

## Geometry

### Unit 2a: FACTORING

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Mathematics I  
Day 1 Student Task

Factor by Greatest Common Factor

Find the GCF of the numbers.

Example: 18 and 30

Factors of 18 are 1, 2, 3, 6, 9 and factors of 30 are 1, 2, 3, 5, 6, 10. The Greatest COMMON Factor is 6.

1. 12, 18 6

5. 28, 49 7

2. 10, 35 5

6. 27, 63 9

3. 8, 30 2

7. 26, 49 1

4. 16, 24 8

8. 110, 225 5

Find the greatest common monomial factor. If the GCF is 1, then write prime.

Example:  $12b^3c^2 + 15bc^5 = 3bc^2(4b^2 + 5c^3)$ . You can break each part down as shown below if needed.

Factors of 12 are 1, 2, 3, 4, 6, 12 and factors of 15 are 1, 3, 5, 15, so the GCF is 3.

Factors of  $b^3$  are  $b \cdot b \cdot b$  and factors of  $b$  is just  $b$ , so the GCF is  $b$ .

Factors of  $c^2$  are  $c \cdot c$  and factors of  $c^5$  are  $c \cdot c \cdot c \cdot c \cdot c$ , so the GCF is  $c^2$ .

9.  $6x + 3$   $3(2x + 1)$

10.  $24x^2 - 8x$   $8x(3x - 1)$

11.  $6x - 12$   $6(x - 2)$

12.  $2x^2 + 8x$   $2x(x + 4)$

13.  $4x + 10$   $2(2x + 5)$

14.  $10x^2 + 35x$   $5x(2x + 7)$

15.  $10x^2y - 15xy^2$   $5xy(2x - 3y)$

16.  $12x^2 - 9x + 15$   $3(4x^2 - 3x + 5)$

17.  $3n^3 - 12n^2 - 30n$   $3n(n^2 - 4n - 10)$

18.  $9m^2 - 4n + 12$  none

19.  $2x^3 - 3x^2 + 5x$   $x(2x^2 - 3x + 5)$

20.  $13m + 26m^2 - 39m^3$   $13m(1 + 2m - 3m^2)$

21.  $17x^2 + 34x + 51$   $17(x^2 + 2x + 3)$

22.  $18m^2n^4 - 12m^2n^3 + 24m^2n^2$   $6m^2n^2(3n^2 - 2n + 4)$

## Factoring Monomials From Polynomials

To factor a polynomial, write the polynomial as a product of other polynomials.

For example,  $4x^2 - 8x$  can be written as  $4x(x - 8)$ .

$4x$  is the **Greatest Common Factor (GCF)** of  $4x^2$  and  $8x$ .

$4x$  is a **Common Monomial Factor** of the terms of the binomial.

$x - 8$  is a **Binomial Factor** of  $4x^2 - 8x$ .

Factor.

1.  $9a^2 - 18a$   
 $9a(a - 2)$

2.  $16a^5b^3 + 32a^4b$   
 $16a^4b(ab^2 + 2)$

3.  $x^2 + x^4 + x^3$   
 $x^2(1 + x^2 + x)$   
 $x^2(x^2 + 1x + 1)$

4.  $3x^5 + 4x^4 - 5x^2$   
 $x^2(3x^3 + 4x^2 - 5)$

5.  $2x^3 - x$   
 $x(2x^2 - 1)$

6.  $3a^5 - a^3$   
 $a^3(3a^2 - 1)$

7.  $32b^2 + 16b$   
 $16b(2b + 1)$

8.  $5x^3 - 7x^2$   
 $x^2(5x - 7)$

9.  $3x^2 - 10x^3$   
 $x^2(3 - 10x)$

10.  $a^{5n} + a^{3n}$

11.  $x^3 - 5x^2$   
 $x^2(x - 5)$

12.  $9c - 3c^2$   
 $3c(3 - c^2)$

13.  $5x^4 - 12x^2$   
 $x^2(5x^2 - 12)$

14.  $x^2 + x$   
 $x(x + 1)$

15.  $6x^2 - 12x^3 - 18x^4$   
 $6x^2(1 - 2x - 3x^2)$

16.  $x^3y^4 + x^2y^2$   
 $x^2y^2(xy^2 + 1)$

17.  $18b - 9b^2$   
 $9b(2 - b)$

18.  $2x^3 + 6x^2$   
 $2x^2(x + 3)$

19.  $12x^3 + 4x^2$   
 $4x^2(3x + 1)$

20.  $x^5 + 3x^2 = x^2(x^3 + 3)$

Mathematics I  
Day 2 Practice

Find the GCF.

1.  $9xy - 6$   $3(3xy - 2)$

2.  $8x^2 + 4x$   $4x(2x + 1)$

3.  $16xy + 12yz$   $4y(4x + 3z)$

4.  $14mn - 21np$   $7n(2m - 3p)$

5.  $3x^3 - 9xy$   $3x(x^2 - 3y)$

6.  $x^2y - xy^2$   $xy(x - y)$

7.  $5xy - 15xz$   $5x(y - 3z)$

8.  $9a - 6b + 3$   $3(3a - 2b + 1)$

9.  $4x - 8y + 16$   $4(x - 2y + 4)$

10.  $15x^2 - 9x$   $3x(5x - 3)$

11.  $6x^2 + 12$   $6(x^2 + 2)$

12.  $4x^3 + 8x^2$   $4x^2(x + 2)$

13.  $12x^3 - 6x^2 + 24x$   $6x(2x^2 - x + 4)$

14.  $10y^3 - 5y^2 + 15y$   $5y(2y^2 - y + 3)$

15.  $\frac{1}{2}yz - \frac{1}{2}xy$   $\frac{1}{2}y(z - x)$

16.  $14x^2 + 21xz$   $7x(2x + 3z)$

17.  $24x^4 - 18x^3 + 12x^2$   $6x^2(4x^2 - 3x + 2)$

18.  $25j^3k - 15j^2k^2 + 5jk^3$   $5jk(5j^2 - 3jk + k^2)$

19.  $-40x^8y^6 - 16x^9y^5$   $-8x^8y^5(5y + 2xy)$

20.  $-18w^5 + 27w^3$   $-9w^3(2w^2 - 3)$

Remember, since there is a plus sign in front of the last term  $m$  and  $n$  should add up to equal the middle term. What happens to  $m$  and  $n$  to get the last term? \_\_\_\_\_

