NOTESsomeANS

Notes that are done in class will be updated online periodically

(Any questions left blank you are responsible to try yourself → get help if needed.)

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The Algebra of Quadratics Unit

Big idea

This unit will cover expanding and factoring methods you will be required to know for all the quadratic units that will follow. You should have seen most of these methods in grade 10. (If you took applied you have not seen the complex trinomial factoring method, since only grade 10 academic course covered that.) You must understand that factoring trinomials can be taught in many different methods (decomposition/Australian/criss cross methods). The criss cross method is the one you'll concentrate on in this class since it is the most efficient of all the methods. Without practicing you may not do very well in this unit and that would carry on into the next two units. Please take the time to practice so that the next two unit marks will not suffer for it.

I know all the prior concepts related to this unit. (If not STOP & complete more review)	Place a ✓ if you are **confident** in that section. Place a ≈ if you are **just ok** in that section. Leave it blank if you are **lost** in that section. If there are gaps in any row, please see the teacher for extra help in that topic.	**Success Criteria** Assessment as Learning for Learning and of Learning							
		I can understand the lesson (If not, ask clarifying questions. Be specific – "what part is unclear?")	I can do a question with an example to follow. (If not, see the teacher for extra help)	I can do questions independently (If not, redo a solved example without looking at solutions)	I can explain/communicate this concept in my own words – JOURNAL (If not, practice explaining steps done in a solved example)	I can apply this concept in other/new contexts/situations (This can be only attained with practice)	I am very confident and am able to complete questions quickly (If not, time yourself to see progress)	I completed the practice in EACH section	I completed the practice test and the review section for this unit.
KU	**Learning Goal**	KU	KU	APP	COMM	TIPS		HW	TEST
Finding equations of and graphing lines, finding equations of and graphing quadratics, simplifying expressions, solving equations, expanding, factoring, problem solving with lines and quadratics	Expanding Quadratic Expressions Section 2.1 #3,6,10,11,13								P122 - Chapter Self-Test P120-121 Chapter Review Questions
	Common Factoring Section 2.2 #3,6,7,8,9								
	Simple Trinomial Factoring Section 2.3 #3,6,8,9,11,13								
	Complex Trinomial Factoring Section 2.4 #4,5,7,10,12								
	Factoring Special Cases Section 2.5 # 2,3,4,6,11								
	Mix of Factoring Methods three Handouts								
	two EXTRA Assignments KU + APP/TIPS								

Tentative TEST date_____

Reflect – TEST mark for this unit_____, Overall mark now_____.
Looking back on this unit, what should you plan to improve upon before the exam?

Corrections for the textbook answers:

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Expand & Look For Patterns – these will help you factor later on.

	A	B	C	Examine the solutions carefully. State any patterns or similarities.	Generalization
1	$(x+4)(x-4)$	$(2x+3)(2x-3)$	$(x+y)(x-y)$		$(A+B)(A-B)$
2	$(4x+1)(4x+1)$	$(x+3)(x+3)$	$(x+y)(x+y)$		$(A+B)^2$ $=(A+B)(A+B)$
3	$(x-2)(x-2)$	$(3x-3)(3x-3)$	$(x-y)(x-y)$		$(A-B)^2$ $=(A-B)(A-B)$

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Expanding Quadratic Expressions

1. Expand and simplify.

a. $3(x+4)(x-2)$ if 3 multiplied start at the end

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

$= 3x^2 - 6x + 12x - 24$

$= 3x^2 + 6x - 24$

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

$= 2b^2 + 2b - (b-1)(b-1)$

$= 2b^2 + 2b - (b^2 - 2b + 1)$

$= 2b^2 + 2b - b^2 + 2b - 1$

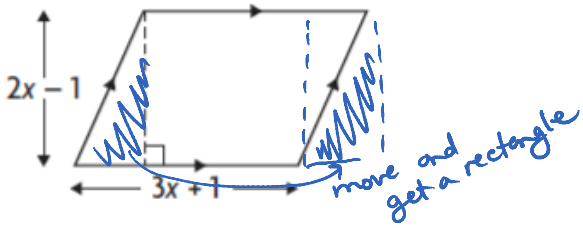
$= b^2 + 4b - 1$

c. $-2(3a+5)(a-2)$

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

2. Write an expression for the area of each shape. Expand and simplify

a.



