Unit0JOURNAL

August 23, 2016 9:57 AM

↓ see below

Unit0JOURNAL

Unit 0 – Preview of Algebra JOURNAL

Tentative TEST date_____

Big idea/Learning Goals

In real life there are relationships that depend upon variables. For example, earnings versus time worked, or pressure under water versus depth, or distance travelled versus time. Most of these relationships are **non linear**, which means equations are not very simple anymore. To help you with this complication, we will begin with algebra skills which you will see again in Units 3 & 4 & 5. Hopefully seeing these topics twice will help you become really good at them since they are foundational to your math career later in high school.

You should complete the following practice topics independently. You may not be independent right away, and that is ok, ask for help, use examples in notes, however on the day of the test, remember that you must do the questions without any help or notes

Tentative TEST date: Wed, Sept. 21

Date	Topics	Finished the journal?	How many questions did you finish from HW?	Questions to ask the teacher:
2days	**Exponent Laws** HW handout DAY 1 HW handout DAY 2		/30 /22	
2days	**Simplify Expressions** HW handout DAY 3 HW handout DAY 4		/16+35 /11+15	
5days	**Factor** HW handout DAY 5 HW handout DAY 6 HW handout DAY 7 HW handout DAY 8 HW handout DAY 9		/20+13 /28 /15+40 /18+20 /22	
2days	**Complete the square** HW handout DAY 10 HW handout DAY 11		/13 /15	

Reflect

What are your strengths as a student?

What are your weaknesses that you'll try to improve upon this semester?

DAY1 & 2 – Exponent Laws

Multiplication of Powers

Product	Expanded Form	Single Power
$x^4 \times x^3$ add	$=(x\times x\times x\times x)\times(x\times x\times x)$	$= x^7$
$m^3 \times m^2$	$=(mmm)(mm)$	$= m^5$
$x^a \times x^b = x^{a+b}$		

Division of Powers

$x^7 \div x^3$ subtract	$=\frac{x\times x\times x\times x\times x\times x\times x}{x\times x\times x}$	$= x^4$
$m^6 \div m^2$	$=\frac{mmmmmm}{mm}$	$= m^4$
$x^a \div x^b = \frac{x^{a-b}}{1}$		

Powers of Powers

$(y^3)^4$ mult.	$=(y\times y\times y)\times(y\times y\times y)\times(y\times y\times y)\times(y\times y\times y)$	$= y^{12}$
$(m^3)^2$	$=(mmm)(mmm)$	$= m^6$
$(x^a)^b = x^{ab}$		

Negative Powers

Division	Written as negative exponent	Expanded Form	Written as positive exponent
$x^3 \div x^7$	$x^{3-7} = x^{-4}$	$\frac{1xxx}{xxxxxxx}$	$\frac{1}{x^4}$
$y^2 \div y^5$ subst.	$y^{2-5} = y^{-3}$	$\frac{1yy}{yyyyy}$	$\frac{1}{y^3}$
$x^{-a} = \frac{1}{x^a}$			

Zero Powers

Question	Written as zero exponent	Expanded Form	Answer
$x^3 \div x^3$	$x^{3-3} = x^0$	$\frac{1xxx}{xxx}$	1
$a^{-6} \times a^6$ add	$a^{-6+6} = a^0$	$\frac{1}{aaaaaa}\cdot\frac{aaaaaa}{1}$	1
$m^0 = 1$			

NOTES:

- keep the base
- add exponents

ex. $2^3 \cdot 2^5$ ~~4^8~~ or 2^8

- record result in the numerator

ex. $\frac{2x^3}{5x^4}$ $\frac{2x^{-1}}{5}$ or ~~$\frac{3}{5x^1}$~~ or $\frac{2}{5x^1}$

- Move the base with negative power to the denominator AND negative power becomes positive.

ex. $(-3)^{-2}$ $\frac{1}{(-3)^2}$ or ~~$\frac{1}{3^{-2}}$~~ or $\frac{1}{9}$

Simplify, write in positive exponent version.