Out of the factors you listed, which ones can you multiply together to get the last term? Factor each expression.

e.  $x^2 + 3x + 2$   $(x+2)(x+1)$

f.  $x^2 + 6x + 5$   $(x+5)(x+1)$

g.  $x^2 + 5x + 6$   $(x+3)(x+2)$

h.  $x^2 + 7x + 12$   $(x+4)(x+3)$

2. Above, the values of  $b$  and  $c$  were positive. Now use that in reverse to factor each of the following quadratic expressions of the form  $x^2 + bx + c$  where  $c$  is positive but  $b$  is negative. The answers are very similar but have one difference than the way you answered above.

a.  $x^2 - 8x + 7$   $(x-7)(x-1)$

b.  $x^2 - 9x + 18$   $(x-6)(x-3)$

c.  $x^2 - 4x + 4$   $(x-2)(x-2)$

d.  $x^2 - 8x + 15$   $(x-3)(x-5)$

3. Now, we are going to use what we know in reverse to factor each of the following quadratic expressions of the form  $x^2 + bx + c$  where  $c$  is negative. Now, what would be different in this expression? We would no longer add the factors of  $c$  to get the middle number... what would we do? \_\_\_\_\_!! Notice that there is a different sign in each of the parentheses. How do you decide which sign goes with which factor?

Factor the following:

a.  $x^2 + 6x - 7$   $(x+7)(x-1)$

b.  $x^2 - 6x - 7$   $(x-7)(x+1)$

c.  $x^2 + x - 42$   $(x+7)(x-6)$

d.  $x^2 - x - 42$   $(x-7)(x+6)$

Mathematics 1

Day 4 Practice

Factor by Trial and Error

1.  $x^2 - x + 12$   
(prime)

2.  $a^2 + 14a + 40$   
 $(a+10)(a+4)$

3.  $x^2 - 10x - 24$   
 $(x-12)(x+2)$

4.  $x^2 - 13x + 36$   
 $(x-4)(x-9)$

5.  $x^2 - 5x + 6$   
 $(x-3)(x-2)$

6.  $x^2 - x - 20$   
 $(x-5)(x+4)$

7.  $x^2 + 16x + 55$   
 $(x+11)(x+5)$

8.  $x^2 - 14x + 45$   
 $(x-9)(x-5)$

9.  $x^2 - 3x - 40$   $\begin{matrix} +40 \\ -20 \end{matrix}$   
 $(x-8)(x+5)$

10.  $x^2 - 11x - 60$   
 $(x-15)(x+4)$

11.  $x^2 + 17x + 72$   
 $(x+9)(x+8)$

12.  $a^2 - 9a - 22$   
 $(a-11)(a+2)$

Key

Factoring Trinomials ( $a = 1$ )

Factor each completely.

1)  $b^2 + 8b + 7$

$(b + 7)(b + 1)$

3)  $m^2 + m - 90$

$(m - 9)(m + 10)$

5)  $n^2 - 10n + 9$

$(n - 1)(n - 9)$

7)  $m^2 + 2m - 24$

$(m + 6)(m - 4)$

9)  $k^2 - 13k + 40$

$(k - 5)(k - 8)$

11)  $n^2 - n - 56$

$(n + 7)(n - 8)$

13)  $b^2 - 6b + 8$

$(b - 4)(b - 2)$

15)  $2n^2 + 6n - 108$

$2(n + 9)(n - 6)$

17)  $2k^2 + 22k + 60$

$2(k + 5)(k + 6)$

19)  $p^2 + 11p + 10$

$(p + 10)(p + 1)$

21)  $2p^2 + 2p - 4$

$2(p - 1)(p + 2)$

23)  $x^2 - 15x + 50$

$(x - 10)(x - 5)$

25)  $p^2 + 3p - 18$

$(p - 3)(p + 6)$

2)  $n^2 - 11n + 10$

$(n - 10)(n - 1)$

4)  $n^2 + 4n - 12$

$(n - 2)(n + 6)$

6)  $b^2 + 16b + 64$

$(b + 8)^2$

8)  $x^2 - 4x + 24$

Not factorable

10)  $a^2 + 11a + 18$

$(a + 2)(a + 9)$

12)  $n^2 - 5n + 6$

$(n - 2)(n - 3)$

14)  $n^2 + 6n + 8$

$(n + 2)(n + 4)$

16)  $5n^2 + 10n + 20$

$5(n^2 + 2n + 4)$

18)  $a^2 - a - 90$

$(a - 10)(a + 9)$

20)  $5v^2 - 30v + 40$

$5(v - 2)(v - 4)$

22)  $4v^2 - 4v - 8$

$4(v + 1)(v - 2)$

24)  $v^2 - 7v + 10$

$(v - 5)(v - 2)$

26)  $6v^2 + 66v + 60$

$6(v + 10)(v + 1)$

Student Name: \_\_\_\_\_

Score: \_\_\_\_\_

**Factorize the Trinomials**

Problems

Work Space

$$2x^2 - 3x - 5$$

$$x^2 - 3x - 10$$

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

$$\rightarrow (2x - 5)(x + 1)$$

Answer:

