Factorizing Polynomial Worksheet

Grade 10

Objectives

1. Bir polinomu ortak çarpan parantezine alma yoluyla çarpanlarına ayırma uygulamaları yapılır.

2. Tam kare (2.1), iki terimin toplamının ve farkının küpü (2.2), iki terimin küplerinin farkına (2.3) ait özdeşlikleri kullanılarak çarpanlara ayırma uygulamaları yapılır.

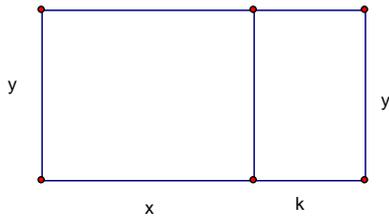3. İkinci dereceden bir polinomun köklerini veren formül oluşturulur.

Necessary Materials

- TI- 84 plus calculator

- Pencil

Problems

1. You can find the area of rectangular from different ways (1. objective).

   a. Find the area of rectangular below in two different ways?

b. When you look at the different expressions of the area of the rectangular, why these are represent the same expressions?

c. Considering the previous examples factorize the following (Each polynomial does not have to have 3 different factor):

Polynomials	Factor 1	Factor 2	Factor 3
$8x^3y^4 - 24x^4y^3$			
$3a(y - x) - 15b(x - y)$			
$x^6 + x^5 - x - 1$			
$(k - y)(t - x) + xy - y\ (x - t)\text{-}\ x(y - k)$			

2. How can you explain to identify the perfect squared form $(x + y + z)^2$ as a $a^2 + b^2 + c^2 + 2(ab + ac + bc)$ form when you think about on the following squared (2.1 objective)?
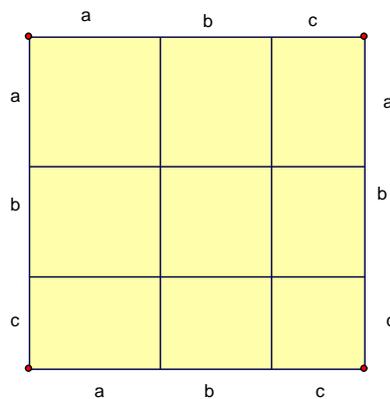
3. Given the polynomial: $x^2 - 8*x - 16$, to check the possible factors of the polynomial, you can use the graphing calculator. Let's check the correct answer among some possible answers (1. and 2. Objective) .
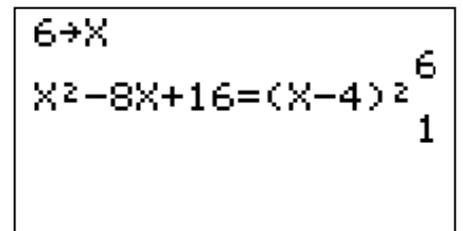
- Choose one positive one-digit (except 1 or 0) integer value and store the value in "x" on graphing calculator. For example for 6 you can store like this:

      6 STO► x

```
6→X
               6
X²-8X+16=(X+4)²
               0
```

- Press **[ENTER].**

- Write the polynomial and then press "=" and one of your possible answer. You can find "=" by pressing **[2ⁿᵈ][MATH](TEST) #1 =.**

```
6→X
               6
X²-8X+16=(X-4)²
               1
```
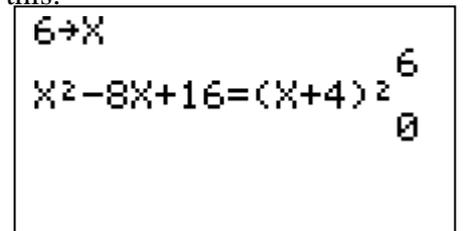
- Press **[ENTER].**

- **0** means the answer is not correct.

    1 means the answer is correct (You can see above).

    So that the factors of $x^2 - 8*x - 16$ is $(x - 4)^2$

Now, you find the possible factors of the following polynomial and then check your answers on the graphing calculator. Explain how the graphing calculator checks the answer? Fill the blanks after being sure on the graphing calculator.

Polynomials	Factor 1	Factor 2
$x^3 - 125$		
$36a^2 - 17a + 2$		

4. Given the polynomial: $x^2 + b*x + 7$, (3. Objective)

    a. Find the two values of b.

b. According to your answer find the factors of the polynomial.

c. Explain why these are the only factors?

5. Jack has a rectangular apple and cherry garden. The apple garden measured $(x - 2)$ m
    by $x^2 + 2*x + 4$ m. and the cherry garden measured $(x - 5)$ m by $x^2 + 5*x + 25$. In
    order to fertilize both gardens he needs to some measurements. (2.3 objective)

   a. So, what is the area of the apple and cherry garden?

    b. Use the two formula above and suggest a new formula which represents
        $(x - a)$ and other factor.