1. 4^{-3} $= \frac{1}{4^3}$ $= \frac{1}{64}$

2. $\frac{1}{6^{-3}}$

3. $\left(\frac{2}{3}\right)^{-4}$

4. $2x^{-3}$ $= \frac{2}{x^3}$

5. $\frac{3}{4^{-2}}$

6. $\frac{8^{-2}}{3}$

7. $(-4x^{-1}z^{-2})^{-2}$ mult.

$= (-4)^{-2}x^2z^4$ or $-4^{-2}x^2z^4$

$= \frac{x^2z^4}{(-4)^2}$

$= \frac{x^2z^4}{16}$

$\frac{x^2z^4}{-4^2}$

$\frac{x^2z^4}{-16}$

8. $(5x^4y^{-3}z^2)(-2x^2y^4z^{-1})$

9. $\frac{5^{-2}x^{-4}y^3}{2^{-3}x^{-5}y}$

10. $(4x)^2 \times 4x^2$ add

$= (4^2x^2)\cdot 4x^2$ $= 16x^2\ 4x^2$

$= 4^3x^4$ $= 64x^4$ $16\ x^4$

$= 64x^4$

11. $(3d^{-3})^3 \times 3d^{-2}$

12. $\frac{(-3c^4)^{-2}}{c^{-1}}$

13. $2(2x^5y^0)^{-2} \times (2x^{-1}y^2)^{-3}$ mult

$= 2^1(2^{-2}x^{-10}y^0)(2^{-3}x^3y^{-6})$ B E → outer exponent D M A S

$= 2^{-4}x^{-7}y^{-6}$

$= \frac{1}{2^4x^7y^6}$

$= \frac{1}{16x^7y^6}$

14. $\left(\frac{(2a^{-2})^3a^3}{2^2a^{-4}}\right)^{-3}$

15. $\frac{(-2xy^3 \times 3x^{-3}y^{-2})^3}{6x^0y^{-1}}$

HW
* white p. 2+3
green DAY 2

one term (no add/subt. separating terms)

DAY 3 & 4– Simplify Monomial Expressions

1. $(2xy)(5yx^2)$ add

$= 10x^3y^2$

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

3. $18x^2y^5 \div 6x^2y^3$ $3x^2y^2$

$\frac{18x^2y^5}{6x^2y^3} = 3x^0y^2$ or $3y^2$

4. $-20x^8y^4z^3 \div -4x^3y^2$

NOTES:
- define "base" + what to do to simplify...
- when do you - add powers ...
  - subtract powers ...
  - mult?

Simplify Polynomials → many terms

5. $3x + 6y + 4x + 3y + 2x^2 + 5x + 4x^2 - 3x$

$= 9x + 9y + 6x^2$ not 4!

6. $-2xy + 5x^3 + 2x(4xy) - xy + x(10x^2) - 6y(-3x^2)$

$= -2xy + 5x^3 + 8x^2y - 6xy + 10x^3 + 18x^2y$

$=$

7. $1(4x + 5y) + 1(3x - 2y)$

$= 4x + 5y + 3x - 2y$

$= 7x + 3y$

8. $(3x^2 - 6x) - (-5x - 9x^2)$

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

$= -8x^3 - 10x^2$

10. $3x^2y^3(-2x^2y + 2xy^4 + 3)$

NOTES:
- define "term" + what to do to simplify ...
- if question has brackets then ....
- when do exponents change + when they do not?...

Multiply two Binomials

Show how to multiply two binomials using different methods

11. $(x+3)(x+2) = x^2+3x+2x+6 = x^2+5x+6$

Using distribution arrows | Using FOIL | Using a visual

remove brackets

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

$= x^2 + 2x + 3x + 6$ (F, O, I, L)

$= x^2 + 5x + 6$

First of the bracket
Outer
Inner
Last of the bracket

	x	3
x	x^2	$3x$
2	$2x$	6

Expand and simplify:

