Cue Cards

Exponent:

- $a^0 = 1$
- $5a^0 = (5)(a^0) = 5 \cdot 1 = 5$

mials:

Numbers → -3, 5, 1/4, 3.7

Variables → x, r, p, b (all 26 letters!)

Products of numbers and variables →
3x, xy, $-7x^2y^3z^4$

ct of Powers:

iply)

$a^m \cdot a^n = a^{m+n}$

$3^4 \cdot 3^6 = 3^{4+6} = 3^{10}$

***Remember:**

- **Same base**
- **Multiply**
- **Add Exponents**

Confuse:

2a + 3a - add coefficients
- keep variable the same

(2a) (3a) - multiply coefficient
$6a^2$ - add exponent of variable

Negative Exponent:

- $a^{-n} = \frac{1}{a^n}$
- $x^{-3} = \frac{1}{x^3}$
- $5x^{-3} = (5)(x^{-3}) = \frac{5}{x^3}$

NOT Monomials:

- **Division of variables** → $\frac{b}{c}$
- **Subtraction of numbers and variables**
- **Addition of numbers and variables**

Parts of Numbers with Exponents:

$-3x^2$ ← exponent

Coefficient: -3; base: x

Power of a Power:

- $(a^m)^n = a^{mn}$
- $(x^5)^4 = x^{20}$
- $(4x^3)^4 = 4^4x^{12}$

egree of Monomial

- add the exponents of each variable

Ex: $2b^8c^2$ → degree is 8 + 2 = 10

Standard form of Polynomial – Descending Order

- Put in order from highest to lowest exponent

$3x^4 + 5x^2 - 7x + 1$

Subtracting Polynomials

a) change minus sign to plus
b) change all terms inside ( ) to their opposites
c) group/line up by like terms (see add'g polys)
d) add coefficients

Ex: $(y^3 - 4y^2 - 2) - (6y^3 + 6y^2 + 4)$
$(y^3 - 4y^2 - 2) + (-6y^3 + -6y^2 + -4)$

$= -5y^3 - 10y^2 - 6$

GCF → ___(±)

a) Find the primes
b) Circle common factors between all terms
***If you can see the GCF without finding the primes, YEAH!!!

Ex: $5x^3 + 25x^2 + 45x$
$5x^3 = 5 \cdot x \cdot x \cdot x$
$25x^2 = 5 \cdot 5 \cdot x \cdot x$
$45x = 5 \cdot 3 \cdot 3 \cdot x$

GCF → 5x

Multiplying Bi by a Bi → **Distributive Prop.**

Ex: $(2x + 4)(3x - 7)$

$6x^2 - 14x + 12x - 28$
$6x^2 - 2x - 28$

Degree of Polynomial

a) find the degree of **each** variable
b) find the monomial with the highest degree
c) degree of polynomial: degree of monomial with the highest degree

Ex: $4x - 1 + 5x^3 + 7x$
$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow$
$1 \quad 0 \quad 3 \quad 1$

Degree of **Polynomial** → 3

Adding Polynomials → horizontally/vertically

a) group/line up by like terms
b) add coefficients

Ex: $2k^2 - k + 3$
$+ 5k^2 + 3k - 7$
$7k^2 + 2k - 4$

Ex: $2k^2 + 5k^2 - k + 3k + 3 - 7 = 7k^2 + 2k - 4$

Multiplying a Mono by a Tri

- use distributive property

Ex: $2b(b + 11) \rightarrow 2b^2 + 22b$

Ex: $4x(2x^3 - 7x^2 + x) \rightarrow 8x^4 - 28x^3 + 4x^2$

Factor Completely

a) find GCF
b) put "leftovers" in ( )

Ex: $4x^5 - 24x^3 + 8x$
$4x^5 = 2 \cdot 2 \cdot x \cdot x \cdot x \cdot x \cdot x$
$24x^3 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot x \cdot x \cdot x$
$8x = 2 \cdot 2 \cdot 2 \cdot x$

GCF → 4x
Factor Completely → $4x(x^4 - 6x^2 + 2)$

Multiplying Bi by a Bi → **Boxes/Chart/Table**

	2x	4
3x	$6x^2$	12x
-7	-14x	-28

$6x^2 - 2x - 28$

Multiplying Bi by a Tri → Distributive Prop

- multiply each term in the binomial by each term in the trinomial
- add like terms

