CHAPTER 17: MATH INTRODUCTION AND GENERAL STRATEGIES

There are often several ways to solve a math problem. You don't have to solve it the way the SAT® wants you to. Since our purpose is to get you to the correct answer in the quickest amount of time, we'll walk you through the strategies, techniques, tips, etc., that our students find extremely helpful. A number of these strategies may seem unfamiliar. However, they have been proven to work and, with practice, they can work for you too.

The College Board tells us that the questions on the Math section fall into four content domains:

1. Algebra
2. Advanced Math
3. Problem-Solving and Data Analysis
4. Geometry and Trigonometry

We've identified the specific categories most commonly tested within these headings, with each question category representing its own chapter, with the specific strategy for tackling each one.

MATH GENERAL STRATEGIES

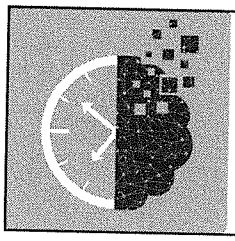
1. **NEVER leave a question blank.** There is no penalty for guessing.
2. **Complete easy questions first.** Questions follow a loose order of difficulty, meaning they tend to get harder as you go. Spend your time wisely on the questions likely to award you points. Pick and choose which questions you can complete when time is running out.
3. **Abide by a 5-second rule (or something close to it).** If after 5 or so seconds you have no idea what to do, skip that question and return to it if time allows.
5. **BALLPARK:** You may be able to get an answer in the ballpark, even if you don't know how to fully solve a problem.
6. **BITE-SIZE:** Break the question down into manageable Bite-sized steps when you get to a stopping point after each step.
7. **Use your CALCULATOR wisely.** Don't trust it unquestioningly; you should always be mentally checking to see if what it's spitting out makes sense.
8. **Know when to walk away!** Beware time-sucker problems. Take a guess and move on.
9. For EVERY math question, ask if the question would be easier if I **Plugged In** for the Variable or Plugged in the Answer.

CHAPTER 18: PLUGGING IN FOR THE VARIABLE

LESSON

"Plugging In" means that you're replacing a variable with an actual number.

Plugging In is often a very effective strategy, especially if you're not sure how to solve a problem algebraically. Even if you know how to solve the problem algebraically, Plugging In can often get you to the answer choice more quickly. It can also make difficult problems much more manageable. You should be able to use this strategy on several math problems.



The Curvebreakers Strategy

PLUG IN FOR THE VARIABLE

1. **If the question contains the words "in terms of....." cross it out – it is meant to confuse you. Highlight what the question is asking.**
2. **Identify a variable(s) to plug in.** Usually, it's best to plug in for the variable that shows up the most or the variable that appears in the answer choices. Don't plug in for the *Lonely Variable*: the one by itself.
3. **Plug in a number for the variable(s).** Pick a number that makes the math easy (2,3,10,etc.).. If the problem contains a graph, chart, or table, see if you can use numbers (or coordinates) given in the graph, chart, or table to plug in. Avoid using 0; use 1 sparingly (to avoid situations in which more than one answer choice works).
4. **Work the steps of the problem.**
5. **Put a TV around the Target Value.**
6. **Check each answer choice to find your Target Value.** If more than one works, plug in a different number.

Example 1: PLUG IN FOR THE VARIABLE

1. Which expression is equivalent to $\frac{3}{a^2}+\frac{1}{2a}+\frac{2}{a}$?

A) $\frac{6}{a^2+3a}$

B) $\frac{2a+3}{a^3}$

C) $\frac{5a+6}{2a^2}$

D) $6a^2$

Solution Using the Strategy: Plug in for the Variable

Step 1: Identify a variable(s) to plug in.

The variable in both the question and answer choices is a. Let's try $a = 2$

Step 2: Work the steps of the problem.

Plug In $a = 2$

$$\frac{3}{(2)^2} + \frac{1}{2(2)} + \frac{2}{(2)} = \quad \frac{3}{4} + \frac{1}{4} + \frac{2}{2} = 2$$

Step 3: Put a box around the Target Value.

$\boxed{2}$

Target Value (TV)

Step 4: Check each answer choice to find your Target Value.

When we plug in $a = 2$, we need a TV of 2.

A) $\frac{6}{a^2+3a}$ $\frac{6}{(2)^2+3(2)} = \frac{6}{10}$ ***No***

B) $\frac{2a+3}{a^3}$ $\frac{2(2)+3}{(2)^3} = \frac{7}{8}$ ***No***

C) $\frac{5a+6}{2a^2}$ $\frac{5(2)+6}{2(2)^2} = \frac{16}{8} = 2$ ***Yes***

D) $6a^2\ 6(2)^2 = 24$ ***No***

Correct Answer: C

Example 2: PLUG IN FOR THE VARIABLE

2. If $\frac{x}{6} = \frac{y+1}{3}$, what is the value of *y* in terms of x?

A) $\frac{3x-1}{6}$

B) $\frac{x-6}{2}$

C) $\frac{x-2}{2}$

D) $2x = 1$

Solution Using the Strategy: Plug in for the Variable

Step 1: If the question contains the words "in terms of….." cross it out – it is meant to confuse you. Highlight what the question is asking.

If $\frac{x}{6} = \frac{y+1}{3}$, what is the value of y ~~in terms of x~~?

Step 2: Identify a variable(s) to plug in.

Let's plug in for x since it shows up the most and appears in the answer choices. Let's try $x = 2$

Step 3: Work the steps of the problem.

Step 4: Put a box around the Target Value.

Plug In $x = 2$

$$\frac{2}{6} = \frac{y+1}{3}$$

Cross multiply to get: $6(y+1) = 6$
Distribute: $6y + 6 = 6$
Subtract 6 from both sides to get $6y = 0$
Divide both sides by 6 to get

$\boxed{y = 0}$

Target Value (TV)

Step 5: Check each answer choice to find your Target Value.

When we plug in $x = 2$, we need a TV of 0.

A) $\frac{3x-1}{6}$ $\frac{3(2)-1}{6} = \frac{5}{6}$ *No*

B) $\frac{x-6}{2}$ $\frac{(2)-6}{2} = \frac{-4}{2}$ *No*

C) $\frac{x-2}{2}$ $\frac{(2)-2}{2} = 0$ *Yes*

D) $2x-1$ $2(2)-1 = 3$ *No*

Correct Answer: C

Practice: PLUG IN FOR THE VARIABLE

1. If $x - y = 3$ and $z = 4x - 5 - 4y$, what is the value of z?

A) -2
B) 2
C) -7
D) 7

$$a = \frac{b - c}{c}$$

2. In the equation above, if b is positive and c is negative, which of the following must be true?

A) $a = 1$
B) $a > 1$
C) $a = -1$
D) $a < -1$

3. Which of the following expressions is equivalent to $\sqrt{2x^{\frac{1}{2}}}$?

A) $\sqrt{2}x^{\frac{1}{4}}$
B) $\sqrt{2}x$
C) $2x^{\frac{1}{4}}$
D) $2x$

4. The cost to buy a certain number of pencils from a stationery shop is $12 when buying 20 pencils. With a purchase of 30 pencils, the cost is $16. If the cost increases at a constant rate as the number of pencils bought increases, which of the following linear models best describes the cost c in dollars to buy n pencils?

A) $c = 0.4n + 4$
B) $c = 0.5n + 9$
C) $c = 0.75n + 6$
D) $c = 0.75n + 9$

$$x^3 - x^2 - 32x + 60$$

5. If the expression above can be written in the equivalent form $y(x - 2)$, which equation represents the value of y?

A) $x^2 - x + 28$
B) $x^2 + x - 30$
C) $x^2 - x + 30$
D) $x^2 + x + 28$

6. If the lengths of the sides of a rectangular swimming pool with an area of 60 square meters are tripled, what is the new area of the pool in square meters?

A) 180
B) 360
C) 540
D) 720

7. The volume of a cylinder is given by the formula $V = \pi r^2 h$. If the height of a cylinder is doubled, what is the ratio of the new volume to the old volume?

A) 1:2
B) 1:4
C) 2:1
D) 4:1

8. Every element in a data set is multiplied by 5, and each resulting product is then decreased by 2. If y is the mean of the final data set, which of the following expressions gives the mean of the original set in terms of y?

A) $\frac{y+2}{5}$
B) $\frac{y-2}{5}$
C) $5y+2$
D) $5y-2$

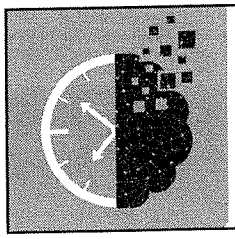
For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 19: PLUG IN THE ANSWER

LESSON

Plugging in the Answer (sometimes referred to as PITA or Backsolving) is often the quickest way to get to the correct answer. See if you can use this strategy when there are only numbers in the answer choices and not variables.

Basic Rule of Thumb: PITA vs Plugging In
Plug in for the variable when there are variables in the answer choices.
Try PITA when there are no variables in the answer choices but numbers only.



The Curvebreakers Strategy

PLUG IN THE ANSWER

1. **Start with Answer Choice B or C by drawing an arrow to the left of the answer choice (except if the question asks for the greatest or smallest value – then start there).** Sometimes, when starting with one of the middle answer choices, you will know whether to go higher or lower if that answer choice doesn't work.
2. **Put a Label over the answer choices.** Write in exactly what it is you're looking to solve for directly over the answer choices.
3. **Label each additional column as necessary.** Create a table with columns when there are several steps needed to solve the problem.
4. **Work the steps of the problem.**
5. **When one answer works, STOP.** Since you're working with numbers only, you do not have to check every answer choice.

Example 1: PLUG IN THE ANSWER

1. If $\frac{20}{x-1} - \frac{18}{x+1} = 2$, what is the value of x?

A) 3
B) 4
C) 5
D) 6

Solution Strategy: Plug in the Answer

Step 1: Start with Answer Choice B or C by drawing an arrow to the left of the answer choice (except if the question asks for the greatest or smallest value – then start there).

Step 2: Put a Label over the answer choices..

Step 3: Label each additional column as necessary.

Step 4: Work the steps of the problem.

x	$\frac{20}{x-1}-\frac{18}{x+1}$		= 2?
A) 3			
↘ B) 4	$\frac{20}{4-1}-\frac{18}{4+1}$	$=\frac{20}{3}-\frac{18}{5}$	= 2 *No*
C) 5	$\frac{20}{5-1}-\frac{18}{5+1}$	$=\frac{20}{4}-\frac{18}{6}$	= 2 *Yes*
D) 6			

Step 5: When one answer works, STOP.

When Answer Choice C (5) is plugged in for x, we get 2.

Correct Answer: C

Example 2: PLUG IN THE ANSWER

2. At a bookstore, the owner sells paperback novels for $10 each and hardcover novels for $25 each. Altogether, she sold 120 novels for $2,250. How many paperback novels did she sell?

A) 50
B) 60
C) 70
D) 80

Solution Strategy: Plug in the Answer

Step 1: Bite-size

At a bookstore, the owner sells paperback novels for $10 each */* and hardcover novels for $25 each. */* Altogether, she sold 120 novels */* for $2,250 */*. How many paperback novels did she sell?

Step 2: Start with Answer Choice B or C by drawing an arrow to the left of the answer choice (except if the question asks for the greatest or smallest value – then start there).

Step 3: Put a Label over the answer choices.

Step 4: Label each additional column as necessary.

Step 5: Work the steps of the problem.

# paperback	# hardcover (120 minus paper)	$ paperback ($10)	$hardcover ($25)	Total = 2,250?
A) 50	70	$500	$1750	$2250 **Yes**
↘ B) 60	60	$600	$1500	$2100 **No**
C) 70	50	$700	$1250	$1950 **No**
D) 80				

- For Choice B. 2nd column: # hardcovers. Since total novels = 120, then if Answer Choice B were correct, the number of hardcovers would be 120 - 60 = 60.
- For Choice B. 3rd and 4th columns: cost of paperbacks and cost of hardcovers. Use the prices given in the question to calculate $600 as the cost for paperbacks and $1500 as the cost for hardcovers.
- For Choice B. Last column: Total Cost. Does it add to $2250? $1500 + $600 = $2100. Since that doesn't add to $2500, Answer Choice B is incorrect. Move on to Answer Choice A or C.
- For Choice C. If we now try Answer Choice C, we calculate the total cost as $1950.
- Since we now know that we're going in the wrong direction (we needed a higher cost than $2100 from Answer Choice B, not a lower cost), the answer choice must be A.

Step 5: When one answer works, STOP.

When Answer Choice A (50) is plugged in for the number of paperbacks, we get a total cost of $2,250.

Correct Answer: A

Practice: PLUG IN THE ANSWER

1. If $x > 0$, which of the following is a solution to the equation $(x-4)^2 - 121 = 0$?

A) 7
B) 11
C) 15
D) 16

$$\frac{3}{a} - 13 = 10a$$

2. What is the value of a in the given equation?

A) 0.2
B) 0.3
C) 1.2
D) 1.3

3. A company charges a flat rate of $30 plus $0.50 per mile driven for their delivery service. If your budget for a delivery is $150, what is the farthest distance, to the nearest mile, that the company can deliver your package?

A) 240 miles
B) 270 miles
C) 280 miles
D) 290 miles

4. What is the solution to the equation $7 + 6(5x)^{\frac{1}{3}} = 37$?

A) 13
B) 25
C) 31
D) 49

5. In a marathon, the first half of the race is 3 kilometers shorter than the second half. If the total length of the marathon is 42 kilometers, how long is the first half of the race?

A) 18 km
B) 19.5 km
C) 20 km
D) 21 km

6. If the expression $4x^2 - 3x - 7 = 0$, then which of the following is the least value of x?

A) -1
B) $\frac{1}{2}$
C) $\frac{3}{2}$
D) 2

7. The length of a rectangle is 3 meters longer than twice its width. If the perimeter of the rectangle is 30 meters, what is the length of the rectangle?

A) 8 m
B) 9 m
C) 10 m
D) 11 m

$$6x - 12ax = 18$$

8. In the given equation, a is a constant. The equation has no solution. What is the value of a?

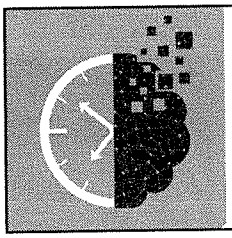
A) 0
B) $\frac{1}{2}$
C) $\frac{3}{2}$
D) 2

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 20: BASIC ALGEBRA

Section: Math
Question Subsection: Algebra and Functions
Question Category: Basic Algebra
Of the 44 Math questions, approximately 6 - 10 may be questions from this category.

While Plugging In and Plugging In The Answer are very useful techniques, you will still need to know how to do basic algebra.



The Curvebreakers Strategy

ISOLATE THE VARIABLE

1. Isolate the Variable
2. Use PEMDAS for the order of operations (Parentheses, Exponents, Multiplication, Division, Addition, Subtraction)
3. Combine Like Terms
4. Perform the same operation on both sides of the equation
5. Know how to Cross Multiply

Example 1: Basic Algebra

1. What is the solution to the equation: $x = \frac{x+6}{3}$?

A) 0.5
B) 1
C) 1.3
D) 3

Solution Strategy: Isolate the Variable

Step 1: Isolate the variable. First, multiply both sides by the reciprocal 3, or get the equation into a format where we can cross multiply:

$$\frac{x}{1} = \frac{x+6}{3}$$

$$3x = x + 6$$

Step 2: Isolate the x by first subtracting x from both sides and then dividing by 3:

$$\begin{array}{r} 3x = x + 6 \\ \underline{-x \quad -x} \\ 2x = 6 \\ x = 3 \end{array}$$

Correct Answer: D

Example 2: Basic Algebra

2. If $z = xy + 4$, then what is the value of x, in terms of y and z?

A) $\frac{y}{z-4}$

B) $\frac{y}{z+4}$

C) $\frac{z-4}{y}$

D) $\frac{z+4}{y}$

Solution Strategy: Isolate the Variable

Step 1: Cross out "in terms of." Underline what it is we're looking for (x).

If $x = xy + 4$. What is the value of x, ~~in terms of y and z~~?

Step 2: First isolate the x by subtracting 4 from both sides:

$$z = xy + 4$$
$$-4 \qquad -4$$
$$z - 4 = xy$$

Step 3: Next divide both sides by y to get x by itself:

$$\frac{z-4}{y} = \frac{xy}{y}$$
$$\frac{z-4}{y} = x$$

Correct Answer: C

Practice: Basic Algebra

1. What is the value of x if $\frac{5(x-1)}{4} - 1 = 0$?

A) $\frac{4}{9}$

B) $\frac{5}{9}$

C) $\frac{9}{5}$

D) $\frac{9}{4}$

2. If $\frac{3}{2x} - \frac{1}{4} = 2$ then $x = ?$

A) $\frac{1}{2}$

B) $\frac{2}{3}$

C) 2

D) 3

3. Mara bought 6 identical backpacks for her family trip. She used a coupon for $72 off the entire purchase. The cost for the entire purchase after using the coupon was $168. What was the original price, in dollars, for 1 backpack?

4. If $AB = \frac{1}{2}xy^2$, which of the following gives the value of y, in terms of AB and x?

A) $y = \sqrt{\frac{x}{2AB}}$

B) $y = \sqrt{\frac{AB}{2x}}$

C) $y = \sqrt{\frac{2AB}{x}}$

D) $y = \frac{2AB}{x}$

5. The formula for converting degrees Celsius (C) to degrees Fahrenheit $F = \frac{9}{5}C + 32$. Which of the following expressions gives the value of C in terms of F?

A) $\frac{5}{9}(F - 32)$

B) $\frac{9}{5}F - 32$

C) $\frac{9}{5}F + 32$

D) $\frac{F - 32}{5}$

6. What is the least value of $x + 11$ if $|2x - 3| = 19$.

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 21: SLOPE INTERCEPT FORM OF A LINE

Section: Math
Question Subsection: Algebra and Functions
Question Category: Slope Intercept Form of a Line
Of the 44 Math questions, approximately 3 - 6 may be questions from this category.

LESSON

The 2 basic things you need to know in order to solve Linear Equations:

1. The Equation of a Straight Line:

$$y = mx + b$$

Where m = **the slope** and b = **the y-intercept**
The slope (m) represents how quickly the line is changing.
The y-intercept *(b)* is the point where the line crosses the y-axis, i.e. when the value of $x = 0$.
When asked to find the slope or y-intercept, you must first get the equation into the $y = mx + \mathrm{b}$ format by isolating the y.

2. To calculate the Slope:

$$\frac{y_2 - y_1}{x_2 - x_1}$$

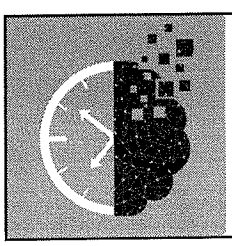
Slope is often also referred to as $\frac{rise}{run}$ or $\frac{change\ in\ y}{change\ in\ x}$.

It does not matter which value you use as y_2 first as long as you make sure to match it with x_2.

Meaning of Parallel and Perpendicular Lines
Parallel lines never touch and therefore have the same slope and no solutions;
Perpendicular lines have negative reciprocal slopes and one solution.

Linear Word Problems
Many Word problems are often just different ways of presenting a Linear Equation.
Slope will be represented by words like "increase/decrease," "per," "each," "every," "additional." Y-intercept will be represented by words like "initial," "beginning," "starting," or "zero" as the independent variable.

TIP: On the test, linear equations will often use different variables than x and y. In these instances, determine which value is acting as your y and which one is acting as your x. The y, which is your dependent variable, is typically alone on one side of the equation.



The Curvebreakers Strategy

WRITE OUT THE FORMULAS REQUIRED

1. Write out the equation of a straight line
2. Write out the slope formula

Example 1: Slope Intercept Form of a Line

1. In the standard (x,y) coordinate plane, what is the slope of a line that is perpendicular to a line passing through the points (-3,5) and (1,-1)?

A) $-\frac{3}{2}$

B) $-\frac{1}{3}$

C) $\frac{2}{3}$

D) 3

Strategy: Write out the slope formula

Step 1: Write out the slope formula:

$$\frac{y_2 - y_1}{x_2 - x_1}$$

Step 2: Calculate the slope:

We're given the points (-3,5), (1,-1)

$$\frac{(-1)-(5)}{(1)-(-3)} = \frac{-6}{1+3} = \frac{-6}{4} = \frac{-3}{2}$$

Step 3: Since we're looking for the slope of a line PERPENDICULAR to this line, the slope is the negative reciprocal.

$$= \frac{2}{3}$$

Correct Answer: C

Example 2: Slope Intercept Form of a Line

2. The function $p(t) = 5t + 10$ models the number of people who visit a museum over time. Which of the following best describes the meaning of the number 5 in the equation?

A) The number of people who visited the museum on the first day it opened
B) The average number of people who visit the museum each week
C) The total number of people who have visited the museum since it opened
D) The approximate increase in the number of people who visit the museum each day

Strategy: Write out the equation of a straight line

Step 1: Recognize that the function is a linear equation:

Think of $p(t) = 5t + 10$
As $y = mx + b$

Therefore, the slope is 5 and the y-intercept is 10, and we are asked the meaning of the slope. The slope represents the approximate increase in the number of people who visit the museum each day.

Correct Answer: D

Practice: Slope Intercept Form of a Line

1. Which of the following is the equation of a line parallel to the line with equation $y = -3x + 2$?

A) $y = 3x + 2$

B) $y = -3x - 4$

C) $y = -2x + 4$

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

2. If $f(x)$ is a linear function such that $f(-2) = 8$ and $f(4) = -2$, what is the slope of the graph of $y = f(x)$?

A) $-\frac{1}{4}$

B) $-\frac{5}{3}$

C) $\frac{1}{4}$

D) 6

3. Which of the following is the equation of a line perpendicular to the line with equation $2x + 5y = 10$?

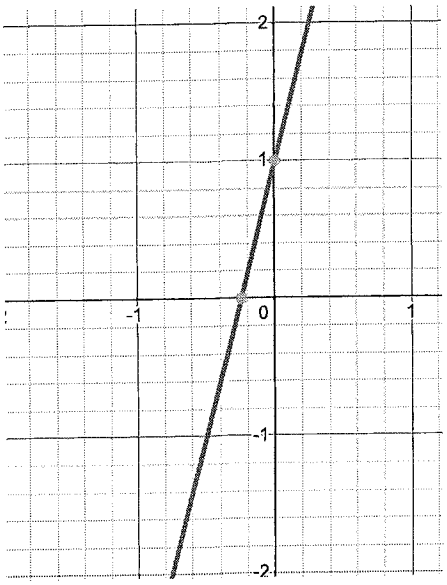
A) $5x - 2y = 5$
B) $2x - 5y = 10$
C) $-2x - 5y = 10$
D) $5x + 2y = 4$

4. A company's costs can be modeled by the equation P(x) = 20 + 3.5x, where x represents the number of units produced. Which of the following best describes the meaning of the number 20 in the equation?

