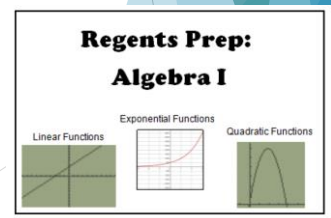


MAXIMIZE SPRING INSTRUCTION FOR YOUR ALGEBRA REGENTS STUDENTS



MARCH 30TH 1:00 PM - 3:00 PM

ABIGAIL KRZYZANOWICZ (SUNY FREDONIA MEPS)
KRISTINE POTTER (NORTHERN CHAUTAUQUA CATHOLIC SCHOOL)



1

OBJECTIVES

- ▶ Introductions
- ▶ Gather materials
 - Cheat sheet
 - Group work practice problems handout
 - TI-84
 - Power point slides
- ▶ Problem solve together
- ▶ Go into breakout rooms
- ▶ Questions

2

PROBLEM SOLVING

3

PEMDAS - an order of operation

$$10 - (3+2) * 4 + 5^2 + 18 \div 9$$

$$10 - (5) * 4 + 5^2 + 18 \div 9$$

$$10 - 5 * 4 + 25 + 18 \div 9$$

$$10 - 20 + 25 + 2$$

$$10 - 20 + 25 + 2$$

7

Parenthesis

Exponent

Multiply / Divide

Addition / Subtraction

4

SUBSTITUTION FOR A GIVEN VALUE

A function is defined as $K(x) = 2x^2 - 5x + 3$.
The value of $K(-3)$ is:

- (1) 54
- (2) 36 ★
- (3) 0
- (4) -18

Let's solve it!

$$\begin{aligned} K(-3) &= 2x^2 - 5(x) + 3 \\ K(-3) &= 2(-3)^2 - 5(-3) + 3 \\ K(-3) &= 2 \cdot 9 + 15 + 3 \\ K(-3) &= 18 + 15 + 3 \\ K(-3) &= 36 \end{aligned}$$

5

FOIL - order of operation

The expression $(m - 3)^2$ is equivalent to:

- (1) $m^2 + 9$
- (2) $m^2 - 9$
- (3) $m^2 - 6m + 9$ ★
- (4) $m^2 - 6m - 9$

Let's solve it!

$$\begin{array}{c} \text{F} \quad \text{L} \\ \text{---} \quad \text{---} \\ (m - 3) \quad (m - 3) \\ \text{---} \quad \text{---} \\ \text{O} \end{array}$$

First: m^2
Outer: $-3m$
Inner: $-3m$
Last: $+9$

$$m^2 - 6m + 9$$

6

un-FOIL - Finding the Roots of a Quadratic

The expression $36x^2 - 9$ is equivalent to:

- (1) $(6x - 3)^2$
- (2) $(18x - 4.5)^2$
- (3) $(6x + 3)(6x - 3)$ ★
- (4) $(18x + 4.5)(18x - 4.5)$

Let's solve it!

$36x^2 - 9$

$(6x + 3)(6x - 3)$

Let's check it!

$36x^2 + 18x - 18x - 9$

* The middle term $(+18x - 18x)$ cancels out

The sign +/- in front of the 9 tells us that we need a positive and negative to cancel out the middle term and get -9

1, 36
 2, 18
 3, 12
 4, 9
 ★ 6, 6

1, 9
 3, 3 ★

7

SOLVE FOR A VARIABLE

What is the solution to

$$\frac{3}{2}b + 5 < 17?$$

- (1) $b < 8$ ★
- (2) $b > 8$
- (3) $b < 18$
- (4) $b > 18$

Let's solve it!

$$\frac{3}{2}b + 5 < 17$$

$$\underline{-5 = -5}$$

$$\frac{2}{3} * \frac{3}{2}b < 12 * \frac{2}{3}$$

$$b < 8$$

8

SOLVE FOR A VARIABLE CONT'D - Common

The volume of a trapezoidal prism can be found using the formula

$V = \frac{1}{2} a(b + c)h$. Which equation is correctly solved for b ?