$$5x^2 - 14x - 3$$

$$x^2 - 14x - 15$$

$$(x - 15)(x + 1)$$

$$\rightarrow (x - 3)(5x + 1)$$

Answer:

$$3x^2 - 7x + 2$$

$$x^2 - 7x + 6$$

$$(x - 6)(x - 1)$$

$$\rightarrow (x - 2)(3x - 1)$$

Answer:

$$4x^2 + 4x - 3$$

$$x^2 + 4x - 12$$

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

$$(x + \frac{3}{2})(x - \frac{1}{2})$$

$$\rightarrow (2x + 3)(2x - 1)$$

Answer:

$$15x^2 - 14x - 8$$

$$x^2 - 14x - 120$$

$$(x - 20)(x + 6)$$

Answer:  $(x - \frac{4}{3})(x + \frac{2}{3})$

$$(3x - 4)(5x + 2)$$



## Factoring Trinomials (a &gt; 1)

Factor each completely.

$$1) \begin{array}{l} 3p^2 - 2p - 5 \\ p^2 - 2p - 15 \\ (x-5)(x+3) \\ \frac{1}{3} \quad \frac{1}{3} \\ \hline (3x-5)(x+1) \end{array}$$

$$2) \begin{array}{l} 2n^2 + 3n - 9 \\ n^2 + 3n - 18 \\ (n+6)(n-3) \\ \frac{1}{2} \quad \frac{1}{2} \\ \hline (n+3)(2n-3) \end{array}$$

$$3) \begin{array}{l} 3n^2 - 8n + 4 \\ n^2 - 8n + 12 \\ (x-6)(x-2) \\ \frac{1}{3} \quad \frac{1}{3} \\ \hline (x-2)(3x-2) \end{array}$$

$$4) \begin{array}{l} 5n^2 + 19n + 12 \\ n^2 + 19n + 60 \\ (n+15)(n+4) \\ \frac{1}{5} \quad \frac{1}{5} \\ \hline (n+3)(5n+4) \end{array}$$

$$5) \begin{array}{l} 2v^2 + 11v + 5 \\ v^2 + 11v + 10 \\ (v+10)(v+1) \\ \frac{1}{2} \quad \frac{1}{2} \\ \hline (v+5)(2v+1) \end{array}$$

$$6) \begin{array}{l} 2n^2 + 5n + 2 \\ n^2 + 5n + 4 \\ (n+4)(n+1) \\ \frac{1}{2} \quad \frac{1}{2} \\ \hline (n+2)(2n+1) \end{array}$$

$$7) \begin{array}{l} 7a^2 + 53a + 28 \\ a^2 + 53a + 196 \\ (a+49)(a+4) \\ \frac{1}{7} \quad \frac{1}{7} \\ \hline (a+7)(7a+4) \end{array}$$

$$8) \begin{array}{l} 9k^2 + 66k + 21 \\ 3(3k^2 + 22k + 7) \\ k^2 + 22k + 21 \\ (k+21)(k+1) \\ \frac{1}{3} \quad \frac{1}{3} \\ \hline 3(k+7)(3k+1) \end{array}$$

9)  $15n^2 - 27n - 6$

$3(5n^2 - 9n - 2)$

$n^2 - 9n - 10$   
 $(n - \frac{10}{5})(n + \frac{1}{5})$

$3(n-2)(5n+1)$

11)  $4n^2 - 15n - 25$

$n^2 - 15n - 100$   
 $(n - \frac{20}{4})(n + \frac{5}{4})$

$(n-5)(4n+5)$

13)  $4n^2 - 17n + 4$

$n^2 - 17n + 16$   
 $(n - \frac{16}{4})(n - \frac{1}{4})$

$(n-4)(4n-1)$

15)  $6x^2 + 37x + 6$

$x^2 + 37x + 36$   
 $(x + \frac{36}{6})(x + \frac{1}{6})$

$(x+6)(6x+1)$

17)  $6n^2 + 5n - 6$

$n^2 + 5n - 36$   
 $(n + \frac{9}{6})(n - \frac{4}{6})$

$(n + \frac{3}{2})(n - \frac{2}{3})$

$(2n+3)(3n-2)$

10)  $5x^2 - 18x + 9$

$x^2 - 18x + 45$   
 $(x - \frac{15}{5})(x - \frac{3}{5})$

$(x-3)(5x-3)$

12)  $4x^2 - 35x + 49$

$x^2 - 35x + 196$   
 $(x - \frac{7}{4})(x - \frac{28}{4})$

$(4x-7)(x-7)$

14)  $6x^2 + 7x - 49$

$x^2 + 2x - 294$

16)  $-6a^2 - 25a - 25$

~~6a~~  
 $-1(6a^2 + 25a + 25)$   
 $a^2 + 25a + 150$   
 $(a + \frac{15}{6})(a + \frac{10}{2})$   
 $(a + \frac{5}{2})(a + \frac{5}{3})$

$-1(2a+5)(3a+5)$

18)  $16b^2 + 60b - 100$

$4(4b^2 + 15b - 25)$   
 $b^2 + 15b - 100$   
 $(b + \frac{20}{4})(b - \frac{5}{4})$

$4(b+5)(4b-5)$

# Factoring

Name \_\_\_\_\_

Trinomials with a Leading Coefficient Other Than One

Period \_\_\_\_\_ Date \_\_\_\_\_

Factor each polynomial completely. If the polynomial cannot be factored, say it is prime.

