Name______________________________ Additional Practice/ Guided Practice/Project Hour_____

Objective: **Solving Systems of Equations in Three Variables**

Section 1.4 BIM Algebra 2 Text p29-36

https://bit.ly/2NgTPXm

- Set up a system of equations in three variables to model real-life behavior
- Solving system of three variable equations through elimination method

1. Uncle Scrooge claims he has a bag of 30 coins (Total) containing nickels, dimes and quarters. The total value of the coins is ~~$3~~ 2.55. There are twice (2·) as many nickels as there are dimes. How many of each type of coin does he have?

more nickels
n is alone

Study
Define Variables:
n: # of nickels
d: # of dimes
q: #of quarters

Plan
The 3 Equations are:
A 1) $\boxed{n} + d + q = 30$ (Total coins)
B 2) $0.05\boxed{n} + 0.10d + 0.25q = \cancel{3.00}$ 2.55 (Total \$)
C 3) $\boxed{n} = 2d$
$n = 2(9)$
$n = 18$

Act
Solve

Step 1
(A) $(2d) + d + q = 30$
(D) $3d + q = 30$
$-3d \quad -3d$
(D) $\boxed{q} = -3d + 30$

(B) $0.05(2d) + 0.10d + 0.25q$
$0.10d + 0.10d + 0.25q = 2.55$
(E) $0.20d + 0.25q = 2.55$

Step 2
(E) $0.20d + 0.25(-3d+30) = 2.55$
$0.20d + -0.75d + 7.5 = 2.55$
$-0.55d + 7.5 = 2.55 \rightarrow d = 9$

Step 3
(D) $q = -3(9) + 30$
$q = -27 + 30$
$q = 3$

Reflect
18 nickels
9 dimes
3 quarters

2. Cornstock sold a total of 440 tickets for \$3940. Each regular ticket cost is \$5, each premium ticket is \$15 and each elite ticket cost is \$25. The number of regular tickets was three times the number of premium and elite tickets combined. How many of each ticket were sold?

Study
Define Variables:
X: # of regular tickets sold
Y: # of premium tickets sold
Z: # of elite tickets sold

Plan
The 3 Equations are:
(A) 1) $x + y + z = 440$ (Total Tickets)
(B) 2) $5x + 15y + 25z = 3940$ (Total money)
(C) 3) $x = 3(y+z)$
$x = 3y + 3z$
$-x \quad -x$
(C) $(0 = -x + 3y + 3z) \cdot 5$
$0 = -5x + 15y + 15z$

Act
Solve

Step 1
(A) $x + y + z = 440$
(C) $-x + 3y + 3z = 0$
(D) $-10 \cdot (4y + 4z = 440)$
(D) $-40y - 40z = -4400$
(E) $30y + 40z = 3940$

(B) $5x + 15y + 25z = 3940$
(C) $-5x + 15y + 15z = 0$
(E) $30y + 40z = 3940$

Reflect

3. The sum of three integers is 40. Three times the smaller integer is equal to the sum of the others. Twice the larger is equal to 8 more than the sum of the others. Find the integers.

Study
Define Variables:
X: first smaller number
Y: second middle number
Z: third larger number

Plan
The 3 Equations are:
(A) 1) $x + y + z = 40$
2) $3x = y + z$
$-3x \quad -3x$
(B) $0 = -3x + y + z$
3) $2z = (x + y) + 8$
$-x-y \quad -x \quad -y$
(C) $-x - y + 2z = 8$

Act
Solve

Step 1 Pair up to cancel variable
(B) $-3x + y + z = 0$
(C) $-x - y + 2z = 8$
(D) $-4x + 3z = 8$

(A) $x + y + z = 40$
(C) $-x - y + 2z = 8$
(E) $3z = 48$

Step 2 Solve 2 variables system
(E) $\frac{3z}{3} = \frac{48}{3}$
$z = 16$

(D) $-4x + 3(16) = 8$
$-4x + 48 = 8$
$\frac{-4x}{-4} = \frac{-40}{-4}$
$x = 10$

Step 3 Plug into Original
(A) $(10) + y + (16) = 40$
$y + 26 = 40$
$y = 14$

Reflect
the three integers are: 10, 14, 16

4. The sum of the angles A, B, and C of a triangle is $180°$. Angle C is equal to the sum of the other two angles. Five times angle A is equal to the sum of angle C and B. Find the angles.

Study
Define Variables:
X: measure of Angle A

Y: measure of Angle B

Z: measure of Angle C

Plan
The 3 Equations are:
(A) 1) $x + y + z = 180$

(B) 2) $z = x + y$
$-x - y + z = 0$

(C) 3) $5x = z + y$
$5x - y - z = 0$

Act
Solve Step 1

(A) $x + y + z = 180$
(B) $-x - y + z = 0$
$2z = 180$
$\frac{2z}{2} = \frac{180}{2}$
(D) $z = 90°$

(A) $x + y + z = 180$
(C) $5x - y - z = 0$
$6x = 180$
$\frac{6x}{6} = \frac{180}{6}$
(E) $x = 30°$

Step 3
(A) $(30) + y + (90) = 180$
$y + 120 = 180$
$y = 60°$

Reflect
$m\angle A = 30°$
$m\angle B = 60°$
$m\angle C = 90°$

5th

5. A parabola passes through three points $(-2,11)$, $(-1,4)$, and $(1,2)$. Use these points and $y = ax^2+bx+c$ to construct a system of three linear equations in terms of a, b, and c and solve it.

Study
Define Variables:
a: the coefficient a for x^2

b: the coefficient b for x

c: the constant c term

Plan
The 3 Equations are:
1) $11 = a(-2)^2 + b(-2) + c$
(A) $11 = 4a - 2b + c$
2) $4 = a(-1)^2 + b(-1) + c$
(B) $4 = a - b + c$
3) $2 = a(1)^2 + b(1) + c$
(C) $(2 = a + b + c)2$
(C) $\rightarrow 4 = 2a + 2b + 2c$

Act
Solve Step 1

(B) $4 = a - b + c$
(C) $2 = a + b + c$
(D) $(6 = 2a + 2c) \cdot -3$
(D) $-18 = -6a - 6c$

(A) $11 = 4a - 2b + c$
(C) $4 = 2a + 2b + 2c$
(E) $15 = 6a + 3c$

Step 2
(D) $-18 = -6a - 6c$
(E) $15 = 6a + 3c$
$-3 = -3c$
$\frac{-3}{-3} = \frac{-3c}{-3}$
$1 = c$

(E) $15 = 6a + 3(1)$
$15 = 6a + 3$
$-3 \quad -3$
$12 = 6a$
$\frac{12}{6} = \frac{6a}{6}$
$2 = a$

Step 3
(C) $2 = (2) + b + (1)$
$2 = 3 + b$
$-3 \quad -3$
$b = -1$

Reflect
The Parabola that goes through these points is:

$\boxed{y = 2x^2 - x + 1}$

6. A parabola passes through three points $(-1,7)$, $(1,-1)$ and $(2,-2)$. Use these points and $y = ax^2+bx+c$ to construct a system of three linear equations in terms of a, b, and c and then solve the system.

Study
Define Variables:
a:

b:

c:

Plan
The 3 Equations are:
1)

2)

3)

Act

Reflect
The Parabola that goes through these points is:

2. Reg=330, Prem=46, Elite= 64 4. A=~~20°~~ 30°, B=~~40°~~ 60°, C=~~120°~~ 90°
6. a=1,b=-4,c=2 $y = x^2 - 4x + 2$