Algebra 1 – Unit 10 Guide

Factoring Polynomials

Look for a GCF

2 terms
$ax^2 - b$

Examples
$x^2 - 36$
$(x-6)(x+6)$

$9x^2 - 4$
$(3x+2)(3x-2)$

3 terms
$x^2 + bx + c$

Examples M
$x^2 + 5x + 6$ $6 = 2 \cdot 3$
$(x+2)(x+3)$ $5 = 2 + 3$

3 terms
$ax^2 + bx + c$

Example
$6x^2 - 5x + 4$ $-24 = -8 \cdot$
$3x$ -4 $-5 = -8 + 3$

$2x$	$6x^2$	$-8x$
1	$3x$	-4

$(2x+1)(3x-4)$

4 terms
$ax^3 + bx^2 + cx + d$

Example
$x^3 + x^2 + 2x + 2$
$x(x+1) + 2(x+1)$
$(x+2)(x+1)$

Skill #1 – Factoring out a Greatest Common Factor

Factor the GCF out of an Expression

$$4x + 8 \rightarrow GCF(\_ + \_) \rightarrow 4(x+2)$$

	4x	8
÷ 4	÷ 4	
4	×	x	2

Check It
$4(x+2)$
$= 4x + 8$

Skill #1 – Factoring with a Coefficient of 1

A   M
$x^2 - 7x + 10$

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

Multiply: 10
Add: -7

$1 \bullet 10$
$2 \bullet 5$
$-1 \bullet -10$
$\boxed{-2 \bullet -5}$

Check:
$x^2 - 5x - 2x + 10$
$x^2 - 7x + 10$

Skill #2 – Factoring with a Coefficient of a

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

$$-3 \times 4 = -12$$
$$-3 + 4 = 1$$

Find factors of -12 that add up to 1

1. Take the two numbers -3 and 4, and put them, **complete with signs and variables**, in the diagonal corners, like this:

$2x^2$	$-3x$
$4x$	-6

It does not matter which way you do the diagonal entries!

Skill #3 – Factoring by Grouping

$$3x^2 + 6x + 4x + 8$$

$$= (3x^2 + 6x) + (4x + 8)$$

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

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

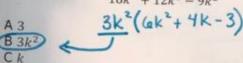## Skill #2 – Factoring Difference of Squares

FACTOR: $4x^2 - 9$

coefficient: 4   9
variable: x   none

$\sqrt{4} = 2$ $\sqrt{9} = 3$

$$\boxed{(2x+3)(2x-3)}$$

Check: $4x^2 - 6x + 6x - 9 = 4x^2 - 9$

Algebra 1 – Unit 10 Study Packet

Factoring Polynomials

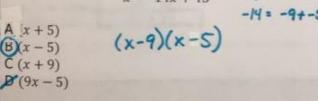|	
1. What is the greatest common monomial factor of $$18k^4 + 12k^3 - 9k^2$$ $3k^2(6k^2 + 4k - 3)$ A 3 **B** $3k^2$ ← C k D $3k$	**2.** What is the greatest common monomial factor of $$16x - 4x^2$$ $4x(4 - x)$ A 4 B $4x^2$ C x **D** $4x$ ←
3. What is the completely factored form of the following expression? $$5x + 40$$ $5(x+8)$ A $5(x-8)$ B $5(x+40)$ C $-5(x-8)$ **D** $5(x+8)$	**4.** When completely factored, write an expression that is equivalent to $$3x^2y^4 + 6xy^5$$ $\boxed{3xy^4(x+2y)}$

Skill #1	□ Factor out the greatest common factor of a polynomial. □ Need more practice (IXL – AA.1 and AA.2)

5. What are the factors of $$\overset{A}{}\overset{M}{}$$ $$x^2 + 5x - 24$$ $\boxed{(x-3)(x+8)}$ $-24 = -3 \cdot 8$ $5 = -3 + 8$	**6.** What are the factors of $$\overset{A}{}\overset{M}{}$$ $$x^2 + 12x + 35$$ $\boxed{(x+7)(x+5)}$ $35 = 7 \cdot 5$ $12 = 7 + 5$
7. What is the completely factored form of the following expression? $$\overset{A}{}\overset{M}{}$$ $$x^2 - 3x - 40$$ $-40 = -8 \cdot 5$ $-3 = -8 + 5$ $(x-8)(x+5)$ A $(x+5)(x+8)$ B $(x-5)(x-8)$ **C** $(x+5)(x-8)$ D $(x-5)(x+8)$	**8.** Which of the following is a factor of $$\overset{A}{}\overset{M}{}$$ $$x^2 - 14x + 45$$ $45 = -9 \cdot -5$ $-14 = -9 + -5$ $(x-9)(x-5)$ A $(x+5)$ **B** $(x-5)$ C $(x+9)$ D $(9x-5)$

9. Select all of the following that are factors of the given polynomial $-6 = 6 \cdot -1$
$$\overset{A}{}\overset{M}{}$$
$$x^2 + 5x - 6$$
$5 = 6 + -1$
$$(x+6)(x-1)$$

$(x+6)$	$(x+5)$	$(x+1)$	$(x+3)$
$(x-5)$	$(x+4)$	$(x-1)$	$(x+2)$

Skill #2	□ Factor a trinomial with a coefficient of 1 □ Need more practice (IXL – AA.4)

