Name: _____ Date: _____

FACTORING
ALGEBRA 2 WITH TRIGONOMETRY

In the study of algebra there are certain skills that are called "gateway skills" because without them a student simply cannot enter into many more complex and interesting problems. Perhaps the most important gateway skill is that of **factoring**. The definition of factor, in two forms, is given below.

FACTOR – TWO IMPORTANT MEANINGS

(1) **Factor** (*verb*) – To rewrite a quantity as an equivalent product.
(2) **Factor** (*noun*) – Any individual component of a product.

You should be familiar with factoring integers as well as algebraic expressions from earlier courses. We will review some of the basic concepts and techniques of factoring in this lesson.

***Exercise* #1:** Factor each of the following integers completely. In other words, write them as the product of only prime numbers (called prime factorization).

(a) 12 (b) 30 (c) 16 (d) 36

Always keep in mind that when we **factor (*verb*)** a quantity, we are simply rewriting it in an different form that is completely equal to the original quantity. It might look different, but $2 \cdot 3$ is still the number 6.

***Exercise* #2:** Rewrite each of the following binomials as a product of an integer with a different binomial.

(a) $5x+10$ (b) $2x-6$ (c) $6x+15$ (d) $6-14x$

The above type of factoring is often referred to as "factoring out" the greatest common factor (gcf). This greatest common factor can be comprised of numbers, variables, or both.

***Exercise* #3:** Write each of the following binomials as the product of the binomial's gcf and another binomial.

(a) $3x^2+6x$ (b) $20x-5x^2$ (c) $10x^2+25x$ (d) $30x^2-20$

***Exercise* #4:** Rewritten in factored form $20x^2-36x$ is equivalent to

(1) $2x(10x-15)$ (3) $5x(4x+7)$

(2) $4x(5x-9)$ (4) $9x(x-4)$

_____

Trinomials can also sometimes be factored into the product of a gcf and another trinomial.

***Exercise* #5:** Rewrite each of the following trinomials as the product of its gcf and another trinomial.

(a) $2x^2+8x+10$ (b) $10x^2-20x+5$ (c) $8x^3-12x^2+20x$ (d) $6x^3+15x^2-21x$

Another type of factoring that you should be familiar with stems from our work in the last lesson on conjugates. Recall the conjugate multiplication pattern. This can be "reversed" in order to factor binomials that have the form of the **difference of perfect squares**.

CONJUGATE MULTIPLICATION PATTERN

$$(x-a)(x+a)=x^2-a^2$$

***Exercise* #6:** Write each of the following binomials as the product of a conjugate pair.

(a) x^2-9 (b) $4-x^2$ (c) $4x^2-25$ (d) $16-81x^2$

***Exercise* #7:** Write each of the following binomials as the product of a conjugate pair.

(a) $x^2-\frac{1}{4}$ (b) $25-\frac{x^2}{9}$ (c) $\frac{4}{81}x^2-\frac{49}{9}$ (d) $36x^2-49y^2$

Factoring an expression until it cannot be factored anymore is known as **complete factoring**. Complete factoring is an important skill to master in order to solve a variety of problems. In general, when completely factoring an expression, the **first** type of factoring always to consider is that of factoring out the gcf.

***Exercise* #8:** Using a combination of gcf and difference of perfect squares factoring, write each of the following in its completely factored form.

(a) $5x^2-20$ (b) $28x^2-7$ (c) $40-250x^2$ (d) $3x^3-48x$

Name: _____ Date: _____

FACTORING
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

1. Rewrite each of the following binomials as the product of an integer with a different binomial.

   (a) $10x-55$ (b) $24x-40$ (c) $6x-45$ (d) $18x-9$

2. Rewrite each of the following binomials as the product of its gcf along with another binomial.

   (a) $2x^2-8x$ (b) $6x+27$ (c) $30x^2-35x$ (d) $24x^3+20x^2$

3. Rewrite each of the following binomials as the product of a conjugate pair.

   (a) x^2-121 (b) $64-x^2$ (c) $4x^2-1$ (d) $25x^2-\frac{1}{9}$

4. Rewrite each of the following trinomials as the product of its gcf and another trinomial.

   (a) $4x^2+12x+28$ (b) $6x^2-4x+10$ (c) $14x^3+35x^2-7x$ (d) $20x^3-5x^2+15x$

5. Completely factor each of the following binomials using a combination of gcf factoring and conjugate pairs.

   (a) $6x^2-150$ (b) $36-4x^2$ (c) $28x^2-7$ (d) $27x^3-12x$

   (e) $80-125x^2$ (f) $2x^3-200x$ (g) $8x^2-512$ (h) $44x-99x^3$

6. When completely factored, the expression $48-3x^2$ is written as

(1) $3(16-x)(16+x)$ (3) $3(x-4)(x+4)$

(2) $3(x-16)(x+16)$ (4) $3(4-x)(4+x)$ _____

7. Which of the following represents the greatest common factor of the terms $4x^2y^6$ and $18xy^5$?

(1) $36xy$ (3) $2xy^5$

(2) $4x^2y^3$ (4) $2x^2y^2$ _____

8. Which of the following is *not* a factor of $6x^2-18x$?

(1) $x-3$ (3) 12

(2) 2 (4) x _____

9. Which of the following prime numbers is *not* a factor of the integer 330?

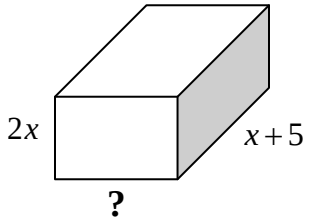
(1) 11 (3) 3

(2) 7 (4) 5 _____

APPLICATIONS

10. The area of any rectangular shape is given by the product of its width and length. If the area of a particular rectangular garden is given by $A=15x^2-35x$ and its width is given by $5x$, then find an expression for the garden's length. Justify your response.

11. The volume of a particular rectangular box is given by the equation $V=50x-2x^3$. The height and length of the box are shown on the diagram below. Find in the width of the box in terms of *x*. Recall that $V=L\cdot W\cdot H$ for a rectangular box.



12. A projectile is fired from ground level such that its height, *h*, as a function of time, *t*, is given by $h=-16t^2+80t$. Written in factored form this equation is equivalent to

(1) $h=-16t(t+4)$ (3) $h=-16t(t-5)$

(2) $h=-8t(2t-7)$ (4) $h=-8t(t-5)$ _____