End of Course Review

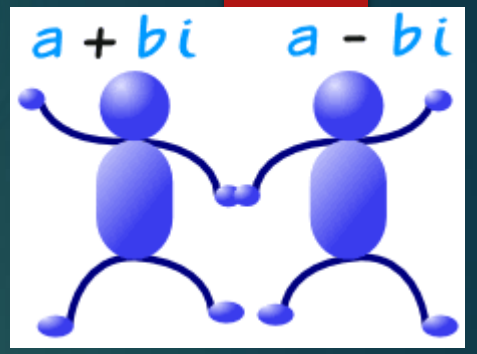
NUMBER SENSE, QUADRATIC FUNCTIONS AND OPERATION SKILLS

DAY 2

Warm Up Day 2

1. What is the complex conjugate of -2 – 3i?
2. What is the product of (4 + 3i) and (-7 – 3i)?
3. One of the roots of the quadratic equation $x^2 – 4x + 5 = 0$ is 2 + i. What is the other root?

Manipulate Complex Numbers



- Complex number :
  - Any number of the form a + bi, where a and b are real numbers and i is an imaginary number whose square equals -1
  - 2 + 3i; -7i; 4 – 5i
- Conjugate is the SAME real number OPPOSITE operation of the imaginary unit:
- Examples:
- Complex Number — Conjugate

Complex Number	Conjugate
2 + 3i	2 – 3i
-7i	7i
-4 – 5i	-4 + 5i

1. What is the complex conjugate of -2 – 3i?

3. One of the roots of the quadratic equation $x^2 – 4x + 5 = 0$ is 2 + i. What is the other root?

Manipulating Complex Numbers

Conjugates of an expression with a complex number in denominator:

$$\frac{4}{3-5i} \cdot \frac{3+5i}{3+5i} = \frac{12+20i}{34}$$

Cannot have imaginary number in denominator, so we must multiply the problem by the complex conjugate of the denominator.

Manipulating Complex Numbers

- Adding and Subtracting Complex Numbers:
  - When adding and subtracting complex numbers, combine like terms like you were adding expressions with variables
  - Example: (8i) + (7 + 3i) – (6i)

    = 7 + 5i

Manipulating Complex Numbers

- Multiplying Complex Numbers:
  - When multiplying complex numbers, multiply the numbers using multiplication properties, i.e., distribution property.
  - Simplify by combining like terms.
  - Remember: $i \times i = i^2$ and $i^2 = -1$

2. What is the product of (4 + 3i) and (-7 – 3i)?

Complex Roots – Things to remember

Complex Roots – when you have a quadratic equation that does not cross the x-axis.

Complex Roots – when you are solving a quadratic equation by the quadratic formula and you get a negative number under the radical sign..

Example: What are the roots to the equation $x^2 + 2x + 12$?

Using Matrices to Organize Data and Solve Problems

- Adding and Subtracting Matrices – can only add and subtract matrices of the exact same dimensions.
- Add/subtract corresponding elements from the matrices being added/subtracted.
- Example: $\begin{bmatrix} -3 & 8 \\ 1 & 6 \end{bmatrix} - \begin{bmatrix} 2 & 11 \\ 4 & -7 \end{bmatrix} = \begin{matrix} -5 & -3 \\ -3 & 13 \end{matrix}$
- Multiplying Matrices – use your **calculator** to do matrix multiplication
- Remember you can only multiply matrices where the columns of the first matrix are the same as the rows of the second matrix
- Example:
- $\begin{bmatrix} 3 & 2 \\ 6 & 5 \\ 1 & -9 \end{bmatrix} \cdot \begin{bmatrix} -5 & 2 \\ 4 & 11 \end{bmatrix}$

Determinant of a matrix

- The formula for calculating the determinant of a 2 x 2 matrix is :
  - $\begin{vmatrix} a & b \\ c & d \end{vmatrix} = a \cdot d - b \cdot c$
- The determinant of a 3 x 3 can be calculated by hand using this method:
  - $\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} \begin{vmatrix} a & b \\ d & e \\ g & h \end{vmatrix} = aei + bfg + cdh - gec - hfa - idb$
- The preferred method for finding the determinant of a 3 x 3 matrix is to use matrix functions on the graphing calculator
- Example: Using a calculator with matrix operations, find the determinant of

$$\begin{vmatrix} -5 & 5 & -2 \\ 5 & -2 & 4 \\ -3 & 5 & -1 \end{vmatrix}$$

Inverse of Matrices

- Use a calculator with matrix operations to find the inverse of a matrix.
- Example: Using a calculator, find the inverse of

$$\begin{vmatrix} -5 & 5 & -2 \\ 5 & -2 & 4 \\ -3 & 5 & -1 \end{vmatrix}$$

Using Inverses to Solve Problems:

- Three friends went shopping at their favorite store. All the pants, shirts and sweaters were on sale, and articles of each type cost the same. The table shows the friends purchases. Using the information in the tables, determine the cost of each sweater.

	# of Pants	# of Shirts	# of Sweaters	Total
Alicia	5	5	2	$377
Bette	5	6	0	$322
Cara	3	7	3	$408