**SUPPLEMENTAL INSTRUCTION ACTIVITY**

**TOPIC: Factoring Trinomials**

**APPLICABLE COURSES:** All math courses starting from Math 060 and other courses in other disciplines.

**LEARNING OUTCOME:** (What will students be able to do by the end of the workshop?)

After completing this workshop, students should be able to factor a quadratic trinomial of the form and **.**

**CONTENT:** (What do students need to know to accomplish the outcome?)

1. Factor Trinomials of the form , .
2. Factor Trinomials of the form , using any one of the following methods: Trial and Error, Factoring by grouping , Factoring using “Rectangle” method.

**METHOD:** (How will the instructor deliver content? Short lecture, handouts, Powerpoint, other audio-visual presentation)

Short lecture followed by active learning exercise and worksheet (40 minutes)

* Teach 1 and Practice 1 (15 minutes)
* Teach 2 and Practice 2 (15 minutes)

The lesson is divided into segments composed of lecture and examples followed by student practice and sharing.

* First, the instructor distributes the exercise worksheet and any supporting handouts.
* Then the instructor presents segments 1(5min). After this brief lecture with examples, students individually think about how they will solve the set of problems for these segments (2 min), and then complete them (5 min). Next, in pairs, students each take a turn to explain to their partner how they solved one of the problems (3 min). At the end of this 10 minute segment, the instructor posts the solutions/answers on the screen for students to check their work.
* Follow the same lecture/practice procedure for Segments 2 .

Note: If time is short, only one student explains his/her process to the partner for each segment of the lesson, taking turns for each segment.

Next students complete a quiz where they are asked to factor trinomials. After completing the quiz, the instructor posts the solutions/answers on the screen. Students check their results.

Then they complete the self-reflection activity. The instructor can also look over the quizzes while the students are completing the self-reflection activity to give feedback to students.

**ACTIVE LEARNING STRATEGIES:** (How will students apply their knowledge? Solve a problem, create a project, analyze a case, and explain a process)

Students reflect on the exercises and teach each other by verbalizing the steps they took to reach their conclusions.

**ASSESSMENT METHOD:** (How will the instructor know that the students met the outcome? Check for understanding. )

(20 minutes.)

Students complete a quiz where they are asked to factor trinomials. After completing the quiz, the instructor posts the solutions/answers on the screen. Students check their results. The instructor can also look over the quizzes while the students are completing the self-reflection activity to give feedback to students.  
If students do not successfully complete the worksheet quiz, they may be referred to individual tutoring or a guided learning activity.

**SELF-REFLECTION ACTIVITY:** (What will the instructor do to get students to reflect on how they learned the content? What they learned, how they learned it, how they will apply it in their coursework)

(5 minutes.)

-Which segment of the factoring trinomials was most challenging for you?

-What steps are you going to take to learn this subject?

|  |  |
| --- | --- |
| ***Factoring Trinomials***  **Handout** | **Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**Objective: To study how to factor a quadratic trinomial of the form .**

**Segment 1**: Factor Trinomials of the form **, .**

**Factoring is a process of writing an expression in terms of multiplication. To factor a polynomial means to rewrite the polynomial as a product of two or more polynomials.**

**Steps to factor a trinomial of the form**

**Step 1**: Find pair of integers whose product is *c* and whose sum is *b*. That is, determine *m* and *n* such that and .

**Step 2**: Write .

**Step 3**: Check your work by multiplying the binomials.

Note: If you can’t find integer factors it means the polynomial is PRIME.

Example 1: Factor

|  |  |
| --- | --- |
| Integers whose product is 5 | Sum ( -6 ) |
| 1 , 5 | 6 |
| -1, -5 | * -6 |

Example 2: Factor = ( )( )

|  |  |
| --- | --- |
| Integers whose product is -9 | Sum (-8 ) |
|  |  |
|  |  |

Example 3: Factor

Example 4: Factor

Example 5: Factor

**Note:** *Always factor out the* ***Greatest Common Factor*** *first.*

*Also, when a polynomial has a negative leading coefficient, begin by factoring our -1.*

**Segment 2**: Factor Trinomials of the form **, .**

We can think of factoring a trinomial as the opposite of multiplying binomials.

-The product of the **first** terms of the factors equal the first term of the trinomial.

- The product of the **last** terms of the factors equal the last term of the trinomial.

-The sum of the outer and inner products of the factors must equal the **middle** term of the trinomial.

To factor trinomials of this form, we have three methods in this segment that can be used. Read through all the methods and find the method that you think is easiest for you and start applying it.

1. Trial and Error
2. Factoring by grouping
3. Factoring using “Rectangle” method

**Steps to factor a trinomial of the form using Trial and Error**

**Step 1:**  List all possibilities for the first term of each binomial whose product is **.**

**Step 2:** List all possibilities for the last term of each binomial whose product is ***c****.*

**Step 3:** Multiply all the different possibilities until the sum of the outer and inner products of the factors equals the middle term of the trinomial.

**Steps to factor a trinomial of the form using Grouping**

**Step 1**: Multiply the coefficients of the first and last terms: i.e. multiple .

**Step 2**: At the same time, pay attention to the middle term---the sum of the two factors must yield the middle term: i.e. find two integers whose product is *ac* and sum is *b.*

**Step 3**: Rewrite the polynomial by changing the middle term into two separate terms, but leave the first and last terms alone: i. e. replace the middle term *bx* with the sum of difference using the two integers.

**Step 4**: Factor by grouping.

**Step 5**: Check your answer by multiplying the binomials.

**Steps to factor a trinomial of the form using “Rectangle” Method**

-Prepare the “grid rectangle” that will hold the terms. (It consists of 4 smaller rectangles that hold the areas).

First term

-Place first and last terms diagonal from each other

Last Term

- Find factors of that sum up to *b.*

*-*Place those factors in the two empty rectangles as a coefficient of *x.(*Order is not important).

*-*Find the common factors in each row and in each column.

-Answer is found by taking the dimensions of the rectangle.

**Note**: The trinomial represents the area of the rectangle and the factors of the trinomial are the dimensions of the rectangle.

Now, let’s find the dimensions of the rectangle with given area.

Example: Find the dimensions of the rectangle with given area (i.e. factor the trinomial).

Area = 

-Prepare the grid and place the first and last terms diagonal from each other





-Find factors of that sum up to *17* and place those factors in two empty rectangles*.*

The factors go as coefficients of *x* and the order is not important.









or









-Find the common factors in each row and in each column.









- Answer is found by taking the dimensions of the rectangle.





- Answer is .

**Note:** Before you start factoring trinomials with one of the methods discussed in Segment 2, *always factor out the* ***Greatest Common Factor*** *first.*

*Also, when a polynomial has a negative leading coefficient, begin by factoring our -1.*

Example 6: Factor

Example7: Factor

Example 8: Factor

Example 9: Factor

|  |  |
| --- | --- |
| ***Factoring Trinomials***  **Handout- KEY** | **Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

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Answer:

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Answer:

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Answer: PRIME

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Example 6: Factor Answer:

Example7: Factor Answer:

Example 8: Factor Answer:

Example 9: Factor Answer: PRIME

**Quiz for Factoring Trinomials**

Factor Completely:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SELF-REFLECTION ACTIVITY**

- Which segment of the factoring trinomials was most challenging for you?

- What steps are you going to take to learn this subject?

**Quiz for Factoring Trinomials-KEY**

Factor Completely:

1. Answer:
2. Answer:
3. Answer :
4. Answer: PRIME