move and get a rectangle

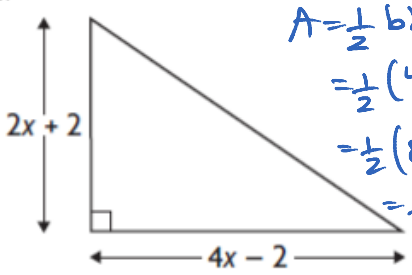
$A = b \times h$

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

$= 6x^2 - 3x + 2x - 1$

$= 6x^2 - x - 1$

b.



$A = \frac{1}{2}bh$

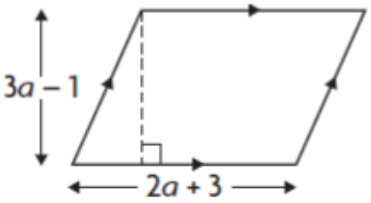
$= \frac{1}{2}(4x-2)(2x+2)$

$= \frac{1}{2}(8x^2 + 8x - 4x - 4)$

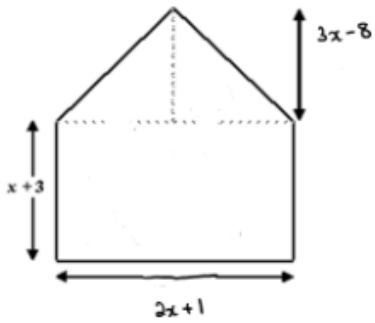
$= \frac{1}{2}(8x^2 + 4x - 4)$

$= 4x^2 + 2x - 2$

c.



d.



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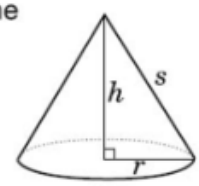
3. Simplify the expression for the volume of the cone if $V = \frac{\pi r^2 h}{3}$, $r = 2 + x$, and $h = 2x - 3$

Cone



4. You need to understand when to expand and when distribute the exponent. Simplify the following, if possible. Summarize the rules.

a. $(5x^2y^3)^2$ CAN do :)

$= (5x^2y^3)(5x^2y^3)$

$= 25x^4y^6$

$5^2x^4y^6$

∴ can distribute exponent for MONOMIALS

b. $(5x^2 + y^3)^2$ not allowed because of plus sign

$= (5x^2 + y^3)(5x^2 + y^3)$ FOIL

$= 25x^4 + 5x^2y^3 + 5x^2y^3 + y^6$

$= 25x^4 + 10x^2y^3 + y^6$

∴ CAN'T distribute exponent for POLYNOMIALS!

c. $\sqrt{25x^2y^4}$

$= \sqrt{25}\sqrt{x^2}\sqrt{y^4}$

$= 5xy^2$ can distribute square root for MONOMIALS

d. $\sqrt{25x^2 - y^4}$ can't do anything

ex. $\sqrt{25 - 16} = \sqrt{9} = 3$

not the same as $\sqrt{25} - \sqrt{16}$

$5 - 4$

don't distribute

e. $2x(3x)(4x^2)$

multiply all at once

$= 24x^4$

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

distribute By FOIL

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

$= -4x^3 + 5x^2 + 6x$

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Common Factoring

1. Summarize the steps of common factoring.

- Find G.C.F
- divide it out of all terms
- record the G.C.F outside of the bracket of the final answer

2. Factor the following

a. $9x^3 - 15x^2 + 3x$ G.C.F = $3x$

$= 3x(3x^2 - 5x + 1)$

b. $25x^2 - 100x^3$ G.C.F = $25x^2$

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

c. $2\pi h(r+h)^2 + 4\pi(r+h)h^2$ G.C.F = $2\pi h(r+h)$

$= 2\pi h(r+h)[(r+h) + 2h]$

$= 2\pi h(r+h)(r+3h)$

d. $25x^2 - 5x - 15xy + 3y$ group!

