Things You Should Know How to Do on the SAT Math

Heart of Algebra:

- **Create, solve, or interpret a linear expression or equation in one variable**
  - Solving requires backwards PEMDAS, i.e. SADMEP, sad-mehp??? lol
  - Know how to isolate variables.
- **Create, solve, or interpret linear inequalities in one variable**
  - Do you know how to shade? How do you know where to shade?
- **Build a linear function that models a linear relationship between two quantities**
  - Know how to find the slope of two points, find the y-intercept and write it in the form of a linear equation!
- **Create, solve, and interpret systems of linear inequalities in two variables**
- **Create, solve, and interpret systems of two linear equations in two variables**
- **Algebraically solve linear equations (or inequalities) in one variable**
- **Algebraically solve systems of two linear equations in two variables**
  - Do you know how to solve using substitution or just elimination?
- **Interpret the variables and constants in expressions for linear functions within the context presented**
  - What does the y-intercept of an equation mean? What about the slope?
- **Understand connections between algebraic and graphical representations**

Problem Solving and Data Analysis:

- **Use ratios, rates, proportional relationships, and scale drawings to solve single- and multistep problems**
  - Notice it is similar to unit conversions. Example: The ratio of students to teachers at Cerritos HS is 28 to 3 and teachers to cafeteria workers if 9 to 2, what is the ratio of cafeteria workers to students?
    - $\frac{28\ students}{3\ teac\ hers} \times \frac{9\ teac\ hers}{2\ cafeteria\ \ workers}$ notice the "unit" teachers cancel! And so you are left with the unit "x students per y cafeteria workers". Do you know how to make it so that it's "z students per cafeteria workers"?
      - Do you know how to make it a unit rate? If you don't know the difference between "x students per y cafeteria workers" and "z students per cafeteria workers" please make sure you figure that out before the exam.
- **Solve single- and multistep problems involving percentages**
  - $Percent\ change = \frac{amount\ \ of\ change}{Orginal\ \ Value} \times 100\%$
  - Now determine if it a loss or increase?
- **Solve single- and multistep problems involving measurement quantities, units, and unit conversion**
  - You want to cancel units you don't want, circle the units you do want!
- **Given a scatter plot, use linear, quadratic, or exponential models to describe how the variables are related**
  - What does a linear, quadratic, and exponential graphs look like?
- **Use the relationship between two variables to investigate key features of the graph**
- **Compare linear growth with exponential growth**
  - Which one grows/decreases faster?
- **Use two-way tables to summarize categorical data and relative frequencies, and calculate conditional probability**
  - $Probablity = \frac{number\ \ of\ ways\ \ an\ event\ \ can\ \ occur}{number\ \ of\ possible\ \ outcomes}$

- Remember
  - ♦ "or" = adding probabilities
  - ♦ "and" = multiplying probabilities

- **Make inferences about population parameters based on sample data**
- **Use statistics to investigate measures of center of data and analyze shape, center, and spread**
  - Mean, median and mode: Do you know what all of them are? How do you find each one?
  - If your set of data is changed so that each number is increased by 5, how does that affect mean, median and mode?
- **Evaluate reports to make inferences, justify conclusions, and determine appropriateness of data collection methods**

Passport to Advanced Math:

- **Create a quadratic or exponential function**
  - What is doest a linear, exponential, and quadratic equation look like?
- **Determine the most suitable form of an expression**
- **Create equivalent expressions involving rational exponents** and radicals
  - What are the rules of exponents? What is the relation between exponents and radicals?
- **Create an equivalent form of an algebraic expression**
  - Do you know how to go forwards and backwards on a quadratic expression?
  - Do you know how to go from factoring to FOIL and from FOIL to factoring?
- **Solve a quadratic equation—you have a couple ways, use the easiest way**
  - Completing the square
  - Quadratic equation
  - Factoring
  - Graphing (if you are allowed to use a graphing calculator)
- **Add, subtract, and multiply polynomial expressions and simplify the result**
  - Know which variables' coefficients combine.
  - Example: $3x + 5x^2 + 7x + 3 = (3x + 7x) + 5x^2 + 3$ notice we can only combine 3x and 7x, because $5x^2$ is entirely different from 7x and 3x!!!
- **Solve an equation in one variable that contains radicals or contains the variable in the denominator of a fraction**
  - Know how to notice extraneous solutions!
    - ♦ Does it make sense in the problem? Example: Can the length of the side of a box be negative?
  - $\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}$, NEVER!!! However, $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$. Do you remember the law of exponents and radicals?
  - Know how to translate $\frac{\frac{a}{b}}{\frac{c}{d}} = \frac{a}{b} \div \frac{c}{d}$. Do you see that the two dots on the dividing sign are just place holders for the "numbers" like a fraction? Do you know how to divide fractions?
  - Do you know how to "rationalize" a fraction with radicals? (Hint: Use the **conjugate**)
    - ♦ The conjugate of $3 - \sqrt{5}$ is the negative of the *radical* part i.e. $3 + \sqrt{5}$ is the conjugate!
      - ◊ You have to notice that when you multiply: $(3 - \sqrt{5}) \times (3 + \sqrt{5})$, you must FOIL and what does this look like? (*Hint: Difference of squares*)
  - Do know that $\sqrt{a} = a^{\frac{1}{2}}$? Do you know how to solve $x^2 = 9$? How about $\sqrt{x+1} = 5$?
- **Solve a system of one linear equation and one quadratic equation**
  - If two quadratic equations are the same what does that say about the coefficients of the two equations? (Hint: they must match in some way)
- **Rewrite simple rational expressions**

- Use your answer choices and try to move things around so it looks similar to what you are given.
- Example: if $3+\frac{2}{x+1}$ was given as one of your answer choices, change it so that you have one fraction! $3+\frac{2}{x+1}=3\times\frac{x+1}{x+1}+\frac{2}{x+1}=\frac{3(x+1)}{x+1}+\frac{2}{x+1}$ and so then you can combine the fractions.

