Honors Algebra 2
Factoring Quadratic Expressions

Name _____
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Lesson Opener: Find each product.

Multiplying	Factoring
1. $6v(2v+3)$ Distribute $12v^2+18v$	4. $10b^2+2b$ Greatest Common Factor $\frac{2b}{2b}\ \frac{2b}{2b}$ $2b(5b+1)$
2. $(x+5)(x-5)$ $x^2-5x+5x-25$ x^2-25	5. a^2-121 $a^2-b^2=(a+b)(a-b)$ $(a+11)(a-11)$
3. $(x-4)^2$ $x^2-8x+16$	6. $x^2+14x+49$ $(x+7)(x+7)$ or $(x+7)^2$

I. GCF (undistribute): Factor the expression.

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

2. $30p-45p^2$
$15p(2-3p)$ $15p(2-3p)$
$3\cdot 5p(\frac{6}{3}-\frac{9p}{3})$

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

4. $3m-12m^2$
$3m(1-4m)$

II. Special Product: Factor the expression.

5. b^2-100
$(b+10)(b-10)$

6. $49x^2-16$
$(7x-4)(7x+4)$

II. Special Product: Factor the expression, continued.

7. $w^2+10w+25$ $(w+5)(w+5)$ $(w+5)^2$

8. $9x^2-24x+16$ $(3x-4)^2$

Lesson Opener: Find each product.

Multiplying	Factoring
A. $(x+4)(x+2)$ $x^2+2x+4x+8 = x^2+6x+8$ F O+I L	$x^2+14x+40$ $(x+4)(x+10)$
B. $(x-7)(x-3)$ $x^2-10x+21$	$x^2-11x+28$ $(x-4)(x-7)$
C. $(x-5)(x+3)$ $x^2+3x-5x-15$ $x^2-2x-15$	$x^2+7x-30$ $(x-3)(x+10)$ Check: $x^2+7x-30$ ✓

a b c

Prod Sum

ac = 40 b = 14

1·40 41

2·20 22

4·10 14

5·8 13

a = 1, we're done

ax^2+bx+c Quadratic Expression $a \neq 0$

ac = 28 b = -11

-4·-7

-, + ac = -30 b = 7

-3·10

III. UnFOIL AKA Guess-N-Check, $a=1$: Factor the expression.

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

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

11. $x^2+5x-24$ $(x+8)(x-3)$

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

Find each product.

Multiplying	Factoring
D. $(2x-1)(x-3)$ $2x^2-6x-x+3$ $2x^2-7x+3$	$2x^2-13x+15$ $(2x-3)(x-5)$ $-3x$ $-10x$ $-13x$
E. $(3x+2)(x+5)$ $3x^2+17x+10$	$3x^2+11x+6$ $(3x+2)(x+3)$ Check: $3x^2+9x+2x+6$
F. $(4x-3)(x+1)$ $4x^2+4x-3x-3$ $4x^2+x-3$	$2x^2-3x-20$ $(2x+5)(x-4)$ $+5x$ $-8x$ $-3x$

$-1\cdot 15$
 $-3\cdot 5$ $\quad -5\cdot -3$
 $(2x-5)(x-3)$
 $+6$ $\quad 6\cdot 1$
 $2\cdot 3$ $\quad 3\cdot 2$

III. UnFOIL Part Two, $a>1$: Factor the expression.

13. $3x^2-8x+5$
 $(3x-5)(x-1)$
 $-5x$
 $-3x$
 $-8x$ ✓

14. $2x^2+11x+15$
 $(2x+5)(x+3)$
 $+5x$
 $+6x$
 $+11x$ ✓

15. $3a^2+11a-4$
 $(3a-1)(a+4)$
 $-a$
 $+12a$
 $+11a$ ✓

16. $5x^2-13x-6$
 $ac=-30$ $\quad b=-13$
 $1\cdot -30$
 $+2\cdot -15$
 $5x^2-15x+2x-6$
 $(5x^2-15x)+(2x-6)$
 $5x(x-3)+2(x-3)$
 $x-3$ $\quad x-3$
 $(x-3)(5x+2)$

$a\neq 1$; we're not done. Groupit! $(\quad)+(\quad)$
 We used Factor by Grouping!

IV. FACTOR BY GROUPING, 4 terms: Factor the expression.

17. $4p^3+3p^2+12p+9$

$\left(\frac{4p^3}{p^2}+\frac{3p^2}{p^2}\right)+\left(\frac{12p}{3}+\frac{9}{3}\right)$ Group

GCF,

$p^2(4p+3)+3(4p+3)$ GCF

$4p+3$ $4p+3$ 1 more GCF

$(4p+3)(p^2+3)$ $4p^3+3p^2+12p+9$

18. $12n^3+4n^2+3n+1$

$\left(\frac{12n^3}{4n^2}+\frac{4n^2}{4n^2}\right)+(3n+1)$

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

$3n+1$ $3n+1$

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

19. a^3-a^2-7a+7

$(a^3-a^2)+(-7a+7)$

-7 -7

$a^2(a-1)-7(a-1)$

$(a-1)(a^2-7)$

20. $2x^2+5x+6x+15$

$(2x^2+5x)+(6x+15)$

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

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

V. FACTOR BY GROUPING: 3 terms
Factor the expression.

Quadratic Expression: $ax^2 + bx + c$

21. $3x^2 - 8x + 5$

prod $ac = 15$ sum $b = -8$

$-3 \cdot -5$

KEEP SPLIT KEEP

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

$a \neq 1$, UR not done

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

$-3x - 5x$

$3x(x-1) - 5(x-1)$

$(x-1)(3x-5)$

22. $2x^2 + 11x + 15$

$ac = 30$ $b = 11$

$5 \cdot 6$

$5x, 6x$

$(2x^2 + 6x) + (5x + 15)$

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

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

23. $3a^2 + 11a - 4$

$ac = -12$ $b = 11$

$-1 \cdot 12$

$-1a, +12a$

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

$a(3a-1) + 4(3a-1)$

$(3a-1)(a+4)$ Check ✓

24. $5x^2 - 13x - 6$

$ac = -30$ $b = -13$

$-15 \cdot 2$

$(5x^2 - 15x) + (2x - 6)$

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

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