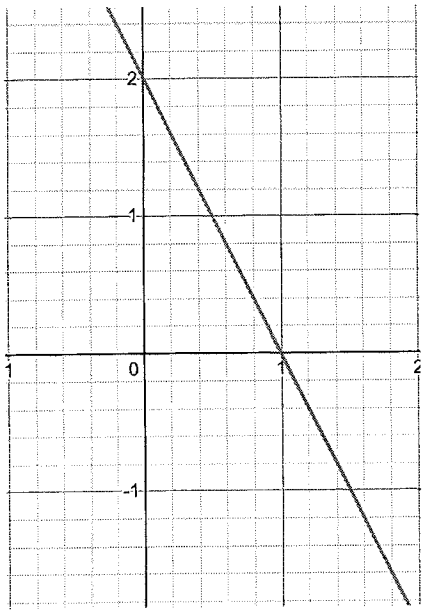
A) The revenue generated by selling 3.5 units
B) The cost of producing one unit
C) The fixed costs incurred by the company
D) The increase in cost for each 3.5 units produced

5. Which of the following could be the graph of the linear equation $\frac{3}{2}y - 6x = -3$?

A)



B)



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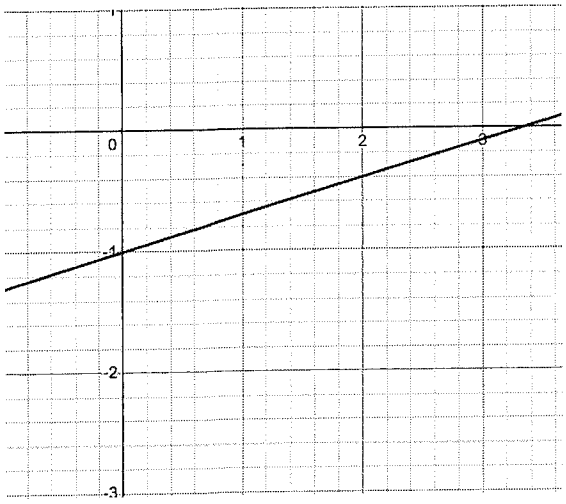
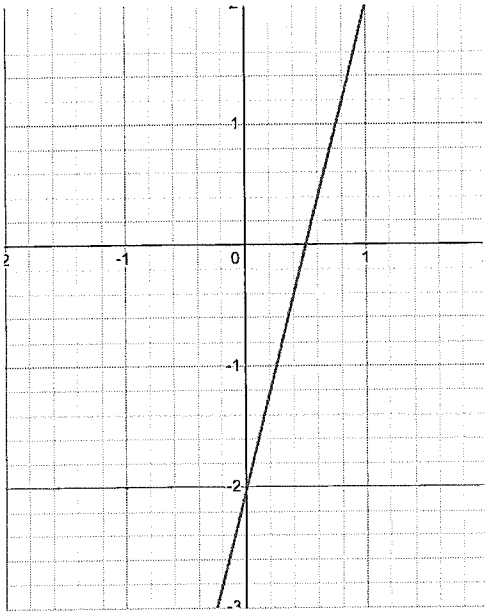
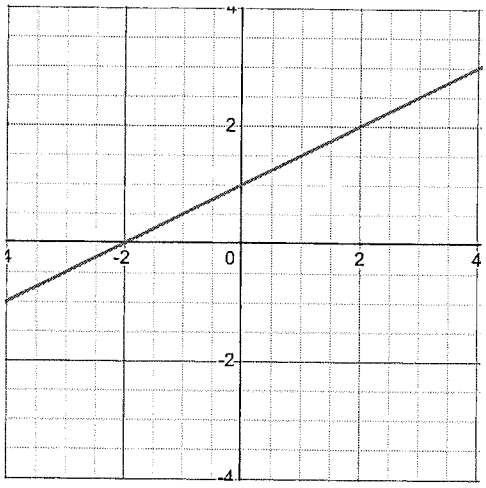


D)

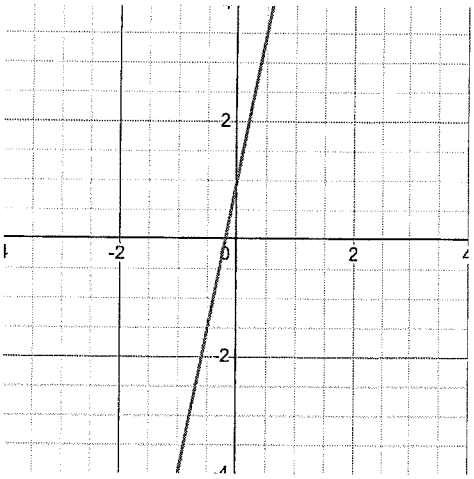


6. If m is a constant less than 0, which of the following could be the graph of $y = 2m(x+y)$?

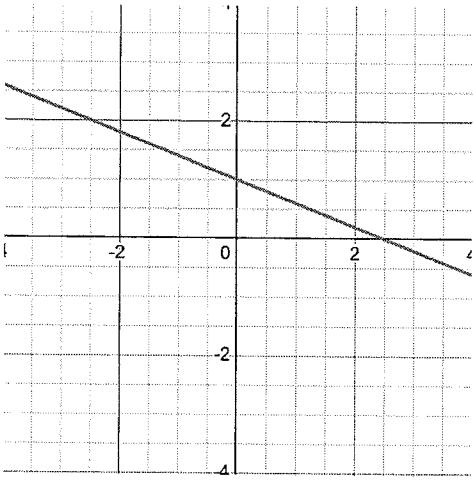
A)



B)



C)



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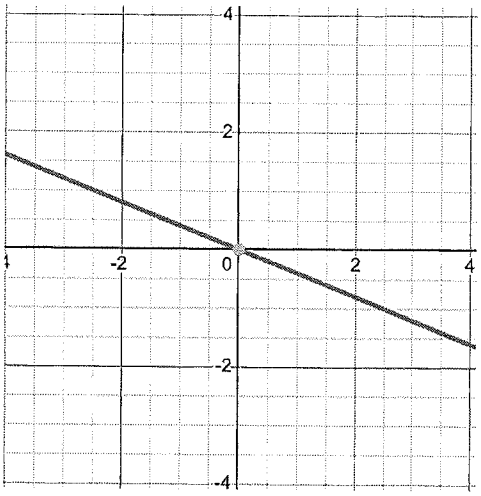


For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 22: PROPORTIONS

Section: Math
Question Subsection: Numbers and Operations
Question Category: Proportions
Of the 44 Math questions, approximately 2 - 5 may be questions from this category.

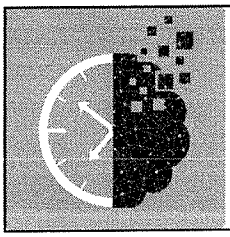
LESSON

When two ratios or fractions are equal in value, they are said to be in proportion.

Set up a proportion when given one complete relationship between two variables and one incomplete relationship between two variables of the same kind. Ratios can be written several ways. For example, a one to two ratio can be written as:

$\frac{1}{2}$, 1:2, or 1 to 2.

Proportions can pop up in a number of scenarios. They can be part of a word problem (recipes and surveys are common) or part of a geometry problem (like questions involving similar triangles or scale drawings). The key to solving proportion questions is to always keep things consistent and properly arranged by physically writing the units, both top and bottom.



The Curvebreakers Strategy

WRITE OUT BOTH TOP AND BOTTOM UNITS

1. Separate the text into bite-sized pieces.
2. When you are given one complete relationship and one incomplete relationship, set up a proportion. Write the units for both the numerator and denominator to ensure you're comparing apples to apples.
3. Cross multiply.

Example 1: Proportions

1. If 5 pens cost $3, how many pens can be bought for $12?

A) 20
B) 15
C) 10
D) 5

Strategy: Write out both top and bottom units

Step 1: Separate the text into bite-sized pieces.

If 5 pens cost \$3, *I* how many pens can be bought for \$12?

Step 2: When you are given one complete relationship and one incomplete relationship, set up a proportion. Write the units for both the numerator and denominator to ensure you're comparing apples to apples.

$$\frac{5\ pens}{\$3} = \frac{x\ pens}{\$12}$$

Step 3: Cross multiply.

$3x = 60$ pens
$x = 20$

Correct Answer: A

Example 2: Proportions

2. If Jayden walks 14.5 inches in one step, approximately how many feet will he walk in 100 steps?

A) 12
B) 15
C) 121
D) 1,450

Strategy: Write out both top and bottom units

Step 1: Separate the text into bite-sized pieces.

If Jayden walks 14.5 inches in one step *I* , approximately how many feet will he walk in 100 steps?

Step 2: When you are given one complete relationship and one incomplete relationship, set up a proportion. Write the units for both the numerator and denominator to ensure you're comparing apples to apples.

$$\frac{14.5\ inches}{1\ step} = \frac{x\ inches}{100\ steps}$$

Step 3: Cross multiply.

$x = 1{,}450$ inches

Step 4: Since we are asked for feet and not inches, we can set up another proportion to convert inches to feet:

$$\frac{12\ inches}{1\ foot} = \frac{1{,}450\ inches}{x\ feet}$$

Cross multiply to get $12x = 1{,}450$ inches.
Divide both sides by 12 to get $x = 120.8$ feet

Correct Answer: C

Practice: Proportions

1. A container holds 2 liters of liquid. If 3/4 of the container is filled with liquid, how many liters of liquid are in the container?

A) 1.5 liters
B) 1.8 liters
C) 2.25 liters
D) 2.67 liters

2. A car is traveling at a constant rate of 60 feet per second. How long will it take the car to travel 1/4 mile at this rate? (Note: 1 mile = 5,280 feet)

A) 6 seconds
B) 11 seconds
C) 22 seconds
D) 44 seconds

3. If the ratio of 6a to 4b is 1 to 5, what is the ratio of 2a to b?

A) 1 to 5
B) 3 to 5
C) 4 to 15
D) 12 to 1

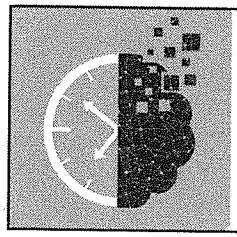
For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 23: FUNCTIONS

Section: Math
Question Subsection: Algebra and Functions
Question Category: Functions
Of the 44 Math questions, approximately 3 - 5 may be questions from this category.

LESSON

A function is a relationship between inputs where each input is related to exactly one output. It is a way to produce an ordered pair: an x value and a y value. For example, f(2) = 10 produces the coordinates (2,10); when you input 2 into the function, you get an output of 10. If functions seem confusing to you, think of the function f(x) as y.



The Curvebreakers Strategy

THINK OF f(x) AS y

1. Think of f(x) as the value of y when you input x into the equation.
2. Determine the x and y values of both coordinates, and fill in the equation.

Example 1: Functions

1. The function g is defined by $g(x) = 5x - 3$ for all values of x. What is the value of $g(2) + g(7)$?

A) 9
B) 28
C) 39
D) 41

Solution Strategy: "THINK OF f(x) as y"

Step 1: Think of $g(x)$ as the value of y when you input x into the equation.

$g(x) = 5x - 3$
$y = 5x - 3$

Step 2: Calculate $g(2)$

When we input x = 2 into the equation, what is the value of y?

$y = 5x - 3$
$y = 5(2) - 3 = 7$
Therefore $g(2) = 7$

Step 3: *Calculate* $g(7)$

When we input $x = 7$ into the equation, what is the value of y?

$y = 5x - 3$
$y = 5(7) - 3 = 32$
Therefore $g(7) = 32$

Step 3: *Calculate* $g(2) + g(7)$

(7) + (32) = 39

Correct Answer: C

Example 2: Functions

2. In the linear function f, $f(2) = 7$ and $f(4) = 9$, which equation defines f?

A) $f(x) = 2x + 3$
B) $f(x) = x + 5$
C) $f(x) = 3x + 1$
D) $f(x) = 5x + 1$

Solution

Step 1: *Determine the ordered pairs: the x and y values*

$f(2) = 7$ is (2,7)
$f(4) = 9$ is (4,9)

Step 2: *Write out the equation of a straight line*

$y = mx + b$

Step 3: *Write out the slope formula*

$$\frac{y_2 - y_1}{x_2 - x_1}$$

Step 4: *Calculate the slope*

$$\frac{(9) - (7)}{(4) - (2)} = \frac{2}{2} = 1$$

The only answer choice with a slope of 1 is Answer Choice B.
No additional work is necessary.

Correct answer: B

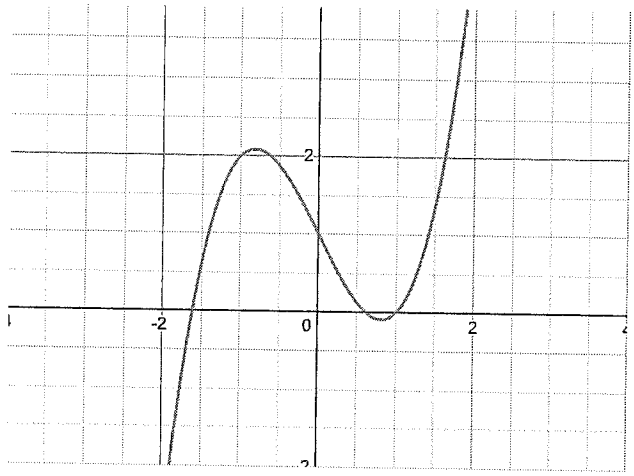
Practice: Functions

1. If $g(x) = 3x - 5$, then $g(4) =$?

A) 7
B) 9
C) 11
D) 13

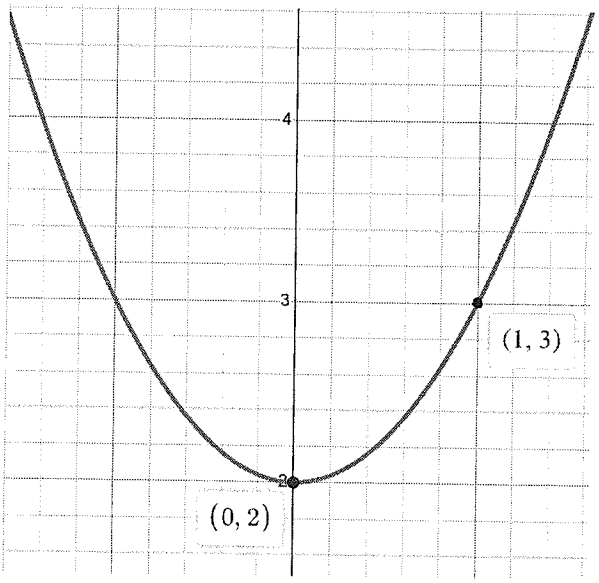
2. If $f(x) = 3x + 1$, what is one possible value of x for which $6 < f(x) < 22$?

A) 3
B) 7
C) 9
D) 10



3. The graph of $h(x)$ is shown above. What must be true about $h(x)$?

A) $h(0)$ is negative.
B) $h(0)$ has two values.
C) $h(x)$ has three solutions for which $h(x) = 0$.
D) $h(2)$ is zero.



4. If the figure above is the graph of $y = f(x)$, which of the following could be the equation of $f(x)$?

A) $f(x) = (x + 2)^2$
B) $f(x) = (x - 2)^2$
C) $f(x) = (x + 4)^2$
D) $f(x) = x^2 + 2$

5. If g is a function and $g(4) = 9$, which of the following CANNOT be the definition of g?

A) $g(x) = x^2 - 7x + 21$
B) $g(x) = 3x - 3$
C) $g(x) = -4x + 25$
D) $g(x) = x + 6$

x	f(x)
-2	4
-1	0
0	-2
1	-2
2	0

6. A function is plotted in the xy-plane. The function passes through the points in the table above. Which of these equations could represent the function?

A) $f(x) = 2x + 8$
B) $f(x) = 2x^2 - 2$
C) $f(x) = (x - 2)(x + 1)$
D) $f(x) = x^2 - 3x + 2$

7. The function $h(x) = 1000(1.05)^x$ models the value, in dollars, of a certain investment account over time, where x is the number of years since the initial investment. Which of the following is the best interpretation of "$h(8)$ is approximately equal to 1,478" in this context?

A) The value of the investment account is estimated to be approximately $1,478 in 8 years.
B) The value of the investment account is estimated to be approximately $8,780 in 8 years.
C) The investment account is estimated to increase in value by approximately $1,478 every year.
D) The investment account is estimated to increase in value by approximately 47.8% after 8 years.

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 24: SYSTEMS OF EQUATIONS

Section: Math
Question Subsection: Algebra and Functions
Question Category: Systems of Equations
Of the 44 Math questions, approximately 3 - 6 may be questions from this category.

LESSON

Systems of Equations are two or more equations with two or more variables. On the test, you will mostly encounter linear systems: 2 lines with 2 variables and neither variable will be raised to a larger power than 1.

Before we discuss the methods for solving, let's first discuss the possible outcomes for a linear system:

1. **One Solution**: 2 distinct lines with the solution being the point at which the lines intersect.
2. **No Solutions**: these lines never intersect; therefore, they are parallel and have the same slope.
3. **Infinite Solutions**: these lines are identical – they may not appear identical at first glance, but if they were to be simplified or rearranged, they would be equivalent.

While there are several ways to solve a system, we will discuss the 3 main ways:

A. **Substitution**

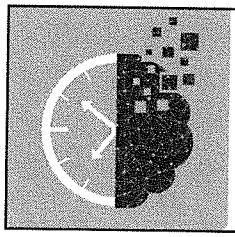
Replace one variable with an expression that contains the other variable.

B. **Stack and Solve**

Place one equation on top of the other, in the same format, and add the equations together to cancel one of the variables. You may have to manipulate one or both equations to get them in a format that, when added, one of the variables will add to 0. Once you solve for one variable, plug it back into one of the equations to solve for the second variable.

C. **Graphing the Intersection**

Any function that relates two variables can be graphed on your calculator. First, rewrite the equations in the standard $y=mx+b$ format. You can then graph the equations as functions and find the intersection. After graphing the lines, use either the "intersection" or "table" function to find the intersection (or solution).



The Curvebreakers Strategy

SUBSTITUTE, STACK, OR GRAPH

1. With Substitution, replace one variable with an expression that contains the other variable.
2. With Stack & Solve, add the equations together to cancel out one of the variables.
3. With Graphing, graph the lines and find the intersection.

Example 1: Substitute

1. If $a = 2b + 3$ and $b = 5a + 1$, what is the value of a?

A) $-\frac{5}{9}$

B) $-\frac{2}{9}$

C) $\frac{2}{9}$

D) $\frac{5}{9}$

Solution Strategy: Substitute

Step 1: With Substitution, replace one variable with an expression that contains the other variable.

Whenever we see the variable b, replace it with $5a + 1$.

$$\begin{aligned} a &= 2(5a + 1) + 3 \\ a &= 10a + 2 + 3 \\ a &= 10a + 5 \\ -10a &\quad -10a \\ \hline -9a &= 5 \\ a &= -\frac{5}{9} \end{aligned}$$

Correct Answer: A

Example 2: Stack and Solve

$$9x + 5y = 22$$
$$7x - 5y = 10$$

2. For the solution (x,y) to the system of equations above, what is the value of $x - y$?

A) $-\frac{5}{14}$

B) $\frac{6}{5}$

C) $\frac{14}{5}$

D) 14

Solution Strategy: Stack and Solve

Step 1: With Stack & Solve, add the equations together to cancel out one of the variables.

$$\begin{aligned} 9x + 5y &= 22 \\ \underline{7x - 5y} &= \underline{10} \\ 16x &= 32 \\ x &= 2 \end{aligned}$$

Step 2: Substitute $x = 2$ into one of the equations to find the value of y.

$$\begin{aligned} 9(2) + 5y &= 22 \\ 18 + 5y &= 22 \\ -18 &\quad -18 \\ 5y &= 4 \\ y &= \frac{4}{5} \end{aligned}$$

Step 3: Solve $x - y$

$$(2) - (\frac{4}{5}) = \frac{10}{5} - \frac{4}{5} = \frac{6}{5}$$

Correct Answer: B

Practice: Systems of Equations

1. If $2x + y = 5$ and $y = 3x - 2$, what is the value of x?

A) -1

B) $-\frac{2}{5}$

C) $\frac{1}{5}$

D) $\frac{7}{5}$

$$2b = 1 - 3a$$
$$-5 - a = 2b$$

2. Based on the system of equations above, what is the value of ab?

A) -12
B) -1
C) -7
D) 7

$$2x + 3y = 12$$
$$-y + 4x = 10$$

3. The solution to the given system of equations is (x,y). What is the value of $y - x$?

$$4x - 3y = 12$$
$$8x - 6y = 24$$

4. How many solutions does the above system of equations have?

A) 0
B) 1
C) 2
D) Infinitely many solutions

5. A convenience store sells bags of chips and bottles of soda. On Monday, Aroze bought 10 bags of chips and 12 bottles of soda for $22.50, and on Tuesday he bought 6 bags of chips and 9 bottles of soda for $14.25. If the cost of a bag of chips and a bottle of soda is the same for all purchases, what is the cost of 16 bags of chips and 21 bottles of soda?

A) $36.75
B) $46.25
C) $59.25
D) $61.50

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

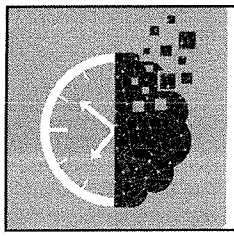
CHAPTER 25: INEQUALITIES

Section: Math
Question Subsection: Numbers & Operations
Question Category: Inequalities
Of the 44 Math questions, approximately 1 - 2 may be questions from this category.

LESSON

Treat an inequality like a regular equation with an = sign; the process for isolating the variable is the same as a standard equation.

Greater Than	$>$
Greater Than or Equal To	$\geq$
Less Than	$<$
Less Than or Equal To	$\leq$



The Curvebreakers Strategy

REMEMBER TO FLIP THE SIGN

Just remember to FLIP THE SIGN when multiplying or dividing by a negative number.

Example: Inequalities

If $-3y + 7 > 19$, which of the following describes all possible values of y?

A) $y < 4$
B) $y < -5$
C) $4 > y$
D) $-4 > y$

Solution Strategy: Remember to Flip the Sign

Step 1: Subtract 7 from both sides.

$$\begin{array}{r} -3y + 7 > 19 \\ \underline{\quad -7 \quad -7} \\ -3y \quad > 12 \end{array}$$

Step 2: Divide both sides by -3. Remember to flip the direction of the inequality since we're dividing by a negative number.

$$\frac{-3y}{-3} > \frac{12}{-3}$$

$$y < -4$$

which can be rewritten as:
$-4 > y$

Correct Answer: D

Practice: Inequalities

1. If $6x + 2 < 26$, then which of the following is a possible value for x?

A) 3.5
B) 4
C) 4.5
D) 5

2. What is the greatest value of y for which $|y + 3| \leq 2$?

A) -1
B) -2
C) -3
D) -5

3. If $x > 9$, which of the following is the smallest?

A) $\frac{3}{x}$

B) $\frac{x}{3}$

C) $\frac{x}{9}$

D) $\frac{10-x}{x}$

For answer explanations to these practice questions, go to
curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 26: QUADRATICS

Section: Math
Question Subsection: Numbers and Operations
Question Category: Quadratics
Of the 44 Math questions, approximately 2 - 4 may be questions from this category.

LESSON

1. A **quadratic** equation is an equation of the second degree, meaning it contains at least one term that is squared. A quadratic function's graph looks like a parabola, and its equation has the form:

$$y = ax^2 + bx + c$$

with a, b, and c being constants, or numerical coefficients, and x is an unknown variable.

If a is positive: parabola opens upward

If a is negative: parabola opens downward

2. Know how to factor a quadratic using the **FOIL** method (First, Outer, Inner, Last). Set the function equal to zero and solve. When the leading coefficient is equal to 1, find two integers that multiply to c and add to b. Don't get confused by the wording in the question: zeros, roots, solutions, x-intercepts all mean the same thing.

$$(a + b)(c + d) = ac + ad + bc + bd$$

3. If a quadratic is difficult to factor using the FOIL method, the formula is:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- The **discriminant** is the part of the quadratic formula underneath the square root symbol: $b^2 - 4ac$. The discriminant tells us whether there are two solutions, one solution, or no solutions.

$b^2 - 4ac < 0$	The equation has 0 real solutions. The graph does not cross the x-axis.
$b^2 - 4ac = 0$	The equation has 1 real solution. The graph crosses the x-axis at 1 point.
$b^2 - 4ac > 0$	The equation has 2 real solutions. The graph crosses the x-axis at 2 points.

4. There are 2 ways to find the **vertex** of the parabola (the vertex of a parabola is the minimum or maximum point of the equation).

A. To find the vertex of a parabola from the General Form $y = ax^2 + bx + c$, use the formula

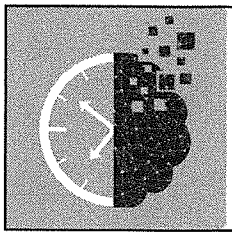
$$x = \frac{-b}{2a}$$

Then, once you find the x-coordinate of the vertex, plug it into the General Form to find the y-coordinate.

B. Or use the Standard Form of a parabola to find the vertex. The Standard form is:

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

where a is a constant and (h,k) is the vertex of the parabola.



The Curvebreakers Strategy

KNOW THE BASIC EQUATIONS

1. General Form: $y = ax^2 + bx + c$
2. FOIL method: $(a + b)(c + d) = ac + ad + bc + bd$
3. Standard Form: $y = a(x - h)^2 + k$
4. Discriminant: $b^2 - 4ac$
5. x-coordinate of Vertex: $x = \frac{-b}{2a}$

Example 1: Quadratics

1. What is the sum of the distinct possible values of x for the equation $x^2 - x - 12 = 0$?

A) –4
B) –3
C) 4
D) 1

Solution Strategy: FOIL

Step 1: Understand the question. Since we are asked to find the sum of the distinct possible values of x, we need to find both solutions and add them together.

Step 2: Use the FOIL method to find 2 numbers that multiply to -12 and add to -1. The numbers that work are -4 and +3 as follows:

$(x - 4)(x + 3) = 0$

Step 3: Set both equations equal to 0 to solve for x:

$(x - 4) = 0$; $(x + 3) = 0$
Therefore $x = 4$; $x = -3$

Adding the two solutions together gives us: $4 + (-3) = 1$

Correct Answer: D

Example 2: Quadratics

$$4x^2 + 8x + c = 0$$

2. In the given equation, c is a constant. The equation has exactly one solution. What is the value of c?

A) -2
B) -1
C) 2
D) 4

Solution Strategy: Know the discriminant rules

Step 1: To determine the value of c, we can use the discriminant:

$b^2 - 4ac$

where a, b, and c are the coefficients of the quadratic equation $a^2+bx + c = 0$.

Step 2: Substitute known values into the discriminant formula.

For the given equation, $a = 4$, $b = 8$, *and* $c = c$.
Substituting these values into the discriminant formula, we have:
$(8)^2 - 4(4)(c)$

$64 - 16c$

Step 3: Set the discriminant formula to zero (one solution).

$$\begin{array}{r} 64 - 16c = 0 \\ +16c \quad +16c \\ \hline 64 = 16c \\ 4 = c \end{array}$$

Correct Answer: D

Practice: Quadratics

1. What is the product of the distinct possible values of y for the equation $y^2 + 6y + 5 = 0$?

A) –6
B) –1
C) 5
D) 6

2. If $\sqrt{x^2 - 11x + 34} = 4$, then what are the roots of the equation?

A) $x = 2; x = -4$
B) $x = -2; x = 9$
C) $x = 2; x = -9$
D) $x = 2; x = 9$

3. One of the factors of $2x^3 + 6x^2 - 20x$ is $x + k$ where k is a positive constant. What is the value of k?

A) -5
B) 2
C) 3
D) 5

$3x^2 - 5x + 7 = 0$

4. How many distinct real solutions does the given equation have?

A) Exactly one
B) Exactly two
C) Infinitely many
D) Zero

5. The equation $x^2 - 20x + c = 0$ has no real solutions if $c > n$. What is a possible value of n?

A) 99
B) 101
C) 103
D) 104

6. The function $g(x) = (x - 7)(x + 4)$ is defined by the given equation. For what value of x does $g(x)$ reach its minimum?