6. The factors of a polynomial can be found by finding the zeros of a polynomial. In

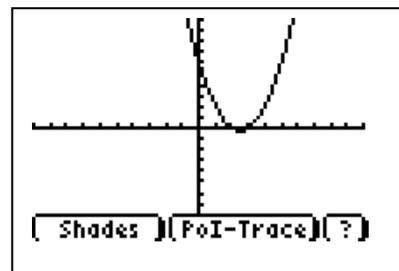order to find the zeros of polynomial. The method is using on graphing calculator.

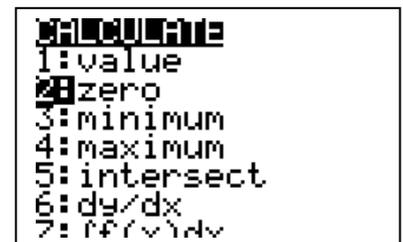Let we assume that the polynomial is $x^2 - 5*x + 6$ (2.2 objective).

The steps are:

```
X= Plot1   Plot2   Plot3
\Y₁⊟X^2-5X+6
\Y₂=
\Y₃=
\Y₄=
\Y₅=
```

- Press the **[Y=] (STAT PLOT)** button on the calculator.

- Write the polynomial like **"Y₁="** $x^2 - 5*x + 6$.
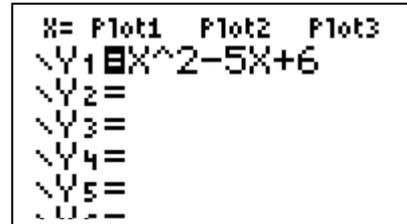
- Press **[GRAPH] (TABLE F5)** button**.**

```
[ Shades ][PoI-Trace][?]
```

- Then press **[2ⁿᵈ][TRACE] (CALC F4)** and

  press **#2: zero** and after that press **[ENTER]**

```
CALCULATE
1:value
2:zero
3:minimum
4:maximum
5:intersect
6:dy/dx
7:∫f(x)dx
```

- Press the circle to left side in order to find

  the x-intercept point and then press **[ENTER].**

```
Y1=X^2-5X+6
Left Bound?
X=2        Y=0
```
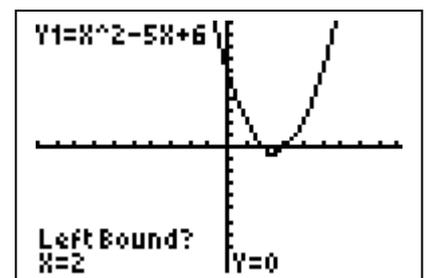
- Press the circle to right side to find y-intercept

  and then press **[ENTER].**

```
Y1=X^2-5X+6
Right Bound?
X=3        Y=0
```
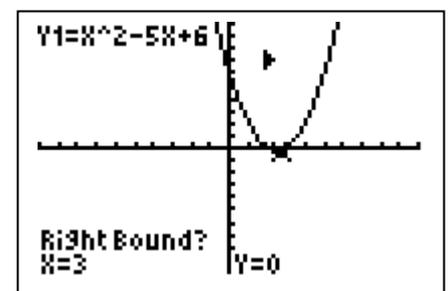
- Enter your guess for x-intercept point and

  and then repeat the process to enter your

```
Y1=X^2-5X+6
Guess?
X=3        Y=0
```
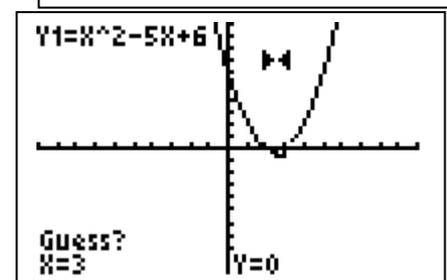
another guess for x-intercept point.

- The roots that you guess should be in this example x=3 and x=2 so that

    We can say that the factors of the polynomial are $x^2 - 5*x + 6 = (x - 3)*(x - 2)$.

a. Explain why these roots are the factors of the polynomial (3. Objective).

b. Find the following polynomials the same method that showed above.

Polynomials	Factors
$x^3 + 21*x^2 + 147*x + 343$	
$x^3 - 33*x^2 + 363*x - 1331$	

7. In order to check the factors of the polynomial you can use Excel (3. objective).

Step 1: First, try to find factors of $x^2 + 3*x - 4$.

Let say it can be $(x + 4)*(x - 1)$ or $(x - 3)* (x + 1)$.

Step 2: In order the check the possible answers of the polynomial, substitute different integers on x-values in the polynomial between [-6, 6] (I did not randomly choose these intervals; you can pick the interval according to the possible answers of you).

