ALGEBRA 2 What you need to know for the EOC

1. Order of Operations: PEMDAS
   Parentheses, Exponents, Mult/Div (left to right), Add/ Subt(left to right)

2. Simplify: Combine LIKE terms (do not change them)
   Simplest Form: No parentheses, exponents, or like terms

3. Associative: a + (b + c) = (a + b) + c Commutative: a + b = b + a
   Distributive: a(b + c) = ab + ac Identity: 3(1) = 3 or 3 + 0 = 3
   Inverse: 3 + (-3) = 0 or 4 (¼) = 1

4. $2x^2 + 6x + 5 + 8x$ $2x^2$, 6x, 5, 8x : **terms** x: **variable**
   5: **constant** 6x , 8x: **LIKE terms** 2, 6, 8: **Coefficients**

5. Natural Numbers : {1, 2, 3, 4…}
   Whole Numbers: {0, 1, 2, 3, 4…}
   Integers {…-3, -2, -1, 0, 1, 2, 3…}
   Rational Numbers: numbers that can be a fraction :{ ¾, 5, 0.12, 0.333333..}
   Irrational Numbers: decimals with no pattern or do NOT terminate
   Real Numbers : any number in the previous lists

6. Know how to add, subtract, multiply, and divide **Fractions Integers (by hand or CALC)**

7. Solve 1-step equations, 2-step equations, & variables on BOTH sides
   Balance an equation by performing the opposite operation on each side.

EX.

x + 4 = 9
- 4 - 4
x = 5

2x - 6 = 14
+ 6 + 6
2x / 2 = 20 / 2
x = 10

-2 + 10p = 8p - 1
- 8p - 8p
-2 + 2p = -1
+2 +2
2p / 2 = 1 / 2
p = 1/2

8. Ratio: Comparison of 2 numbers x to y x:y $\frac{x}{y}$

9. Proportion: two equal ratios, use cross multiplication to solve (criss-cross)

$\frac{n}{15} = \frac{24}{16}$ 15(24) = 16n n = 22.5

10. Percent of Change: $\frac{difference}{original} = \frac{\%}{100}$

11. Tax: $\frac{x}{original} = \frac{100 + \%}{100}$ Discount: $\frac{x}{original} = \frac{100 - \%}{100}$

12. Solve Formulas: solve for letter given

$$3x - 4y = h$$
$$+4y \quad +4y$$
$$\frac{3x}{3} = \frac{h + 4y}{3}$$
$$x = \frac{h + 4y}{3}$$

13. **Coordinate Graph**: Plane containing an x –and-y-axes.
x – axis : horizontal axis **y – axis**: vertical axis
origin: Where axes intersect (0, 0)
coordinate: (x, y)

14. **Midpoint Formula** $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Distance Formula: $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$ OR $\sqrt{(dist\_x's)^2 + (dist\_y's)^2}$

15. **Relation**: set of ordered pairs expressed as a **TABLE, GRAPH, MAPPING**
Inverse: switch each ordered pair (4, 5) inverse(5, 4)
Domain: set of x-values (independent variables)
Range: set of y-values (dependent variables)

16. Linear Equation: Equation of a **LINE**

Slope: $\frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$

Standard Form: Ax + By = C
Slope-intercept form : y = mx + b
Point Slope: $y - y_1 = m(x - x_1)$

17. To Graph:
1**. use a table**: should be in y = mx + b form, pick x values OR use calculator
2. **x & y-interecpts**: should be in standard form

x	y
0	
	0

3. **y = mx + b**
Start at y-intercept (b)
Move according to slope

5. **Inequalities:** graph line **shade** above or below >, < dotted line
≥, ≤ solid line

18**. Functions:** Each element of the domain can only have 1 y value (x's cannot repeat and vertical line test)

y = f(x) y = 2x – 8 **is the same as** f(x) = 2x – 8

f(2) = 2(2) – 8
= 4 – 8 = **-4**

19. **Direct Variation**: y varies directly with x: **y = kx,** where k is a constant

20. **Inverse Variation**: y varies inversely with x: $y = \frac{k}{x}$**,** where k is a constant

21. **Joint variation**: y varies jointly as x and z: $y = kxz$, where k is a constant

22. **Combined Variation**: y varies directly as x and inversely as z: $y = \frac{kx}{y}$

Combined variation puts direct and inverse together! K is still the constant of variation.