(1) $b = \frac{V}{2ah} + c$

(3) $b = \frac{2V}{ah} + c$

(2) $b = \frac{V}{2ah} - c$

(4) $b = \frac{2V}{ah} - c$ ★

Goal: get "b" all by itself → undo the problem

$$\frac{V = \frac{1}{2} a(b + c)h}{ah}$$

$$\frac{2}{1} * \frac{V}{ah} = \frac{1}{2} (b + c) * \frac{2}{1}$$

$$\frac{2V}{ah} = b + c$$

$$\frac{-c}{ah} = \frac{-c}{ah}$$

$$\frac{2V}{ah} - c = b$$

9

Becoming Familiar with TI-84

Given: $x + y = 13$
 $2x - 3y = 1$

What point satisfies both equations?

$$\begin{array}{l} x + y = 13 \rightarrow \left[\begin{array}{cc|c} 1 & 1 & 13 \\ 2 & -3 & 1 \end{array} \right] \\ 2x - 3y = 1 \rightarrow \end{array}$$

After inputting in calculator, we get a new matrix (or set of numbers)

$$\left[\begin{array}{cc|c} 1 & 0 & 8 \\ 0 & 1 & 5 \end{array} \right]$$

First term ("x") Second term ("y")

Numbers in the "yellow" column are our desired values for each term. We end up with the coordinates (8, 5)

"Rewriting as a matrix" means setting it up as rows and columns

On TI-84:

- (2nd), (x⁻¹)
- Arrow over to EDIT, ENTER
- Enter dimensions of the matrix as 2 * 3
- Enter the system as a matrix by putting the numbers in
 - Ex: 1 → 1 → 13
 - 2 (ENTER) (-) 3 (ENTER) 1 (ENTER)

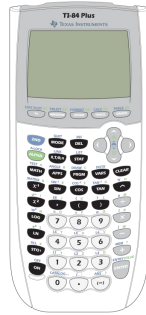
Next:

- Clear the screen: (2nd) (MODE)

How to solve:

- (2nd) (x⁻¹)
- Arrow over to MATH and scroll down
- Option B: "rref" (ENTER)
- 2nd, x⁻¹
- Choose appropriate matrix
- ENTER
- ENTER
- The answer is in matrix form

10



BREAK OUT ROOMS



11



12

BREAKOUT #1



12

BREAKOUT #1 - FOIL

1a) When written in standard form, the product of $(3 + x)$ and $(2x - 5)$ is:

- (1) $3x - 2$
- (2) $2x^2 + x - 15$
- (3) $2x^2 - 11x - 15$
- (4) $6x - 15 + 2x^2 - 5x$

13

Breakout #1 Debrief - FOIL

1a) When written in standard form, the product of $(3 + x)$ and $(2x - 5)$ is:

- (1) ~~$3x - 2$~~ — There aren't 3 terms
 - ★ $2x^2 + x - 15$
 - (3) $2x^2 - 11x - 15$
 - (4) ~~$6x - 15 + 2x^2 - 5x$~~ — This is not an answer because it's not in standard form (the largest exponent to smallest / in order), or combine like terms
- Pay attention to the order of $(x + 3)$

14

Let's solve together!

$$(3 + x) * (2x - 5)$$

$$(x + 3)(2x - 5)$$

$$2x^2 + 6x - 5x - 15$$

$$2x^2 + x - 15$$

1b. Breakout bonus - FOIL

$$(x + 4)(x + 7)$$

15

1b. Breakout bonus - FOIL (answer)

$$(x + 4)(x + 7)$$

	Multiply each part	Get ready to simplify	
First:	$x * x =$	x^2	
Outer:	$x * 7 =$	$(+) 7x$	} Combine like (or similar) terms and put them in "standard form" (aka biggest exponent/variable to lowers)
Inner:	$4 * x =$	$(+) 4x$	
Last:	$4 * 7 =$	$(+) 28$	