Ex: $(3x^2 + x - 5)(2x - 7)$

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

$-7(3x^2 + x - 5)$

$6x^3 + 2x^2 - 10x - 21x^2 - 7x + 35$

$6x^3 - 19x^2 - 17x + 35$

Multiplying Special Case → Squaring a Bi

- square of first term
- square of ~~third~~ second term
- coefficient of first term • second term • 2

Ex: $(x + 8)^2$

$(x + 8)(x + 8)$

64

$1 \cdot 8 \cdot 2$

$x^2 + 16x + 64$

Perfect Square Trinomial

Multiplying the Sum (+) and a Difference (-)

- when simplified results in: a binomial with **no middle term** and a **minus sign**
- square the first term
- square the second term
- no middle term
- minus sign in the answer

Ex: $(x + 8)(x - 8)$

$x^2 - 64$

Factor Completely

a) GCF
b) Factor: My Father Drinks Red Bull

Ex: $24n^2 + 2n - 12$

GCF $2(12n^2 + n - 6)$

Mult $2(n^2 + n - 72)$

Fact $2(n + 9)(n - 8)$

Div $12 \quad 12$

Red $2(n + 3)(n - 2)$

Bot up $2(4n + 3)(3n - 2)$

Factor $x^2 + bx + c$ → both terms positive

- find *factors* of third term so that . . .
- they add together to equal the middle term

Ex: $x^2 + 8x + 15$

Factors of 15: 1, 15 3, 5

Sum: 16 8

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

Factor $x^2 + bx - c$ → one pos/one neg

- find factors of third term so that. . .
- they add together to equal the middle term
- one will be positive/one will be negative
- give the sign of the middle term to the **higher** number

Ex: $x^2 + 2x - 15$

Factors of 15: 1, 15 3, 5

Sum: 14, -14 2, -2

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

Factor $ax^2 + bx + c$ → → → → →

My → **Multiply: ac**
Father → **Factor**
Drinks → **Divide by: a**
Red → **Reduce Fractions**
Bull → **Bottoms up (denominator back to position a)**

Ex: $7x^2 + 22x + 3$

$x^2 + 22x + 21$ Multiply: ac

$(x + 1)(x + 21)$ Factor

$(x + \frac{1}{7})(x + \frac{21}{7})$ Divide by: a

$(7x + 1)(x + 3)$ Reduce Fractions, Bottoms up

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

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

Explanation: Find two numbers that
= 12 when multiplied and
= 7 when added.

Ex. 2:

a	b	c	Steps
$25x^2$	$+15x$	$+2$	
x^2	$+15x$	$+50$	a·c
$(x + 5)$	$(x + 10)$		Factor (see Ex. 1)
25	25		Divide by 'a'
$(x + 1/5)$	$(x + 2/5)$		Reduce the fraction
$(5x + 1)$	$(5x + 2)$		Move the denominator back to 'a'

***Red Bull

Ex. 4 Find the GCF

$6a^3 + 36a^2 + 48a$

GCF is 6a

$6a^3 = 2 \cdot 3 \cdot a \cdot a \cdot a$
$36a^2 = 2 \cdot 2 \cdot 3 \cdot 3 \cdot a \cdot a$
$48a = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot a$

Ex. 5 Factor

$6a3 + 36a^2 + 48a$

$6a(a^2 + 6a + 8)$ Find the GCF (See Ex. 4)

$6a(a + 4)(a + 2)$ Factor (See Ex. 1)

Ex. 3: Difference of Squares

$49x^2 - 1$

Perfect Squares

$(7x - 1)(7x + 1)$ Find Square Roots of each term

Ex. 6 Perfect Square Trinomials

$X^2 + 8x + 16$

Sq. Root of

$1 \cdot 2 \cdot 4$ $1^{st} \cdot 3^{rd} \cdot 2 = 2^{nd}$

Perfect Squares

$(x + 4)(x + 4)$ Use Sq. Rts.
$(x + 4)^2$ 1st and 3rd terms

Ex. 7 Polynomial w/4 terms

$4ab + 8b + 3a + 6$

$(4ab + 8b) + (3a + 6)$

$4b(a + 2) + 3(a + 2)$

$(a + 2)(4b + 3)$

Box - #11

Finding Slope using and 2 points $m = \frac{y_2 - y_1}{x_2 - x_1}$

Ex: (3, 6) (4, 2)