12. $3(5x-2)(3x+5)$

$= 3(15x^2 + 25x - 6x - 10)$

$= 3(15x^2 + 19x - 10)$

$= 45x^2 + 57x - 30$

19
3
10x3
9x3

13. $(x+3)(x+7) - (x+5)(x+5)$

$= x^2 + 7x + 3x + 21 - 1(x^2 + 5x + 5x + 25)$

$= x^2 + 10x + 21 - x^2 - 10x - 25$

$= 0x^2 + 0x - 4$

$= -4$

14. $(3x-5)^2$

15. $-(x-5)(x+5)$

NOTES:

- F.O.I.L – acronym applies only if ...
- what happens to brackets ? ...
- 1st step mult and ...
  2nd step add and ...
- If 3 things multiplied $3(x+1)(x-5)$ then...
- If binomial squared $(x-3)^2$ then...

Expand and simplify.

16. $2(x-5)^2-4$

17. $-(\frac{8}{9}a^2+b-6)-(\frac{5}{4}b+3c-2a^2-9)$

$= \frac{8}{9}a^2 + 1b - 6 - \frac{5}{4}b - 3c + 2a^2 + 9$

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

$= (3x^2+6x)(x-1) + (6x^2-6x+24)(-x^2+x-4)$

$= 3x^3 - 3x^2 + 6x^2 - 6x - 6x^4 + 12x^3 - 54x^2 + 48x - 96$

$= -6x^4 + 15x^3 - 51x^2 + 42x - 96$

rough

$-6x^4 + 6x^3 - 24x^2$

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

$-24x^2 + 24x - 96$

DAY 5 & 6 – Greatest Common Factoring (GCF) – for any # of terms

1. $\frac{-3x}{-3} - \frac{18}{-3}$ $\quad 3(\frac{3x}{3} - \frac{18}{3})$

$= -3(1x + 6)$ $\quad 3(x-6)$

GCF Left overs

2. $24x - 30$

3. $-15x^2 - 25x$

4. $\frac{60x^2}{5} - \frac{25x}{5} + \frac{15}{5}$

$= 5(12x^2 - 5x + 3)$

5. $21x^4 - 28x^3 - 35x^2$

6. $x^2y^3z - 2xy^2$

7. $\frac{24x^3}{1x} - \frac{15x^2}{1x} - \frac{20x}{1x}$

$= x(24x^2 - 15x - 20)$

8. $16x^3y^3 + 24x^5y^7 - 32x^2y^4$

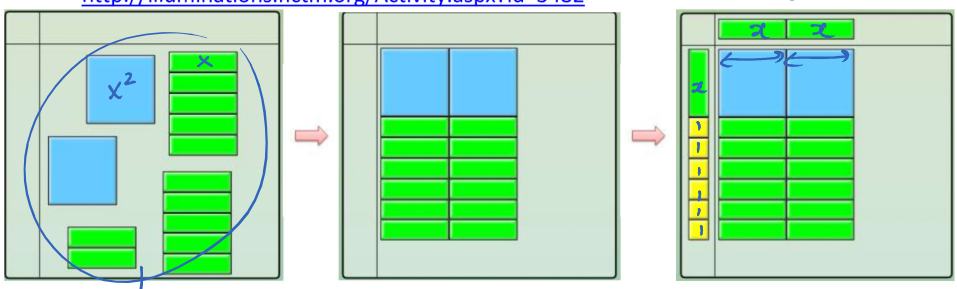
9. $\frac{-30x^4y^6}{-5x^3y^3} - \frac{35x^3y^5}{-5x^3y^3} - \frac{55x^7y^3}{-5x^3y^3}$

$= -5x^3y^3(6xy^3 + 7y^2 + 11x^4)$

NOTES:

- if neg. is 1st ...
- Divide out greatest _____?
- Divide out smallest _____?
- Record like this: GCF (Leftovers)

10. Explain how this diagram shows common factoring visually.
http://illuminations.nctm.org/Activity.aspx?id=3482



$2x^2 + 12x$

- This question shows ↑
- Organize the tiles in a shape of a rectangle
- The length is $x+6$ the width is $2x$
- ANS $= 2x^2+12x$
$= 2x(x+6)$ or $(x+6)(2x)$