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

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

e. $8x^4 - 4x^3 + 20x^2$

f. $54x^5 + 135x^2$

g. $3(g-h)^2 - 5(g-h)$

h. $3mp - 6m - 4p + 8$

i. $27x^3y^3 + 18x^2y^2 + 9xy$

j. $33x^3y^5 + 24x^2y^2 + 3x^2y^4$

k. $2x(x+7) + 3(x+7)$

l. $2y(x-3) + 4z(3-x)$

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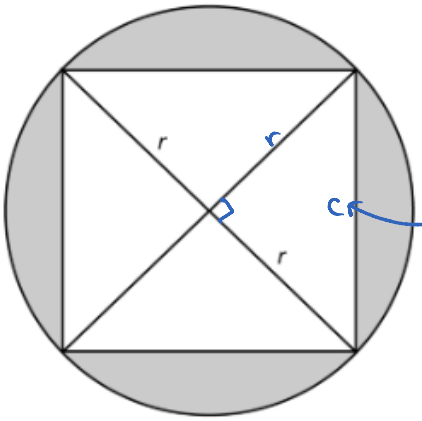
3. Write an expression in factored form for the area of each shaded region.

a.



$r^2+r^2=c^2$

$2r^2=c^2$

$\sqrt{2r}=c$

$A_{\bigcirc} - A_{\square}$

$= \pi r^2 - lw$

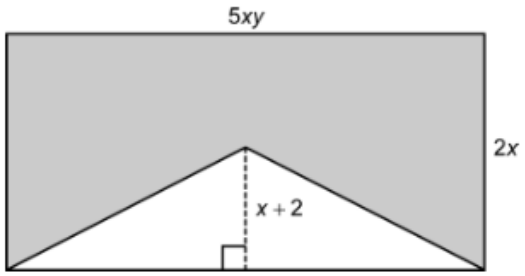
$= \pi r^2 - \sqrt{2r}\sqrt{2r}$

$= \pi r^2 - \sqrt{4r^2}$

$= \pi r^2 - 2r$

$= r(\pi r - 2)$

b.



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Simple Trinomial Factoring

1. What type of trinomial is concidered simple and what type is considered complex? Give an example of a trinomial that looks like it maybe complex but isn't.

Simple trinomial – has no "a" on x^2 term ex. x^2-4x+4 or $a=1$
Complex trinomial – has $a \neq 1$ ex. $2x^2-3x+1$

2. Summarize how to factor simple trinomials Not complex ex. $5x^2+10x+5$ since G.C.F = 5
$5(x^2+2x+1)$

Simple trinomials are factored by Sum + Product method – find two #'s that add to middle and multiply to last

3. Factor the following

a. $x^2+4x-12$ $= (x-2)(x+6)$

Sum Product
-1 12 | 1 -12 | -3 4 | 3 -4 | -2 6 | 2 -6

b. $x^2+8x+12$ $= (x+2)(x+6)$

1 12 | -1 -12 | 2 6 | -2 -6

4. Summarize how to figure out what signs (+ or –) to use in the factoring process.

Positive Product $(+)(+)$ $(-)(-)$

Negative Product $(-)(+)$ $(+)(-)$

5. Find two integers with the given product and sum.

sum = 14 and product = 48

sum = 2 and product = –15

sum = –1 and product = –30

sum = –3 and product = 2

6. Factor the following, if possible

a. $x^2-7x-18$

b. x^2-5x+6

c. $c^2+13c-30$

d. x^2+x+1

e. $d^2-12d+35$

f. $x^2+15x-16$

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7. Sometimes you must do both: common factor and trinomial factor. Show how you can do this in any order for the following example $3x^2 - 12x - 36$

8. Factor fully.

a. $-2x^2 + 2x + 4$

b. $6x^2 - 42x + 72$

c. $-3x^2 - 18x - 24$

d. $x^3 + 7x^2 + 12x$

9. Dtermine some values of k so that the trinomial can be factored.

a. $x^2 + kx - 12$

b. $x^2 - 9x + k$

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Complex Trinomial Factoring

1. Summarize how to factor complex trinomials – when there is an "a" value and you can't pull it out by G.C.F. do Criss-Cross method

(1.) list factors of 1st and last term
(2.) Criss-Cross multiply to find the combination that adds to middle
(3.) Record (top + top)(bottom + bottom)