Step 3: Open Excel. Then, enter these x values for the A column. Then enter the value of the polynomial to the B column when you substitute x-values.

Step 4: Pick all values, click "Insert" and then double click to "XY chart". You should see a chart on the screen.
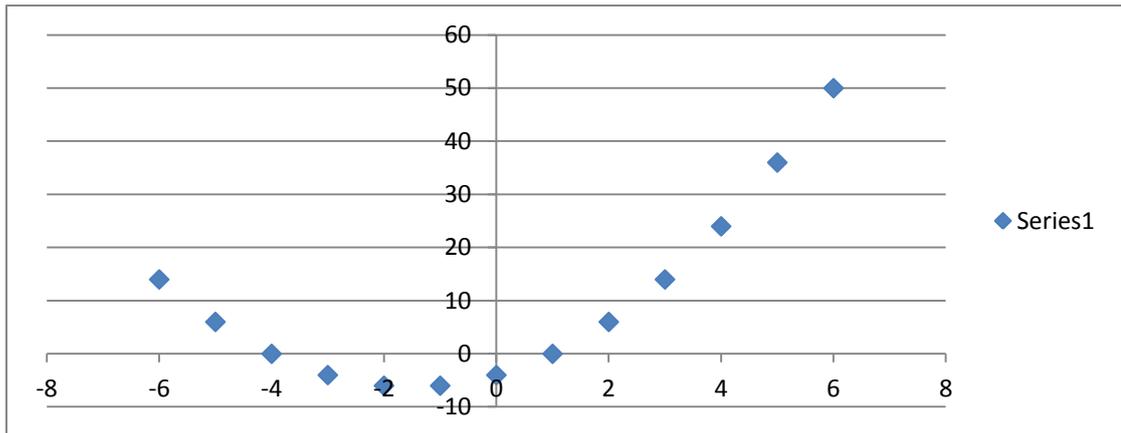
a. When you compare the possible factors considering the chart which factor is the correct one? Explain why? (Hint: You can think the y-values which equals 0).

8. In the seventh question you can use the Graphing calculator to find the y-values when you substitute x-values (3. Objective).

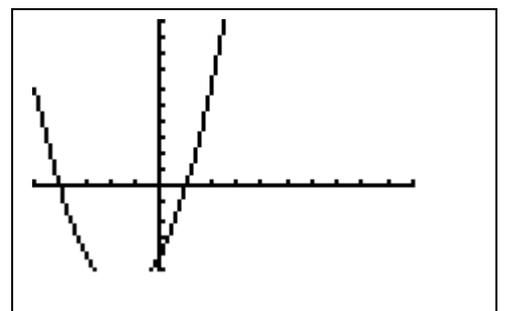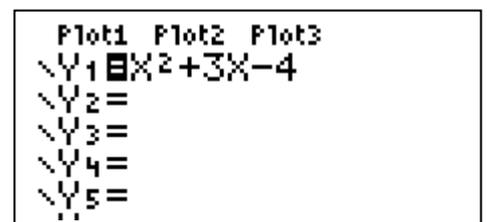**Step 1:** The polynomial is $x^2 + 3*x - 4$. Try to find possible factors.

Let say it can be $(x + 4)*(x - 1)$ or $(x - 3)* (x + 1)$.

Step 2: Press **[Y=] (STAT PLOT)** button.

Enter the polynomial to the **"Y₁="**.
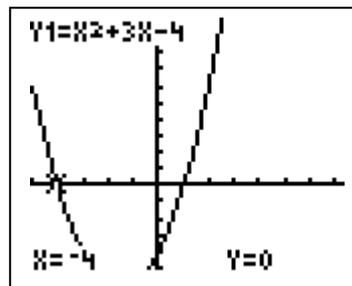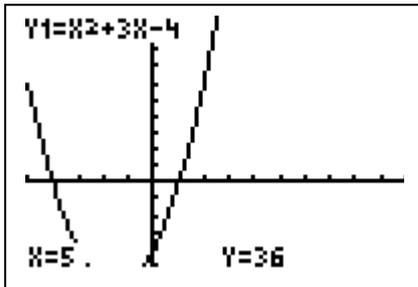
Step 3: Press **[GRAPH] (TABLE F5).**

On the screen you can see it.

Step 4: Press **[2ND] TRACE (CALC F4)** and

select **#1 value** and then press **[ENTER].**

Step 5: On the screen enter any x value that you want

to see the y-value. For example, x= - 4 or x=5.

```
CALCULATE
1:value
2:zero
3:minimum
4:maximum
5:intersect
```

```
Y1=X2+3X-4



      X=5 .           Y=36
```

```
Y1=X2+3X-4



      X=-4           Y=0
```

The question is in order to find the factors of the polynomial how can you decide which answer is the correct when you look at the graphics? Explain your reason**.**