Factor by Grouping – for 4 terms

11. $4a^2(2b+d) - 5c(2b+d)$

$(2b+d)[4a^2 - 5c]$
GCF Leftovers

12. $12x(3y+8) + 17y(3y+8)$

13. $2bm - 4bn + am - 2an$

14. $-8ad + 12bc - 24bd + 4ac$

$-8ad-24bd \quad +12bc+4ac$

$=-8d(a+3b) + 4c(3b+a)$

$=(a+3b)(-8d+4c) = (a+3b)(4)(2d-c)$
GCF leftovers $-4(a+3b)(2d-c)$

15. $-5 - 10x + x^2 + 2x^3$

16. $12ab - 9ac - 28bd + 21cd$

17. $25j^3 + 15j^2 - 5j - 3$

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

$(5j+3)(5j^2-1)$
GCF leftovers

18. $64d^3 - 40d^2 - 24d + 15$

19. $36n^3 - 27n^2 - 8n + 6$

NOTES:

- regroup when ...
- sign in front of 2nd set ...
- on right track if ...
- how to record, not squared since ...

7

ax^2+bx+c

DAY 7 & 8 – Factor Simple Trinomials – for 3 terms and no 'a' value – i.e. nothing on x^2 term

1. $x^2 + 7x + 12$

Sum / Product

x, x | $1 \cdot 12$, $2 \cdot 6$, $3 \cdot 4$

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

2. $x^2 - 1x - 12$

3. $2x^2 + 6x - 8$

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

$= -1(x^2 - 7x + 12)$

Sum / Product

x, x | $-1 \cdot -12$, $-2 \cdot -6$, $-3 \cdot -4$

$= -(x-3)(x-4)$

5. $m^2 - 9mp - 112p^2$

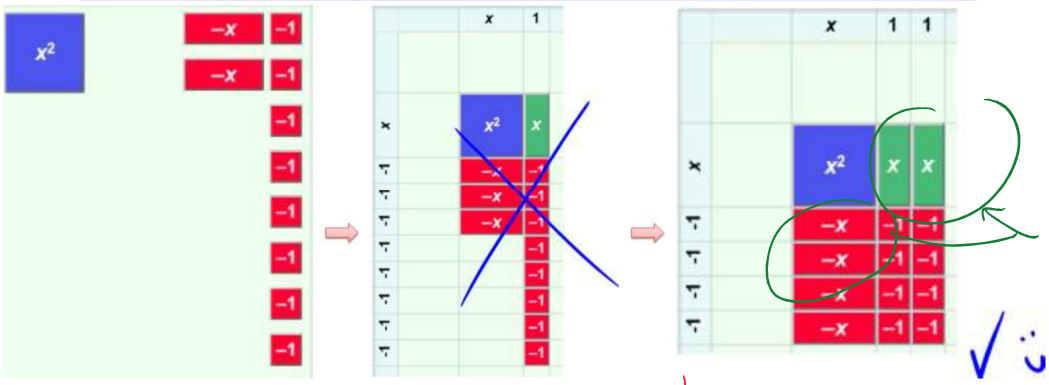
m, m | $-7 \cdot 16$, $7p \cdot -16p$

$= (m+7p)(m-16p)$

6. $-a^2 - 2ab - b^2$

NOTES:
- check that the variable pattern is x^6 x^3b^2 b^4 / x^2 xy y^2 / x^2 x #
- check if can ÷ by ...
- Sum # is ... Product # is ...
- Look at sign of Product # if pos: (+)(+) (−)(−) if neg: (+)(−) (−)(+)

