Math 1: Fundamentals

Madrona Tutoring

SAT Math: Fundamentals

There are two sections of math on the SAT. **Section three** has 25 minutes for 20 questions without a calculator. Section three is about how well you understand theoretical math. It isn't heavy on calculation, but emphasizes definitions, and knowing the processes to effective solve a problem. **Section four** has 55 minutes for 38 questions with a calculator. The problems will have more steps, but might seem easier because they are more straightforward. **Typical students** rush through the easy questions because they know they are going to need extra time on the hard questions. **A better idea:** slow down. All the questions are worth the same: one point. The easy points are at the beginning. If you slow down and nail the first half of the section, then you've already achieved a 500 in math. The worst case scenario is getting the first half right, and being forced to guess on the last half. That would give you an additional 6 correct questions, statistically, which should bump you up to a score of 560 or so.

Slowing down is still a good idea if you are taking calculus, and completely understand all of the math, and have ten minutes left over. If you move through the math section like a speed demon you're missing the point. The test doesn't care if you understand high math. The test only cares if you correctly interpret its questions and give it what it wants. No matter how good at math you are, you'll make fewer silly mistakes if you keep a deliberate pace.

Three things for every problem:

1. Underline what they want.

Every question ends with a sentence that explains what the correct answer is. Underline it. You'll start to notice that they don't ever just want you to solve for x. They want x+1. Keep an eye on what they're asking for. Do they want the area or the circumference of the circle? Are they asking for the volume or the surface area of the cube?

2. Look at the answers before doing any work.

The answers listed are the only possible correct solutions after all. They can tell you a lot about the problem. Are they easy whole numbers? Then maybe you can work backwards from them. Do a couple of them seem way, way too big, or too small? Then you can eliminate them automatically. Are they all formulas? Then you can probably use the process of elimination. Bottom line: don't spend time doing math work that you don't need to do. Check the

answers to help you find out what you have to do.

3. No Mental Math.

You don't need to do all of it by hand. Use your calculator when you can. But write down what you are doing in your calculator. If you write down each step, you're less likely to make mistakes distributing negatives, or mis-remembering formulas. Also, when you make a mistake, and get an answer that's not one of the options, you can go back and check your work, instead of having to do the whole problem over again.

Vocab

You'll need to look these up and write them down in your book.

Non-Negative:
Factor:
Multiple:
Prime:
Median:
Mean:
Mode:
Range:
Remainder:
Sum:
Difference:
Product:
Quotient:
Consecutive:
Units Digit:
Distinct:
Dividing by Zero:
Rasing to Zero power:
Integer:

1. What is the remainder when 12 is divided by 5?
2. How many prime factors does 45 have?
3. How many distinct prime factors does 45 have?
4. How many non-negative integers exist in a set of numbers which spans from -11 to 11?

PEMDAS

The order of operations. Parentheses, Exponents, Multiplication and Division, Addition and Subtraction.

You can multiply and divide at the same time and you can add and subtract at the same time. But you can't mix and match. No multiplying while subtracting.

1. What is the value of -2^3?
2. What is the value of $(-2)^3$?
3. What is the value of $(4)2^2$?
4. What is the value of $((4)2)^2$?

Exponents and Radicals

Here are the rules that you'll need to know:

1. $x^a x^b = x^{a+b}$
2. $\frac{x^a}{x^b} = x^{a-b}$
3. $x^{-a} = \frac{1}{x^a}$
4. $(x^a)^b = x^{ab}$
5. $x^{\frac{a}{b}} = \sqrt[b]{x^a}$ or $(\sqrt[b]{x})^a$

Use the exponent rules to solve these problems:

1. $(x^2)^2$
2. $\frac{x^4}{x^2}$
3. $(x^3)(x^4)$
4. $x^{\frac{2}{6}}$
5. x^{-5}
6. $x^{\frac{-6}{7}}$
7. $(\frac{y}{z})^{-3}$

Percents

You need to know how to get between decimals and percents easily. It's pretty easy though: remove the decimal, and divide by 100. So, .22 is really 22/100. If you're using a scientific calculator, you can usually type MATH, ENTER, ENTER to turn a decimal into a fraction too.

Translating percentages comes in really handy on a lot of word problems:

1. The word "is" means "="
2. The word "what" means a variable, like x or y
3. The word "percent" means divide by 100
4. The word "of" means multiply

For example: Twenty five percent of thirty percent of what number is eighty percent of two hundred and fifty?

If I translate that correctly it looks like this: $(25/100)(30/100)(x) = (80/100)250$

Now all I have to do is simplify, and solve for x.

Translate these two problems with the above rules, and then solve them:

1. What is thirty percent of twenty percent of seventy five percent of two thousand?

2. thirty five is what percent of seventy five percent of ten percent of three hundred and fifty?

Proportions

Proportions are equations that contain two ratios that have been set equal to each other. Remember cross multiplying to solve for x? That's exactly what we're talking about. Setting up a proportion is usually the fastest way to solve for an ammount or distance when you have been told what ratio things are in. Always set up a proportion so that the same types of things are on the bottom and top on both sides of the equals sign.

If I know that for every three ninjas that I hire, I need to supply twelve muffins, and I 've just hired 21 ninjas, how many muffins will I need to get at Costco?

Let's keep the Ninjas on the bottom and the muffins on the top.
$\frac{12muffins}{3ninjas} = \frac{xmuffins}{21ninjas}$ or $\frac{12}{3} = \frac{x}{21}$
So then I cross multiply and get $3x = (12)(21)$
And all I have left is to solve for x
$x = \frac{12(21)}{3}$
$x = \frac{4(21)}{1}$ (reduce whenever possible)
$x = (4)(21)$
$x = 84$

Try this example: Triangles ABC and DEF are similar. Side AB measures 5 inches, BC measures 7 inches, and CA measures 9 inches. If side DE of triangle DEF is 10 inches, what does side EF measure?