23. **Parallel & Perpendicular Lines**:

Parallel: same slope Perpendicular: opposite reciprocal slopes OR "flippin opposite" slopes

24**. Scatter Plots**: a graph which two sets of data are plotted with a positive, negative, or NO correlation

Best line of fit*: y* = m*x* + b equation that **BEST FITS DATA**

Calculator RULES:

1. PLUG IN DATA

1. STAT
2. EDIT
3. x – values in L_1
   y – vales in L_2 (to clear list, highlight L_1, hit clear NOT DELETE)

2. **Get equation**

4. STAT
5. CALC
6. #4 (Lin Reg) Enter
   y = mx + b

3. SEE GRAPH

7. y =
8. VARS
9. #5 (statistics)
10. EQ, Enter (the equation will show up in y =)
11. Hit graph (to see graph fully, Zoom 9)

4. To see the points on a graph

12. turn on stat plot----2nd y ='s
13. or under y ='s move the up arrow to highlight the **plot 1**

5. Find missing value

14. Use table if needed go to tableset (2nd Window) to change Table Start value

25. **Quadratic/exponential Regression**

Same Rules as linear regression---for entering in the data and graphing

To get the equation:

1. STAT
2. CALC
3. #5 QuadReg, #6 CubicReg, #10 ExpReg

26. **Inequalities**: $>$ greater than $<$ less than $\geq$ greater than or = to $\leq$ less than or = to

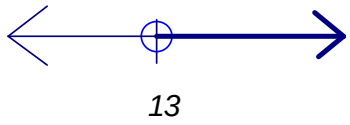
Solve just like an equation EXCEPT: when dividing or multiplying by negative, switch the sign.

Ex.

$x - 6 > 7$

$+6 \quad +6$

$x > 13$



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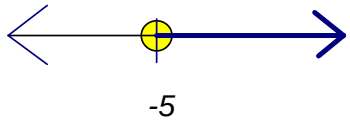
Ex. $\frac{-4x}{-4} \leq \frac{20}{-4}$

$x \geq -5$



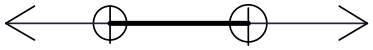
-5

27. **Compound Inequality**: two inequalities using AND or OR

Intersection (AND)

y > 5 and y < 10

graph where they overlap BOUNDRIES



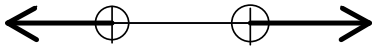
5 10

$5 < y < 10$

Union (OR)

y < 5 OR y > 10

graph whatever it says, NO BOUNDRIES



5 10

Ex:

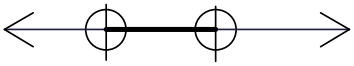
$-5 < x - 4 < 2$

$-5 < x - 4$ AND $x - 4 < 2$

$+4 \quad +4$ AND $+4 \quad +4$

$-1 < x$ AND $x < 6$

$-1 < x < 6$



-1 6

28. **Absolute Value**: Solve Problems **TWICE**

GreatOR Less ThAND

$|x| = 7$

$x = 7 \quad |x| = 7$ $\qquad |x| > 7$ $\qquad |x| < 7$

$x = -7$

$x = 7$ or $x = -7$ $\qquad x > 7$ OR $x < -7$ $\qquad x < 7$ AND $x > -7$

Graph two points Graph OUTSIDE GRAPH BETWEEN

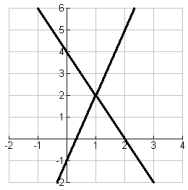
29. **Systems of Equations**: two or more equations

Solve systems can have three possible answers

1. (x, y) coordinate
2. NO solution: lines are parallel or $3 \neq 6$ false statement (ex)
3. Infinitely many solutions: same line or $4 = 4$ true statement (ex)

30. Three ways to solve System

1. **Graphing**: intersection is answer



(1, 2)

2. **Substitution**:solve for 1 variable and plug into other equation

system

$x + y = 5$
$y = 3 + x$

substitute

$x + y = 5$
$x + (\mathbf{3 + x}) = 5$

solve

$2x + 3 = 5$
$2x = 2$
$x = 1$

plug in

$x + y = 5$
$(1) + y = 5$
$y = 4$

check answer

(1, 4)
$(1) + (4) = 5$
$(4) = 3 + (1)$

3. **Elimination**: must be in standard form and eliminate a variable

System

$3x - 5y = -16$
$2x + 5y = 31$

Eliminate

$3x - 5y = -16$
$2x + 5y = 31$
$\frac{5x}{5} = \frac{15}{5}$
$x = 3$

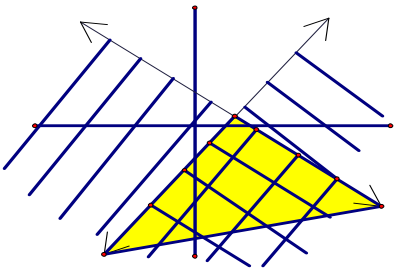
Plug In

$3(3) - 5y = -16$
$9 - 5y = -16$
$-5y = -25$
$y = 5$

Answer (3, 5)