A) $-\frac{7}{4}$
B) $-\frac{4}{7}$
C) $\frac{3}{2}$
D) 4

7. The equation $f(x) = 2x^2 - 12x + 18$ defines the function f. For what value of x does $f(x)$ reach its minimum?

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 27: GRAPHS

Section: Math
Question Subsection: Data, Statistics, & Probability
Question Category: Graphs
Of the 44 Math questions, approximately 2 - 5 may be questions from this category.

LESSON

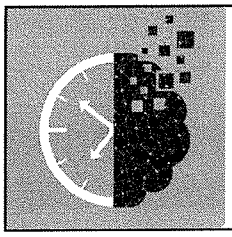
There are often several ways to solve graphing problems. Choose the method that will get you to the answer in the least amount of time.

1. **Observation**: Oftentimes you can answer graph questions by simply viewing the trends or the data points in the graph.
2. **Know the Transformation Rules**: Just knowing the main transformation rules can get you to the correct answer choice without requiring calculations (see below).
3. **Use your Graphing Calculator:** Plug the values into your calculator and match the graph generated with the graph in the question.
4. **Process of Elimination:** For example, if you are presented with a parabola, eliminate answer choices related to linear equations.
5. **Plug In:** You may be given data points that you can use to plug into equations in the answer choices to find the correct answer.

TRANSFORMATION OF GRAPHS

In relation to $f(x)$:

- $f(x) + c$ is shifted upward c units in the xy-plane
- $f(x) - c$ is shifted downward c units in the xy-plane
- $f(x + c)$ is shifted to the left c units in the xy-plane
- $f(x - c)$ is shifted to the right c units in the xy-plane
- $-f(x)$ is flipped upside down over the x-axis
- $f(-x)$ is flipped left-right over the y-axis
- $|f(x)|$ the result of flipping upward all the parts of the graph that appear below the x-axis
- $a \cdot f(x)$ widens the graph if $|a| < 1$ and narrows the graph if $|a| > 1$

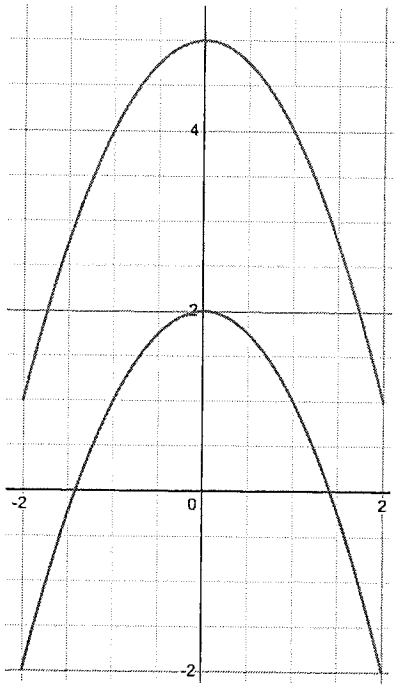


The Curvebreakers Strategy

SELECT THE QUICKEST OPTION TO SOLVE

1. Observation
2. Know the Transformation Rules
3. Use your Graphing Calculator
4. POE
5. Plug In

Example 1: Graphs



1. The graphs of the functions m (top) and n (bottom) are shown in the xy-plane above. Which of the following could be equal to $n(x)$?

A) $m(x+3)$
B) $m(x-3)$
C) $m(x)+5$
D) $m(x)-3$

Solution Strategy: Use the Transformation Rules

Step 1: Identify the quickest way to solve: Know the transformation rules.

Equations that represent the transformation of graphs that apply to this question are:

- $f(x)+c$ is shifted upward c units in the xy-plane
- $f(x)-c$ is shifted downward c units in the xy-plane
- $f(x+c)$ is shifted to the left c units in the xy-plane
- $f(x-c)$ is shifted to the right c units in the xy-plane

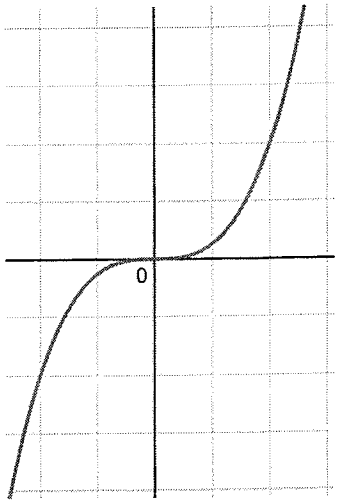
Step 2: Identify the relevant equation from the transformation rules.

Since $n(x)$ is shifting down what appears to be 5 units in relation to $m(x)$, the relevant equation is:

- $f(x)-c$ is shifted downward c units in the xy-plane

Correct Answer: D

Example 2: Graphs



2. Which of the following equations is depicted in the graph above?

A) $y = \frac{3x}{x^3} + 5$

B) $y = \frac{x^3}{4}$

C) $y = 2x + 4$

D) $y = (3x - 8)(3x + 1)$

Solution Strategy: Plug In

Step 1: *Identify the quickest way to solve:* POE and Plug In

Step 2: *Use POE to eliminate an answer choice(s).*

Answer Choice C is a linear equation and would be graphed as a line. This answer choice can be eliminated.

~~C) $y = 2x + 4$~~

Answer Choice D is a quadratic equation and would be graphed as a parabola. This answer choice can be eliminated.

~~D) $y = (3x - 8)(3x + 1)$~~

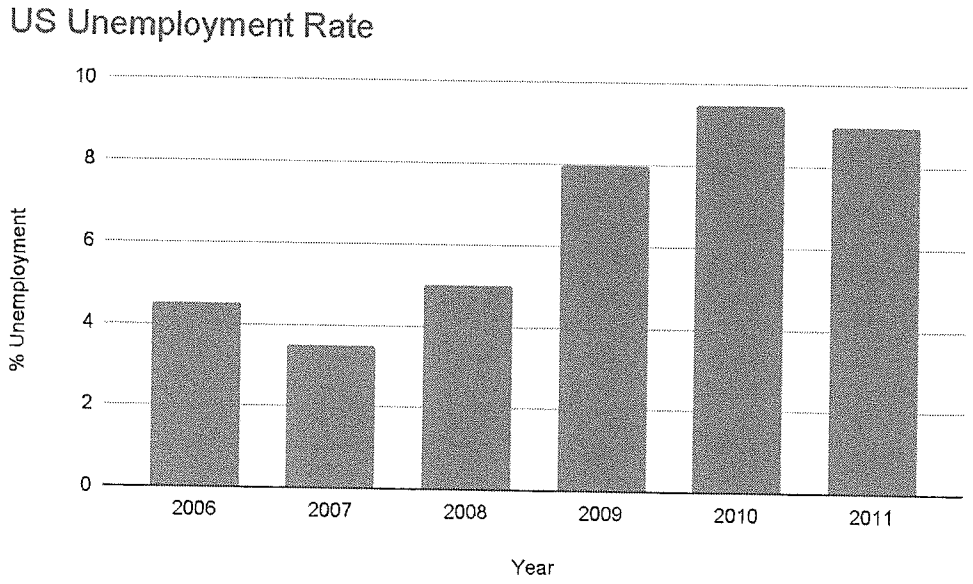
Step 3: *Plug In*

For the 2 remaining answer choices, we can just plug in values from the graph. Let's start with the easiest to visualize (0,0) where $x = 0$ and $y = 0$.

Only Answer Choice B works: $y = \frac{x^3}{5}$ $\quad (0) = \frac{(0)^3}{5}$

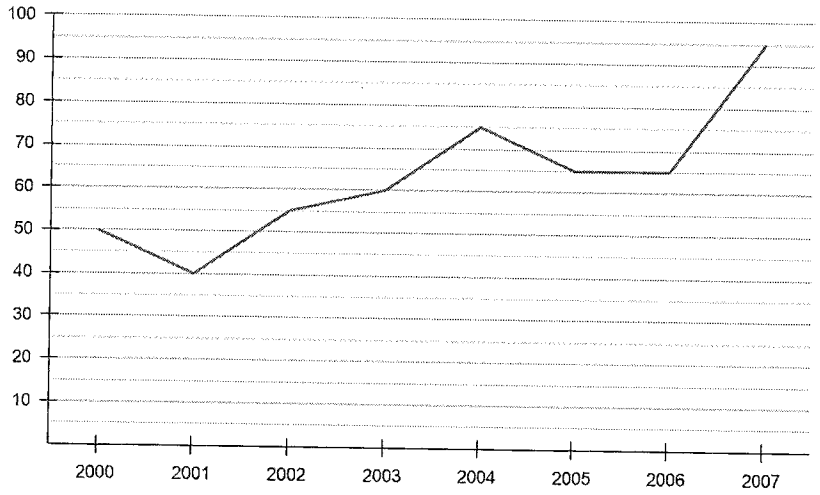
Correct Answer: B

Practice: Graphs



1. The bar graph above shows the U.S. unemployment rate from 2006 to 2011. Based on the data presented in the graph, which of the following statements is accurate?

A) The unemployment rate in 2006 was approximately double the unemployment rate in 2008.
B) The unemployment rate in 2006 was approximately one-third the unemployment rate in 2009.
C) The unemployment rate declined in 2011 as compared to 2008.
D) The unemployment rate in 2010 was higher than that of any other year listed.

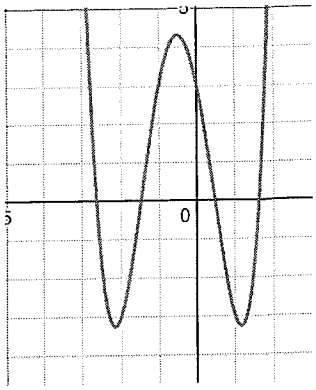


2. The line graph above shows the annual snowfall amounts (in inches) in a particular city from 2000 to 2007. According to the graph, what was the greatest change (in absolute value) in the annual snowfall amounts between two consecutive years?

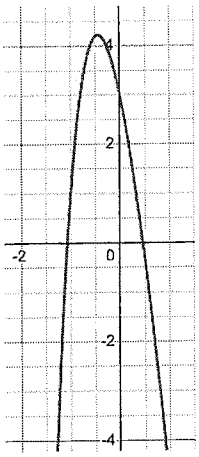
A) 30 inches
B) 45 inches
C) 55 inches
D) 95 inches

3. A certain function has 4 distinct zeros. Which of the graphs below could represent the function in the *xy*-plane?

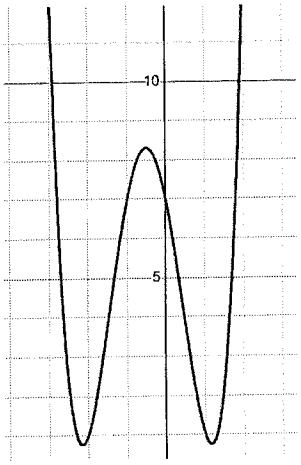
A)



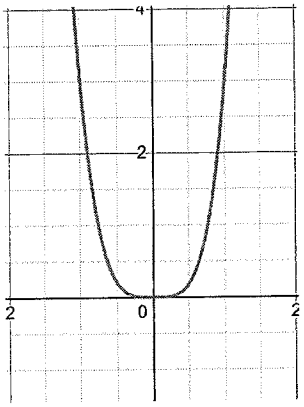
B)

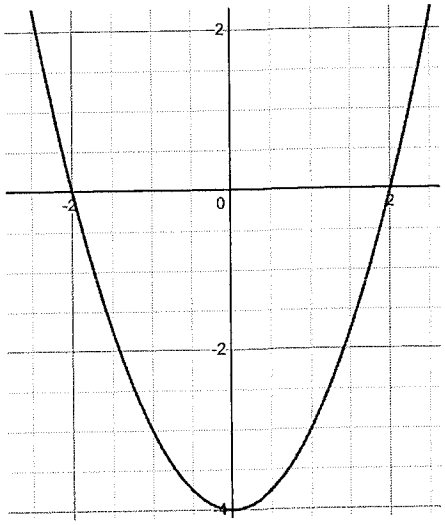


C)



D)





4. Which of the following equations best describes the graph above?

A) $f(x) = -x^2+4$
B) $f(x) = x^2 - 2x$
C) $f(x) = x^2 + 4$
D) $f(x) = x^2 - 4$

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 28: PERCENTS

Section: Math
Question Subsection: Numbers and Operations
Question Category: Percents
Of the 44 Math questions, approximately 2 - 5 may be questions from this category.

LESSON

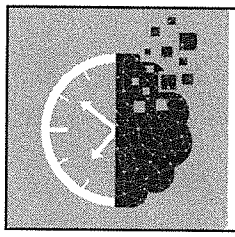
Percents are used to indicate portions of a whole.
To solve questions with percents, translate the text into a mathematical equation. Replace the words from the left of the table with the elements in an equation from the right of the table.

Rewrite the text as an equation:

TEXT	EQUATION
PERCENT	/100 (over 100)
OF	. (multiply)
IS	= (equals)
WHAT, HOW MUCH, HOW MANY, ETC.	x (variable)

Exponential Growth Formula: $A = I(1 \pm r)^t$

I represents Initial Value, r represents Rate, t represents Time, and A represents the final value of growth.



The Curvebreakers Strategy

TRANSLATE THE TEXT INTO A MATH EQUATION

1. Whenever you see the word "percent" in the question, it means to put it over 100.
2. Whenever you see the word "of" in the question, it means to multiply.
3. Whenever you see the word "is" in the question, it means equals.
4. Whenever you see the words "what, how much, how many, etc." in the question, this is the variable.

Example 1: Percents

1. 12 is approximately what percent of 8?

A) 67%
B) 140%
C) 150%
D) 167%

Solution Strategy: Translate

Step 1: Translate the text into a math equation.

English: 12 is approximately what percent of 8?
Math: 12 = $x/100 \cdot 8$

Step 2: Now we have a simple equation we can solve:

$$12 = (\frac{x}{100})(\frac{8}{1})$$

Let's put it into a format where we can cross multiply:

$$\frac{12}{1} = \frac{8x}{100}$$

$8x = 1200$, divide both sides by 8 to solve for x

$x = 150$

Correct Answer: C

Example 2: Percents

2. Ashanti earns $8.50 per hour as a cashier. She works 30 hours each week and has 20% of her total pay deducted for taxes. What is her weekly take-home pay?

A) $51.00
B) $204.00
C) $255.00
D) $315.25

Solution Strategy: Translate

Step 1: Separate the text into bite-sized pieces.

Ashanti earns $8.50 per hour / as a cashier. She works 30 hours each week / and has 20% of her total pay deducted / for taxes. What is her weekly take-home pay?

A) $51.00
B) $204.00
C) $255.00
D) $315.25

Step 2: Translate into a math equation.

$8.50 per hour x 30 hours = $255 earned per week

Calculate 20% of total pay to find how much is deducted. Translate the text to a math equation:

$\frac{20}{100} \cdot total\ pay = \frac{20}{100} \cdot \$255 = \$51$ deducted for taxes

Subtract taxes from total earned:

$255 - 51 = 204$

Correct Answer: B

Practice: Percents

1. If Camryn uses a 30% off coupon for a dress that originally cost $80, how much will the dress be before tax and shipping fees?

A) $24.00
B) $50.00
C) $56.00
D) $104.00

2. If 30 percent of a number P is 90, what is 0.5 percent of P?

A) 0.15
B) 1.5
C) 15
D) 45.0

3. The number x is 120% greater than the number y. The number y is 80% less than 60. What is the value of x?

A) 2.2
B) 12.0
C) 26.4
D) 48.0

	Men	Women
Prefer Tea	23	19
Prefer Coffee	169	192
Total	192	211

4. The table above shows the number of individuals who prefer tea or coffee by gender in a certain cafe. What percent of all individuals in this cafe, rounded to the nearest percent, are male coffee drinkers?

A) 12
B) 42
C) 80
D) 88

5. 900 is r % greater than 200. What is the value of r?

A) 350
B) 400
C) 500
D) 700

6. Aliyah has $5,000 in her savings account. Each month, she gains 0.8% in interest. After 2 months, she deposits $1,200 into her account. Which is closest to the amount of money in Aliyah's savings account after two months?

A) $5,040.00
B) $5,080.32
C) $6,280.32
D) $7,032.00

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 29: EXPONENTS AND RADICALS

Section: Math
Question Subsection: Numbers and Operations
Question Category: Exponents and Radicals
Of the 44 Math questions, approximately 2 - 5 may be questions from this category.

LESSON

Remember this acronym for the most commonly tested rules for exponents:

MADSPM

When the bases are the same:
MULTIPLY/ADD DIVIDE/SUBTRACT POWER/MULTIPLY

MULTIPLY/ADD $a^x a^y = a^{x+y}$

DIVIDE/SUBTRACT $\frac{a^x}{a^y} = a^{x-y}$

POWER/MULTIPLY $(a^x)^y = a^{xy}$

Other Exponent and Radical Rules to Remember:

$$1^{396} = 1$$

$$15^0 = 1$$

$$2^{-2} = \frac{1}{2^2}$$

$$16^{\frac{1}{2}} = \sqrt{16}$$

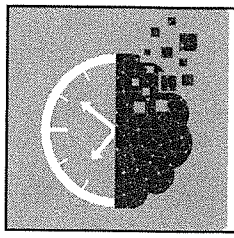
$$9^{\frac{3}{4}} = \sqrt[4]{9^3}$$

Factoring with a Greatest Common Factor (GCF):

Use a number that divides into all of the terms' coefficients.

Example:

$4x^5 - 16x^2$ can be factored as $4x^2(x^3 - 4)$



The Curvebreakers Strategy

MADSPM for Exponents

1. Identify the bases and make sure they are the same.
2. Multiply/Add
3. Divide/Subtract
4. Power/Multiply

Example 1 : Exponents and Radicals

1. What is the solution to the expression $\frac{(x^{\frac{1}{3}})^2}{x^{\frac{1}{6}}}$?

A) $x^{\frac{1}{9}}$

B) $x^{\frac{1}{2}}$

C) $x^{\frac{2}{3}}$

D) x

Solution Strategy: MADSPM

Step 1: MADSPM tells us to multiply the exponents because the numerator is to a power.

The numerator $(x^{\frac{1}{3}})^2$ becomes $x^{\frac{2}{3}}$

Step 2: *Because the second step is to divide, MADSPM tells us to subtract the exponents:*

$\frac{x^{\frac{2}{3}}}{x^{\frac{1}{6}}}$ Subtract the exponents: $\frac{2}{3}-\frac{1}{6}=\frac{4}{6}-\frac{1}{6}=\frac{3}{6}=\frac{1}{2}$

Therefore the answer is $x^{\frac{1}{2}}$

Correct answer: B

Example 2: Exponents and Radicals

2. What is the solution to the equation $\sqrt[3]{x+3} = 2$?

A) -5
B) -2
C) 2
D) 5

Solution

Step 1: Raise both sides of the equation to the 3rd power to cancel out the cube root:

$$\left(\sqrt[3]{x+3}\right)^3 = 2^3$$

This expression equals: $x + 3 = 2^3$

Step 2: Now solve for x

$$x + 3 = 8$$
$$x = 5$$

Correct Answer: D

Practice: Exponents and Radicals

1. If $\sqrt{x+7} + x = 13$, what is x?

A) -3
B) 2
C) 9
D) 18

2. Which of the following is equivalent to $(5x^2y^3)^{\frac{1}{2}}$?

A) $\frac{1}{5x^4y^6}$
B) $\frac{1}{10}xy^{\frac{1}{2}}$
C) $\sqrt{5}xy^{\frac{3}{2}}$
D) $5x^4y^6$

3. The expression $\frac{1}{x^2}$ is equal to all the following EXCEPT?

A) $(x^{-10})\,(x^{-4})^{-2}$
B) $\frac{x^{-4}}{x^{-2}}$
C) $(x^2)^{-1}$
D) $\left(\frac{1}{x^{-1}}\right)^2$

4. Two variables m and n are related such that for each increase of 1 in the value of m, the value of n decreases by a factor of 3. When $m = 0$, $n = 120$. Which equation represents this relationship?

A) $n = 3m^{120}$
B) $n = (120)3^{m}$
C) $n = 0.1(3)^{120m}$
D) $n = (120/3)^{m}$

5. The function $h(t) = 5000(2)^{\frac{t}{5}}$ represents the population of a city t years after an initial observation. How much time, in years, does it take for the population of the city to double?

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 30: MEAN, MEDIAN, MODE, and RANGE

Section: Math
Question Subsection: Data, Statistics, & Probability
Question Category: Mean/Median/Mode/Range
Of the 44 Math questions, approximately 1 - 3 may be questions from this category.

LESSON

MEAN = Average

Mean = Sum of all numbers / Number of elements

MEDIAN = Middle

Arrange the numbers in ascending order from smallest to largest. If the set has an odd number of elements, the median is the middle number. If the set has an even number of elements, the median is the average of the two middle numbers.

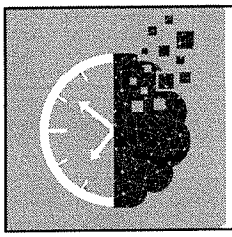
MODE = Most

Identify the number(s) with the highest frequency. If there is more than one number with the same highest frequency, the set is considered multimodal (having multiple modes). If all numbers have the same frequency, the set is uniform and has no mode.

RANGE = the difference between the highest and lowest values.

The spread or difference between the smallest and largest values in the dataset.

TIP: Most of the questions from this category involve the Mean.



The Curvebreakers Strategy

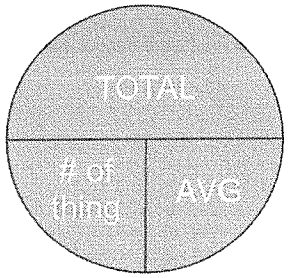
USE THE "AVERAGE PIE" FOR MEAN QUESTIONS

To organize information for average (mean) questions, draw an Average Pie.

Whenever you can fill in the pie with 2 knowns, you can calculate the unknown as follows:

# of Things x Average = Total

Draw as many Average Pies as you need to answer the question.



Example: Mean/Median/Mode/Range

In a bowling tournament, Amir has an average score of 180 for his first five games. If Amir's scores for the first three games were 200, 180, and 160 respectively, what was his average score for the last two games?

A) 180
B) 170
C) 165
D) 160

Solution Strategy: Average Pie

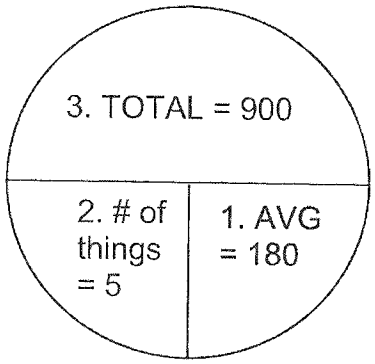
Step 1: Separate the text into bite-sized pieces.

In a bowling tournament, Amir has an average score of 180 for his first five games */*. If Amir's scores for the first three games were 200, 180, and 160 respectively, */* what was his average score for the last two games?

Let's draw as many Average Pies as we need to in order to solve the problem:

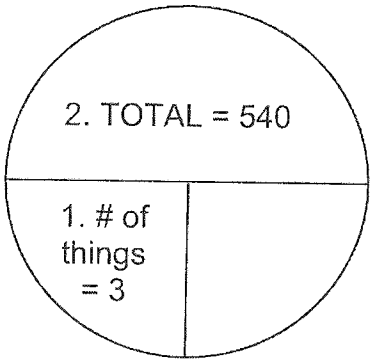
Step 2: Draw Average Pie #1 for the five games.

1. The average is 180.
2. The number of things is 5.
3. The total is 180 x 5 = 900.



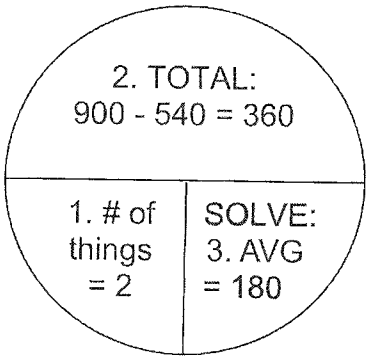
Step 3: Draw Average Pie #2 for the first three games

1. The number of things is 3.
2. The total is 200 + 180 + 160 = 540.
3. Finding the average for the first three games isn't necessarily needed to solve the problem. What's important is the total of the three games so that the total of the last two games can be determined.



Step 4: Draw Average Pie #3 for the last two games.

1. The number of things is 2.
2. The total of the last two games is the five-game total minus the three-game total (refer to totals in Avg Pies #1 and #2). 900 - 540 = 360.
3. The average is 360 / 2 = 180.