↓

$$x^2 + 11x + 28$$

16

1c. Breakout bonus - FOIL

$$(2x + 9)(2x - 3)$$

17

1c. Breakout bonus - FOIL answer

$$(2x + 9)(2x - 3)$$

First:	$2x * 2x$	$= 4x^2$	} = $12x$
Outer:	$2x * (-3)$	$= -6x$	
Inner:	$9 * 2x$	$= (+)18x$	
Last:	$9 * (-3)$	$= -27$	

$$4x^2 - 6x + 18x - 27$$

$$4x^2 + 12x - 27$$

18

1d. Breakout bonus - FOIL

Students were asked to write $2x^3 + 3x + 4x^2 + 1$ in standard form. Four student responses are shown below.

Alexa: $4x^2 + 3x + 2x^3 + 1$

Carol: $2x^3 + 3x + 4x^2 + 1$

Ryan: $2x^3 + 4x^2 + 3x + 1$

Eric: $1 + 2x^3 + 3x + 4x^2$

Which student's response is correct?

19

1d. Breakout bonus - FOIL answer

Students were asked to write $2x^3 + 3x + 4x^2 + 1$ in standard form. Four student responses are shown below.

Alexa: $4x^2 + 3x + 2x^3 + 1$

Carol: $2x^3 + 3x + 4x^2 + 1$

Ryan: $2x^3 + 4x^2 + 3x + 1$

Eric: $1 + 2x^3 + 3x + 4x^2$

Which student's response is correct?

Ryan - Because his is written in standard notation
(aka - the biggest exponent to smallest exponent)

▶ $x^3 > x^2 > x > 1$

20

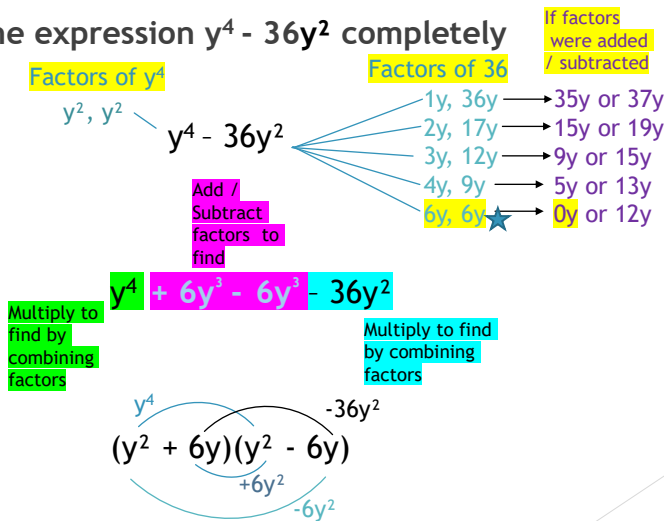
1e. Breakout bonus - FOIL

Factor the expression $y^4 - 36y^2$ completely

21

1e. Breakout bonus - FOIL answer

Factor the expression $y^4 - 36y^2$ completely



22

We are not going to get intimidated with the different exponents 😊

We know that $2 + 2 = 4$ and that the same applies for exponents!

$$y^4 = y^2 * y^2$$

We chose factors 6 and 6 because, when multiplied, they make 36.

The middle term when one is positive and one is negative, $(+6 * -6)$ cancels out and gives us -36 for a "last" number.

BREAKOUT #2

23

Breakout (#2) - unFOIL

$$x^2 + 5x - 6$$

- (1) $(x + 3)(x - 2)$
- (2) $(x + 2)(x - 3)$
- (3) $(x - 6)(x + 1)$
- (4) $(x + 6)(x - 1)$

24

Breakout (#2) - unFOIL

$$x^2 + 5x - 6$$

- (1) $(x + 3)(x - 2)$
- (2) $(x + 2)(x - 3)$
- (3) $(x - 6)(x + 1)$
- (4) $(x + 6)(x - 1)$ ★

Let's solve it!