1.  $2x^2 + 7x + 6$   
 $x^2 + 7x + 12$   
 $(x + \frac{4}{2})(x + \frac{3}{2})$   
 $(x+2)(2x+3)$

2.  $3a^2 - 8a + 4$   
 $a^2 - 8a + 12$   
 $(x - \frac{6}{3})(x - \frac{2}{3})$   
 $(x-2)(3x-2)$

3.  $2m^2 - 3m - 14$   
 $m^2 - 3m - 28$   
 $(m - \frac{7}{2})(m + \frac{4}{2})$   
 $(2m-7)(m+2)$

4.  $3k^2 - k - 4$   
 $k^2 - k - 12$   
 $(x - \frac{4}{3})(x + \frac{3}{3})$   
 $(x+1)(3x-4)$

5.  $2g^2 - 7g - 4$   
 $g^2 - 7g - 8$   
 $(g - \frac{8}{2})(g + \frac{1}{2})$   
 $(g-4)(2g+1)$

6.  $6x^2 - 17x + 5$   
 $x^2 - 17x + 30$   
 $(x - \frac{15}{6})(x - \frac{2}{6})$   
 $(x - \frac{5}{2})(x - \frac{1}{3})$   
 $(2x-5)(3x-1)$

7.  $8x^2 - 10x + 3$   
 $x^2 - 10x + 24$   
 $(x - \frac{6}{8})(x - \frac{4}{8})$   
 $(x - \frac{3}{4})(x - \frac{1}{2})$   
 $(4x-3)(2x-1)$

8.  $3x^2 + 10x - 25$   
 $x^2 + 10x - 75$   
 $(x + \frac{15}{3})(x - \frac{5}{3})$   
 $(x+5)(3x-5)$

9.  $36a^2 + 12a + 1$   
 $a^2 + 12a + 36$   
 $(a + \frac{6}{36})(a + \frac{6}{36})$   
 $(6a+1)(6a+1)$

10.  $3x^2 - 14x - 24$   
 $x^2 - 14x - 72$   
 prime

11.  $12y^2 + 7y + 1$   
 $y^2 + 7y + 12$   
 $(y + \frac{4}{12})(y + \frac{3}{12})$   
 $(3y+1)(4y+1)$

12.  $2x^2 + 17x + 30$   
 $x^2 + 17x + 60$   
 $(x + \frac{12}{2})(x + \frac{5}{2})$   
 $(x+6)(2x+5)$

13.  $28y^2 - 18y + 2$   
 $2(14y^2 - 9y + 1)$   
 $y^2 - 9y + 14$   
 $(y - \frac{7}{14})(y - \frac{2}{14})$   
 $2(2y-1)(7y-1)$

14.  $4a^2 - 20a + 25$   
 $a^2 - 20a + 100$   
 $(a + \frac{20}{4})(a - \frac{10}{4})$   
 $(2a-5)(2a-5)$

15.  $3m^2 - 13m - 30$   
 $m^2 - 13m - 90$   
 $(m - \frac{18}{3})(m - \frac{5}{3})$   
 $(m-6)(3m-5)$

16.  $2x^2 - 11x - 40$   
 $x^2 - 11x - 80$   
 $(x - \frac{16}{2})(x + \frac{5}{2})$   
 $(x-8)(2x+5)$

17.  $2x^2 + 23x + 45$   
 $x^2 + 23x + 90$   
 $(x + \frac{18}{2})(x + \frac{5}{2})$   
 $(x+9)(2x+5)$

18.  $3t^2 + 10t - 48$   
 $t^2 + 10t - 144$   
 $(t + \frac{18}{3})(t - \frac{8}{3})$   
 $(t+6)(3t-8)$

19.  $2x^2 - 25x + 50$   
 $x^2 - 25x + 100$   
 $(x - \frac{20}{2})(x - \frac{5}{2})$   
 $(x-10)(2x-5)$

20.  $3b^2 + 8b - 35$   
 $b^2 + 8b - 105$   
 $(b + \frac{15}{3})(b - \frac{7}{3})$   
 $(b+5)(3b-7)$

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**GCF & Factoring Trinomials with Last Term Positive**

⊙ **Factoring Trinomials:** Writing the polynomial as a product of 2 binomials.

- Check for GCF 1<sup>st</sup>. Divide out the GCF of each term if one exists.
- When factoring  $ax^2 + bx + c$ , first find factors of  $a$  and  $c$ .
- Check the products of the inner and outer terms to see if the sum is  $b$ .

Factor each trinomial completely.

1.  $x^2 + 9x + 14$

$$(x+7)(x+2)$$

2.  $2x^2 - 5x + 3$

$$\begin{array}{l} x^2 - 5x + 6 \\ (x-3)(x-2) \\ \frac{2}{2} \quad \frac{2}{2} \\ \hline (2x-3)(x+1) \end{array}$$

3.  $5x^2 + 11x + 2$

$$\begin{array}{l} x^2 + 11x + 10 \\ (x+10)(x+1) \\ \frac{5}{5} \quad \frac{2}{2} \\ \hline (x+2)(5x+1) \end{array}$$

4.  $6x^2 - 11x + 3$

$$\begin{array}{l} x^2 - 11x + 18 \\ (x-9)(x-2) \\ \frac{6}{6} \quad \frac{3}{3} \\ \hline (2x-3)(3x-1) \end{array}$$

5.  $3x^2 - 10x + 3$

$$\begin{array}{l} x^2 - 10x + 9 \\ (x-9)(x-1) \\ \frac{3}{3} \quad \frac{3}{3} \\ \hline (x-3)(3x-1) \end{array}$$

6.  $2x^2 - 7x + 5$

$$\begin{array}{l} x^2 - 7x + 10 \\ (x-5)(x-2) \\ \frac{2}{2} \quad \frac{5}{5} \\ \hline (2x-5)(x-1) \end{array}$$

7.  $3x^2 - 8x + 4$

$$\begin{array}{l} x^2 - 8x + 12 \\ (x-6)(x-2) \\ \frac{3}{3} \quad \frac{2}{2} \\ \hline (x-2)(3x-2) \end{array}$$