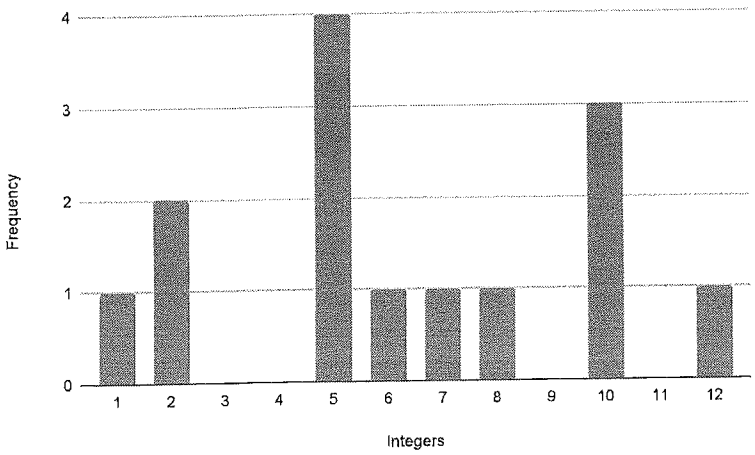
Correct Answer: A

Practice: Mean, Median, Mode, and Range

Data set A: 6, 7, 8, 9
Data set B: 1, 2, 2, 2, 100

1. The lists give the values in data sets A and B. Which statement is correct?

A) The mean of data set A is greater than the median of data set A.
B) The range of data set B is less than the mean of data set B.
C) The mode of data set B is equal to the median of data set B.
D) The mean of data set A is greater than the mean of data set B.



2. The bar graph above shows the distribution of randomly selected integers from 1 to 12. What is the mean, median, and mode of the list of numbers?

A) mean = 6.29; median = 5.5; mode =5
B) mean = 2; median = 6; mode = 5
C) mean = 1.5; median = 5.5; mode = 8
D) mean = 6.3; median = 5.5; mode = 8

3. Sara purchases 2 books for $10 each, 3 pens for $2 each, and 4 notebooks for $5 each. What is the average price of all the items she bought?

A) $1.89
B) $4.50
C) $5.11
D) $5.63

4. The average age of 6 friends in a group is 25 years. If the youngest person leaves the group, the average age of the remaining 5 friends becomes 27 years. What is the age of the youngest person?

A) 13 years
B) 15 years
C) 17 years
D) 21 years

218, 226, 227, 228,120, 122, 125, 130, 190, 211

5. To the nearest tenth, what is the value when the range of this set of numbers is subtracted from the median of this set of numbers?

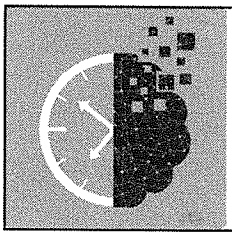
For answer explanations to these practice questions, go to
curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 31: PROBABILITY

Section: Math
Question Subsection: Data, Statistics, & Probability
Question Category: Probability
Of the 44 Math questions, approximately 1 - 2 may be questions from this category.

LESSON

Probability is the likelihood that something will happen. It is calculated by creating a ratio of the desired outcomes to the total outcomes. Probability ranges between 0 and 1, inclusive, or between 0% and 100%.



The Curvebreakers Strategy

USE THE FORMULA FOR PROBABILITY

$$\text{PROBABILITY} = \frac{SUCCESS}{TOTAL}$$

Examples of Probability

Questions 1 and 2 refer to the table below.

The table below classifies 120 students from a high school who participate in different extracurricular activities: sports, music, or art. Each student is further categorized as either a sophomore, junior, or senior.

	Sophomore	Junior	Senior	Total
Sports	4	17	24	45
Music	24	19	16	59
Art	12	4	0	16
Total	40	40	40	120

1. What is the probability that a randomly selected student from this high school does NOT participate in sports?

A) .375
B) .491
C) .500
D) .625

Solution Strategy: Use the Formula for Probability

Step 1: Since this is a probability question, let's write the formula:

$$\text{PROBABILITY} = \frac{SUCCESS}{TOTAL}$$

Step 2: Determine the total.

The total will be any of the randomly selected students. According to the table, there are a total of 120 students.

Step 3: Determine the success.

In this case, success is defined as a student who does *not* participate in sports. The fastest way to find the number of students not involved in sports is to subtract the number of sports students from the total:

120 – 45 = 75

Step 4: Plug in the numbers for Success and Total into the probability formula and solve.

$$P = \frac{S}{T} = \frac{75}{120} = .625$$

Correct Answer: D

2. If a senior is selected at random, what is the probability that the student will participate in sports?

A) $\frac{1}{3}$

B) $\frac{2}{3}$

C) $\frac{1}{5}$

D) $\frac{3}{5}$

Solution Strategy: Use the Formula for Probability

Step 1: Since this is a probability question, let's write the formula:

PROBABILITY = $\frac{SUCCESS}{TOTAL}$

Step 2: Determine the total.

Since we're told that a senior is selected at random, the total will be any of the randomly selected seniors = 40

Step 3: Determine the success.

Success will be a senior who participates in sports = 24.

Step 4: Plug in the numbers for Success and Total into the probability formula and solve.

$$P = \frac{S}{T} = \frac{24}{40} = \frac{3}{5}$$

Correct Answer: D

Practice: Probability

	Round	Square
Vanilla	**13**	**9**
Chocolate	**21**	**7**

1. A bakery offers a selection of vanilla and chocolate cakes. The cakes are categorized as either round or square in shape. If a cake is chosen at random and is known to be square, what is the likelihood that it is a chocolate-flavored cake?

A) $\frac{7}{16}$

B) $\frac{9}{16}$

C) $\frac{7}{50}$

D) $\frac{16}{50}$

2. A 6-sided die, with sides 1, 2, 3, 4, 5, and 6, is thrown. What is the probability that the die lands on a prime-numbered face?

A) $\frac{1}{3}$

B) $\frac{1}{2}$

C) $\frac{2}{3}$

D) $\frac{5}{6}$

POSITION	NUMBER OF PLAYERS
Shortstop	4
Pitcher	2
Catcher	6
Outfield	8

3. Ella will draft 1 player at random from a list of 20 players for her fantasy baseball team. Each player in the list plays only 1 position. The number of players who play a particular position is given in the table above. What is the probability that the player Ella drafts will play shortstop or outfield?

A) $\frac{1}{5}$

B) $\frac{2}{5}$

C) $\frac{1}{2}$

D) $\frac{3}{5}$

CARD	NUMBER
Clubs	10
Spades	8
Hearts	6
Diamonds	4
Jokers	2

4. Camryn will use a deck of 30 playing cards for a game in which each player randomly draws cards from the deck. The distribution of the cards by suit (plus the Jokers) is shown above. Camryn will randomly draw 2 cards from the deck, one after the other, without replacing the first card. What is the probability that Camryn will draw a Hearts first and a Joker second?

A) $\frac{1}{75}$
B) $\frac{2}{145}$
C) $\frac{4}{15}$
D) $\frac{39}{145}$

5. In Nico's wallet, he has 8 5-dollar bills, 9 10-dollar bills, and 7 20-dollar bills. How many additional 5-dollar bills does he need to add to his wallet so that the probability of randomly taking out a 5-dollar bill from his wallet is 0.6?

A) 12
B) 16
C) 20
D) 24

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 32: REPRESENTS SITUATION

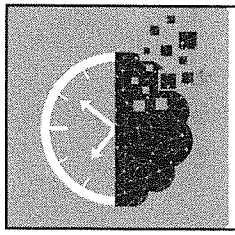
Section: Math
Question Subsection: Algebra and Functions
Question Category: Represents Situation
Of the 44 Math questions, approximately 1 - 4 may be questions from this question category.

EXAM QUESTION

You are given data and variables and are asked, *Which of the following equations represents this situation?*

LESSON

Most of these questions can be answered by using POE (Process of Elimination).



The Curvebreakers Strategy

BITE-SIZE AND POE

1. Separate the text into bite-sized pieces.
2. Note what the variables represent.
3. In each answer choice, highlight what works and eliminate what doesn't.
4. If you can't solve it in this manner, try Plugging In numbers for the variables.

Example 1: Represents Situation

1. A container holds red and blue liquids. The total volume of the liquids is 60. The volume of the red liquid is 20 liters more than twice the volume of blue liquid. Which system of equations represents this situation, where y represents the volume (in liters) of blue liquid and x represents the the volume (in liters) of red liquid?

A) $x + y = 60$
$x = 2y + 20$

B) $x + y = 20$
$2y = 60 - x$

C) $x + y = 20$
$2x = 60 - y$

D) $x + y = 60$
$y = 2x + 20$

Solution Strategy: Bite-size and POE

Step 1: Separate the text into bite-sized pieces.

A container holds red and blue liquids. The total volume of the liquids is 60. / The volume of the red liquid is 20 liters more than twice the volume of blue liquid. / Which system of equations represents this situation, where y represents the volume (in liters) of blue liquid and x represents the the volume (in liters) of red liquid?

Step 2: Note what the variables represent.

y = blue liquid; x = red liquid

Step 3: In each answer choice, highlight what works and eliminate what doesn't

Since the total volume of liquid = 60, highlight any answer choices that show x and y adding to 60 and eliminate any answer choices that don't. (POE B and C)

A) $x + y = 60$
$x = 2y + 20$

B) ~~$x + y = 20$~~
$2y = 60 - x$

C) ~~$x + y = 20$~~
$2x = 60 - y$

D) $x + y = 60$
$y = 2x + 20$

Since we're told that the number of red liquid (x) is 20 more than twice the number of blue liquid (y), select Answer Choice A. (POE D)

A) $x + y = 60$
$x = 2y + 20$

Correct Answer: A

Example 2: Represents Situation

2. A coffee shop sells two sizes of coffee cups: small for $2.50 and large for $3.50. If the shop makes at least $135 per day in sales, which inequality represents this situation, where s represents the number of small cups sold and l represents the number of large cups sold?

A) $2.50l + 3.50s \geq 135$
B) $2.50s + 3.50l \geq 135$
C) $2.50s + 3.50l \leq 135$
D) $2.50s + 3.50l > 135$

Solution Strategy: Bite-size and POE

Step 1: Separate the text into bite-sized pieces.

A coffee shop sells two sizes of coffee cups: small for $2.50 / and large for $3.50 / . If the shop makes at least $135 per day / in sales, which inequality represents this situation, where s represents the number of small cups sold and l represents the number of large cups sold?

Step 2: Note what the variables represent.

s = small cups; l = large cups

Step 3: In each answer choice, highlight what works and eliminate what doesn't

Since small cups are $2.50(s)$ and large are $3.50(l)$, highlight any answer choices that contain $2.50s$ and $.3.50l$ and eliminate any answer choices that don't.

~~A) $2.50l + 3.50s \geq 135$~~
B) $2.50s + 3.50l \geq 135$
C) $2.50s + 3.50l \leq 135$
D) $2.50s + 3.50l > 135$

Since we're told that the coffee shop makes at least $135 in sales, highlight anything in the answer choices that show $135 or more and eliminate anything that does not. (POE C and D)

~~A) $2.50l + 3.50s \geq 135$~~
B) $2.50s + 3.50l \geq 135$
~~C) $2.50s + 3.50l \leq 135$~~
~~D) $2.50s + 3.50l > 135$~~

Correct Answer: B

Practice: Represents Situation

1. A company charges a flat fee of $25 plus $5 per hour for computer repair services. If the total cost of the service is $90, how many hours did the repair take?

A) $5h + 25 = 90$
B) $25h + 5 = 90$
C) $5h + 90 = 25$
D) $90h + 5 = 25$

2. A school is holding a fundraiser where students can sell chocolate bars for $2 each and raffle tickets for $5 each. The school wants to raise a total of $500. Which equation represents this situation, where x represents the number of chocolate bars sold and y represents the number of raffle tickets sold?

A) $5x + 2y = 500$
B) $x + y = 500 \,/\, 7$
C) $7x + 5y = 500$
D) $2x + 5y = 500$

3. A vending machine dispenses candy bars for $1.25 each and bags of chips for $0.75 each. If the vending machine made $62.50 in one day, which equation represents this situation, where x represents the number of candy bars sold and y represents the number of bags of chips sold?

A) $1.25x + 0.75y = 62.50$
B) $1.25x + 0.75y = 75$
C) $1.25(x + y) = 62.50$
D) $0.75(x + y) = 62.50$

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 33: GEOMETRY FACTS

Section: Math
Question Subsection: Geometry and Measurement
Of the 44 Math questions, approximately 6 - 10 may be questions from this category.

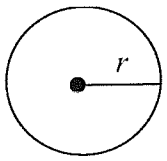
LESSON

The SAT® gives us basic reference information so you will not need to memorize the formulas. However, if you do memorize at least the most commonly used formulas, it will **save you time**.

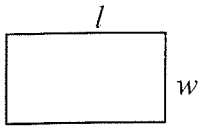
Lessons on geometry will be divided into the following chapters to reflect the types of questions most asked on the test:

1. Angles
2. Triangles
3. Quadrilaterals
4. Circles
5. Radians
6. Volume
7. Trigonometry

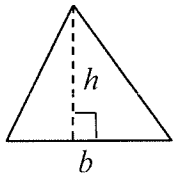
SAT® REFERENCE TABLE



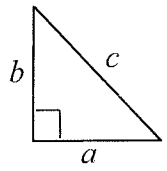
$A = \pi r^2$
$C = 2\pi r$



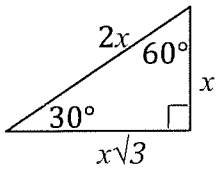
$A = l \cdot w$



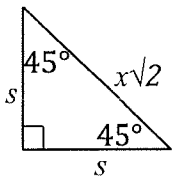
$A = \frac{1}{2}bh$



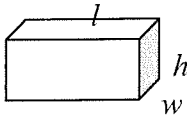
$c^2 = a^2 + b^2$



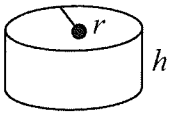
Special Right Triangle



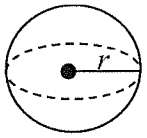
Special Right Triangle



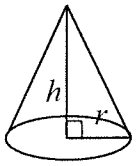
$V = lwh$



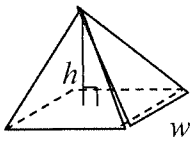
$V = \pi r^2 h$



$V = \frac{4}{3}\pi r^3$



$V = \frac{1}{3}\pi r^2 h$



$V = \frac{1}{3}lwh$

The number of degrees of arc in a circle is 360
The number of radians of arc in a circle is 2π
The sum of the measures in degrees of the angles of a triangle is 180

There are also some basic geometry facts you should know:

ANGLE FACTS

- There are 90 degrees in a right angle.
- When two lines intersect, the opposite angles are equal.
- There are 180 degrees in a triangle.
- Two lines are called perpendicular when they meet at a 90 degree angle.
- The sign for perpendicular is $\perp$
- There are 180 degrees in a straight line.
- Bisect means to cut exactly in half.
- The angles of any four-sided figure add up to 360 degrees.

FOUR-SIDED FACTS

In a square:

- All four sides are equal.
- Each of the 4 angles is 90 degrees.
- Area = s^2
- Perimeter = 4s

In a rectangle:

- Opposite sides are equal.
- Each of the 4 angles is 90 degrees.
- Area = lw
- Perimeter = 2l + 2w

In a parallelogram:

- Opposite sides are parallel and equal.
- Area = bh

In a quadrilateral:

- Angles add up to 360 degrees.

TRIANGLE FACTS

In any triangle:

- The largest side or hypotenuse is opposite the largest angle.
- The smallest side is opposite the smallest angle.
- Equal sides are opposite equal angles.
- Angles add up to 180 degrees.
- $A = \frac{1}{2}bh$
- The height is perpendicular to the base.
- Perimeter is the sum of the sides.
- Any side of the triangle must be greater than the difference but less than the sum of the other two sides.

In an Isosceles triangle:

- Two angles and sides are equal.
- Angles opposite the equal sides are equal.

In an Equilateral triangle:

- All sides are equal.
- All angles each equal 60 degrees.

CIRCLE FACTS

In any circle
- There are 360 degrees in a circle.
- The equation of a circle with center (h,k) and radius r is $(x-h)^2+(y-k)^2=r^2$

Radius
- A radius is the distance from the center to any point on the edge of the circle.
- All radii in a circle are equal.

Diameter
- A diameter is the straight line distance from one point on the circle to another, passing through the center.
- It is the longest line or chord in the circle.
- It equals twice the radius.

Chord
- A chord is any line segment from one point on the circle to another.
- The diameter is the longest chord.

Circumference
- The circumference is the distance around the outside of the circle.
- The formula for circumference is πd *or* $2\pi r$

Arc
- An arc is part of the circumference.
- Arc measure is proportional to the size of the interior angle.

Area
- The area of a circle is the amount of space inside the circumference of the circle.
- The formula for area is πr^2

LINE FACTS

Line Segment
- The degree measure of a line segment is 180 degrees.

Tangent
- A tangent line is always perpendicular to the radius.

Perpendicular
- Two lines that intersect in a 90 degree angle are perpendicular and their slopes are negative reciprocals.

TRANSFORMATION FACTS

Rotation
- Rotation means turning an object around a point, which is called the center of rotation.

Reflection
- To reflect an object means to create its mirror image across a line of reflection.
- Lines reflected across the *x*-axis have slopes that are negatives of each other and also *y*-intercepts that are negatives of each other.
- Lines reflected across the *y*-axis have the same *y*-intercept and slopes that are negatives of each other.

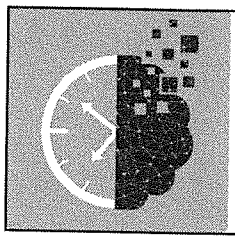
Symmetry
- A figure has reflective symmetry if it looks the same after a reflection.
- A figure has rotational symmetry if it can be rotated and still look the same.

TRIGONOMETRY FACTS

- SOHCAHTOA: The 3 basic trig ratios to calculate sides in a Right triangle:

  $\sin = \frac{OPP}{HYP}$ $\cos = \frac{ADJ}{HYP}$ $\tan = \frac{OPP}{ADJ}$

- When two angles are complementary (meaning they add to 90 degrees), the sine of one angle equals the cosine of the other.



The Curvebreakers Strategy

DRAW, LABEL, FORMULAS, CARVE

1. Draw the shape if no shape is given
2. Label all relevant information
3. Write out all complete formulas or geometry facts needed to solve
4. See if you can carve up complex shapes into the SAT®'s favorite shapes: right triangles and rectangles.

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

Chapter 34: ANGLES

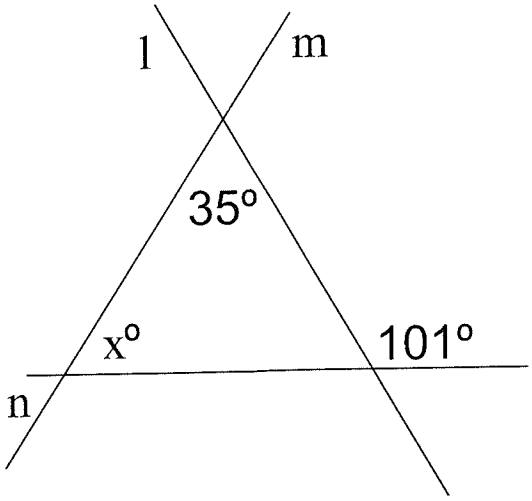
Section: Math
Question Category: Angles
Expect at least one angle question.

LESSON

- There are 90 degrees in a right angle.
- When two lines intersect, the opposite angles are equal.
- There are 180 degrees in a triangle.
- Two lines are called perpendicular when they meet at a 90 degree angle.
- The sign for perpendicular is ⊥
- There are 180 degrees in a straight line.
- Bisect means to cut exactly in half.
- The angles of any four-sided figure add up to 360 degrees.

When parallel lines are intersected by a straight line, two kinds of angles are created: BIG angles and SMALL angles. All BIG angles are equal. All SMALL angles are equal. BIG + SMALL = 180 degrees.

Example 1: ANGLES



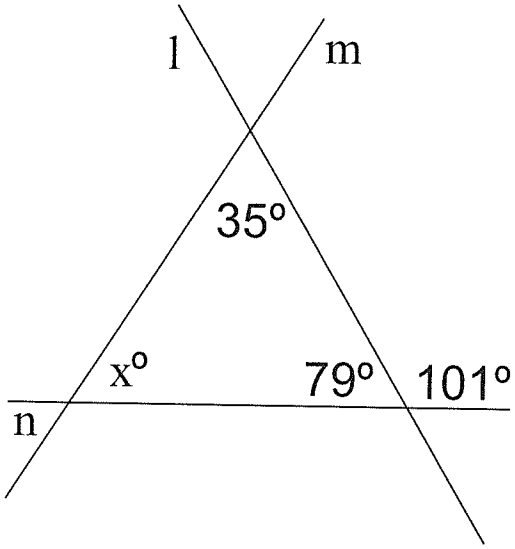
1. Intersecting lines l, m, and n are shown above. What is the value of x in degrees?

A) 35
B) 61
C) 66
D) 79

Solution Strategy: Draw, Label, Formulas, Carve

Step 1: Label

Since we know the measure of a line is 180°, this means that the angle directly to the left of 101° is 79° (180 - 101 = 79)

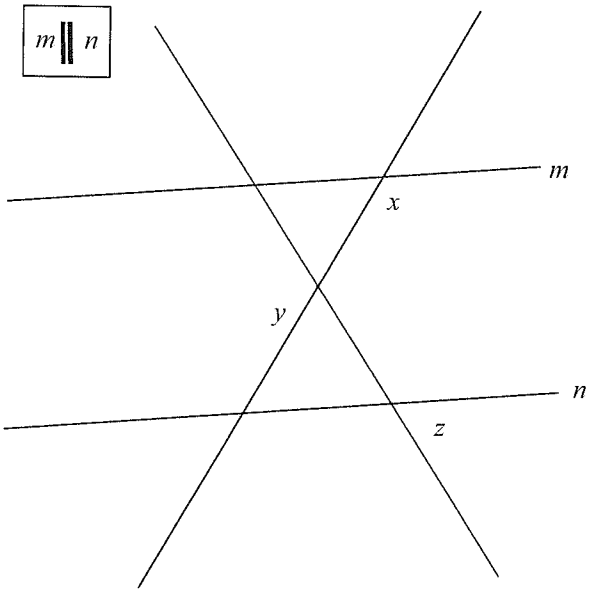


Step 2: Carve out the triangle.

Since we know the angles of a triangle add up to 180°, we can calculate *x* by subtracting the other 2 angles from 180 (180 - 79 - 35 = 66)

Correct Answer: C

Example 2: ANGLES



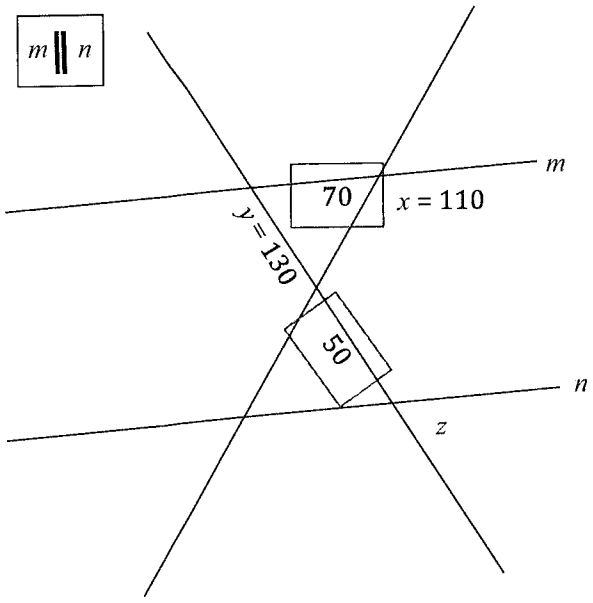
2. If the figure above, $m \parallel n$ and $x = 110°$ and $y = 130°$. What is the measure of z, in degrees?

A) 50
B) 60
C) 70
D) 110

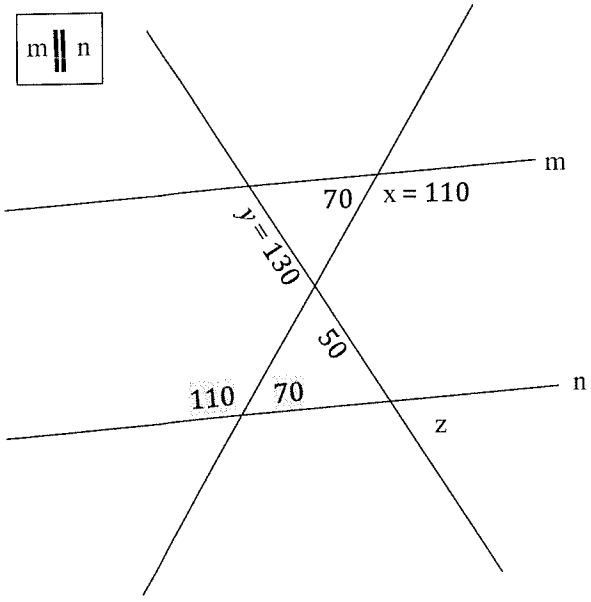
Solution Strategy: Draw, Label, Formulas, Carve

Step 1: Label

We are given $x = 110$ and $y = 130$.
Since we know the measure of a line is 180°, this means that the angle directly to the left of $x = 70°$ and the angle to the right and below $y = 50°$

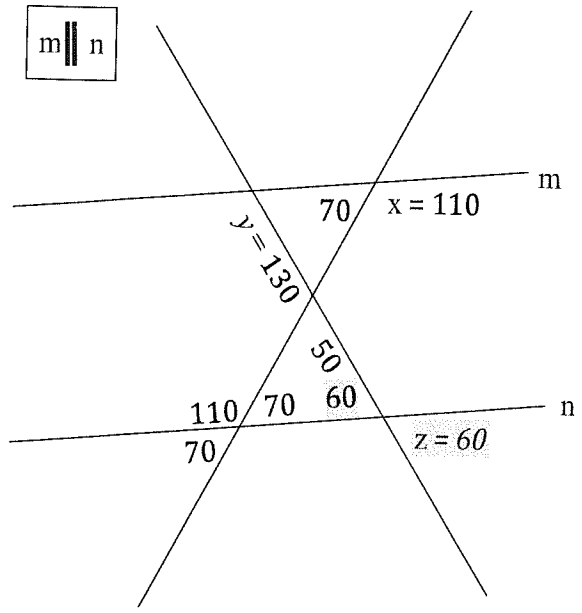


Step 2: Keep labeling: Since m and n are parallel, when a straight line intersects 2 parallel lines, the big angles are equal to the big angles and the small angles are equal to the small angles. So we can label 110 as the big bottom angle and 70 as the small bottom angel.