Factors of 6
To find the last number

x, x

$$x^2 + 5x - 6$$

1, 6
2, 3

1+6=7, 6-1=5
2+3=5, 3-2=1

$$(x + \underline{\quad})(x - \underline{\quad})$$

$$(x + 6)(x - 1)$$

If factors were added or subtracted to find the middle factors

Both signs in the trinomial would have to be +'s for this to work

25

2b. Breakout bonus

Which expressions is equivalent to $2x^2 + 8x - 10$?

- (1) $2(x - 1)(x + 5)$
- (2) $2(x + 1)(x - 5)$
- (3) $2(x - 1)(x - 5)$
- (4) $2(x + 1)(x + 5)$

26

2c. Breakout bonus answer

Which expressions is equivalent to $2x^2 + 8x - 10$?

- (1) $2(x - 1)(x + 5)$ ★
 (2) $2(x + 1)(x - 5)$
 (3) $2(x - 1)(x - 5)$
 (4) $2(x + 1)(x + 5)$

1. We can factor out (or divide by) a 2 to make the trinomial more simple

$$(2x^2 + 8x - 10) \div 2 = 2(x^2 + 4x - 5)$$

2. Setting the 2 to the side, let's look at our new trinomial and its factors:

$$(x^2 + 4x - 5)$$

x, x

$$(x^2 + 4x - 5)$$

★ 1, 5
 because
 $1 \cdot 5 = 5$
 $1 + 5 = 6$
 $5 - 1 = 4$

27

2c. Breakout bonus - FOIL

Factor completely: $3y^2 - 12y - 288$

28

2d. Breakout bonus-FOIL answer

Factor completely: $3y^2 - 12y - 288$

Factors of $3y^2$
1, 3

Method #1

$3y^2 - 12y - 288$

$(y - 8)(3y - 36)$

$(y + 8)(3y - 36)$

OR

Factors of y^2
 $y * y$

Factors of 96
1, 96
2, 48
3, 32
4, 24
6, 16
8, 12 (-12 + 8 = -4)

Method #2

$3 * (y^2 - 4y - 96)$

$3(y - \underline{\quad})(y - \underline{\quad})$

$3(y - 12)(y + 8)$

Factors of 288
1, 288
2, 144
3, 96
4, 72
6, 48
8, 36★
9, 32
12, 24
16, 18

Add / Subtract factors to find

Multiply to find by combining factors

Multiply to find by combining factors

Don't let the large numbers intimidate you!

We know that our first factors are going to be y and $3y$ because $3 * 1 = 3$

Next we break 288 down into its different multiples

We are going to do some trial and error.

$$3 * 8 = 24$$

$36 - 24 = 12$ (giving us the middle number in our trinomial).

36 needs to be negative (because our middle term is negative)

29

2e. Breakout bonus

The expression $36x^2 - 9$ is equivalent to:

- (1) $(6x - 3)x^2$
- (2) $(18x - 4.5)x^2$
- (3) $(6x + 3)(6x - 3)$
- (4) $(18x + 4.5)(18x - 4.5)$

30

2e. Breakout bonus answer

The expression $36x^2 - 9$ is equivalent to:

- (1) $(6x-3) x^2$
- (2) $(18x - 4.5) x^2$
- (3) $(6x + 3)(6x - 3)$ ★
- (4) $(18x + 4.5)(18x - 4.5)$

Factors of $36x^2$
 1x, 36x
 2x, 18x
 3x, 12x
 4x, 9x
 ★ 6x, 6x
 ...