7. Explain how this diagram shows simple trinomial – SUM & PRODUCT factoring visually.
https://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=111



pull in a pair of opposites (+x and −x) to help fill in the rectangle

This question shows $x^2 - 2x - 8$ expression

-8 can be factored $-1 \cdot 8$, $1 \cdot -8$, $-2 \cdot 4$, $2 \cdot -4$

BUT using ⟶ doesn't create a rectangle shape

ANS: Read the answer from
Length = $x - 4$
Width = $x + 2$

$\therefore x^2 - 2x - 8 = (x-4)(x+2)$

Factor Complex Trinomials – for 3 terms with 'a' value – that can't divide out

1. $16x^2 - 8x + 1$

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

2. $2x^2 + 3x - 20$

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

3. $2x^2 + 13x + 6$

4. $4x^2 - 27x + 35$

$= (1x-5)(4x-7)$

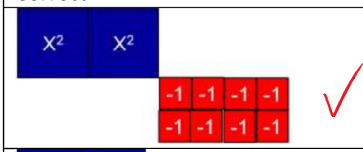
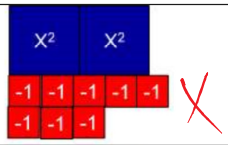
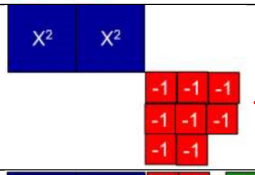
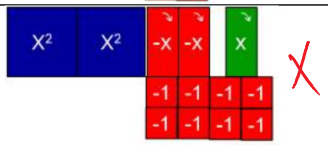
5. $9x^2 + 12x + 4$

6. $-15 - y + 6y^2$

NOTES:
- 1st check variable pattern and if you can ÷ by GCF
- split factors for (1st) and (last) + decide on negatives (Look at Last #)
- reverse order on shorter list
- Cross mult, then add to get (middle) → trial
- way to check is F.O.I.L. → record

pos: $(+)(-)$ neg: $(+)(-)$ or $(-)(+)$

8. Develop Rules for Using Algebra Tiles and explain how to factor complex trinomials visually.
http://staff.argyll.epsb.ca/jreed/math9/strand2/2213.htm *and scroll down*

Correct	Incorrect	Rules
 ✓	 ✗	- place x^2 tiles and "ones tiles" diagonally from each other at a corner
 Ok arrangement but can't fill with opposites fully	 ✗	- must create a rectangle from each colour/type
 ✓	 ✗	- when pulling in opposites ($-x$ and $+x$), colours can't be mixed

Explain Question:
- Question shows $2x^2 + 4x - 4x - 8$ or $2x^2 - 8$
- you can add as many opposites as you need to fill in a rectangle
- To read the answer look at Length = $2x-4$, Width = $x+2$

$\therefore 2x^2 - 8 = (2x-4)(x+2)$
$= 2(x-2)(x+2)$

Factor Completely.

7. $8x^2 - 22xy - 21y^2$

$(4x \quad 8x \;\; 1x \;\; 2x)(3y \quad 1y \;\; 21y)$ one neg!
$(2x \quad 1x \;\; 8x \;\; 4x)(-7y)$

$= (4x+3y)(2x-7y)$

8. $15a^2 - 25ab - 10b^2$

$5(3a^2 - 5ab - 2b^2)$

$(3 \quad 1)(-1 \quad 2)$
$(1 \quad 3)(2 \quad -1)$

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

9. $m^4 - 9m^2 - 112$

$(m^2)(-7 \quad 7 \;\; 16 \;\; \ldots)$
$(m^2)(16 \quad -16)$

$= (m^2+7)(m^2-16)$

10. $3x^2 - 18x + 15$

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

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

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

11. $6x^2 - 33x + 36$

$= 3(2x^2 - 11x + 12)$

$(2x)(-1 \;\; -2)(-3)$
$(1x)(-12 \;\; -6)(-4)$

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

12. $14x^2 - 62x - 40$

$= 2(7x^2 - 31x - 20)$

$(7)(1)$ one neg!
$(1)(7)$

$1 \quad 2 \quad (4)$
$20 \quad 10 \quad (-5)$

$= 2(7x+4)(1x-5)$

DAY 9 – Factor Special Products – Difference of Squares – for 2 terms

1. $16x^2 - 25 = 16x^2 + 0x - 25$

$(4x \quad -5)$
$(4x \quad 5)$

$= (4x-5)(4x+5)$

2. $81m^4 - 625y^6 = (9m^2 - 25y^3)(9m^2 + 25y^3)$

$(9m^2 \quad -25y^3)$
$(9m^2 \quad 25y^3)$

3. $-9m^2 + 49$

$49 - 9m^2 = (7 - 3m)(7 + 3m)$

$(7 \quad -3m)$
$(7 \quad 3m)$

4. $16 + 9y^2$ = can't factor

$9y^2 + 0y + 16$

$(-3y \quad 4)$
$(-3y \quad 4)$

5. $x^2 - 7$ ← not a perfect square.