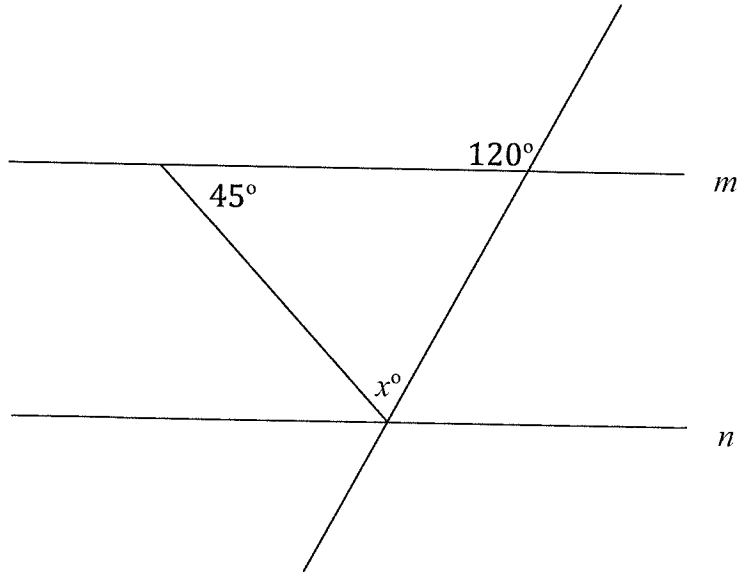
Step 3: Carve out the triangle

Recognizing that the bottom figure is a triangle, and a triangle has 180°, the third angle of the triangle must be 180 - 70 - 50 = 60°. And since z is a vertical angle directly opposite, so it must be 60° as well.



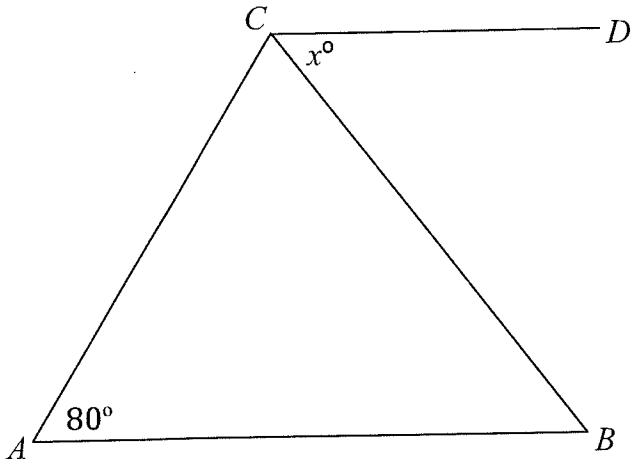
Correct Answer: B

Practice: ANGLES



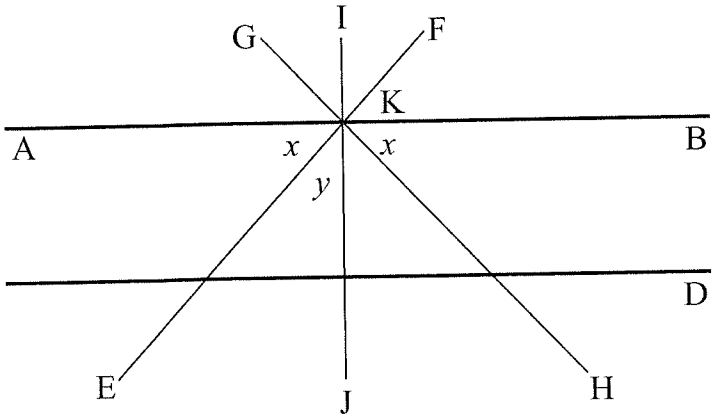
1. In the figure above, if line m is parallel to line n, what is the value of x?

A) 115°
B) 75°
C) 65°
D) 45



2. In the figure above, $\overline{AB} \cong \overline{AC}$ and $\overline{AB} \parallel \overline{CD}$. What is the value of x in degrees?

A) 30
B) 40
C) 50
D) 80



3. In the figure above, $\overline{AB} \parallel \overline{CD}$ and $\overline{IJ}$ bisects ∠EKH. Which of the following is equal to $4y$ in terms of x?

A) $360 - 4x$
B) $180 - 3x$
C) $360 + 4x$
D) $180 + 2x$

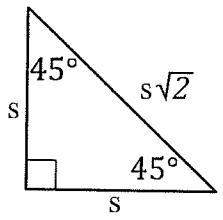
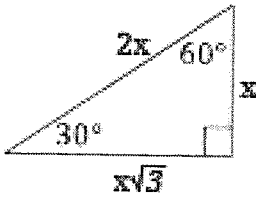
For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

Chapter 35: TRIANGLES

Section: Math
Question Category: TRIANGLES
Expect about three triangle questions, one of which will be related to similar triangles.

LESSON

The SAT® will often ask triangle questions involving special right triangles, and triangles with the Pythagorean triples of 3:4:5; 6:8:10; or 5:12:13. Knowing these may save you time on the test by not having to do the Pythagorean Theorem. The reference table tells us how to calculate the sides of special right triangles and is shown below:

Special Right Triangles		
Angles	45: 45: 90	30: 60: 90
Sides	side: side: side$\sqrt{2}$	side: side$\sqrt{3}$: 2(side)

Similar Triangles

- Similar triangles have the same angle measurements.
- The corresponding sides of similar triangles are PROPORTIONAL.

In any triangle:

- The largest side or hypotenuse is opposite the largest angle.
- The smallest side is opposite the smallest angle.
- Equal sides are opposite equal angles.
- Angles add up to 180 degrees.
- $A = \frac{1}{2}bh$
- The height is perpendicular to the base.
- Perimeter is the sum of the sides.
- Any side of the triangle must be greater than the difference but less than the sum of the other two sides.

In an isosceles triangle:

- Two angles and sides are equal.
- Angles opposite the equal sides are equal.

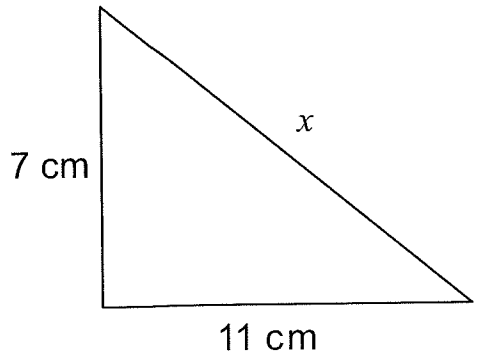
Example 1: TRIANGLES

1. In a right triangle, the two shorter sides are 7 cm and 11 cm long. What is the length of the longest side, in cm?

A) $\sqrt{18}$
B) $\sqrt{72}$
C) $\sqrt{77}$
D) $\sqrt{170}$

Solution Strategy: Draw, Label, Formulas, Carve

Step 1: Draw the triangle and label the sides.

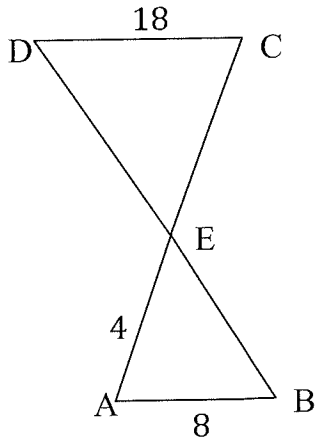


Step 2: Use the Pythagorean Theorem to find the 3rd side.

$$a^2 + b^2 = c^2 \rightarrow 7^2 + 11^2 = c^2$$
$$49 + 121 = c^2$$
$$170 = c^2$$
$$c = \sqrt{170}$$

Correct Answer: D

Example 2: TRIANGLES



Note: Figure not drawn to scale

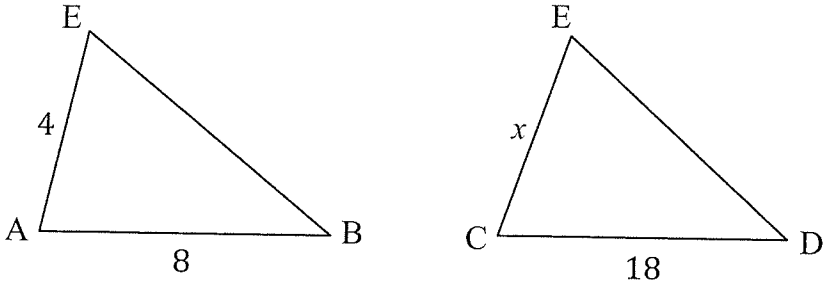
2. In the figure above, $\overline{AB} \parallel \overline{DC}$. What is the length of $\overline{AC}$?

A) 13
B) 16
C) 20
D) 24

Solution Strategy: Draw, Label, Formulas, Carve

Step 1: Recognize that we have 2 similar triangles since all angles are equal.

Step 2: Redraw the triangles to visualize the correct proportion to set up.



Step 3: Set up a proportion to find the length of $\overline{EC}$, since similar triangles are proportional.

In order to find the length of $\overline{AC}$ we need to first find the length of $\overline{EC}$. Set up a proportion with side $\overline{AE}$ over side $\overline{CE}$ and set that equal to sides $\overline{AB}$ over side $\overline{CD}$. We will cross multiply and then solve for x.

$$\frac{4}{x} = \frac{8}{18}$$
$$72 = 8x$$
$$x = 9$$

Step 4: The question asked for the length of $\overline{AC}$ so we have to add the lengths of $\overline{AE}$ and $\overline{CE}$ together to find the correct answer.

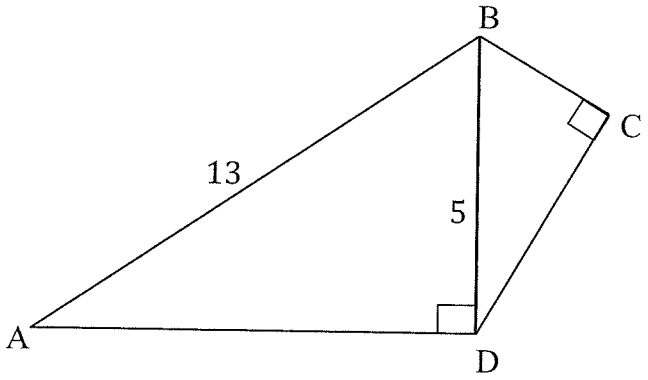
$$4 + 9 = 13$$

Correct Answer: A

Practice: TRIANGLES

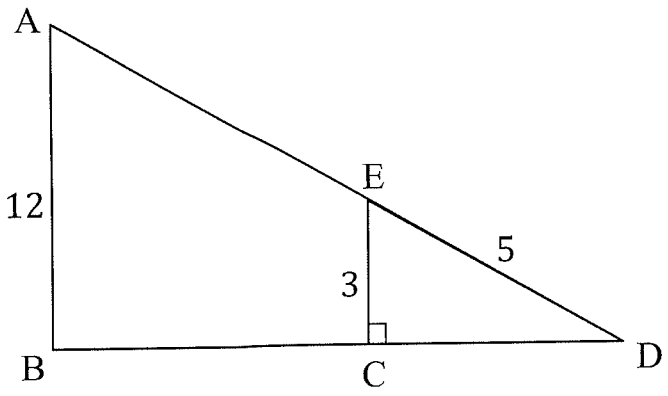
1. A right triangle (not shown) has a hypotenuse with a length of 13 and a leg with the length of 5. What is the length of the other leg?

A) 5
B) 8
C) 12
D) 13



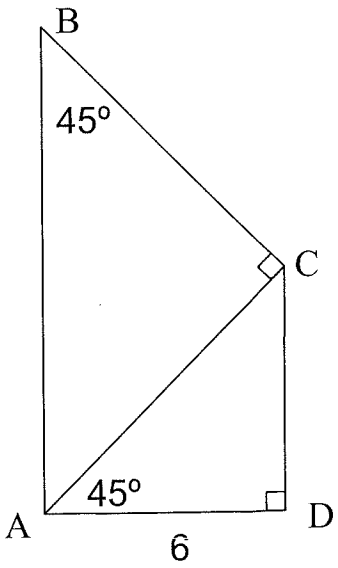
2. In the figure above, $\overline{CD} = \frac{1}{3}\overline{AD}$. What is the perimeter of quadrilateral $ABCD$?

A) 32
B) 37
C) 63
D) 72



3. In the figure above, $\overline{BA}$ is parallel to $\overline{EC}$. What is the length of $\overline{BD}$?

A) 16
B) 18
C) 20
D) 24



4. In quadrilateral ABCD above, what is the length of $\overline{AB}$?

A) 12
B) $6\sqrt{3}$
C) $6\sqrt{2}$
D) 6

5. What is the area of an equilateral triangle with a perimeter of 24?

A) 24
B) $16\sqrt{3}$
C) 32
D) $32\sqrt{3}$

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

Chapter 36: QUADRILATERALS

Section: Math
Question Category: QUADRILATERALS
Expect about one quadrilateral question.

LESSON

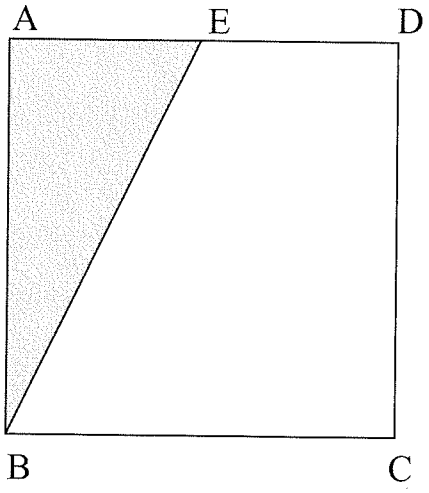
In a square:
- All four sides are equal.
- Each of the 4 angles is 90 degrees.
- Area = s^2
- Perimeter = $4s$

In a rectangle:
- Opposite sides are equal.
- Each of the 4 angles is 90 degrees.
- Area = $l \cdot w$
- Perimeter = $2l + 2w$

In a parallelogram:
- Opposite sides are parallel and equal.
- Area = $b \cdot h$

In any quadrilateral:
- Angles add up to 360 degrees.

Example 1: QUADRILATERALS



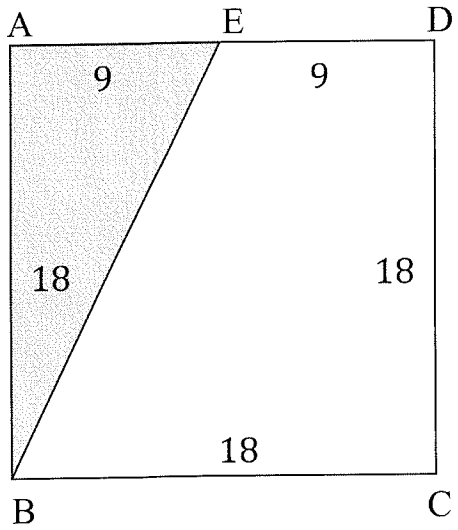
1. In the figure above, ABCD is a square with side length 18 centimeters. The midpoint of AD is E. What is the area, in square centimeters, of the shaded region?

A) 50
B) 81
C) 243
D) 324

Solution Strategy: Draw, Label, Formulas, Carve

Step 1: Label

Since we know that each side of the square is 18, and we're told that E is the midpoint of AD, then AE is equal to 9.



Step 2: Formula

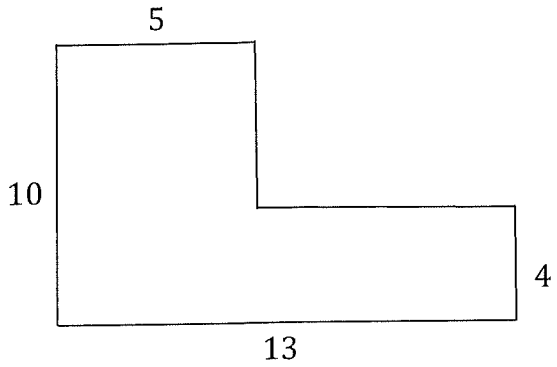
The shaded region is a triangle, and we know the base and height, so we can calculate the area:

$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2}(9)(18) = 81$$

Correct Answer: B

Example 2: QUADRILATERALS

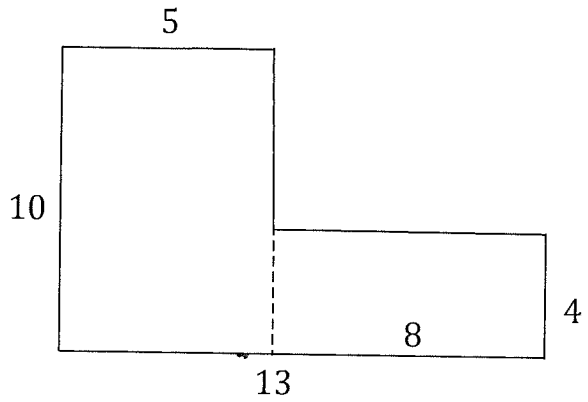


2. In the figure above, all angles are right angles, and the side lengths given are in centimeters. What is the area, in square centimeters, of the figure?

A) 75
B) 82
C) 86
D) 92

Solution Strategy: Draw, Label, Formulas, Carve

Step 1: Carve the figure up into two rectangles and figure out the length of the smaller rectangle.



Length of the small rectangle:
$13 - 5 = 8$

Step 2: Now we can find the area of both rectangles and add them together to get the total area.

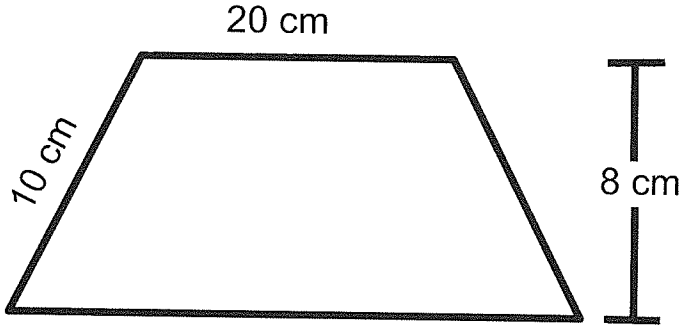
The larger rectangle has a width of 5 and a length of 10.
$A = l \cdot w = (5) \cdot (10) = 50$

The second, smaller rectangle has a width of 4 and a length of 8.
$A = l \cdot w = (8) \cdot (4) = 32$

Step 3: Add the two numbers together to get the total area.
$50 + 32 = 82$

Correct Answer: B

Practice: QUADRILATERALS



Note: Figure not drawn to scale

1. What is the area of the trapezoid shown above, in square centimeters?

A) 120
B) 208
C) 210
D) 240

2. Kamal is painting the ceiling in his local community center. The ceiling is 60 feet wide and 80 feet long. If 1 can of paint can cover exactly 250 square feet, what is the minimum number of cans of paint he will need in order to cover the ceiling with 1 coat of paint?

A) 9
B) 10
C) 19
D) 20

For answer explanations to these practice questions, go to
curvebreakerstestprep.com/decoding-the-digital-sat

Chapter 37: CIRCLES AND RADIANS

Question Category: CIRCLES
Expect about two circle questions.

LESSON ON CIRCLES

All Circles
- There are 360 degrees in a circle.
- The equation of a circle with center (h,k) and radius r is $(x-h)^2+(y-k)^2=r^2$

Radius
- A radius is the distance from the center to any point on the edge of the circle.
- All radii in a circle are equal.

Diameter
- A diameter is the straight line distance from one point on the circle to another, passing through the center.
- It is the longest line or chord in the circle.
- The diameter equals twice the radius.

Chord
- A chord is any line segment from one point on the circle to another.
- The diameter is the longest chord.

Circumference
- The circumference is the distance around the outside of the circle.
- The formula for circumference is πd or $2\pi r$

Arc
- An arc is part of the circumference.
- Arc measure is proportional to the size of the central angle.

Area
- The area of a circle is the amount of space inside the circumference of the circle.
- The formula for area is πr^2
- A sector is part of the area.
- The measure of the sector is proportional to the size of the central angle.

Example 1: CIRCLES

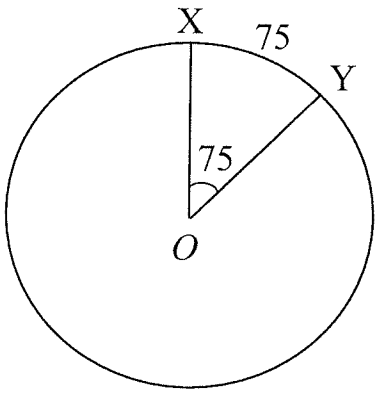
1. In a circle, the measure of arc XY is 75 degrees. Point O is the center of the circle. What is the measure, in degrees, of its associated angle XOY?

A) 30
B) 65
C) 75
D) 105

Solution:

Step 1: Recognize that arcs and sectors are proportional to the central angle.

Step 2: Draw and label



In a circle, the measure of an arc is equal to the measure of its associated central angle. Therefore, if the measure of the arc is 75 degrees, the measure of the associated angle will also be 75 degrees.

Correct Answer: C

Example 2: CIRCLES

2. Consider the circle with the equation $(x-5)^2+(y+3)^2=36$ in the xy-plane. This circle is translated so that its center moves to the origin (0, 0), resulting in a new circle.

What is the equation of this new circle?

A) $x^2+y^2=36$
B) $(x-5)^2+(y+3)^2=0$
C) $x^2+y^2=6$
D) $(x-5)^2+(y+3)^2=6^2$

Solution:

Step 1: Recognize that the equation of a circle is: $(x-h)^2+(y-k)^2=r^2$ with center (h,k) and radius r to be able to find the center.

We can find the center by looking at the number with the opposite sign in each of the parentheses of the equation. Therefore we see that the *h* value is equal to 5 and the *k* value is equal to -3.

Step 2: The radius would not change if we translated the circle. This means:

Our equation would still be equal to 36.

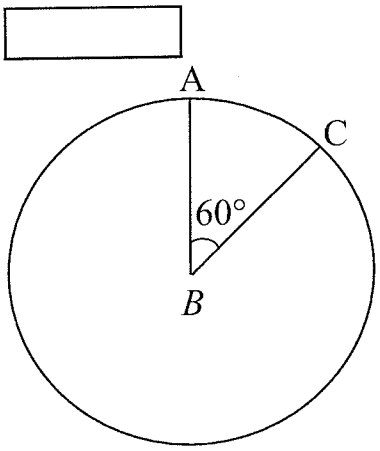
Step 3: Since the point (0,0) now replaces (5,-3) we know that the answer has to be A since those terms would disappear.

Correct Answer: A

Practice: CIRCLES

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

1. A certain circle is defined by the equation above. What is the diameter of this circle?

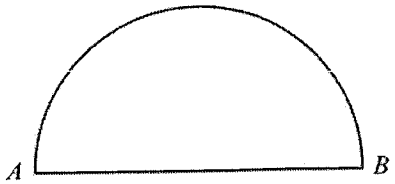


2. The circle above with center B has an area of 48, What is the area of sector ABC?

A) 48
B) 16
C) 12
D) 8

3. A circle in the xy-plane has a diameter with endpoints (3, -2) and (9, -2). An equation of this circle is $(x-6)^2+(y+2)^2=r^2$, where r is a positive constant. What is the value of r?

A) 1
B) 2
C) 3
D) 6



4. The semicircle shown in the figure above has an area of 50π. What is the measure of arc AB?

A) $5\pi\sqrt{2}$
B) 10π
C) $10\pi\sqrt{2}$
D) 20π

LESSON ON RADIANS

Section: Math
Question Category: Radians
Expect about 0-1 Radian questions.

A radian is an angle whose corresponding arc in a circle is equal to the radius of the circle.

A circle has 360 degrees or 2π radians, which means one radian is about 360 /(2π) or 57.3 degrees.

π radians = 180°
1 radian = 180°/π

Example: Radians

An angle in standard position measures $\frac{7\pi}{6}$ radians. What is the degree measure of this angle?

A) 60
B) 120
C) 210
D) 300

Solution:

Step 1: Since π radians = 180°, we can set up the proportion:

$$\frac{\pi\, radians}{180\, degrees} = \frac{\frac{7}{6}\pi\, radians}{x\, degrees}$$

Step 2: Cross multiply

$$\pi x = 180\left(\frac{7\pi}{6}\right)$$
$$\pi x = 210\pi$$
$$x = 210$$

Correct Answer: C

Practice: Radians

1. What is the degree measure of an angle that measures $\frac{3\pi}{4}$ radians?

A) 45
B) 90
C) 135
D) 180

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

Chapter 38: VOLUME

Section: Math
Question Category: Volume
Expect about one volume question.