4. **Inequalities**:

Graph and shade both lines and intersection is answer



31. **Monomial:** 5, x, y^3, 6xy, $8x^2y$
Binomial: x + 3, y - 7
Trinomial: $2x^2 + 4x - 7$

32. **Multiplying Monomials**
To multiply there must be the same base. Multiply coefficients, **ADD exponents**
$(x^2)(x^5) = x^{2+5} = x^7$ $(3x^4)(4x^{7)} = (3)(4)x^{4+7} = 12x^{11}$

33. **Powers of Monomials**
To raise powers there must be the same base. Raise coefficients to power. **MULT exp.** Distribute when needed.
$(x^3)(x^5) = x^{(3)(5)} = x^{15}$ $(3x^5y^2)^3 = 3^3x^{5(3)}y^{2(3)} = 27x^{15}y^6$

34. **Dividing Monomials**
To divide, there must be the same base. Divide/ reduce coefficients, SUBTRACT exponents.
$\frac{x^6}{x^2} = x^{6-2} = x^4$ $\frac{18x^7}{3x^4} = \frac{18}{3}x^{7-4} = 6x^3$

32. **Negative Exponents**: $x^{-1} = \frac{1}{x}$ and $\frac{1}{x^{-1}} = x$ ---No negative exponents!

35. **Add & Subtract Polynomials**
Add/Subtract LIKE TERMS, DO NOT change exponents
$(7r^2 + 3x) + (8x - 5r^2) = 7r^2 - 5r^2 + 3x + 8x =$ **$2r^2 + 11x$**

36. **Multiplying**
Monomial & Polynomials: Distribute, follow multiplication rules
$3x^3(7x^2 + 4x - 7) = 21x^5 + 12x^4 - 21x^3$

Binomials : Use **FOIL**, distribute or BOX method
$(x + 4)(3x - 5) = x(3x) + x(-5) + 4(3x) + 4(-5) = 3x^2 - 5x + 12x - 20$
$3x^2 + 7x - 20$

37. **Prime:** a whole number whose factors are only 1 and itself. (11)
Composite: A whole number that has more than two factors (12)

38. **Factoring**: 1. Always look for GCF first
2. If two terms, check to see if difference of squares
3. If three terms, check if trinomial
4. If four terms, check if you can group.

GCF: $3x^2 - 12x$
$3x(x - 4)$

Difference of squares: $4x^2 - 25$
$(2x - 5)(2x + 5)$

Trinomial: 1. $x^2 - 7x + 12$
$(x - 4)(x - 3)$

12	
2	6
1	12
→ 3	4

2. $6x^2 + 17x + 5$

Method 1

$\frac{6x^2 + 2x}{2x} + \frac{15x + 5}{5}$
$2x(3x + 1) + 5(3x + 1)$
$(3x + 1)(2x + 5)$

30	
→ 2	15
1	30
3	10
6	5

Method 2

$6x^2 + 17x + 5$
$(6x + 2)(6x + 15)$
$(3x + 1)(2x + 5)$

Grouping:

$\frac{35x - 5xy}{5x} + \frac{21 - 3y}{3}$
$5x(7 - y) + 3(7 - y)$
$(5x + 3)(7 - y)$

Cubic : $x^3 + 8 = (x + 2)(x^2 - 2x + 4)$ $x^3 - 27 = (x - 3)(x^2 + 3x + 9)$

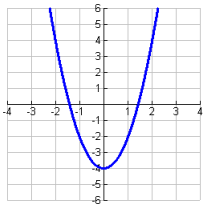
39. Complete the square

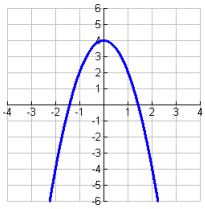
$x^2 - 4x + 3 = 0$
$x^2 - 4x + \_\_ = -3 + \_\_$
$x^2 - 4x + 4 = -3 + 4$
$(x - 2)^2 = 1$
$x - 2 = \pm 1$
$x = 2 \pm 1$
$\{1, 3\}$