2. Factor the following.

a. $8x^2+2x-3$

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

one negative somewhere

$=(4x+3)(2x-1)$ can check by expanding!

b. $3x^2+14x+8$

$3x$ 1 8 2 4
$1x$ 8 1 4 2

or two negatives

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

c. $2x^2+x-10$

d. $4x^2-11x-15$

e. $2x^2+7x+3$

f. $6x^2+10x-4$

g. $56x^2-9x-2$

h. $12c^2-26c-16$

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i. $6x^2 - 5xy - 4y^2$

j. $12r^2 + 7rs - 10s^2$

k. $10x^4 - 3x^2 - 18$

l. $20x^6 - 59x^3y^2 + 42y^4$

3. Summarize what the variable pattern should be for the factoring to work.

Trinomials can only factor if variable pattern is like:

first	middle	last
x^2	x	
x^2	xy	y^2
x^4	x^2y^3	y^6

even powers on 1st and last and $\frac{1}{2}$ of these powers in the middle.

4. Find some values of k so that the trinomial can be factored.

a. $6x^2 + kx + 10$

b. $4x^2 - 12x + k$

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Factoring Special Cases

1. What are the conditions for something to be classified as a difference of squares? How do you factor the difference of squares? Why does it work that way?

Difference of Squares only if
- 2 terms
- one negative
- perfect squares
  $1, 4, 9, 16, \ldots\ x^2, x^4, x^6 \ldots$

To factor set up answer: $(\ +\ )(\ -\ )$ and square root each term

Why it works? when you expand middle terms cancel out

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

2. Factor the following

a. $4x^2 - 25$

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

b. $100 - (x-3)^2$

$= [10 + (x-3)][10 - (x-3)]$
$= [10 + x - 3][10 - x + 3]$
$= (7+x)(13-x)$

c. $25x^2 - 16y$ can't sq. root

d. $x^2 - 6$ not perfect square (possible but don't worry about it in 3M course)

e. $100r^2 + 81s^2$

f. $121x^2 - 9y^2$

g. $64a^2 - 49b^4$

h. $(x+2)^2 - 36$

i. $y^2 - 8$

j. $81r^2 - 4t^3$

k. $50x^2 - 72$

l. $16x^4 - 100y^4$

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3. What are the conditions for something to be classified as a perfect square? How do you factor a perfect square?

Perfect square only if
1st and last terms are perfect squares
and middle is twice the sq. root of each
ex. $a^2+2ab+b^2=(a+b)^2$

To factor — use criss cross since it works for any trinomial
- just don't list all combinations try ✓ 1st