LESSON

Generally, you can answer volume questions by getting the formula from the Reference Table (or memorizing it) and plugging in the numbers they give you.

Example 1: Volume

1. A cylinder has a height of 12 meters and a radius of 5 meters. What is the volume, in cubic meters, of the cylinder?

A) 24π
B) 60π
C) 144π
D) 300π

Solution:

Step 1: Refer to the Reference Table for the formula for volume of a cylinder:

$$V = \pi r^2 h$$

Step 2: Plug the numbers given into the equation:

$$V = \pi(5)^2 \cdot (12)$$

$$V = 300\pi$$

Correct Answer: D

Example 2: Volume

2. What is the volume of a sphere with a diameter of 4?

A) $\frac{3}{4}\pi$
B) $\frac{4}{3}\pi$
C) $\frac{16}{3}\pi$
D) $\frac{32}{3}\pi$

Solution:

Step 1: Refer to the Reference Table for the formula for volume of a sphere:

$$V = \frac{4}{3}\pi r^3$$

Step 2: Plug the numbers given into the equation. The radius is half the diameter:

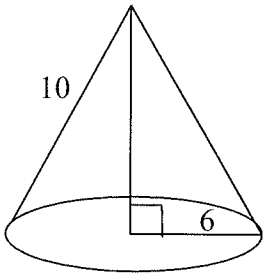
$$V = \frac{4}{3}\pi(2)^3$$
$$V = \frac{4}{3}\pi(8)$$
$$V = \frac{32}{3}\pi$$

Correct Answer: D

Practice 1: Volume

1. A cube has an edge length of 8 centimeters. What is the volume, in cubic centimeters, of the cube?

A) 24
B) 48
C) 64
D) 512



2. In the cone shown above, the radius of the base is 6 and the slant height is 10. What is the approximate volume of the cone?

A) 62.8
B) 226.2
C) 301.5
D) 377

For answer explanations to these practice questions, go to
curvebreakerstestprep.com/decoding-the-digital-sat

Chapter 39: TRIGONOMETRY

Section: Math
Question Category: Trigonometry
Expect about one trig question.

LESSON

Most trigonometry questions test your knowledge of SOHCAHTOA

SOHCAHTOA: The 3 basic trig ratios to calculate sides in a right triangle:

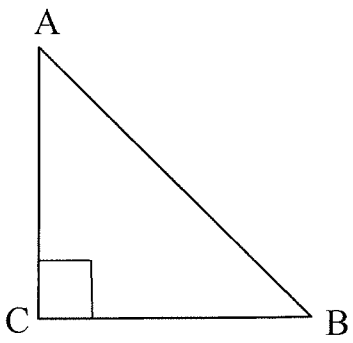
$$sin = \frac{OPP}{HYP}$$

$$cos = \frac{ADJ}{HYP}$$

$$tan = \frac{OPP}{ADJ}$$

When two angles are complementary (meaning they add to 90 degrees), the sine of one angle equals the cosine of the other.

Example 1: Trigonometry



1. In triangle ABC above, the measure of cos A is $\frac{1}{2}$. What is the measure of sin A?

A) $\frac{1}{2}$
B) $\frac{\sqrt{3}}{2}$
C) $\frac{\sqrt{3}}{3}$
D) 2

Solution Strategy: SOHCAHTOA

Step 1: SOHCAHTOA

Since we know cos A is $\frac{1}{2}$, CAH tells us that side $\overline{AC}$ (Adjacent) is equal to 1 and side $\overline{AB}$ (hypotenuse) is equal to 2.

Step 2: Now we can use the Pythagorean Theorem to solve for the missing side length $\overline{BC}$.

$$a^2 + b^2 = c^2$$
$$a^2 + (1)^2 = (2)^2$$
$$a^2 = 3$$
$$a = \sqrt{3}$$

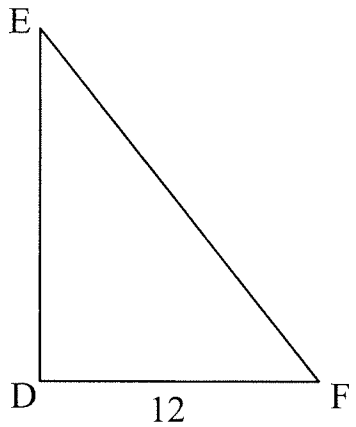
This means that $\overline{BC} = \sqrt{3}$

Step 3: Now that we know all 3 sides of the triangle we can find sin A which is the opposite side $\overline{BC}$ over the hypotenuse $\overline{BC}$.

$$sin = \frac{OPP}{HYP}$$
$$sin\ A = \frac{\sqrt{3}}{2}$$

Correct Answer: B

Example 2: Trigonometry



2. In right triangle DEF above, the measure of sin E is $\frac{3}{5}$. What is the length of side EF?

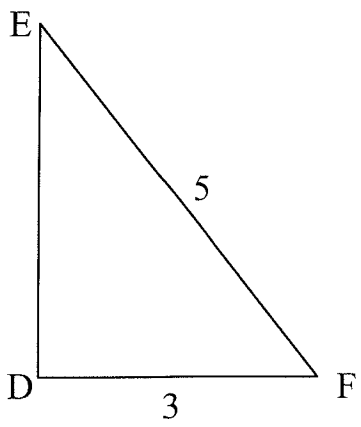
A) 13
B) 20
C) 24
D) 25

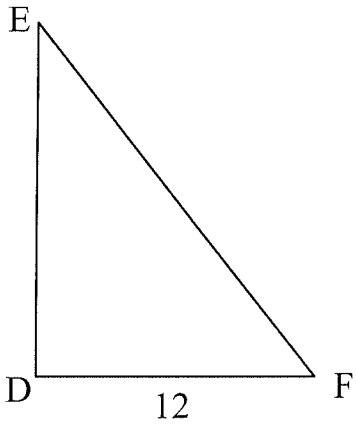
Solution Strategy: SOHCAHTOA

Step 1: Draw another triangle that has the ratios of the sides so that we can then see the actual side lengths of the triangle given to us.

$$sin = \frac{OPP}{HYP}$$

Since sin E is $\frac{3}{5}$, side DF (opposite) is 3, and side EF is 5 (hypotenuse).





Step 2: Once we have both triangles we see that there is a scale factor of 4 getting us to our original triangle. We can set up a proportion with x as side EF:

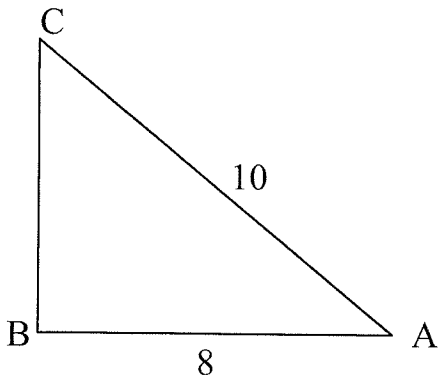
$$\frac{3}{12} = \frac{5}{x}$$

Step 3: Cross multiply

$3x = 60$
$x = 20$

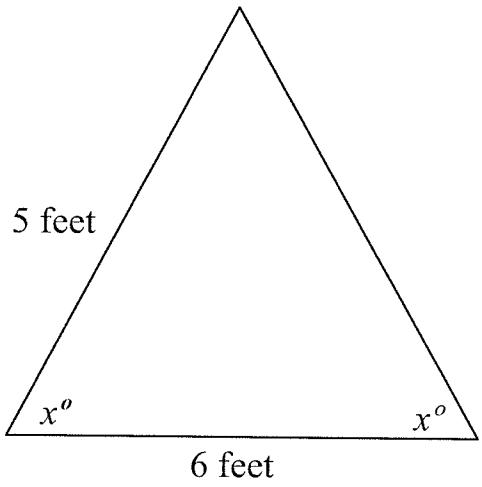
Correct Answer: B

Practice: Trigonometry



1. In right triangle ABC above, the measure of side AB is 8 and the measure of side AC is 10. What is the value of tan A?

A) $\frac{3}{4}$
B) $\frac{3}{5}$
C) $\frac{4}{5}$
D) $\frac{1}{2}$



2. Jaya sketches out the above diagram for the sail of a boat she is building. What is the value of sin x?

A) $\frac{3}{8}$
B) $\frac{2}{5}$
C) $\frac{3}{5}$
D) $\frac{4}{5}$

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

CHAPTER 40: STATISTICS & SURVEY DESIGN

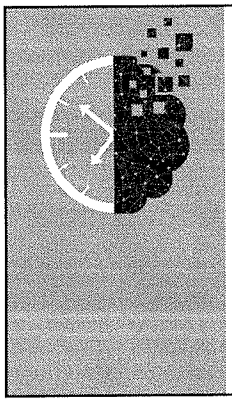
Section: Math
Question Subsection: Data, Statistics, & Probability
Question Category: Statistics & Survey Design
Of the 44 math questions, approximately 0 - 1 may be questions from this category.

LESSON

The purpose of statistics is to apply the findings of a small group to a much larger scale. Statistics is not an exact science, so avoid definitive language in the answer choices such as "all" or "most," and look for words such as "plausible," "likely," "roughly," "about."

- **Margin of Error**: usually a small amount that is allowed for in case of miscalculation.
- **Standard Deviation**: measures the amount of variability from the mean.

To reduce the error rate of a survey, the sample should be as **large** as possible and as **random** as possible.



The Curvebreakers Strategy

1. **If required, calculate the Lower and Upper Bounds.**
2. **Avoid Definitive Language in the Answer Choices.**
3. **The best survey designs have LARGE and RANDOM samples.**

Example 1: Statistics & Survey Design

1. To estimate the average score of students in a class, a random sample of scores was taken. Based on the sample, it is estimated that the average score is 75, with an associated margin of error of 4. Based on this estimate and margin of error, which of the following is the most appropriate conclusion about the average score of students in the class?

A) It is plausible that the average score is between 71 and 79.

B) It is plausible that the average score is less than 71.

C) The average score is exactly 75.

D) It is plausible that the average score is greater than 79.

Solution:

Step 1: Calculate the lower bound:

75 - 4 = 71

Step 2: Calculate the upper bound:

75 + 4 = 79

Therefore, based on this estimate and margin of error, the most appropriate conclusion about the average score of students in the class is that it is plausible that the average score is between 71 and 79.

Correct Answer: A

Example 2: Statistics & Survey Design

2. A customer satisfaction survey conducted by a restaurant chain reveals that 92% of surveyed customers rated their dining experience as excellent. Which of the following conclusions is most valid based on this survey?

A) The restaurant chain provides the best food among all competitors.
B) This restaurant chain has the highest customer satisfaction rating among all competitors.
C) 8% of customers had a poor dining experience at the restaurant.
D) Approximately 92% of all customers who have dined at the restaurant rated their experience as excellent.

Solution:

Step 1: Avoid definitive language in answer choices

A) The restaurant chain provides the ~~best food~~ among ~~all~~ competitors.
~~B~~) This restaurant chain has the ~~highest~~ customer satisfaction rating among ~~all~~ competitors.
? C) 8% of customers had a poor dining experience at the restaurant.
✓D) Approximately 92% of all customers who have dined at the restaurant rated their experience as excellent.

Correct Answer: D

Look for words like "approximately" when answering questions about survey design. The survey states that 92% of surveyed customers rated their dining experience as excellent. Therefore, the conclusion that approximately 92% of all customers who have dined at the restaurant rated their experience as excellent is a direct interpretation of the information provided.

Practice: Statistics & Survey Design

1. If the mean of a data set is 50 and the standard deviation is 3, which of the following contains the interval one standard deviation from the mean?

A) 40-56
B) 44-56
C) 47-53
D) 54-62

2. A national survey was conducted to estimate the proportion of adults who own a smartphone. Out of a random sample of 2,000 adults, 1,500 indicated that they own a smartphone. If the survey has a margin of error of 2%, which of the following represents the approximate range for the percentage of adults nationwide who likely own a smartphone?

A) 71-75%
B) 73-77%
C) 75-79%
D) 78-82%

3. A survey was conducted to estimate the proportion of voters supporting a particular referendum. Out of a random sample of 1,500 voters, 55% indicated support for the referendum. The survey had a margin of error of 2.5%. On election day, the referendum passed with 57% of the votes. Based on this information, which of the following conclusions is most supported by the data?

A) The survey accurately predicted the outcome of the referendum.
B) The survey results were too close to make an accurate prediction about the outcome of the referendum.
C) The survey results incorrectly predicted the outcome of the referendum.
D) No conclusions can be made using the survey results.

4. A company wants to survey its employees to gather feedback on workplace satisfaction. The company has 10 departments with a total of 5,000 employees. Which of the following surveying methods would result in the most accurate representation of the employees' opinions?

A) Survey all 1,000 employees who have been with the company for more than 10 years.
B) Randomly select 50 employees from each department to send surveys to.
C) Survey the first 500 employees who arrive at work on a specific day.
D) Survey only the employees who work on the ground floor of the company building.

For answer explanations to these practice questions, go to curvebreakerstestprep.com/decoding-the-digital-sat

SUMMARY OF STRATEGIES

READING

The table below lists a summary of the Reading strategies by category. Key things to focus on:

1. **Highlight:** Key words or phrases
2. **Summarize:** Try to summarize text and write it down
3. **Predict:** Know the direction you want to go before looking at the answer choices
4. **POE:** Eliminate answer choices that don't match your direction or contain too strong or extreme language

QUESTION CATEGORY	STRATEGY
Vocabulary Word Choice	Write In Your Own Word
Main Idea	Read and Predict
Support or Weaken Claim	Summarize the Claim
Relevant Information From Notes	Focus on the Goal
Text interpretation	Summarize and Predict; POE
Dual Passage Comparison	Summarize and POE
Transition Words	Write In Your Own Word

GRAMMAR

The table below lists a summary of the Grammar strategies by category. Key things to focus on:

1. **Vertical Line Test:** Use the Vertical Line test for answer choices with Full or Half-Stop punctuation.
2. **3 Reasons to Use a Comma:**
   a. List
   b. Before/After non-essential
   c. Intro
3. **Be consistent:** Subjects need to agree with verbs; pronouns need to agree with nouns; tenses need to remain the same.

QUESTION CATEGORY	STRATEGY
Punctuation; Full-Stop and Half-Stop	Vertical Line Test
Punctuation; Comma Usage	Know the 3 Main Reasons
Punctuation: Apostrophes	Put Apostrophe After Thing Doing the Possessing
Punctuation: End of Sentence	Know the 3 Main Reasons
Agreement; Subject/Verb	Be Consistent and Trim the Fat
Agreement: Pronouns	Be Consistent with Subject
Misplaced Modifiers	Draw the Arrow

MATH

QUESTION CATEGORY	STRATEGY
Plug In for the Variable	Find the Target Value
Plug in the Answer	Start with B and Label Columns
Basic Algebra	Isolate the variable
Slope Intercept Form of a Line	Write out the Formulas
Proportions	Write out Top and Bottom Units
Functions	Think of f(x) as y
Systems of Equations	Substitute, Stack, or Graph
Inequalities	Flip the Sign
Quadratics	Know the Basic Equations
Graphs	Select Quickest Option
Percents	Translate Text to Math
Exponents/Radicals	MADSPM
Mean/Median/Mode/Range	Use Average Pie for Mean
Probability	Success/Total
Represents Situation	Bite-size and POE
Geometry	Draw/Label/Complete Formulas/Carve
Trigonometry	SOHCAHTOA
Statistics and Survey Design	Large and Random Sample Sizes are Best

DESMOS CALCULATOR GUIDE

While you are allowed to bring your own calculator for the digital exam just as you would for the paper exam, the digital exam will now contain a built-in graphing calculator for you to use through the Desmos interface. This calculator is similar to the regular TI-84 calculator that you are used to in class, but there are some important differences.

Algebraic Math

Maximizing Your Performance

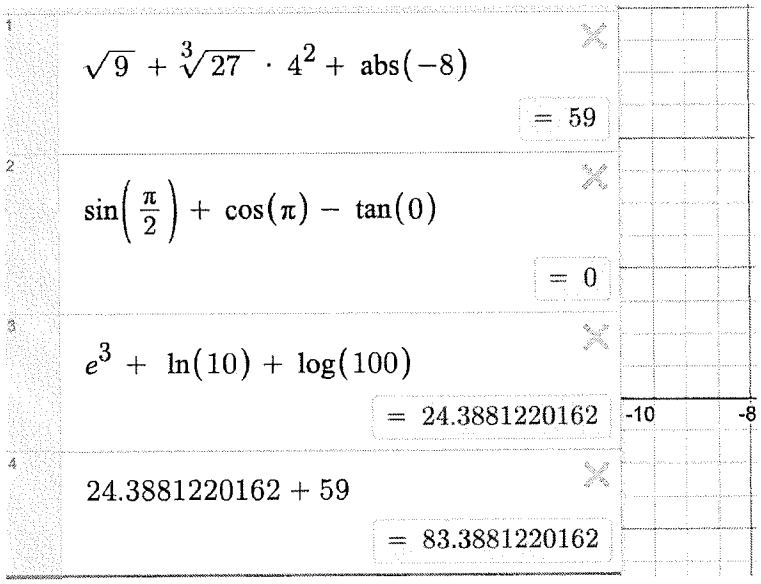
When tackling the algebraic challenges of the SAT, the Desmos calculator emerges as a powerful ally, mirroring the familiar functionalities of the classic TI-84 calculator. As you navigate through the exam, you'll find that inputting calculations into Desmos is a straightforward process: simply type your expression on the left side of the screen, keeping the order of operations firmly in mind. The answer will conveniently appear directly below your input.

Efficiency at Your Fingertips

One of the standout features of the Desmos calculator is its ability to enhance your workflow through the copy-paste function, allowing you to reuse previous calculations. Additionally, the expansive screen real estate means that you can view a comprehensive history of your past calculations without the need to scroll, allowing you to reference previous work.

Navigating Desmos: A Quick Guide

See below for how to execute common calculator functions, tailored specifically for the SAT algebra section, covering basic arithmetic operations to more advanced functions such as square roots, exponents, and trigonometric calculations.



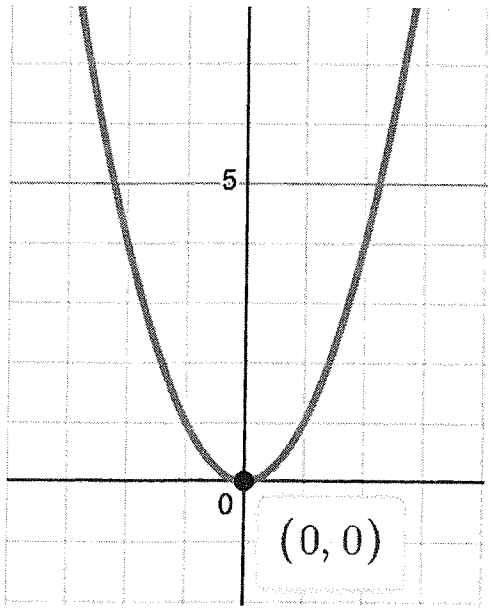
Graphing

Graphing Mastery

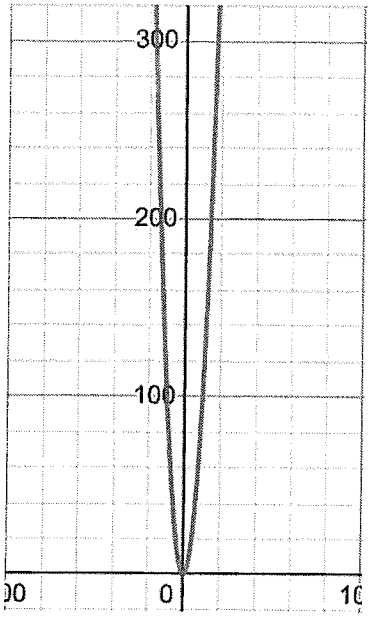
Embarking on the graphing section of the SAT, you'll find that the Desmos calculator offers an innovative approach, distinct from traditional graphing calculators. Desmos provides an expansive, infinite graphing canvas, ensuring that you are never confined by screen limitations. This feature is particularly advantageous for visualizing the behavior of functions across a wide range of values. Zooming in and out is achieved with a simple scroll of your mouse or touchpad, allowing for precise examination or a broader overview as needed.

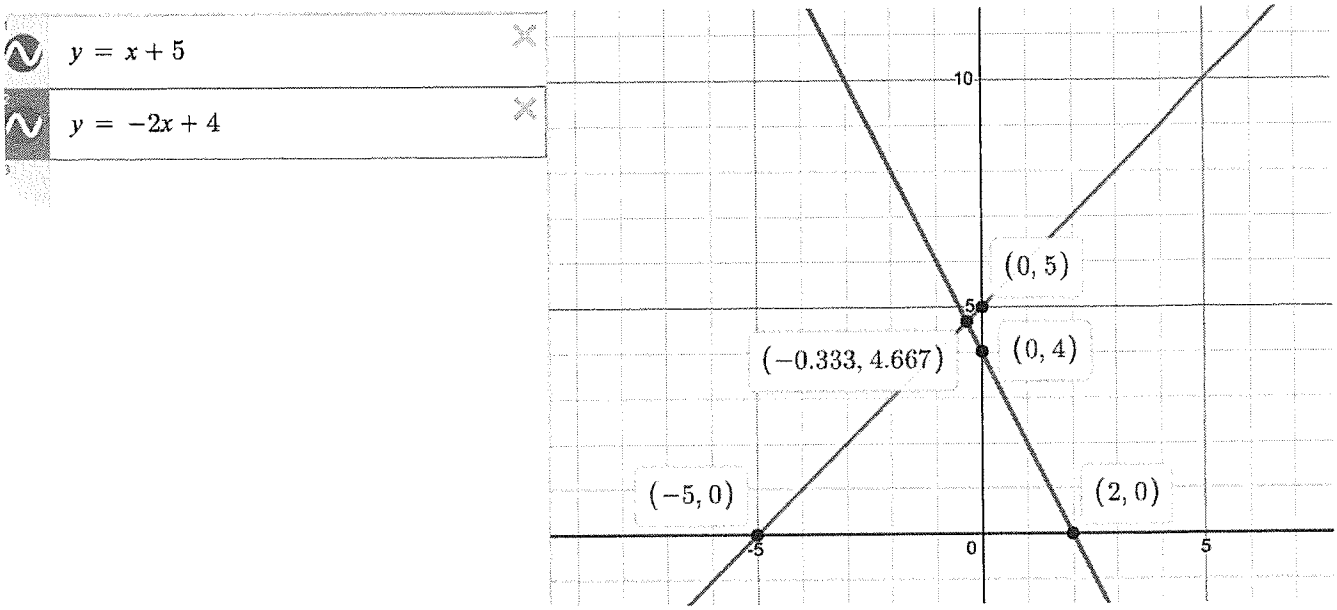
Inputting graphing equations is seamlessly integrated into the Desmos interface. You can enter equations for graphing in the same area where you perform algebraic calculations, starting with \(y = \) or another dependent variable. The Desmos calculator immediately generates a vivid, color-coded graph on the right side of the screen, providing a clear visual representation within the infinite 2-D graphing space. This color-coding is especially helpful when dealing with multiple functions, as it allows for quick and easy differentiation between graphs.

The Desmos calculator revolutionizes the way you find key features of graphs. Unlike traditional calculators, which may require a series of button presses and menu navigations, Desmos enables you to interact directly with the graph using your mouse or touchscreen. Simply click on or hover over key points on the graph to reveal their coordinates, intersection points and roots, and other important information. Additionally, Desmos assists in locating and understanding the maximum or minimum points of a graph, crucial for analyzing the behavior of various functions.