- **Interpret parts of nonlinear expressions in terms of their context**
  - What does the constant of the expression stand for? Example: If the equation of a ball's position after it has been dropped from a cliff is $s(t)=16t^2+3t+20$, what does the 20 mean?
- **Understand the relationship between zeros and factors of polynomials, and use that knowledge to sketch graphs.**
  - How are factors of a polynomial and zero of a polynomial similar? Are they different in some way?
- **Understand a nonlinear relationship between two variables by making connections between their algebraic and graphical representations**
- **Use function notation, and interpret statements using function notation.**
  - $f(x)=3x,\ g(x)=x^2+3$, what is $f\big(g(x)\big)$? $g(f(x))$? What about $f\big(g(5t)\big)$?
- **Use structure to isolate or identify a quantity of interest**
  - Example: If $3x-y=17$ and $2x-2y=6$, what is the value of $x+y$?
    - Stack them:

$$3x-y=17$$
$$2x-2y=6$$
$$x+y=?$$

Now do you see how to get x+y? (There is always at least one on the SAT)

Additional Topics in Math:

- **Solve problems using volume formulas.**
  - You are given these formulas; do you know how to split a figure into two volumes you do know? Example: A scoop of ice cream in a waffle cone, what are the two shapes you have? What about an hourglass?
- **Use trigonometric ratios and the Pythagorean theorem**
  - Do you know SOHCAHTOA?
  - What kind of triangles does Pythagorean Theorem only apply to?
- **Add, subtract, multiply, divide, and simplify complex numbers.**
  - Imaginary numbers—FOIL is your friend.
  - Do you know how to "rationalize" a fraction with imaginary numbers? (Hint: Use the **conjugate**)
    - This is similar to "conjugate" in radical expressions: Using a similar example the conjugate of $3+5i$ is the negative of the imaginary part, i.e. $3-5i$!!!
    - Do you know the conjugate of 3 or $3i$? Put it into the form of $a+bi$!
- **Convert between degrees and radians and use radians to determine arc lengths; use trigonometric functions of radian measure**
  - 180 degrees = π
  - So what does 360 degrees in radians mean? What is $\frac{\pi}{3}$ in degrees?
  - Use ratios!!!! That is, $\frac{180^\circ}{\pi}=\frac{degrees}{radians}$!!!
- **Apply theorems about circles to find arc lengths, angle measures, chord lengths, and areas of sectors**
  - Notice there is a direct relation between the area/circumference of the circle and the degrees of the circle

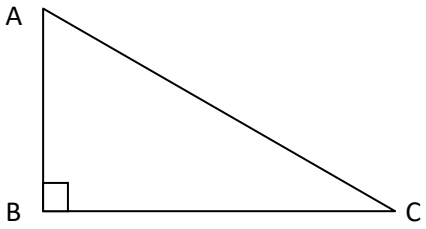
- ♦ $\frac{360^{\circ}}{Area\ \ of\ Circle} = \frac{degrees\ \ of\ sector}{area\ \ of\ sector}$
- ♦ $\frac{360^{\circ}}{Circumference\ \ \ of\ Circle} = \frac{degrees\ \ of\ arc}{lengt\ h\ of\ arc}$
- ♦ Remember the circumference and area of circle is given on the sheet on the test!

 Use concepts and theorems about congruence and similarity to solve problems about lines, angles, and triangles

- What are *vertical angles, corresponding angles, complementary angles, supplementary angles, alternate interior angles, alternate exterior angles, adjacent angles, perpendicular lines, parallel lines, angle bisectors, line bisectors*????
- Isosceles triangles!!! What are some facts about them? (SAT loves isosceles triangles)

 Use the relationship between similarity, right triangles, and trigonometric ratios; use the relationship between sine and cosine of complementary angles

- Again know SOHCAHTOA.
- Know that **sin (90°-x) = cos (x)** and **cos (90°-x) = sin (x)**? (There is always at least one question on this!)
- If two triangles are similar, what do you know about their angles? What about their sides?
- In a right triangle ΔABC, because of that fact up there we get:
  - ♦ sin (A) = cos (B)
  - ♦ sin (B)= cos (A)



 Create or use an equation in two variables to solve a problem about a circle in the coordinate plane.

- What is the equation for a circle?
- If you are given an equation of a circle in nonstandard form, what do you need to do to find its center and radius? (*Hint: Complete the what?*)

Extra Tips:

- Please do remember, if you have a fractions you can get rid of them by multiplying the whole equation with the *least common denominator*.
- If you have a fraction on one side of the equation and a plain number on the other side, **cross multiplying** never fails!
  1. You can only **cross multiply** between an equal sign **=**
     - ♦ You can remember it by, there are two lines that *haven't* crossed yet so you can cross multiply.
  2. You can **cross cancel** between a multiplying sign ×
     - ♦ And this one is already crossed, so you can't cross multiply and that usually "x" means "cancel"
- If you see x^2, x^3 or anything with exponents on variables, you got a quadratic in your hands!
- Know what happens when:
  1. $(a+b)^2 = (a+b)(a+b) = a^2 + 2ab + b^2$
  2. $(a-b)^2 = (a-b)(a-b) = a^2 - 2ab + b^2$
  3. $\boldsymbol{(a-b)(a+b) = a^2 - b^2}$ **(Difference of Squares)—this one is very important.**

  Number 1 and 2 are something you should know, to do things faster, but you don't have to know.
- Do the easy questions first! Underline what you do know and what you are told to find!
- Use the calculator to your advantage! Learn how to use your calculator!