$m = \frac{2 - 6}{4 - 3}$

$m = \frac{-4}{1}$

Box - #12

Slope- Intercept (S-I)Form: $y = mx + b$

1) Find m
2) Find b

Use the information given

Box - #13

Write an equation in S-I form given: m = 3 b = -4

$y = 3x - 4$

***You are only finding:

m and b

Box - #14

Write an equation in S-I form given: m = 3 (3, -4)

$y = 3x + b$

$y = 3x + b$
$-4 = 3(3) + b$
$-4 = 9 + b$
$-13 = b$

$y = 3x - 13$

Box - #15

Write an equation in S-I form given: (2, 4) (3, 5)

$y = mx + b$

$m = \frac{5 - 4}{3 - 2}$

$m = \frac{1}{1}$

$y = 1x + b$

$y = 1x + b$ (Choose 1 point)
$4 = 1(2) + b$
$4 = 2 + b$
$2 = b$

$y = 1x + 2$

Box - #16

Arithmetic Sequence: $a_n + (n - 1)d$

*n*th term term # common diff.

Ex: $a_1 = 1.5$ $d = 2.25$ $n = 39$
$a_n = a_1 + (n - 1)d$
$a_{39} = 1.5 + (39 - 1)2.25$
$a_{39} = 1.5 + (38)(2.25)$
$a_{39} = 1.5 + 85.5$
$a_{39} = 87$

Box - #17

Point-Slope Formula: $y - y_1 = m(x - x_1)$

1) Use when given a point and a slope
2) Another option to use other than S-I form
3) You can use point-slope to find S-I form or Standard Form
4) Point-Slope → S-I Form → Standard Form
5) This equation will get you wherever you need to go!

Box - #18

Using Point-Slope Form: m = 3 (3, -4)

$y - y_1 = m(x - x_1)$
$y - -4 = 3(x - 3)$
$y + 4 = 3x - 9$
$y = 3x - 13$ S-I Form

$-3x + y = -13$
$-1(-3x + y = -13)$
$3x - y = 13$ Standard Form

Box - #19

Parallel Lines

1) Have the ***same*** slope
2) Have a different y-intercept
3) Ex: $y = 2x + 4$
$y = 2x - 2$

Box - #20

Parallel Lines:

Write an equation that is parallel to $y = 3x - 2$ and goes through the ordered pair (0, 3).

$y = 3x + b$
$3 = 3x + b$
$3 = 3(0) + b$
$3 = b$

$y = 3x + 3$

Box - #21

Perpendicular Lines

1) Slope is Opposite *and* Reciprocal
2) Have a different y-intercept
3) Ex: $y = 1/2x + 2$
$y = -2x - 1$

Box - #22

Perpendicular Lines:

Write an equation that is perpendicular to $y = 2x - 4$ and goes through the ordered pair (4, 1).

$y = -1/2x + b$
$1 = -1/2(4) + b$
$1 = -2 + b$
$3 = b$

$y = -1/2x + 3$

Box - #23

x – intercept

1) use with Standard Form to graph a line quickly
2) where the line crosses the *x*-axis
3) represented by the ordered pair (x, 0)
4) to find: sub 0 for y

Ex: $3x + 4y = 24$
$3x + 4(0) = 24$
$3x = 24$
$x = 24$

x-intercept = 8; (8, 0)

Box - #24

y-intercept

1) use with Standard Form to graph a line quickly
2) where the line crosses the *y*-axis
3) represented by the ordered pair (0 , y)
4) to find: sub 0 for x

Ex: $3x + 4y = 24$
$3(0) + 4y = 24$
$4y = 24$
$y = 6$

y-intercept = 6; (0, 6)

Box - #25

Find x – and y-intercepts *given* two points

1) use Point-Slope
2) Write in Slope-Intercept Form
3) Write in Standard Form
4) Use "Tic-Tac-Toe"