⇐ Same Graph ⇒





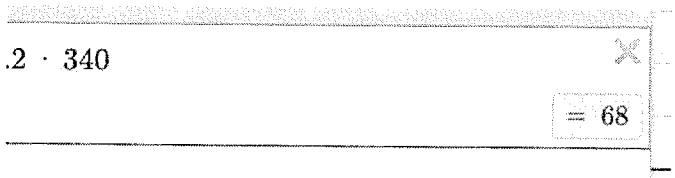
* Here I can see all important points on the graphs like intersections and intercepts

Function	How to Get
Square Root	Type **sqrt** then whatever you want inside it then the right arrow key to get out from under the radical
Cube Root	Type **cbrt** then whatever you want inside it then the right arrow key to get out from under the radical
Exponent	Use **Shift + 6** to get into the exponent and use the right arrow key to get out of the exponent
Sine	Type **Sin** then input what you want the sine of making sure to use parenthesis
Cosine	Type **Cos** then input what you want the cosine of making sure to use parenthesis
Tangent	Type **Tan** then input what you want the tangent of making sure to use parenthesis
e	Just type out **e** regularly and using proper order of operations, Desmos will recognize it as the constant number 2.718
Log / Ln	Just like the trig functions type **Log or Ln** followed by what you are looking for in parentheses
Pi	Just type out **pi** and it will turn into π
Absolute Value	Type **abs** and put what you want in parentheses to get the absolute value function

Some Example Question Uses

1. What is 20% of 340 ?

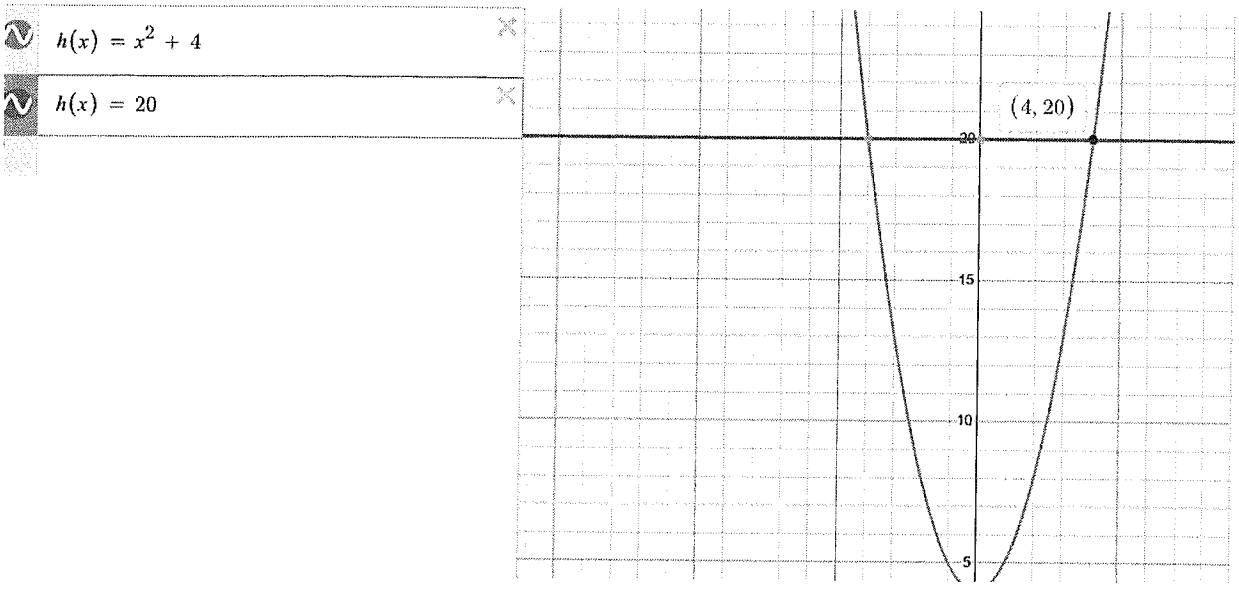
A) 30
B) 20
C) 34
D) 68



2. The function h is defined by $h(x) = x^2 + 4$. For which **Solution**
Type 20% as a number which means moving the decimal over 2 places to get .2. Then multiply this number by 340 and you will get answer D) 68.

h value of x is $h(x) = 20$?

A) 2
B) 3
C) 4
D) 5

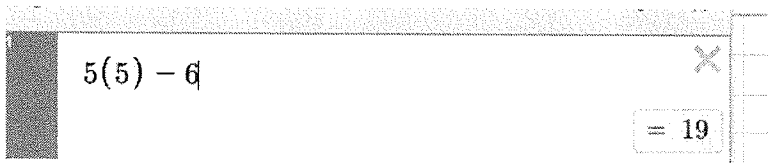


Solution

First plot the graph $h(x)$ in DESMOS then plot the line we want the function to equal. Then hover over the intersection to see where the two lines intersect and see what the x value is which in this case is C) 4.

3. The function f is defined by the equation $f(x) = 5x - 6$. What is the value of $f(x)$ when $x = 5$?

A) 19
B) 21
C) 25
D) 30



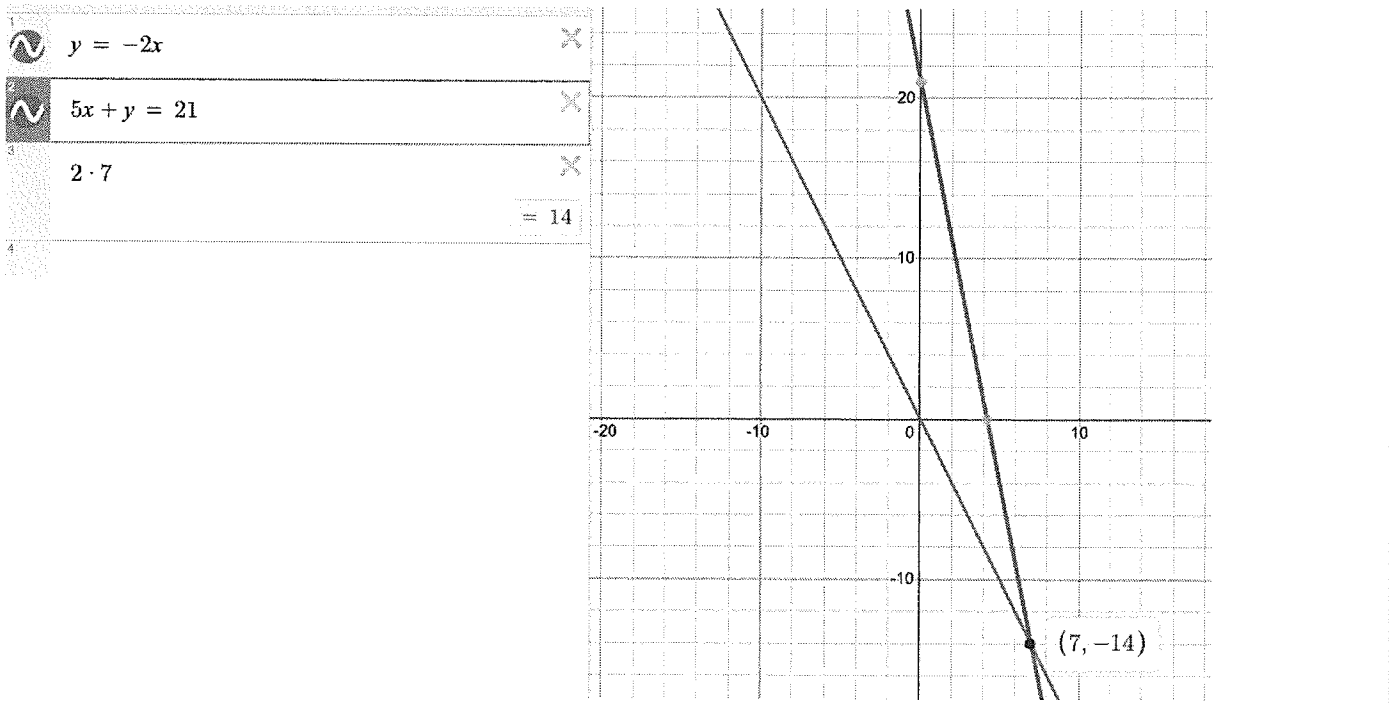
Solution

Since we know what we want x to equal and we have the function, we can just plug 5 into our function for x and figure out what the corresponding $f(x)$ value should be, which is A) 19.

$$\begin{aligned} y &= -2x \\ 5x + y &= 21 \end{aligned}$$

4. The solution to the given system for equations is (x,y). What is the value of $2x$?

A) 7
B) -14
C) 14
D) 21



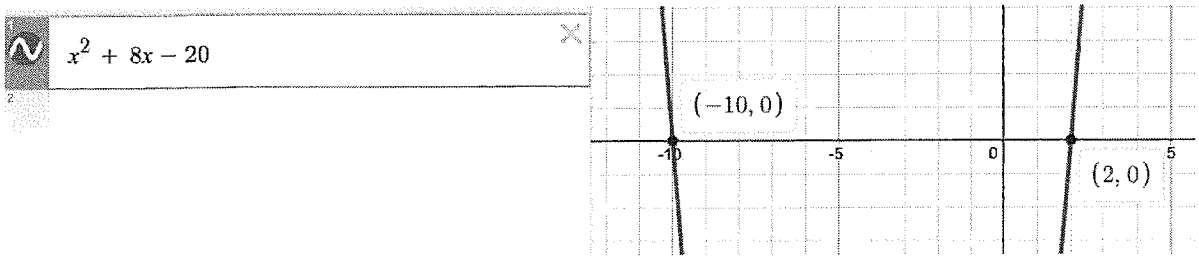
Solution

First plot the graphs in DESMOS then hover over the intersection to see where the two lines intersect and see what the x value of the intersection is which in this case is 7. Then since they ask for $2x$, we can multiply this value of 7 times 2 to get a final answer of C) 14.

$c^2 + 8c - 20$

5. What is one solution to the given equation

A) 2
B) 4
C) 8
D) 20

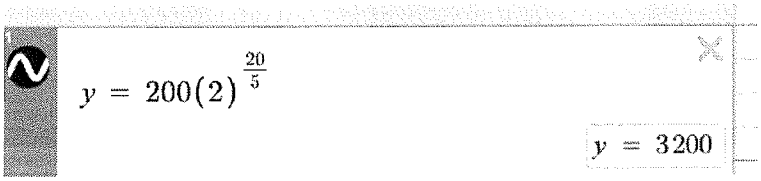


Solution

First plot the graph in DESMOS and look at the x-axis because that is where the roots/zeros/solutions will be. The variable itself does not matter so even though the question uses c, we will use x when we plug into DESMOS. Hover over these points to reveal both solutions and then look at the answer choices to see if there are any that match these points with the correct x values. The answer is A) 2.

6. Bacteria are growing in a liquid growth medium. There were 200 cells per milliliter during an initial observation. The number of cells per milliliter doubles every 5 hours. How many cells per milliliter will there be 20 hours after the initial observation?

A) 200
B) 800
C) 1000
D) 3200

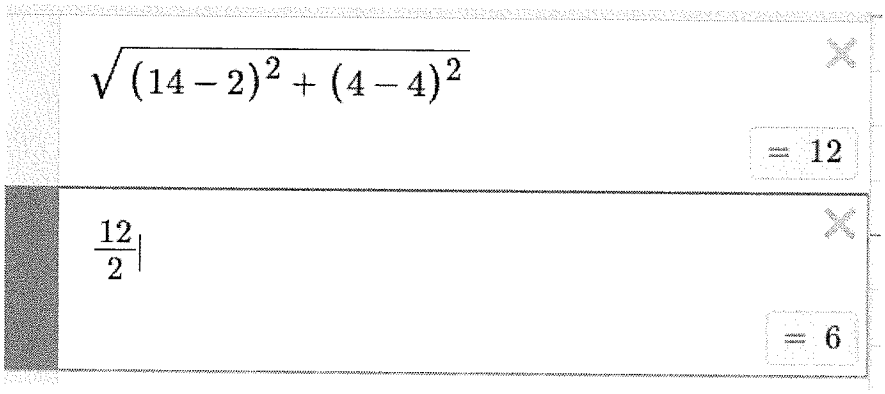


Solution

Since this is an exponential function, we can plot this in DESMOS using our traditional equation for an exponential. We know 200 is the initial value, since it doubles the rate inside the parenthesis is 2 and we know that $t = 20$ which should go into our exponent. We then see that the answer is D) 3200.

7. A circle in the xy-plane has a diameter with endpoints (4, 2) and (4, 14). An equation of this circle is $(x-4)^2+(y-8)^2=r^2$, where r is a positive constant. What is the value of r?

A) 4
B) 5
C) 6
D) 7

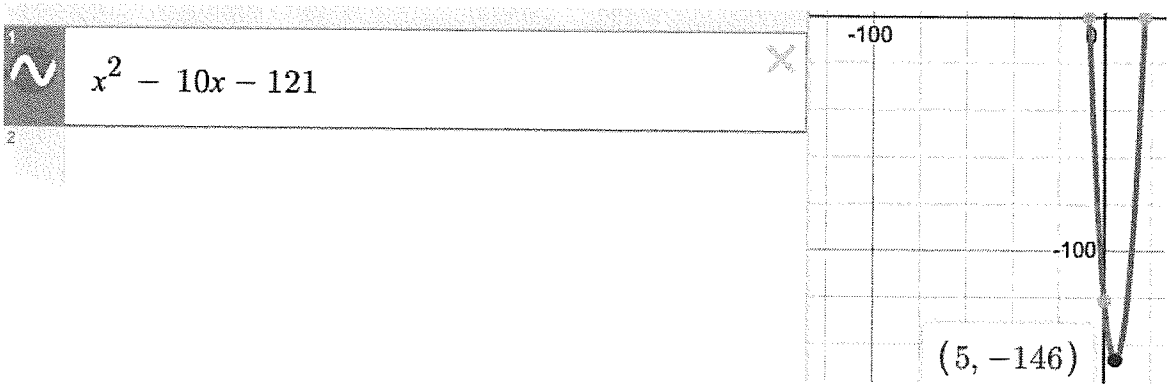


Solution

The first thing that we do is use the distance equation to find the length between the endpoints of the circle which we know will be the diameter. Once we find this, we know that the diameter is just twice the radius, so we need to divide this value (12) by 2 to get the radius C) 6.

8. In the xy-plane, the graph of the equation $y=x^2-10x-121$ intersects the line $y=c$ at exactly one point. What is the value of c?

A) -100
B) -121
C) -140
D) -146

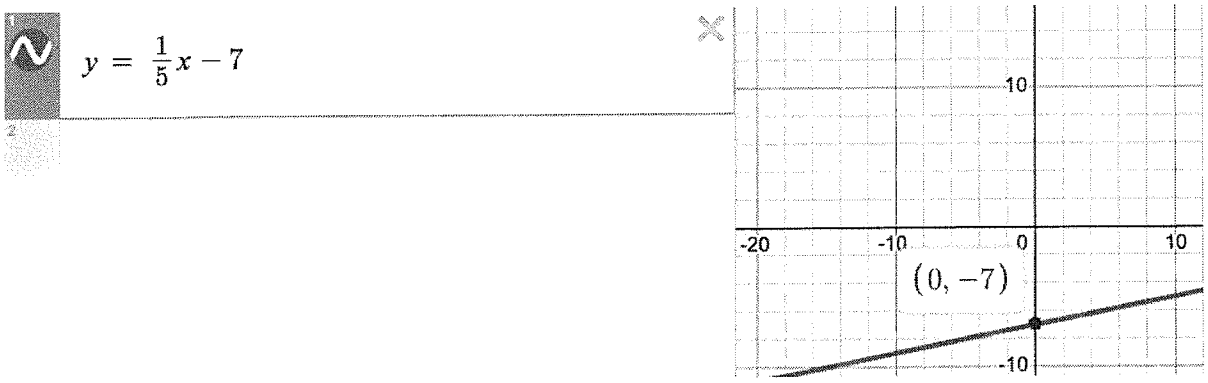


Solution

Plot this equation is DESMOS and then we know that the only time a parabola will hit a horizontal line once is at the vertex so we need to find that point. Hover over the vertex point and find the y-value associated with it and then we know that this value is the line that will only hit the parabola once, which is d) (-146).

9. The function g is defined by $g(x) = \frac{1}{5}x - 7$. What is the y-intercept of the graph $y = f(x)$ in the xy-plane?

A) -7
B) -3
C) $\frac{1}{5}$
D) 4



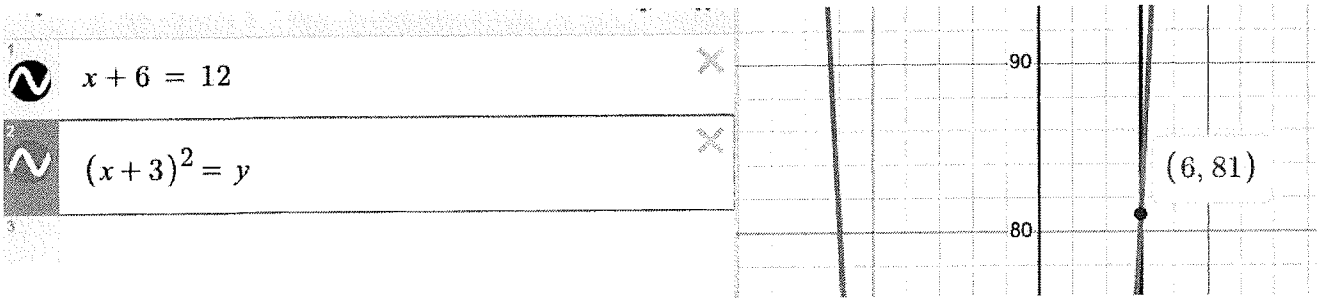
Solution

First plot the graph in DESMOS and since we are looking for the y-intercept we know that this is the value when $x = 0$. So we go down to the graph at this point to figure out what the corresponding y-value is. In this case it is answer C) -7.

$$x + 6 = 12$$
$$(x + 3)^2 = y$$

10. What ordered pair (x,y) is a solution to the given system of equations?

A) (3,36)
B) (4,49)
C) (0,0)
D) (6,81)

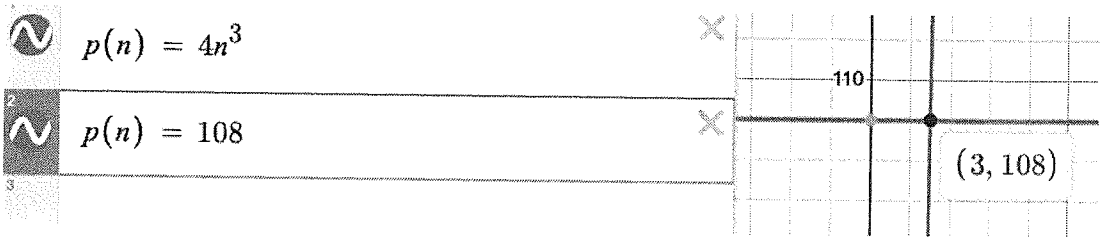


Solution

So we can plot both of these graphs just as they are in DESMOS and we are looking for the solution which is also known as the intersection point. We can highlight over this point and see the ordered pair that is the solution for this set of equations.

11. The function p is defined by $p(n) = 4n^3$. What is the value of n when $p(n) = 108$?

A) 2
B) 3
C) 4
D) 5



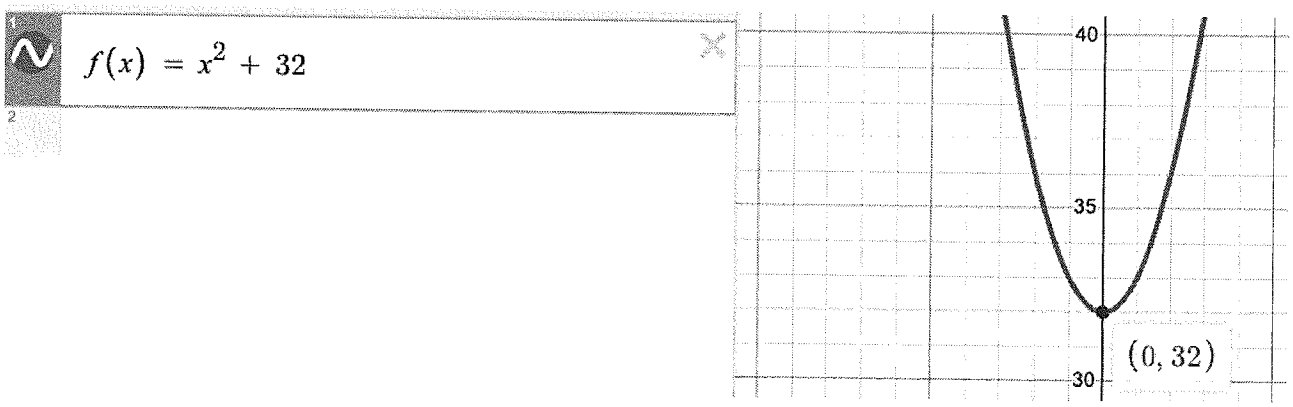
Solution

So first plot the graph $p(n)$ in DESMOS and then plot the value that we want to hit which is 108. Then we want to hover over the intersection point because this will give us the value of n where this happens, which is B) 3.

$f(x) - x^2 + 32$

12. What is the minimum value of the given function?

A) 0
B) 20
C) 28
D) 32



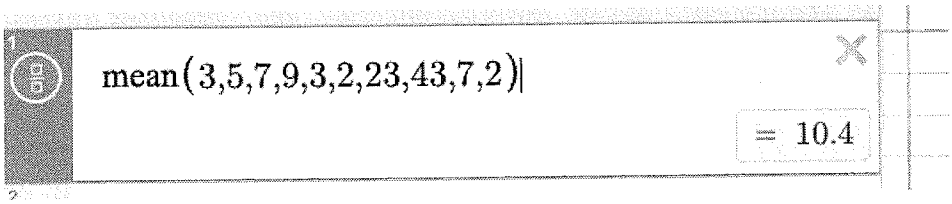
Solution

We know that the minimum value of a parabola occurs at the vertex so we are going to plot this graph to find the coordinates of the vertex. Plot this graph in DESMOS and then hover over the vertex to find the points of the vertex and see what the y-value is because that is what corresponds to the minimum value. The answer is D) 32.

3, 5, 7, 9, 3, 2, 23, 43, 7, 2

13. What is the mean of the following data?

A) 7.5
B) 8.3
C) 10.4
D) 12.2

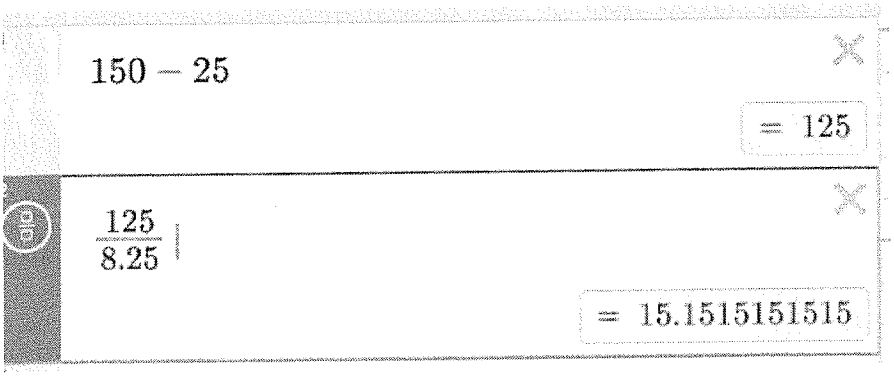


Solution

So here we can use the mean function that DESMOS has. First type mean then add a parentheses. Then add in all of the values each separated by a comma and then close the parenthesis. This function will then automatically give you the mean of the numbers. The answer is C) 10.4

14. Cory is planning a party. It costs Cory a one time fee of $25 to rent the venue and $8.25 per attendee. Cory has a budget of $150. What is the greatest number of attendees possible without exceeding the budget?

A) 12
B) 13
C) 14
D) 15

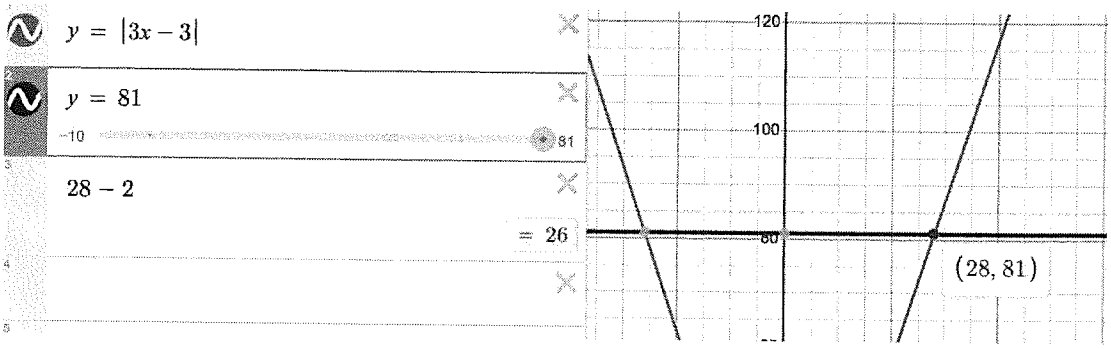


Solution

So first subtract the 25 dollars from the original 150. Then take the answer of that (125) and divide that by the amount it costs each person to attend. In this case since we cannot have a decimal amount of a person, we must round down to get an answer of 15, which is choice D.

15. If $|3x - 3| = 81$, what is the positive value of $x - 2$?

A) 20
B) 26
C) 28
D) 81

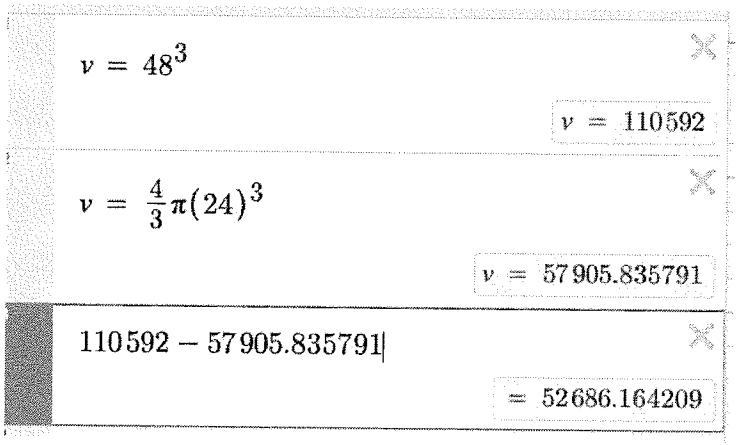


Solution

First graph the function and the value of 81 on DESMOS. Now look for the positive intersection point and hover over it to figure out the x value where this intersection happens on the positive side. Now since we want this value minus 2 we can plug that equation in below to solve for our answer, which is B) 26.