8.  $2x^2 - 11x + 9$

$$\begin{array}{l} x^2 - 11x + 18 \\ (x-9)(x-2) \\ \frac{2}{2} \quad \frac{9}{9} \\ \hline (2x-9)(x-1) \end{array}$$

9.  $14x^2 - 32x + 18$

$$\begin{array}{l} 2(7x^2 - 16x + 9) \\ x^2 - 16x + 63 \\ (x-9)(x-7) \\ \frac{2}{2} \quad \frac{9}{9} \\ \hline 2(7x-9)(x-1) \end{array}$$

10.  $2x^2 - 17x + 35$

$$\begin{array}{l} x^2 - 17x + 70 \\ (x-10)(x-7) \\ \frac{2}{2} \quad \frac{7}{7} \\ \hline (x-5)(2x-7) \end{array}$$

11.  $6x^2 - 21x + 15$

$$\begin{array}{l} 3(2x^2 - 7x + 5) \\ x^2 - 7x + 10 \\ (x-5)(x-2) \\ \frac{3}{3} \quad \frac{5}{5} \\ \hline 3(2x-5)(x-1) \end{array}$$

12.  $4x^2 - 15x + 9$

$$\begin{array}{l} x^2 - 15x + 36 \\ (x-9)(x-6) \\ \frac{4}{4} \quad \frac{3}{3} \\ \hline (4x-9)(2x-3) \end{array}$$

13.  $3x^2 + 17x + 20$

$$\begin{array}{l} x^2 + 17x + 60 \\ (x+12)(x+5) \\ \frac{3}{3} \quad \frac{4}{4} \\ \hline (x+4)(3x+5) \end{array}$$

14.  $7x^2 - 45x + 18$

$$\begin{array}{l} x^2 - 45x + 126 \\ (x-42)(x-3) \\ \frac{7}{7} \quad \frac{3}{3} \\ \hline (x-6)(7x-3) \end{array}$$

15.  $4x^2 - 22x + 10$

$$\begin{array}{l} 2(2x^2 - 11x + 5) \\ x^2 - 11x + 10 \\ (x-10)(x-1) \\ \frac{2}{2} \quad \frac{5}{5} \\ \hline 2(x-5)(2x-1) \end{array} \quad ||$$

Mathematics I  
Day 5 Practice

Difference of Two Squares Practice

Factor completely if possible, if not, write "not possible". Take out GCF first if necessary!

1.  $(s^2 - 1) (s+1)(s-1)$

2.  $(2y^2 - 8) 2(y^2 - 4) = 2(y+2)(y-2)$

3.  $(3x^2 + 9) = 3(x^2 + 3)$

4.  $(4x^2 - 1) (2x-1)(2x+1)$

5.  $(x^2 - y^2) (x-y)(x+y)$

6.  $(16k^2 - 4) 4(4k^2 - 1) = 4(2k-1)(2k+1)$

7.  $(x^4 - x^2) \cancel{x^2} x^2(x^2 - 1) = x^2(x-1)(x+1)$

8.  $(x^2 - 20)$  prime

9.  $(49x^{10} - 1) (7x^5 - 1)(7x^5 + 1)$

10.  $(x - 81)$  prime

Ch. 10

Practice Worksheet

Factoring Differences of Squares

Factoring each polynomial, if possible. If the polynomial cannot be factored, write prime.

