DO NOW

- **1** Take out your homework from the previous lesson.
- **2** Prepare 2-3 sheets of paper for note taking.
 - Title the notes "Lesson 4.2: Polynomial Division"Include today's date (Oct. 22,2014)
- **3** WITHOUT using a calculator, complete each of the following division problems.
 - 2)1510
 - 4)868

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Major Topics Today

By the end of this lesson you should be able to...

- determine if a given factor is a factor of another polynomial.
- rewrite a polynomial as a product of two other polynomials.
- use synthetic division.
- polynomial long division.

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Steps For Polynomial Long Division

Copy these steps into your note

- 1 Write the problem using the long division symbol
- 2 Use a "sidebox" to make a small problem:
 - What is the highest power term inside the division symbol?
 - what is the highest power term outside the division symbol?
- 3 Write the answer from the sidebox problem at the top of the division symbol.
- 4 Multiply the outside by the top answer, then subtract.
- Repeat steps 2–4 until the power inside the division symbol is smaller than the outside power.

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Long Division Example

What is the solution to the given problem?

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

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Long Division Example: You Help

What is the solution to the given problem?

$$x+2) \overline{x^2+8x+12}$$

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Long Division Example: You Do

What is the solution to the given problem?

$$(x+7)$$
 $x^2 + 12x + 35$

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Long Division Example: You Do

What is the solution to the given problem?

$$\begin{array}{r} x + 5 \\
 x + 7 \\
 -x^2 + 12x + 35 \\
 -x^2 - 7x \\
 5x + 35 \\
 -5x - 35 \\
 0
 \end{array}$$

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What is the solution to the given problem?

$$x+2) \overline{x^2+7x+12}$$

What is the solution to the given problem?

$$\begin{array}{r} x + 5 \\
 x + 2) \overline{\smash{\big)} x^2 + 7x + 12} \\
 \underline{-x^2 - 2x} \\
 5x + 12 \\
 \underline{-5x - 10} \\
 2
 \end{array}$$

What is the solution to the given problem?

$$\begin{array}{r} x + 5 \\
 x + 2) \overline{\smash{\big)} x^2 + 7x + 12} \\
 - x^2 - 2x \\
 5x + 12 \\
 - 5x - 10 \\
 2
 \end{array}$$

What does the 2 means?

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What is the solution to the given problem?

$$\begin{array}{r} x + 5 \\
 x + 2) \overline{\smash{\big)} x^2 + 7x + 12} \\
 \underline{-x^2 - 2x} \\
 5x + 12 \\
 \underline{-5x - 10} \\
 2
 \end{array}$$

What does the 2 means? It's a remainder

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Synthetic Division

- Synthetic division is similar to Long Division but it focuses on the coefficients **not the variables**.
- Synthetic division uses the zeroes instead of the factors when dividing
- ALL of the powers of a variable have to be sorted before solving the problem.

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Synthetic Division

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We are about to rework the long division problems using synthetic division

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Example 1 Reworked

What is the solution to the given problem?

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

Example 2 Reworked: You Help

What is the solution to the given problem?

$$(x^2 + 8x + 12) \div (x + 2)$$

Example 3 Reworked: You Do

What is the solution to the given problem?

$$\frac{x^2+12x+35}{x+7}$$

Example 4 Reworked: You Do

Is x + 2 *a factor of* $x^2 + 7x + 12$ *?*

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CAUTION!

When there is a missing power of x in synthetic division, you MUST put a zero in its place as a "holder" for the power.

Example

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What is (x^3 + 2) \div (x + 2)?
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Exit Ticket I

I What is the remainder of
$$\frac{x^3 + 4x - 272}{x - 5}$$
 ?

2 The answer to question 1 means that x - 5 is...

(one additional problem on the back...)

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Exit Ticket II

3 What is the quotient $x + 3\overline{)x^2 - 4x - 21}$?