Factors of $36x^2 - 9$
 1, 9
 3, 3 ★

Factors of middle numbers (think addition/subtraction)
 0
 * Something that cancels itself out

$$36x^2 - 9$$

$$36x^2 - 9$$

$$(6x + \underline{\quad})(6x - \underline{\quad})$$

$$(6x + 3)(6x - 3)$$

31

BREAKOUT #3

32

Breakout (#3) - Word Problem (solve for "d")

Joe has dimes and nickels in his piggy bank totaling \$1.45. The number of nickels he has is 5 more than twice the number of dimes (d). Which equation could be used to find the number of dimes he has?

- (1) $0.10d + 0.05(2d + 5) = 1.45$
- (2) $0.10(2d + 5) + 0.05d = 1.45$
- (3) $d + (2d + 5) = 1.45$
- (4) $(d - 5) + 2d = 1.45$

33

Breakout (#3) Debrief - Word Problem

Joe has dimes and nickels in his piggy bank totaling \$1.45. The number of nickels he has is 5 more than twice the number of dimes (d). Which equation could be used to find the number of dimes he has?

- (1) $0.10d + 0.05(2d + 5) = 1.45$ ★
- (2) $0.10(2d + 5) + 0.05d = 1.45$
- (3) $d + (2d + 5) = 1.45$
- (4) $(d - 5) + 2d = 1.45$

Given:

d = # of dimes

Value of a dime (0.10)

Value of a nickel (0.05)

Has to be one of the first two choices

(Twice the number of dimes) + 5

$2d + 5$ (distributing the amount of nickels)

$0.10d + 0.05(2d + 5) = 1.45$ (PEMDAS - check)

$0.10d + 0.10d + .25 = 1.45$

$0.2d + 0.25 = 1.45$

$d = 6$ → plug in to check your answer with the original equation

34

Breakout bonus 3b - Word Problem

- ▶ At an amusement park, the cost for an adult admission is a , and for a child the cost is c . For a group of six that included two children, the cost was \$325.94. For a group of five that included three children, the cost was \$256.95. All ticket prices include tax.
 - ▶ Write a system of equations, in terms of a and c , that models this situation.
 - ▶ Use your system of equations to determine the exact cost of each type of ticket algebraically.
 - ▶ Determine the cost for a group of four that includes three children.

35

Breakout bonus - Word Problem answer

At an amusement park, the cost for an adult admission is a , and for a child the cost is c . For a group of six that included two children, the cost was \$325.94. For a group of five that included three children, the cost was \$256.95. All ticket prices include tax.

- ▶ Write a system of equations, in terms of a and c , that models this situation.

$$\text{▶ } 4a + 2c = \$325.94$$

$$\text{▶ } 2a + 3c = \$256.95$$

- ▶ Use your system of equations to determine the exact cost of each type of ticket algebraically.

$$\begin{array}{l}
 4a + 2c = \$325.94 \\
 2a + 3c = \$256.95
 \end{array}
 \rightarrow
 \begin{array}{|c|c|c|}
 \hline
 4 & 2 & 325.94 \\
 \hline
 (a) & (c) & \\
 \hline
 2 & 3 & 256.95 \\
 \hline
 \end{array}$$

↓

$$\begin{array}{|c|c|c|}
 \hline
 1 & 0 & 57.99 \\
 \hline
 0 & 1 & 46.99 \\
 \hline
 \end{array}$$

$a = \text{cost of one adult ticket}$
 $c = \text{cost of one child ticket}$

- ▶ Determine the cost for a group of four that includes three children.

$$\text{▶ } 1a + 3c = 1(57.99) + 3(46.99) = \$198.96$$

On TI-84:

- ▶ (2nd), (x⁻¹-1)
- ▶ Arrow over to EDIT, ENTER
- ▶ Enter dimensions of the matrix as 2 * 3
- ▶ Enter the system as a matrix by putting the numbers in
 - ▶ Ex: 4 (ENTER) 2 (ENTER) 325.94 (ENTER)
 - ▶ 2 (ENTER) 3 (ENTER) 256.95 (ENTER)