1.  $a^2 - 4$   
 $(a-2)(a+2)$

2.  $y^2 - 1$   
 $(y-1)(y+1)$

3.  $x^2 - 64$   
 $(x-8)(x+8)$

4.  $1 - 49c^2$   
 $(1-7c)(1+7c)$

5.  $-16 + p^2$   
 $(p-4)(p+4)$

6.  $100r^2 - 9$   
 $(10r-3)(10r+3)$

7.  $36 - n^2$   
 $(6-n)(6+n)$

8.  $144 - 9f^2$   
 $(12-3f)(12+3f)$

9.  $-r^2s^2 + 81$   
 $(9-rs)(9+rs)$

10.  $5a^2 - 4d^2$   
prime

11.  $4g^2 - 81h^2$   
 $(2g-9h)(2g+9h)$

12.  $36j^2 - 49m^2$   
 $(6j-7m)(6j+7m)$

13.  $8n^2 - 72p^2$   
 $8(n-3p)(n+3p)$

14.  $20q^2 - 5r^2$   
 $5(2q-r)(2q+r)$

15.  $s^4t^2 - 4t^2$   
 $t^2(s^2-1)(s^2+1)$

16.  $36n^2 - 25$   
 $(6n-5)(6n+5)$

17.  $49 - 100k^2$   
 $(7-10k)(7+10k)$

18.  $32 - 8n^2$   
 $8(4-n^2) = 8(2-n)(2+n)$

19.  $t^2 - 64u^2$   
 $(t-8u)(t+8u)$

20.  $121r^2 - 1$   
 $(11r-1)(11r+1)$

21.  $2yz^4 - 50yz^2$   
 $2yz^2(z^2-25) = 2yz(z-5)(z+5)$

22.  $25v^2x - 9u^2x$   
 $x(5v-3)(5v+3)$

23.  $4t^2 - 5t^2$   
 $t^2(4-5)$

24.  $200y^2z^5 - 242y^4z^3$   
 $4y^2z^3(50z^2-61y^2)$

25.  $75x^2 - 147y^2$   
 $3(5x-7y)(5x+7y)$

26.  $32h^2 - 18l^2$   
 $2(16h^2-9l^2) = 2(4h-3l)(4h+3l)$

27.  $x^2 + y^2$   
prime

28.  $x^2y^2 - z^2$   
 $(xy-z)(xy+z)$

29.  $-4c^2 + 25$   
 $-(4c-5)(4c+5)$

30.  $j^2 - 33k^2$   
prime

31.  $100b^4 - 169$   
 $(10b^2-13)(10b^2+13)$

32.  $24e^2 - 54f^4$   
 $6(4e^2-9f^4) = 6(2e-3f^2)(2e+3f^2)$

33.  $32a^2 - 50b^2$   
 $2(16a^2-25b^2) = 2(4a-5b)(4a+5b)$

34.  $-98r^2 + 8t^2$   
 $-2(49r^2-4t^2) = -2(7r-2t)(7r+2t)$

35.  $x^{12} - 4x^2$   
 $x^2(x^{10}-4) = x^2(x^5-2)(x^5+2)$

36.  $3l^2 - \frac{1}{3}$   
 $\frac{1}{3}(9l^2-1) = \frac{1}{3}(3l-1)(3l+1)$

37.  $\frac{1}{4}u^2 - \frac{9}{4}$   
 $\frac{1}{4}(u^2-9) = \frac{1}{4}(u-3)(u+3)$

38.  $9r^6m^4 - 196t^2m^4$   
 $t^2m^4(9r^6-196t^2) = t^2m^4(3r^3-14t)(3r^3+14t)$

39.  $5v^2 - \frac{5}{4}$   
 $\frac{5}{4}(4v^2-1) = \frac{5}{4}(2v-1)(2v+1)$

40.  $64u^7r^3 - 121ux^7$   
 $(8u^3r-11x^7)(8u^3r+11x^7)$

41.  $2z^2 - 98c^2$   
 $2(z^2-49c^2)$

42.  $85p^2 - 17q^2$   
 $17(5p^2-1q^2)$

## Factoring By Grouping

**Factor each completely.**

1)  $8r^3 - 64r^2 + r - 8$   
 $(8r^2 + 1)(r - 8)$

2)  $12p^3 - 21p^2 + 28p - 49$   
 $(3p^2 + 7)(4p - 7)$

3)  $12x^3 + 2x^2 - 30x - 5$   
 $(2x^2 - 5)(6x + 1)$

4)  $6v^3 - 16v^2 + 21v - 56$   
 $(2v^2 + 7)(3v - 8)$

5)  $63n^3 + 54n^2 - 105n - 90$   
 $3(3n^2 - 5)(7n + 6)$

6)  $21k^3 - 84k^2 + 15k - 60$   
 $3(7k^2 + 5)(k - 4)$

7)  $25v^3 + 5v^2 + 30v + 6$   
 $(5v^2 + 6)(5v + 1)$

8)  $105n^3 + 175n^2 - 75n - 125$   
 $5(7n^2 - 5)(3n + 5)$

9)  $96n^3 - 84n^2 + 112n - 98$   
 $2(6n^2 + 7)(8n - 7)$

10)  $28v^3 + 16v^2 - 21v - 12$   
 $(4v^2 - 3)(7v + 4)$

11)  $4v^3 - 12v^2 - 5v + 15$   
 $(4v^2 - 5)(v - 3)$

12)  $49x^3 - 35x^2 + 56x - 40$   
 $(7x^2 + 8)(7x - 5)$

13)  $24p^3 + 15p^2 - 56p - 35$   
 $(3p^2 - 7)(8p + 5)$

14)  $24r^3 - 64r^2 - 21r + 56$   
 $(8r^2 - 7)(3r - 8)$

$$15) 56xw + 49xk^2 - 24yw - 21yk^2 \\ (7x - 3y)(8w + 7k^2)$$

$$16) 42mc + 36md - 7n^2c - 6n^2d \\ (6m - n^2)(7c + 6d)$$

$$17) 12x^2u + 3x^2v + 28yu + 7yv \\ (3x^2 + 7y)(4u + v)$$

$$18) 40ac^2 + 25ak^2 + 32bc^2 + 20bk^2 \\ (5a + 4b)(8c^2 + 5k^2)$$

$$19) 12bc - 4bd - 15xc + 5xd \\ (4b - 5x)(3c - d)$$

$$20) 16mn - 4m^2 + 28n - 7m \\ (4m + 7)(4n - m)$$

$$21) 56xy - 35x + 16ry - 10r \\ (7x + 2r)(8y - 5)$$

$$22) 21xy + 15x + 35ry + 25r \\ (3x + 5r)(7y + 5)$$

$$23) 5a^2z - 4a^2c + 15xz - 12xc \\ (a^2 + 3x)(5z - 4c)$$

$$24) 4xy + 6 - x - 24y \\ (x - 6)(4y - 1)$$

$$25) 21xy - 12b^2 + 14xb - 18by \\ (7x - 6b)(3y + 2b)$$

$$26) 9mz - 4nc + 3mc - 12nz \\ (3m - 4n)(3z + c)$$

$$27) 28xy + 25 + 35x + 20y \\ (7x + 5)(4y + 5)$$

$$28) 30uv + 30u + 36u^2 + 25v \\ (6u + 5)(5v + 6u)$$

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## Factoring By Grouping

Factor each completely.