Box - #26

Find x – and y-intercepts *given* two points

1) Find slope
2) Put in S-I Form
3) Plug in calculator and find points

Box - #27

Standard Form : $Ax + By = C$

1) 'A' cannot be negative
2) 'A' cannot be a decimal
3) 'A' cannot be a fraction

Box - #28

Slope-Intercept →→→→→ Standard Form

Ex: $y = \frac{-3}{7}x + 5$

$7y = 7(\frac{-3}{7}x + 5)$

$7y = -3x + 35$
$3x + 7y = 35$ →→→→ Standard Form

Box - #29

Another Example: Slope-Intercept →Standard Form

Ex: $y = 2x + 5$
$-2x + y = 5$
$-1(-2x + y = 5)$
$2x - y = -5$ →→→→→Standard Form

Box - #30

Another Example: Slope-Intercept →Standard Form

Ex: $y = \frac{-2}{3}x - 1$

$\frac{2}{3}x + y = -1$

$3(\frac{2}{3}x + y = -1)$

$2x + 3y = -3$→ →→Standard Form

Formulas – When to use; especially to solve word problems:

$y = mx + b$ ⟶

1) easy to graph
2) the starting point is greater or less than zero
3) constant that ↑ or ↓ at a steady rate
4) when asked to write 'an equation of the line' – use this formula unless it states otherwise

$y - y_1 = m(x - x_1)$ ⟶

1) if you know or can find the 'm' and one ordered pair
2) if you have two ordered pairs

$Ax + By = C$ ⟶

1) combining two different items with different unit measures
Ex: (money, tickets)

$y = kx$ ⟶

1) when the starting point is zero
2) 'y' will increase or decrease depending on 'x'
3) the constant determines how much the 'x' and 'y' will increase or decrease
4) can also be used like a proportion

Use the Calculator to Find:

Line of Best Fit: Stat → Edit → Enter L_1 (x) L_2 (y) → Stat D to calc → #4 Enter

r value: 2^{nd} 0 → x^{-1} → arrow down to Diagnostic On → Enter, Enter

Intersection of 2 Lines: Enter first equation in y_1 → Enter second equation in y_2 → 2^{nd} Trace → #5 Intersect → Enter, enter, enter

x-intercept and y-intercept given two points: stat → edit → enter points → stat → calc → 4 → get linear eqtn → y = → go to table and find x = 0 and y = 0

Slope Cheat Sheet

Slope — Box - #1

a) Slope – determines slant or grade
b) rise / run
c) a fraction
d) difference in y / difference in x
e) rate/rate of change
f) $m = \frac{y_2 - y_1}{x_2 - x_1}$
g) k → constant of variation

More Slope — Box - #2

- don't confuse finding an ordered pair with finding slope
  1) finding ordered pair: move left/right first; up/down second (x, y)
  2) finding slope: move up/down first; left/right second

Positive Slope — Box - #3

- "Uphill" "Upward"
- m → positive

Negative Slope — Box - #4

- "Downhill" "Downward"
- m → negative

Zero Slope — Box - #5

a) Horizontal line
b) m = 0
c) y = _____

Ex: (2, 4) (5,4) → $\frac{4-4}{5-2} = \frac{0}{3}$ → y = 4

No Slope/Undefined — Box - #6

a) Vertical line
b) m = undefined
c) x = _____

Ex: (4, 3) (4, 2) → $\frac{3-2}{4-4} = \frac{1}{0}$ → x = 4

Finding r – the missing coordinate — Box - #7

- find value r so that the line through (r, 6) and (10, -3) has a slope of -3/2

$m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad -3/2 = \frac{-3 - 6}{10 - r}$

$-3/2 = \frac{-9}{10 - r}$

$-18 = -3(10 - r)$
$-18 = -30 - 3r$
$12 = 3r$
$4 = r$

Rate of Change (Slope) — Box - #8

- on average how a quantity changes over time (x)

Ex:

- change in $ (y) / change in time (x)
- change in distance (y) / change in time (x)

Direct Variation — Box - #9

- y = kx
- constant of variation = k
- always goes through (0, 0)
- (0, 0) is the starting point
- "y varies directly with x"

Direct Variation: Application — Box - #10

- If y = 30 when x = 6, find x when y = 90.

First: $y = kx$, $30 = k6$, $5 = k$ Second: $y = kx$, $90 = 5x$, $18 = x$

- A flock of geese migrate 375 miles in 7.5 hrs. *Write a DV* for the distance flown in any time.

$375 = k7.5$
$50 = k$