4. Factor the following

a. $4x^2+32x+64$ $=(2x+8)^2$

2x 8
2x 8

b. $4x^2-12xy+9y^2$ $=(2x-3y)^2$

2x -3y
2x -3y

c. $100-20x+x^2$

d. $49x^2+70xy+16y^2$

e. $25x^2+20x+4$

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

g. $25x^2y^2-150xyab+225a^2b^2$

h. $4(3x-1)^2+28(3x-1)+49$

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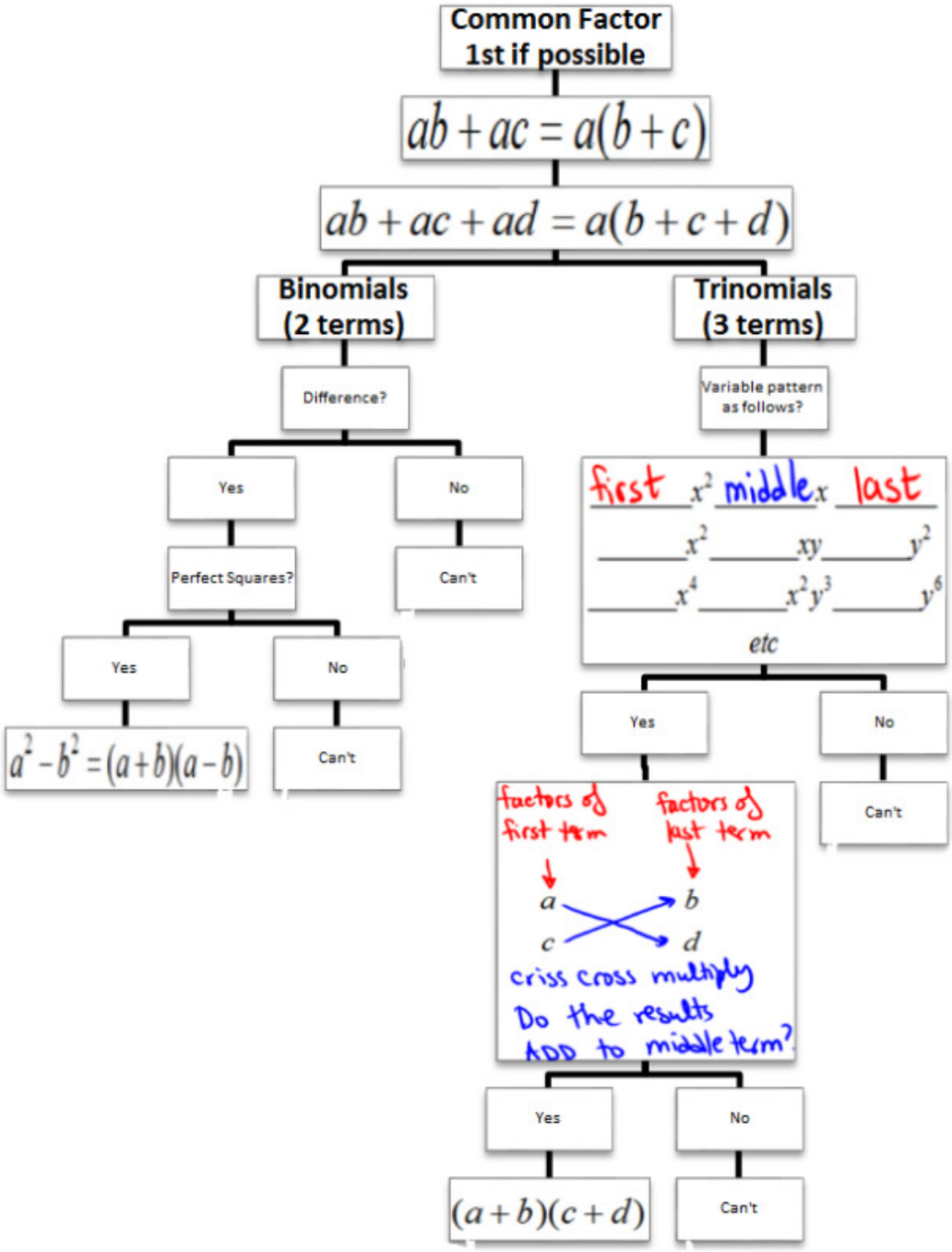
Mix of Factoring Methods



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Factor the following as much as possible.

1. $18x^2y^6 + 39xy^3 - 7$

$18xy^3 \quad 2xy^3 \quad 3xy^3 \quad 7 \quad 1$
$1xy^3 \quad 9xy^3 \quad 6xy^3 \quad -1 \quad 7$ one neg

$= (3xy^3 + 7)(6xy^3 - 1)$

2. $16x^2 - 49$

$= (\ + \ )(\ - \ )$
$= (4x^2 + 7)(4x^2 - 7)$

3. $2y^2 - 12y + 18$

$= 2(y^2 - 6y + 9)$
$y \quad y \quad -3 \quad -3$
$= 2(y-3)^2$

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

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

5. $4x^2 - 28x + 40$

6. $7x^2 - 54xy^2 - 16y^4$

7. $8x^2 - 12x^4 + 24$

8. $30x^2y - 20x^2y^2 + 10x^3y^2$

9. $9x^2 + 29x - 28$

10. $2x^2 + 12x + 16$

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11. $7x^2 - 19x - 6$

12. $4x^2 - 44x + 121$

13. $16x^2 - 81$

14. $8mn^2 - 12mn - 16m^2n$

15. $28a^2 - 7a^3$

16. $6 - 27x - 15x^2$


17. $12b^2a^4 - 75a^2$

18. $300 - 48x^4$

19. $(2c - 5)^2 - 121$

20. $(x + a)^2 + 6(x + a) + 8$