Name _____ Date _____

7.8 Notetaking with Vocabulary

I can factor polynomials by grouping. Day 1
I can factor polynomials completely. Day 2
I can use my understanding of polynomials to create mathematical models that enable me to solve real life problems.

Core Concepts

Factoring by Grouping

→ Group using parentheses
→ Group using the box

To factor a polynomial with four terms, group the terms into pairs. Factor the GCF out of each pair of terms. Look for and factor out the common binomial factor. (parentheses)
This process is called factor by grouping.

Notes: 1. Put poly in standard form.
2. Pull out the GCF (if exists) and a negative (if leading coef. is −)
3. Look for and use special patterns (1st and last terms are perfect squares)
4. Is the poly of the form ax^2+bx+c? ($b=0$, $c=0$ ok)
Use a·c method / box ← when $a \neq 1$
5. Does the poly have 4 terms? Try factor by grouping.

In Exercises 1–4, factor the polynomial by grouping.

1. $b^3 - 4b^2 + b - 4$

① Parentheses
$(b^3-4b^2)+(b-4)$
$b^2(b-4)+1(b-4)$
$(b-4)(b^2+1)$ — prime? yes!

$a=1$ $b=0$ $c=1$
__ · __ = 1
__ + __ = 0
nothing works.

2. ~~$21h^3 + 18h^2 - 35h - 30$~~

② Box

	b	-4
b^2	b^3	$-4b^2$
1	b	-4

$= (b-4)(b^2+1)$
check (already done)

3. $8s^3 + s - 64s^2 - 8$

$8s^3-64s^2+s-8$

	s	-8
$8s^2$	$8s^3$	$-64s^2$
1	s	-8

$= (s-8)(8s^2+1)$

$a=8$ $b=0$ $c=1$
__ · __ = 8
__ + __ = 0 not possible
so above is fully factored.

4. $ac + ad + bc + bd$

	c	d
a	ac	ad
b	bc	bd

$(c+d)(a+b)$

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7.8 Notetaking with Vocabulary (continued)

Guidelines for Factoring Polynomials Completely

To factor a polynomial completely, you should try each of these steps. Put the poly in standard form.

1. Factor out the greatest common monomial factor. (pull out − if leading coefficient −) $3x^2 + 6x = 3x(x + 2)$

2. Look for a special pattern. (Perfect squares in 1st and last) $x^2 + 4x + 4 = (x + 2)^2$

   can skip

3. Factor a trinomial $(ax^2 + bx + c)$ into a product of binomials. use the a·c method / box $3x^2 - 5x - 2 = (3x + 1)(x - 2)$

4. Factor a polynomial with 4 terms by grouping. $x^3 + x - 4x^2 - 4 = (x^2 + 1)(x - 4)$

In Exercises 5–10, factor the polynomial completely.

5. $4c^3 - 4c$

6. $\frac{100x^4}{25x^2} - \frac{25x^2}{25x^2}$

$25x^2(4x^2 - 1)$

$25x^2(2x+1)(2x-1)$

$a=4 \quad b=0 \quad c=-1$

$-2 \cdot 2 = -4$

$-2 + 2 = 0$

	2x	1
2x	$4x^2$	2x
−1	−2x	−1

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

$a=10 \quad b=11 \quad c=-6$

$-4 \cdot 15 = -60$

$-4 + 15 = 11$

	5p	−2
2p	$10p^2$	−4p
3	15p	−6

8. $20p^2 + 22p - 12$

$2(10p^2 + 11p - 6)$

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

9. $12x^2 - 20x - 48$

-7
$1, -7$
$-1, 7$

10. $3s^3 + 2s^2 - 21s - 14$

factor further?

$a = 1 \quad b = 0 \quad c = -7$

$\_\_ \cdot \_\_ = -7$

$\_\_ + \_\_ = 0$,

nothing works.

this is prime.

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

	$3s$	2
s^2	$3s^3$	$2s^2$
-7	$-21s$	-14

In Exercises 11–15, solve the equation.

11. $3x^2 - 21x + 30 = 0$

	d	1
d^2	d^3	d^2
-9	$-9d$	-9

for problem below

12. $c^4 - 81c^2 = 0$ $\quad \sqrt{c^2} = c \quad \sqrt{81} = 9$

$c^2(c^2 - 81) = 0$

$c^2(c-9)(c+9) = 0$

$c^2 = 0 \quad c - 9 = 0 \quad c + 9 = 0$

$c = 0 \quad c = 9 \quad c = -9$

13. $9d + 9 = d^3 + d^2$
$-d^3 - d^2$

$-d^3 - d^2 + 9d + 9 = 0$

$-1(d^3 + d^2 - 9d - 9) = 0$

$-1(d+1)(d^2 - 9) = 0$

$-1(d+1)(d-3)(d+3) = 0$

$a = 1 \quad b = 0 \quad c = -9$

$\frac{-3}{} \cdot \frac{3}{} = -9 \quad \frac{-3}{} + \frac{3}{} = 0$

$d + 1 = 0 \quad d - 3 = 0 \quad d + 3 = 0$

$d = -1$ or $d = 3$ or $d = -3$

14. $48n - 3n^2 = 0$

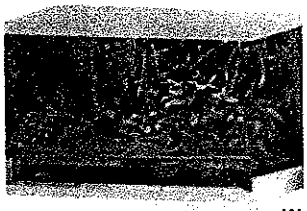
$-3n^2 + 48n = 0$

$-3n(n - 16) = 0$

$-3n = 0$ or $n - 16 = 0$

$n = 0$ or $n = 16$

15. A terrarium in the shape of a rectangular prism has a volume of 4608 cubic inches. Its length is more than 10 inches. The dimensions of the terrarium in terms of its width are shown. Find the length, width, and height of the terrarium.



$(w + 4)$ in.

$(36 - w)$ in. $\quad w$ in.