} 10 & -20 \\ 14 & -3 \end{bmatrix}$

$A+B = \begin{bmatrix} 17 & -17 \\ 13 & 2 \end{bmatrix}$

$A-B = \begin{bmatrix} -3 & 23 \\ -15 & 8 \end{bmatrix}$

$4A = \begin{bmatrix} 28 & 12 \\ -4 & 20 \end{bmatrix}$

$A+3B = \begin{bmatrix} 37 & -57 \\ 41 & -4 \end{bmatrix}$

18. $A = \begin{bmatrix} 6 & 0 & 7 \\ 5 & -1 & 2 \\ 3 & 2 & 3 \end{bmatrix}, B = \begin{bmatrix} 0 & 5 & 1 \\ -4 & 8 & 6 \\ 2 & -1 & 1 \end{bmatrix}$

$A+B = \begin{bmatrix} 6 & 5 & 8 \\ 1 & 7 & 8 \\ 5 & 1 & 4 \end{bmatrix}$

$A-B = \begin{bmatrix} 6 & -5 & 6 \\ 9 & -9 & -4 \\ 1 & 3 & 2 \end{bmatrix}$

$4A = \begin{bmatrix} 24 & 0 & 28 \\ 20 & -4 & 8 \\ 12 & 8 & 12 \end{bmatrix}$

$A+3B = \begin{bmatrix} 6 & 15 & 10 \\ -7 & 23 & 20 \\ 9 & -1 & 6 \end{bmatrix}$

19. ***Sales*** At a dairy mart, the numbers of gallons of skim, 2%, and whole milk sold on Friday, Saturday, and Sunday of a particular week are given b the following matrix.

$$A = \begin{array}{c} \begin{matrix} \text{Skim milk} & \text{2\% milk} & \text{Whole milk} \end{matrix} \\ \begin{bmatrix} 40 & 64 & 52 \\ 60 & 82 & 76 \\ 76 & 96 & 84 \end{bmatrix} \end{array} \begin{matrix} \textit{Friday} \\ \textit{Saturday} \\ \textit{Sunday} \end{matrix}$$

3 × 3

A second matrix gives the selling price per gallon and the profit per gallon for each of the three types of milk sold by the dairy mart.

$$B = \begin{array}{c} \begin{matrix} \text{Selling price per gallon} & \text{Profit per gallon} \end{matrix} \\ \begin{bmatrix} 2.65 & 0.25 \\ 2.81 & 0.30 \\ 2.93 & 0.35 \end{bmatrix} \end{array} \begin{matrix} \textit{Skim milk} \\ \textit{2\% milk} \\ \textit{Whole milk} \end{matrix}$$

3 × 2

$AB = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix}$

$a_{11} = 40 \cdot 2.65 + 64 \cdot 2.81 + 52 \cdot 2.93 = 438.20$

$a_{12} = 40 \cdot .25 + 64 \cdot .30 + 52 \cdot .35 = 47.40$

$a_{21} = 60 \cdot 2.65 + 82 \cdot 2.81 + 76 \cdot 2.93 = 612.10$

$a_{22} = 60 \cdot .25 + 82 \cdot .30 + 76 \cdot .35 = 66.20$

$a_{31} = 76 \cdot 2.65 + 96 \cdot 2.81 + 84 \cdot 2.93 = 717.28$

$a_{32} = 76 \cdot .25 + 96 \cdot .30 + 76 \cdot .35 = 77.20$

(a) Find AB. What is the meaning of AB in the context of the situation?

$AB = \begin{bmatrix} 438.20 & 47.40 \\ 612.10 & 66.20 \\ 717.28 & 77.20 \end{bmatrix}$

Total $ Product and total Profit For ther types of milk.

(b) Find the dairy mart's profit for Friday through Sunday.

$190.80 (add 2nd column)

7.6 INVERSE MATRIX $AX=B \rightarrow X=A^{-1}B$

Use an inverse matrix to solve (if possible) the system of linear equations.