Next:

- ▶ Clear the screen: (2nd) (MODE)

How to solve:

- ▶ (2nd) (x⁻¹-1)
- ▶ Arrow over to MATH and scroll down
- ▶ Option B (after numbers): "rrf" (ENTER)
- ▶ 2nd, x⁻¹-1
- ▶ Choose appropriate matrix
- ▶ ENTER
- ▶ ENTER
- ▶ The answer is in matrix form

36

Breakout bonus question 3c

Which domain is most appropriate for a function that represents the number of items, $f(x)$, placed into a laundry basket each day, x , for the month of January?

- (1) integers
- (2) rational numbers
- (3) whole numbers
- (4) irrational numbers

37

Breakout bonus answer

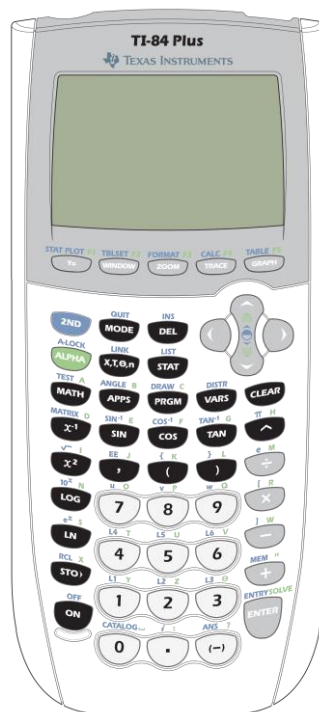
Which domain is most appropriate for a function that represents the number of items, $f(x)$, placed into a laundry basket each day, x , for the month of January?

- (1) integers (definition): whole numbers and their opposites {ex: - 3, -2, -1, 0, 1, 2, 3...}
 - (1) Can't have a negative number of laundry items
- (2) rational numbers: can be written as a fraction or as a decimal that ends or repeats. Integers are included as a type of rational number
 - (1) Can't have a fraction / part of a laundry item
- (3) **whole numbers:** start with 0 {ex: 0, 1, 2, 3, 4...}, not a fraction or decimal
 - (1) You can have 0 laundry items, or whole laundry items
- (4) irrational numbers: numbers that cannot be written as a fraction, never end and never repeat
 - (1) The amount of laundry can end and repeat (unfortunately it is ongoing haha)

38

Questions? 😊

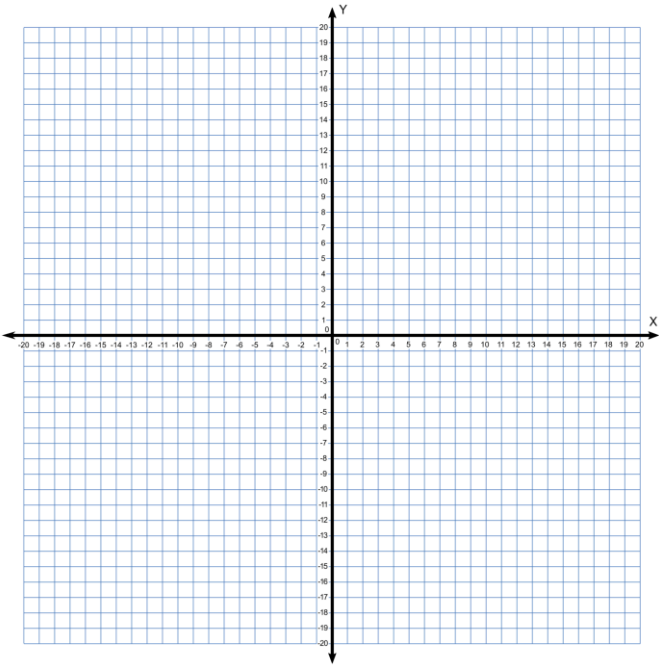
39



40



41



SunCatcherStudio.com