40. **Parabola**: graph of a quadratic function, $ax^2 + bx + c$

If a > 0, opens up, MIN If a < 0, opens down, MAX

C is the y- intercept





Axis of symmetry (vertical line) $x = \frac{-b}{2a}$

Vertex (MAX or MIN) $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$ OR USE CALC (table)

Roots = zeros = solutions = x – intercepts (when y = zero)

You can complete the square to put the equation in vertex form;

$y = a(x-h)^2 + k$ $x = a(y-k)^2 + h$

Vertex: (h, k) (h, k)

AoS x = h y = k

41. **Quadratic Formula** $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

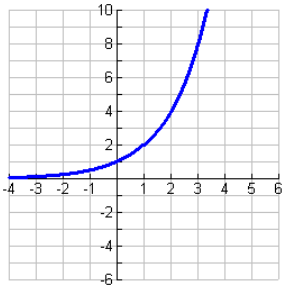
:

42. **Exponential Function**: graph described by $y = a^x$

|a| > 1 increases

0 < |a| < 1 decreases

y – intercept is (0, 1)



$y = 3^x + 4$ increases, y – int (0, 5)

43. **Growth Formula**: $A = P(1 + r)^t$ Decay Formula: $A = P(1 - r)^t$

Compound: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Compounded continuously : $A = Pe^{rt}$

Exponential decay: $y = ae^{kt}$ **growth**---k is positive, **decay**---k is negative

44. **Logarithms** Properties

1. Product property $\log_a(xy) = \log_a x + \log_a y$

2. Quotient property $\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$

3. Power Property $\log_a x^p = p\log_a x$

4. Natural logs $\ln e = 1$

44. **Simplifying Radicals**: $\sqrt{a} \bullet \sqrt{a} = a$

Basic Rules:

$\sqrt{b} \bullet \sqrt{a} = \sqrt{ab}$ $\qquad \frac{\sqrt{a}}{\sqrt{b}} \cdot \frac{\sqrt{b}}{\sqrt{b}} = \frac{\sqrt{ab}}{b}$

$\sqrt{ab} = \sqrt{a} \bullet \sqrt{b}$

Break Down Root Rules $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

1. Make a factor tree $\sqrt{a^2} = a$
2. Circle Pairs
3. Pairs go outside root (multiply more than 1)
4. Leftovers stay inside root (multiply more than 1)
5. Check : square outside, multiply with inside

Simplest Radical Form

1. All roots are simplified
2. No roots in denominator
3. Fraction is reduced

45. **Addition & Subtraction of Radicals**

ONLY ADD LIKE roots, do NOT change roots

46. **Pythagorean Theorem**: right triangles ONLY $a^2 + b^2 = c^2$

47. Circles: $(x-h)^2 + (y-k)^2 = r^2$ **center** is (*h*, *k*) **radius** = *r*

48. **Imaginary numbers** $i^1 = \sqrt{-1}$

$i^1 = i$ add and subtract just like variables

$i^2 = -1$ multiply just like variables, but replace i^2 with -1

$i^3 = -i$ divide by rationalizing with the conjugate----change the sign in the

$i^4 = 1$ middle…..ex if $(2-4i)$, then the conjugate is $(2+4i)$

You may use the calculator to work with imaginary numbers.

Ex $\sqrt{-50} = 5i\sqrt{2}$, $(2-4i)+(7-2i) = 9-6i$

$(2-4i)^2 = (2-4i)(2-4i) = -12-16i$ **FOIL**

$\sqrt{-5}\cdot\sqrt{-10} = i\sqrt{5}\cdot i\sqrt{10} = i^2\sqrt{50} = -5\sqrt{2}$ ---take the i's out first!

49. **Synthetic Division** $(2x^3+3x^2-10x-3)\div(x+3)$

-3	**2**	**3**	**-10**	**-3**
		-6	**9**	**3**
	2	-3	-1	0

so, $2x^2-3x-1$ **is the quotient, there is no remainder**

50. Multiplying and Dividing Polynomials

FACTOR, FACTOR, FACTOR FIRST!!!!!
Then cross off like factors from the numerator and denominator

If division, change to multiplication by multiplying by the reciprocal.

If a complex fraction----multiply all terms by the LCD!

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