$$1) 12a^3 - 9a^2 + 4a - 3$$
$$(3a^2 + 1)(4a - 3)$$

$$2) 2p^3 + 5p^2 + 6p + 15$$
$$(p^2 + 3)(2p + 5)$$

$$3) 3n^3 - 4n^2 + 9n - 12$$
$$(n^2 + 3)(3n - 4)$$

$$4) 12n^3 + 4n^2 + 3n + 1$$
$$(4n^2 + 1)(3n + 1)$$

$$5) m^3 - m^2 + 2m - 2$$
$$(m^2 + 2)(m - 1)$$

$$6) 5n^3 - 10n^2 + 3n - 6$$
$$(5n^2 + 3)(n - 2)$$

$$7) 35xy - 5x - 56y + 8$$
$$(5x - 8)(7y - 1)$$

$$8) 224az + 56ac - 84yz - 21yc$$
$$7(8a - 3y)(4z + c)$$

$$9) mz - 5mh^2 - 5nz + 25nh^2$$
$$(m - 5n)(z - 5h^2)$$

$$10) 12xy - 28x - 15y + 35$$
$$(4x - 5)(3y - 7)$$

$$11) 40xy + 30x - 100y - 75 \\ 5(2x - 5)(4y + 3)$$

$$12) 75a^2c - 45a^2d - 30bc + 18bd \\ 3(5a^2 - 2b)(5c - 3d)$$

$$13) 192x^2y + 72x^3 - 24rxy - 9rx^2 \\ 3x(8x - r)(8y + 3x)$$

$$14) 90au - 36av - 150yu + 60yv \\ 6(3a - 5y)(5u - 2v)$$

$$15) 140ab - 60a^2 + 168b - 72a \\ 4(5a + 6)(7b - 3a)$$

$$16) 105ab - 90a - 21b + 18 \\ 3(5a - 1)(7b - 6)$$

$$17) 16x^2c + 8xyd - 16x^2d - 8xyc \\ 8x(2x - y)(c - d)$$

$$18) 150m^2nz + 20mn^2c - 120m^2nc - 25mn^2z \\ 5mn(6m - n)(5z - 4c)$$

$$19) 105xuv + 60xv - 70xu - 90xv^2 \\ 5x(7u - 6v)(3v - 2)$$

$$20) 112xy - 16x + 128x^2 - 14y \\ 2(8x - 1)(7y + 8x)$$

Accelerated Math 1  
Factoring 1

Name MS. Scott

Factor each of the following.

1.  $y^2 - 5y$

$$y(y-5)$$

2.  $4a^2 + 2a$

$$2a(2a+1)$$

3.  $x^3 + 9x^2$

$$x^2(x+9)$$

4.  $3x^2 + 12$

$$3(x^2+4)$$

5.  $7y^3 + 14y^2$

$$7y^2(y+2)$$

6.  $6x^2y^3 + 21xy^2$

$$3xy^2(2xy+7)$$

7.  $9x^3y^2 - 6x^2y^3 + 3x^3y^3$

$$3x^2y^2(3x-2y+xy)$$

8.  $24x^3 + 36x^2 + 72x$

$$12x(2x^2+3x+6)$$

9.  $x^2 - 16$

$$(x+4)(x-4)$$

10.  $9x^2 - 25y^2$

$$(3x+5y)(3x-5y)$$

11.  $4a^2 - 49$

$$(2a+7)(2a-7)$$

12.  $100y^2 - 81$

$$(10y+9)(10y-9)$$

13.  $6x^2 - 6y^2$

$$6(x^2 - y^2)$$

$$= 6(x+y)(x-y)$$

14.  $x^2 - 144$

$$(x+12)(x-12)$$

15.  $3x(y+1) - 4(y+1)$

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

16.  $5(3x-7) + 2y(3x-7)$

$$(3x-7)(5+2y)$$

17.  $x^3 + 6x^2 + 2x + 12$

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

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

18.  $m^3 - m^2 - 3m + 3$

$$m^2(m-1) - 3(m-1)$$

$$(m-1)(m^2-3)$$

19.  $w^2 - 14w + 45$

$$(w-9)(w-5)$$

20.  $x^2 + 2x - 24$

$$(x+6)(x-4)$$

21.  $r^2 + 12r + 20$

$$(r+10)(r+2)$$

22.  $y^2 - 15y + 54$

$$(y-9)(y-6)$$

23.  $g^2 - 5g + 6$

$$(g-3)(g-2)$$

24.  $k^2 - k - 20$

$$(k-5)(k+4)$$

Accelerated Math 1  
Factoring 2

Name \_\_\_\_\_

1.  $x^2 + 16x + 64$

$(x+8)^2$

2.  $m^2 + 5m + 6$

$(m+3)(m+2)$

3.  $a^2 - 3a - 18$

$(a-6)(a+3)$

4.  $x^2 + x - 42$

$(x+7)(x-6)$

5.  $5x^2 - 15$

$5(x^2 - 3)$

6.  $x^2 - 49$

$(x+7)(x-7)$

7.  $x^3 - 2x^2 + 3x - 6$

$(x^2 + 3)(x - 2)$

8.  $2x^3 - 16x^2 + 8x - 64$

$2(x^3 - 8x^2 + 4x - 32)$

$2(x^2 + 4)(x - 8)$

9.  $3x^2 - 5x - 2$

$(3x + 1)(x - 2)$

10.  $x^3y + 2x^2y$

$x^2y(x + 2)$

11.  $x^5 - 9x^3$

$x^3(x^2 - 9)$

$x^3(x+3)(x-3)$

12.  $t^2 - 7t + 12$

$(t-4)(t-3)$

13.  $x^3 + 2x^2 - 7x - 14$

$(x^2 - 7)(x + 2)$

14.  $a^2 - 2a + 1$

$(a-1)^2$

15.  $2x^2 - 13x - 45$

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

16.  $5m^2 - 20$

$5(m^2 - 4) = 5(m+2)(m-2)$

17.  $n^3 - 2n^2 + 4n - 8$

$(n^2 + 4)(n - 2)$

18.  $a^2 - 3a - 18$

$(a-6)(a+3)$

19.  $2y^2 - 10y + 8$

$2(y^2 - 5y + 4)$

$2(y-4)(y-1)$

20.  $x^2 - 11x + 28$

$(x-7)(x-4)$

21.  $y^5 + 7y^2$

$y^2(y^3 + 7)$

22.  $9a^2 - 400$

$(3a+20)(3a-20)$

23.  $y^3 - y + 3y^2 - 3$

$(y+3)(y^2 - 1)$

24.  $6a^2b^3 - 14abc$

$2ab(3ab^2 - 7c)$

25.  $x^6 - 9x^4$

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

$x^4(x+3)(x-3)$

26.  $3a^2 - 10a + 3$

$(3a-1)(a-3)$

AC Math 1  
Extra Factoring Worksheet 1

Name \_\_\_\_\_

Factor the expression.