18. $\begin{cases} x+5y=-1 \\ 3x-5y=5 \end{cases}$ $\begin{bmatrix} 1 & 5 \\ 3 & -5 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} -1 \\ 5 \end{bmatrix}$

$\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} 1 \\ -2/5 \end{bmatrix}$ $\left(1, -\frac{2}{5}\right)$

19. $\begin{cases} 3x+2y-z=6 \\ x-y+2z=-1 \\ 5x+y+z=7 \end{cases}$ $\begin{bmatrix} 3 & 2 & -1 \\ 1 & -1 & 2 \\ 5 & 1 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}=\begin{bmatrix} 6 \\ -1 \\ 7 \end{bmatrix} \rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix}=\begin{bmatrix} 2 \\ -1 \\ -2 \end{bmatrix}$

$(2, -1, -2)$

20. $\begin{cases} x+2y+z-w=-2 \\ 2x+y+z+w=1 \\ x-y-3z=0 \\ z+w=1 \end{cases}$ $\begin{bmatrix} 1 & 2 & 1 & -1 \\ 2 & 1 & 1 & 1 \\ 1 & -1 & -3 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix}=\begin{bmatrix} -2 \\ 1 \\ 0 \\ 1 \end{bmatrix} \rightarrow \begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix}=\begin{bmatrix} 1 \\ -2 \\ 1 \\ 0 \end{bmatrix}$

$(1, -2, 1, 0)$

21. ***Fast-Food Sales*** A small fast-food chain with restaurants in Santa Monica, Long Beach, and Anaheim sells only hamburgers, hot dogs, and milk shakes. On a certain day, sales are distributed according to the following matrix.

	Number of items sold		
	Santa Monica	Long Beach	Anaheim
Hamburgers	4000	1000	3500
Hot dogs	400	300	200
Milk shakes	700	500	9000

$= A$

The price of each item is given by the following matrix.

Hamburger	Hot dog	Milk Shake
[\$0.90	\$0.80	\$1.10] $= B$

$BA=\begin{bmatrix} 4690 & 1690 & 13210 \end{bmatrix}$

Revenue For each Location

(a) Calculate the product BA.

(b) Interpret the entries in the product matrix BA.

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⑦ $\begin{cases} 3x-2y=0 \\ +\ 3x+2y=0 \end{cases}$

$6x = 0$

$x = 0$

$y = 0$

$(0,0)$

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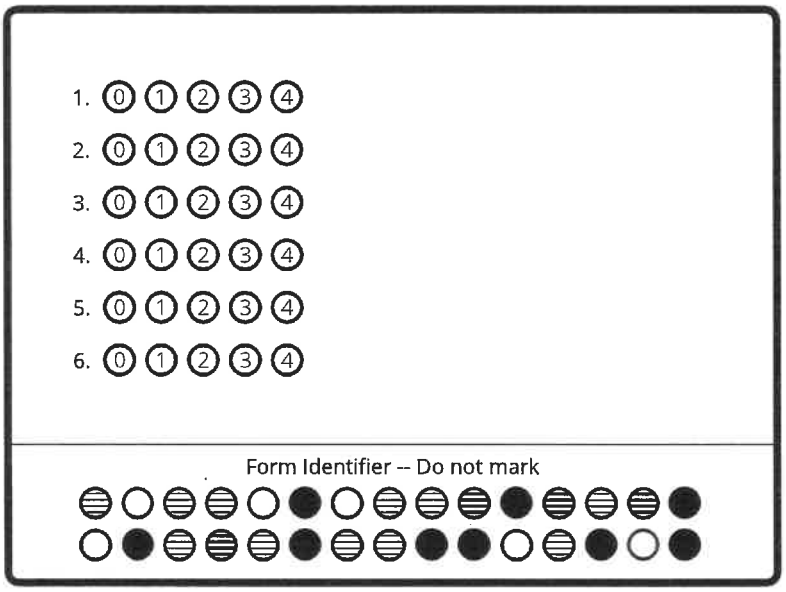
Geometry Unit 9 (Ext. Response) Mathematics CC Common Assessment



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5 Advanced Geometry - H, M. Johnson