10. What are the factors of

$$(3y^2 - 8y + 5) = 15 = -5 \cdot -3$$
$$-8 = -5 + -3$$

$3y \quad -5$

y	$3y^2$	$-5y$	←
-1	$-3y$	5	←

↑ ↑

$$(3y-5)(y-1)$$

11. What are the factors of

$$(4x^2 + 8x + 3) = 12 = 6 \cdot 2$$
$$2x \quad 3 \qquad 8 = 6 + 2$$

$2x$	$4x^2$	$6x$	←
1	$2x$	3	←

↑ ↑

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

12. What is the completely factored form of the following expression?

$$(3h^2 - 7h - 6) \qquad -18 = -9 \cdot 2$$
$$-7 = -9 + 2$$

$h \quad -3$

$3h$	$3h^2$	$-9h$	←
2	$2h$	-6	←

↑ ↑

A $(3h + 2)(h + 3)$
B $(h + 2)(3h - 3)$
C $(3h + 2)(h - 3)$ ⟵ circled
D $(h - 2)(3h + 3)$

$$(h-3)(3h+2)$$

13. Which of the following is a factor of

$$(2k^2 + 5k - 3) \qquad -6 = 6 \cdot -1$$
$$5 = 6 + -1$$

$k \quad 3$

A $(2k - 1)$ ⟵ circled
B $(k + 1)$
C $(k - 3)$
D $(2k - 3)$

$2k$	$2k^2$	$6k$	←
-1	$-1k$	-3	←

↑ ↑

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

14. Select all of the following that are factors of the given polynomial

$$6x^2 + 4x - 2$$

GCF

$$2(3x^2 + 2x - 1) \qquad -3 = 3 \cdot -1$$
$$2(3x - 1)(x + 1) \qquad 2 = 3 + -1$$

$x \quad 1$

$3x$	$6x^2$	$3x$	←
-1	$-1x$	-2	←

↑ ↑

2	$(2x - 1)$	$(2x - 3)$	$(x - 1)$
4	$(2x + 1)$	$(3x - 1)$	$(x + 1)$

Skill #3 ☐ Factor a trinomial with a coefficient of a
☐ Need more practice (IXL – AA.5)

13. What is the completely factored form of the following expression?

$$(15g^3 + 5g^2) + (3g + 1)$$
$$5g^2(3g + 1) + 1(3g + 1)$$
$$(3g + 1)(5g^2 + 1)$$

14. Which of the following is a factor of

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

A $(4x - 2)$
B $(x - 1)$
C 2
D $(2x - 1)$ ⟵ circled

15. When factored completely, the following equals	16. When factored completely, the following equals
$b(b+3) - 4(b+3)$	$2x(x-2) + 9(x-2)$
$(b+3)(b-4)$	$(x-2)(2x+9)$
A $b(b+3)$	A $(2x+9)(x+2)$
B $(b-4)(b+3)$	B $(9x+9)(x-2)$
C $(b+4)(b-3)$	C $(2x+9)(x-2)$
D $-4(b+3)$	D $2x(x-2)$

Skill #4   □ Factor a four term polynomial with grouping method
                □ Need more practice (IXL – AA.7)

17. When factored completely, the following is equal to:	18. When factored completely, the following is equal to:
$x^2 - 49$	$4x^2 - 81$
$(x+7)(x-7)$	$(2x-9)(2x+9)$

19. When factored completely, the following is equal to:	20. When factored completely, the following is equal to:
$18x^2 - 200$	$5x^2 - 180$
$2(9x^2 - 100)$	$5(x^2 - 36)$
$2(3x-10)(3x+10)$	$5(x-6)(x+6)$

Skill #5   □ Factor two term polynomials using the difference of squares method
                □ Need more practice (IXL – AA.6)

21. What are the factors of	22. What are the factors of
A M	
$x^2 - 8x + 16$ $16 = -4 \cdot -4$	$9x^2 - 4$
$(x-4)(x-4)$ $-8 = -4 + -4$	$(3x-2)(3x+2)$

23. What are the factors of $$7x^3 + 14x^2 + 7x$$ $7x(x^2 + 2x + 1)$ $1 = 1 \cdot 1$ $7x(x+1)(x+1)$ $2 = 1+1$ $\boxed{7x(x+1)^2}$	24. What are the factors of $$(2x^3 - 4x) + (3x - 6)$$ $2x^2(x-2) + 3(x-2)$ $(2x^2+3)(x-2)$
25. What are the factors of $3x^2 - 11x - 20$ $-60 = -15 \cdot 4$ x -5 $-11 = -15 + 4$ $\begin{array}{c|c|c} & 3x^2 & -15x \\ \hline 3x & 3x^2 & -15x \\ \hline 4 & 4x & -20 \end{array}$ ← ← ↑ ↑ $(3x+4)(x-5)$	26. What are the factors of $$4x^2 + 12x - 40$$ $4(x^2 + 3x - 10)$ $-10 = 5 \cdot -2$ $4(x+5)(x-2)$ $2 = 5 + -2$
27. What are the factors of $$x^2 + 15x + 56$$ $(x+8)(x+7)$ $56 = 8 \cdot 7$ $15 = 8 + 7$	28. What are the factors of $$(18x^3 + 30x^2) + (3x + 5)$$ $6x^2(3x+5) + 1(3x+5)$ $(3x+5)(6x^2+1)$
29. What are the factors of $$x^2 - 16x + 64$$ $(x-8)(x-8)$ $64 = -8 \cdot -8$ $-16 = -8 + -8$	30. What are the factors of $$169x^2 - 196$$ $(13x-14)(13x+14)$

Skill #5   □ Factor completely first- and second-degree polynomials in one variable with integral coefficients.
         □ Need more practice (IXL – AA.8)