1.  $x^2 - x - 6$   $(x-3)(x+2)$

2.  $x^2 - 6x + 5$   $(x-5)(x-1)$

3.  $2x^6 + 8x^5 + 7x^4$   $x^4(2x^2 + 8x^3 + 7)$

4.  $x^2 + 5x + 6$   $(x+3)(x+2)$

5.  $x^2 - 6x - 7$   $(x-7)(x+1)$

6.  $x^2 + 10x - 11$   $(x+11)(x-1)$

7.  $x^2 + 4x - 5$   $(x+5)(x-1)$

8.  $x^2 - 4x - 5$   $(x-5)(x+1)$

9.  $5x^5 - 80x$   $5x(x^4 - 16)$   
 $= 5x(x^2 + 4)(x+2)(x-2)$

10.  $x^3 - 3x^2 - 4x + 12$   $(x-3)(x^2 - 4)$   
 $= (x-3)(x+2)(x-2)$

11.  $8x^2 - 98$   $2(4x^2 - 49)$   
 $= 2(2x+7)(2x-7)$

12.  $x^2 - 2x - 63$   $(x-9)(x+7)$

13.  $x^2 - 64$   $(x+8)(x-8)$

14.  $8y^2 - 18y - 5$   $(4y+1)(2y-5)$

15.  $20x^3 - 4x^2 - 72x$   $4x(5x^2 - x - 18)$   
 $= 4x(5x+9)(x-2)$

16.  $x^2 - 10x - 96$   $(x-16)(x+6)$

17.  $x^2 + 10x - 96$   $(x+16)(x-6)$

18.  $18z^3 - 21z^2 + 30z - 35$   $(6z-7)(3z^2+5)$

19.  $x^2 + 4x - 45$   $(x+9)(x-5)$

20.  $x^2 + 9x - 36$   $(x+12)(x-3)$

21.  $12x^3 - 16x^2 + 3x - 4$   $(3x-4)(4x^2+1)$

22.  $x^2 + 11x - 80$   $(x+16)(x-5)$

23.  $7x^2 - 15x + 2$   $(7x-1)(x-2)$

24.  $8x^2 - 6x + 1$   $(4x-1)(2x-1)$

25.  $8x^2 - 11x + 3$   $(8x-3)(x-1)$

26.  $12x^2 - 8x + 1$   $(6x-1)(2x-1)$

27.  $9x^2 + 3x - 2$   $(3x-1)(3x+2)$

28.  $6x^2 + 11x - 2$   $(6x-1)(x+2)$

29.  $2x^2 + 4x - 6$   $2(x^2 + 2x - 3)$   
 $= 2(x+3)(x-1)$

30.  $8x^2 + 7x - 1$   $(8x-1)(x+1)$

AC Math 1  
Extra Factoring 2

Name \_\_\_\_\_

Factor the expression.

1.  $x^2 + 4x - 21$   $(x+7)(x-3)$

14.  $15x^2 - 14x + 3$   $(5x-3)(3x-1)$

2.  $x^4 - 81$   $(x^2+9)(x^2-9)$   
 $= (x^2+9)(x+3)(x-3)$

15.  $15y^2 + 19y - 10$   $(5y-2)(3y+5)$

3.  $x^2 + 8x + 15$   $(x+5)(x+3)$

16.  $x^2 + 16x + 64$   $(x+8)^2$

4.  $3x^3 + 25x^2 + 52x$   $x(3x^2 + 25x + 52)$   
 $= x(3x+13)(x+4)$

17.  $2x^2 - 8$   $2(x^2-4) = 2(x+2)(x-2)$

5.  $x^2 - 11xy + 28y^2$   $(x-7y)(x-4y)$

18.  $9x^2 - 1$   $(3x+1)(3x-1)$

6.  $x^2 - 10x + 24$   $(x-6)(x-4)$

19.  $4x^2 + 4x + 1$   $(2x+1)^2$

7.  $1 - 16y^4$   $(1-4y^2)(1+4y^2)$   
 $= (1+2y)(1-2y)(1+4y^2)$

20.  $9x^2 - 12x + 4$   $(3x-2)^2$

8.  $2x^2 - 5x - 3$   $(2x+1)(x-3)$

21.  $m^4 + 8m^3 + 8m^2 + 64m$   $m(m^3 + 8m^2 + 8m + 64)$   
 $= m(m+8)(m^2+8)$

9.  $3x^2 - x - 2$   $(3x+2)(x-1)$

22.  $6x^2 + 17x + 5$   $(3x+1)(2x+5)$

10.  $3x^2 + 7x + 2$   $(3x+1)(x+2)$

23.  $4x^2 + 14x + 6$   $2(2x^2 + 7x + 3)$   
 $= 2(2x+1)(x+3)$

11.  $2x^2 + 5x + 3$   $(2x+3)(x+1)$

24.  $6x^2 - 33x + 15$   $3(2x^2 - 11x + 5)$   
 $= 3(2x-1)(x-5)$

12.  $10x^2 - 3x - 1$   $(5x+1)(2x-1)$

25.  $45x^2 + 30x + 5$   $5(9x^2 + 6x + 1)$   
 $= 5(3x+1)^2$

13.  $6x^2 - 13x + 2$   $(6x-1)(x-2)$

26.  $12a^3b^2 - 6a^2b + 4a^2b^3 - 2ab$   
 $2ab(6a^2b - 3a + 2ab^2 - 1)$   
 $= 2ab(3a+1)(2ab-1)$