for univ. math

$(x+\sqrt{7})(x-\sqrt{7})$

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

$(x^4 \quad -1)$
$(x^4 \quad 1)$

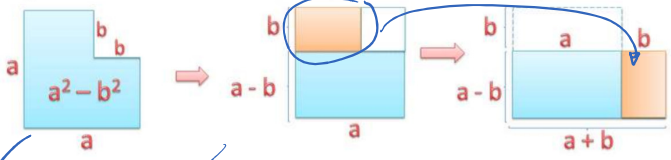
$(x^2 \quad -1)$
$(x^2 \quad 1)$

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

NOTES:

- Difference of Squares check ⇄ } if not then can't do it.
-
- Can also follow a formula $a^2 - b^2 = (a+b)(a-b)$

7. Explain how this diagram shows the difference of squares formula visually.



This shows $a^2 - b^2$ since Big square a^2 is missing a corner b^2

Split the irregular shape into 2 rectangles and move top rectangle to the side

Now that the shape IS a rectangle AND is visible from
Length = a+b
Width = a−b
∴ $a^2 - b^2 = (a+b)(a-b)$

Factor Special Products – Perfect Square Trinomials – for 3 terms

8. $x^2 - 12x + 36$

a^2 6^2

x -6

x -6

$= (a-b)^2$

$(x-6)^2$

$= (x-6)(x-6)$

$= (x-6)^2$

9. $x^2 + 18xy + 81y^2$

x $9y$

x $9y$

$= (x+9y)^2$

10. $m^2b^2 - 10mb + 25$

mb -5

mb -5

$(mb-5)^2$

NOTES:

- Perfect Square Trinomials ⇄
- Formula $a^2 \pm 2ab + b^2 = (a \pm b)^2$

Factor Completely

11. $\frac{x^2}{25} - 1$

$= \left(\frac{x}{5}+1\right)\left(\frac{x}{5}-1\right)$

12. $4a^2 - 80a + 400$

13. $32a^3 + 16a^2 + 2a$

$2a(16a^2 + 8a + 1)$

$4a$ 1

$4a$ 1

$= 2a(4a+1)^2$

Factor Completely

14. $48x^2 - 27y^2$

$3(16x^2 - 9y^2)$

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

15. $8e^2 - 50$

16. $x^3 - xy^2$

17. $(3a + 7)^2 - 121$

let $A = 3a+7$

$= A^2 - 121$

$= (A+11)(A-11)$

$= (3a+7+11)(3a+7-11)$

$= 3\left(\frac{3a}{3} + \frac{18}{3}\right)(3a-4)$

$= 3(a+6)(3a-4)$

18. $(5j - 3)^2 - 49$

19. $9m^2 - (2n + 5)^2$

ax^2+bx+c

DAY 10 & 11 – Completing the Square

1. $-3(3x^2+24x)-1$

$=-3(x^2-8x)-1$

rough: $\left(\frac{-8}{2}\right)^2=(-4)^2=16$ special #

$=-3(x^2-8x+16-16)-1$ (×a)

a; perfect sq. trinomial

$=-3(x^2-8x+16)-16(-3)-1$ (a)

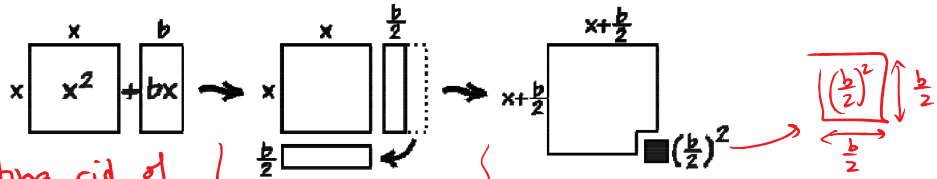
$=-3(x-4)(x-4)+48-1$ (x −4, x −4)

can skip

$=-3(x-4)^2+47$

NOTES:

20. Explain how this diagram shows the completing the squares method visually.



- after getting rid of the "a" coefficient on x^2 the result is a rectangle
- cut the bx rectangle in half and place the 2nd half on bottom to create a shape resembling a square.
- the square is missing a corner of size $\left(\frac{b}{2}\right)^2$ in area
- this is the special # to add to create the perfect square.

Complete the square no fractions

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

$=1(x^2+10x+?-?)-10$

$=1(x^2+10x+25-25)-10$ (×1)

$=1(x+5)^2-25-10$

$=(x+5)^2-35$

3. $\frac{4x^2}{4}-\frac{32x}{4}+17$

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

$\left(\frac{-8}{2}\right)^2=(-4)^2=16$

$=4(x^2-8x+16-16)+17$ (×4)

$=4(x^2-8x+16)-16(4)+17$ (x x, −4 −4)

$4(x-4)(x-4)-64+17$

$=4(x-4)^2-47$

4. $-5x^2-10x-30$

$=-5(x^2+2x+1-1)-30$ (x −5)

$\left(\frac{2}{2}\right)^2=1^2=1$

$=-5(x^2+2x+1)-1(-5)-30$

$=-5(x+1)^2-25$

Complete the square WITH fractions

5. $\left(\frac{2}{3}x^2 - 12x\right) - 20$

$= \frac{2}{3}\left(x^2 - 18x + 81 - 81\right) - 20$

rough: $\left(\frac{-18}{2}\right)^2 = (-9)^2 = 81$

$= \frac{2}{3}(x^2 - 18x + 81) - 54 - 20$

$= \frac{2}{3}(x-9)^2 - 74$

6. $2x^2 - 10x + 12$

$= 2\left(x^2 - 5x + \frac{25}{4} - \frac{25}{4}\right) + 12$

rough: $\left(\frac{-5}{2}\right)^2 = \frac{+25}{4}$

$= 2\left(x^2 - 5x + \frac{25}{4}\right) - \frac{25}{2} + 12$

$= 2\left(x - \frac{5}{2}\right)^2 - \frac{25}{2} + \frac{12}{1}\cdot\frac{2}{2}$

$= 2\left(x - \frac{5}{2}\right)^2 - \frac{1}{2}$

7. $-3x^2 + 8x - 15$

Complete the square to Solve – find x, or get x alone.

8. $x^2 - 36 = 0$

$+36 \quad +36$

$\sqrt{x^2} = \sqrt{36}$

$x = \pm 6$

BOTH

SAMDEB

9. $x^2 + 6x - 16 = 0$

can't isolate x until it appears once!

→ complete sq.

rough: $\left(\frac{6}{2}\right)^2 = (3)^2 = 9$

$1(x^2 + 6x + 9 - 9) - 16 = 0$

$1(x^2 + 6x + 9) - 9(1) - 16 = 0$

$1(x+3)^2 - 25 = 0$

$\sqrt{(x+3)^2} = \pm\sqrt{25}$

$x + 3 = \pm 5$

$x = -3 \pm 5$

$x = -3 + 5 \rightarrow x = 2$

or

$x = -3 - 5 \rightarrow x = -8$

10. $x^2 - 4x + 4 = 3$

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

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

$\sqrt{(x-2)^2} = \pm\sqrt{3}$

isolate SAMDEB

$x - 2 = \pm 1.7$

$x - 2 = 1.7$ $\quad$ $x - 2 = -1.7$

$x = 3.7$ $\quad$ $x = 0.3$

From now on: when you apply $\sqrt{\ }$ on your own, use $\pm$ ANS

NOTES:

- To Solve an equation that has x appearing once, you undo operations in SAMDEB order
- If x appears more than once you must complete the square 1st.