16. A cube has an edge length of 48 inches. A solid sphere with a radius of 24 inches is inside the cube, such that the sphere touches the center of each face of the cube. To the nearest cubic inch, what is the volume of the space in the cube not taken up by the sphere?

A) 516,087
B) 520,087
C) 525,243
D) 526,686



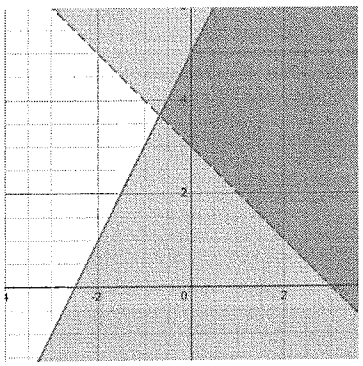
Solution

So first plug into the volume of a cube formula and then do the same thing for the volume of a sphere formula right below it. Use the numbers they give you for the components of the volumes and then subtract these two numbers to see what remaining volume is in the cube and not the sphere. The answer is choice D.

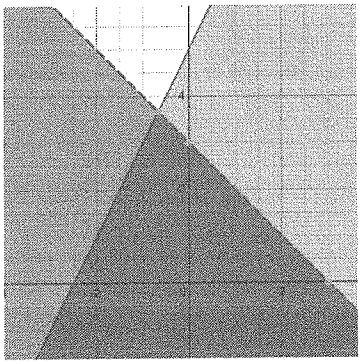
$y > -x + 3$
$y \leq 2x + 5$

17. Which graph represents the solution to the system of inequalities?

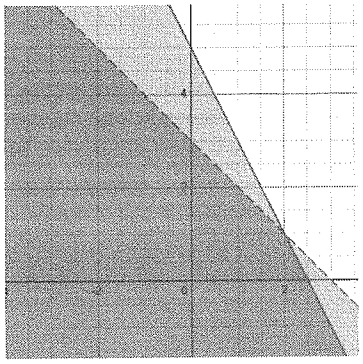
a)



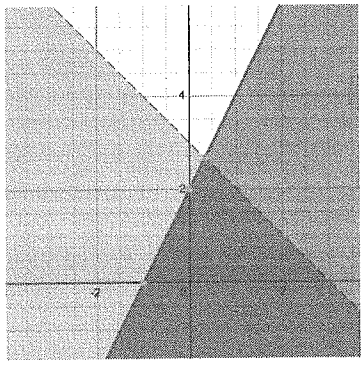
b)



c)

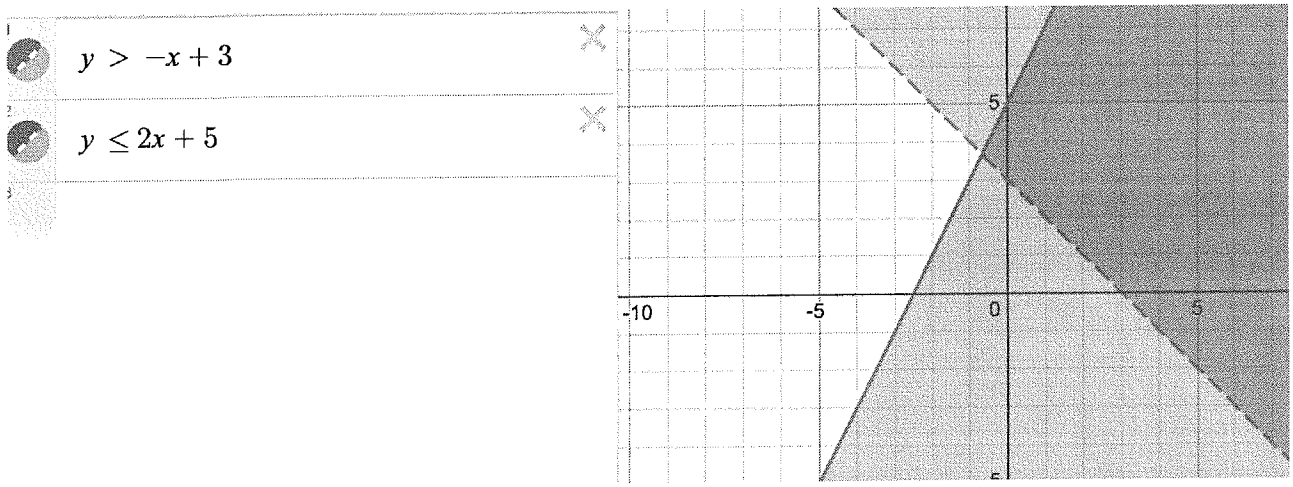


d)



Solution

When we plug the equations into DESMOS it is important to note that the signs are different and represent dotted and solid lines respectively. When we plot the system we look at the choices and see that our graph matches choice A.



CALCULATOR TIPS AND TRICKS

PERMITTED CALCULATORS ON THE SAT

Most students use some type of TI-83 or TI-84, which is allowed by the College Board on the SAT exam. Curvebreakers recommends the TI-84 Plus CE. For more information about using calculators on the SAT, read Curvebreakers' detailed blog posts online at curvebreakerstestprep.com/blog.

PROHIBITED DEVICES

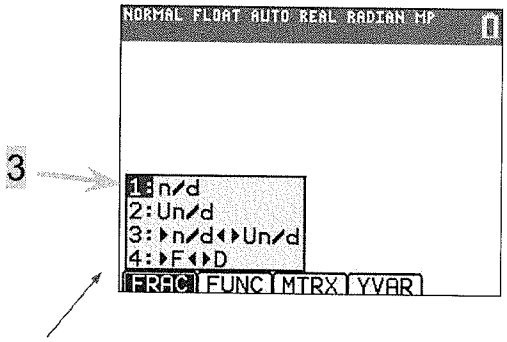
Unless students have an accommodation approved by the College Board, they can't access these items during the test or breaks:

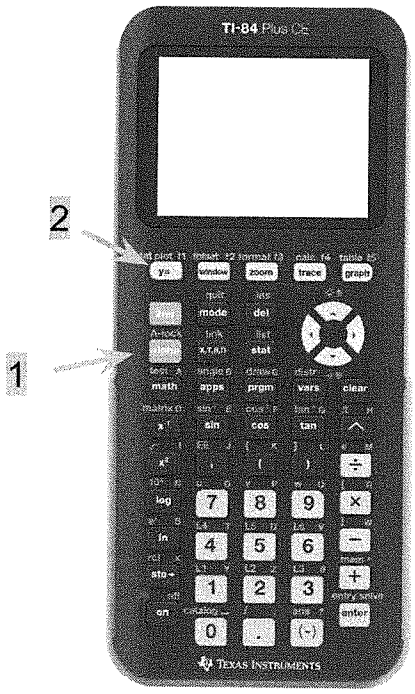
- Phones smartwatches, fitness trackers, or other wearable technology
- Audio players, Bluetooth devices (like wireless earbuds/headphones), or any other electronic devices (except your testing device)
- Detachable privacy screens
- External keyboards for use with laptops or Chromebooks (keyboards for iPads are allowed)
- Stylus for iPad
- Any cameras, recording device, or timer
- Notes, books, or any other reference materials
- Compasses, rulers, protractors, or cutting devices
- Headphones, earbuds, or earplugs
- Unacceptable calculators that have computer-style (QWERTY) keyboards, use paper tape, make noise, or use a power cord

HOW TO USE A GRAPHING CALCULATOR

Inputting A Fraction

1) Press "alpha"
2) Press "y="
3) Press "enter" to select "1: n/d"





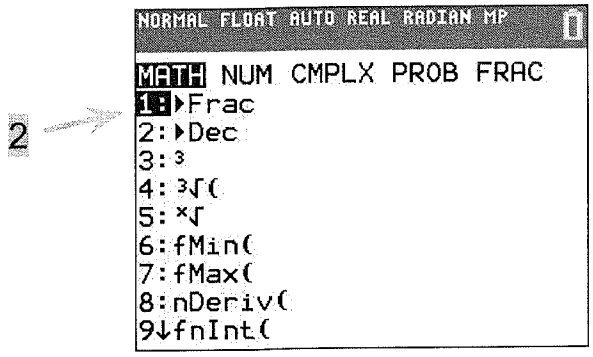
NOTE: There are several other functions you'll see in this list.

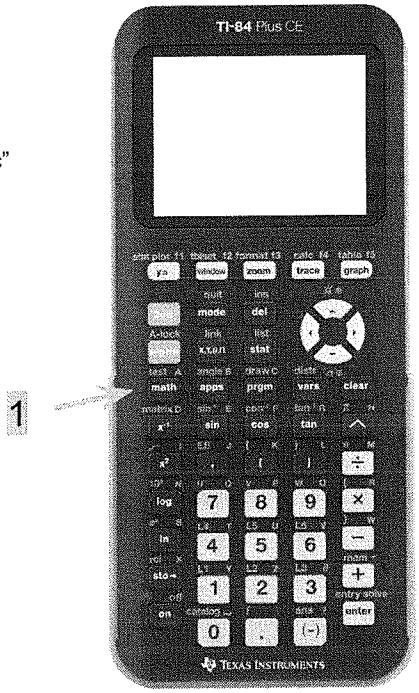
- "2: Un/d" will allow you to input a mixed number
- "3: ▶ n/d ◀ ▶Un/d" will change a fraction into a mixed number

To get a decimal in fraction form:

1) Press "math"
2) Press "enter" to select "1: ▶ Frac"
3) Press "enter"

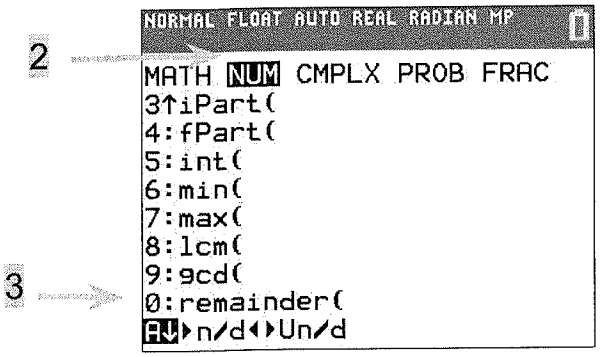
*To get from fraction form into decimal, repeat the procedure, but select "2: ▶ Dec"

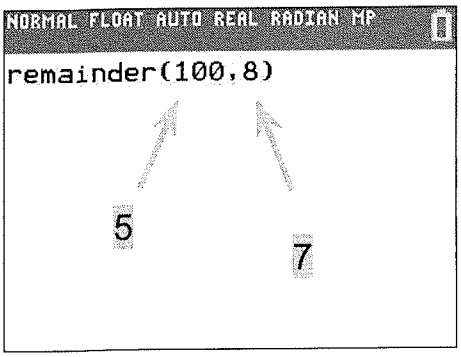


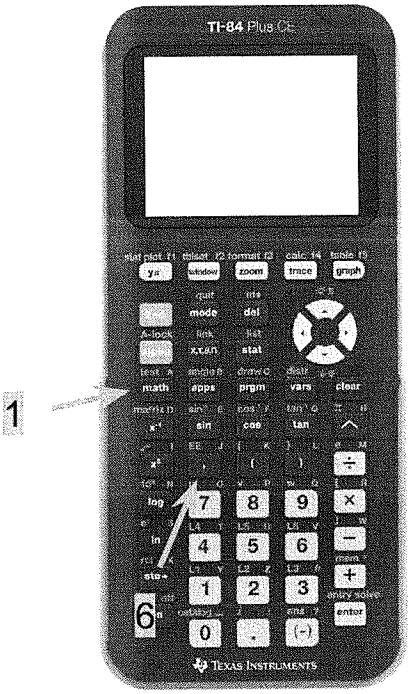


Calculating A Remainder:

1) Press "math"
2) Scroll right to "num"
3) Scroll down to "0: remainder("
4) Press "enter"
5) Input your dividend (what you're dividing)
6) Input a comma
7) Input your divisor (what you're dividing by)
8) Close parentheses and press "enter"







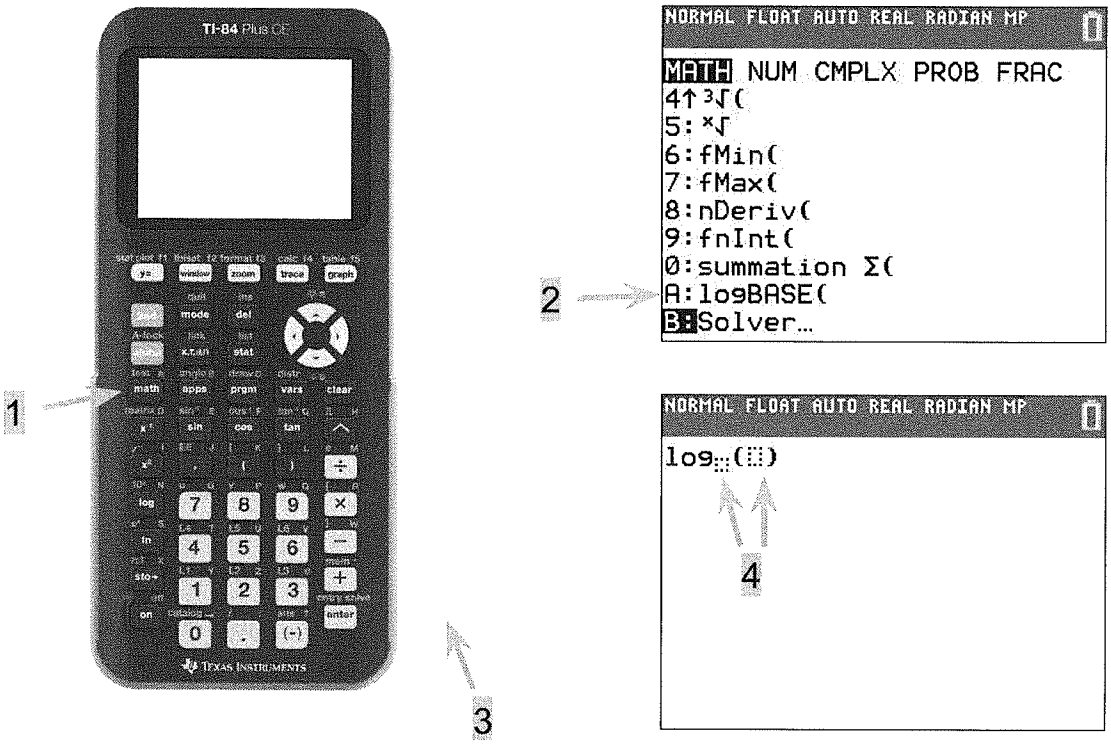
NOTE: There are several other functions you'll see in this list that can be calculated with the same steps.

- 8: lcm(" will calculate a least common multiple
- 9: gcd(" will calculate a greatest common divisor

*Place commas between your terms.

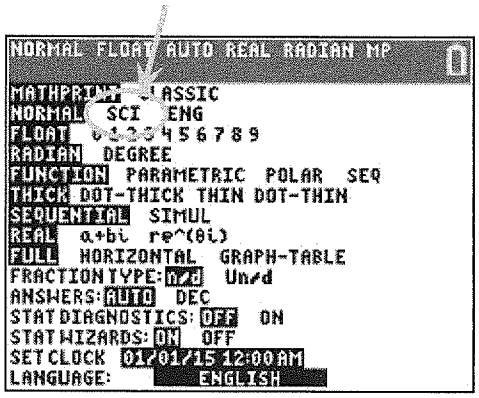
Logarithm with a Base not equal to 10:

1) Press "math"
2) Scroll down to "A: LogBASE("
3) Press "enter"
4) Input base and what you are calculating the logarithm of



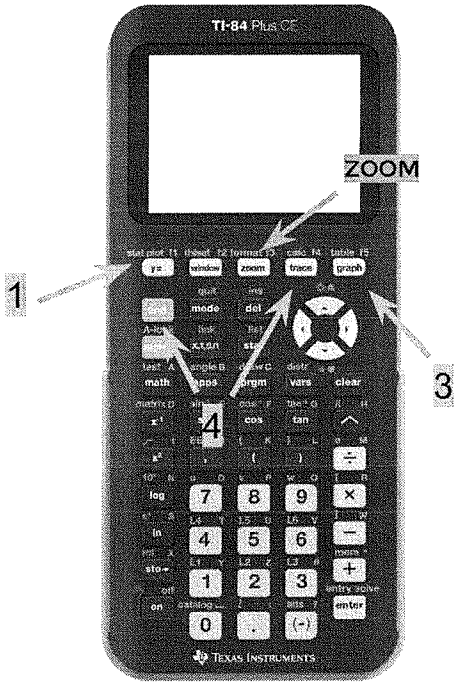
Scientific Notation

1) Press "mode"
2) Scroll down to second row and select "SCI"
3) Quit (Press 2nd and then "mode" to quit)



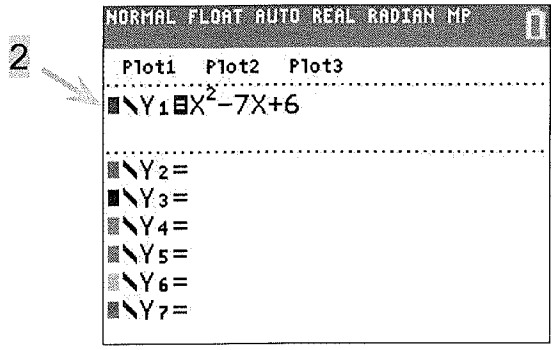
To find a zero (solution or root) by graphing:

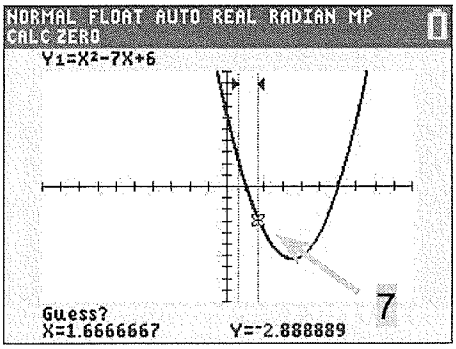
1) Press "y="
2) Input function into Y1=
3) Press "graph" (the graph will appear in your window; if it does not, try zooming out by pressing "zoom" and scrolling down to "3: zoom out")
4) Press "2ND" and then "trace"
5) Scroll down to "2: zero" and press "enter"
6) Move the cursor to a spot on the curve to the LEFT of the zero. Push "enter"
7) Move the cursor to a spot on the curve to the RIGHT of the zero. Push "enter"
8) Push "enter" a third time
9) The x and y coordinates will appear at the bottom of the screen

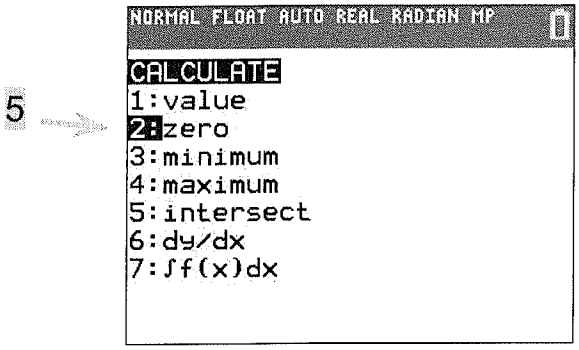


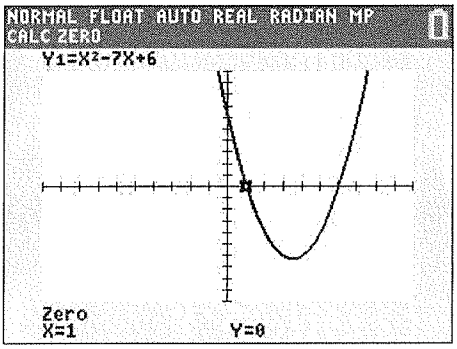
NOTE: You can find a maximum or minimum with the same procedure.
In step 5, select:

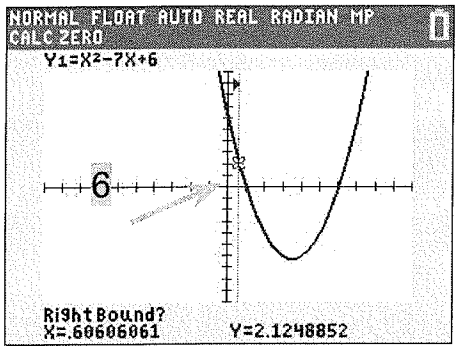
- "3: minimum" to trace a minimum
- "4: maximum" to trace a maximum





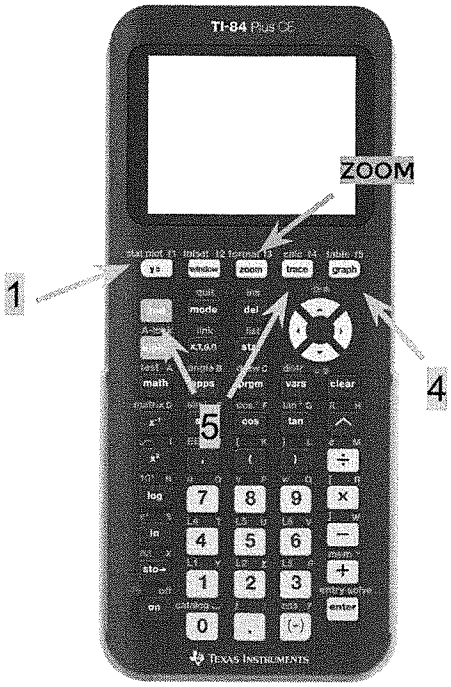






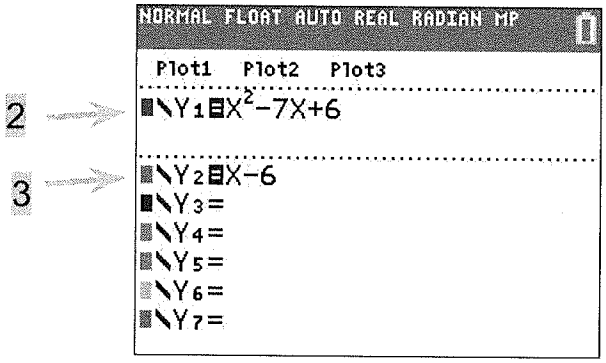
To find a point of intersection:

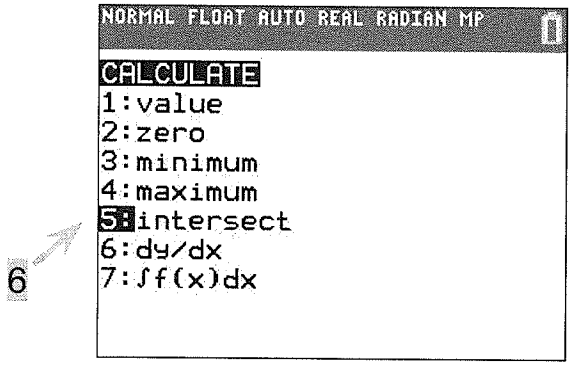
1) Press "y="
2) Input first function into Y1=
3) Input second function into Y2=
4) Press "graph" (both graphs will appear in your window; if they do not, try zooming out by pressing "zoom" and scrolling down to "3: zoom out")
5) Press "2ND" and then "trace"
6) Scroll down to "5: intersect" and press "enter"
7) Move the cursor to a spot near the intersection on the FIRST curve. Push "enter"
8) Move the cursor to a spot near the intersection on the SECOND curve. Push "enter"
9) Push "enter" a third time
10) The x and y coordinates will appear at the bottom of the screen

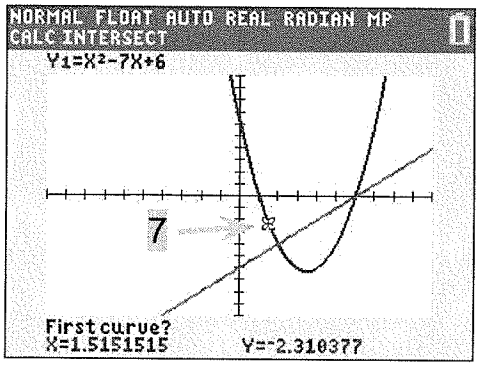


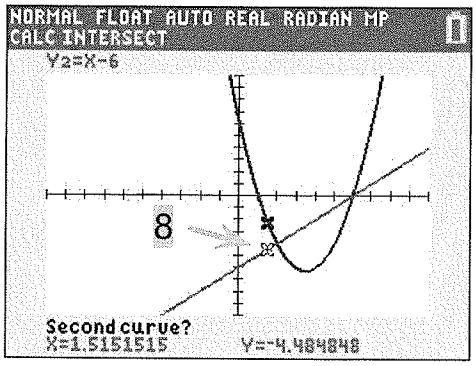
NOTE: This is a great way to solve equations that are difficult to solve by hand.

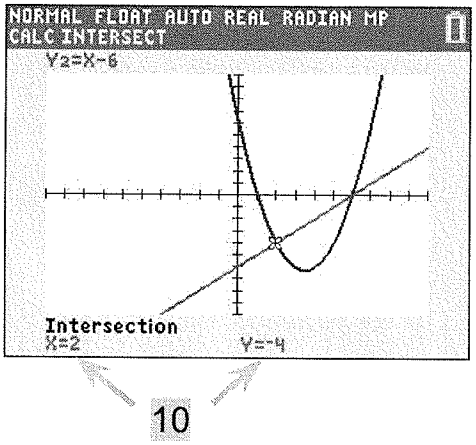
- Put one side of the equation into Y1=
- Put the other side of the equation into Y2=
- Trace the intersection







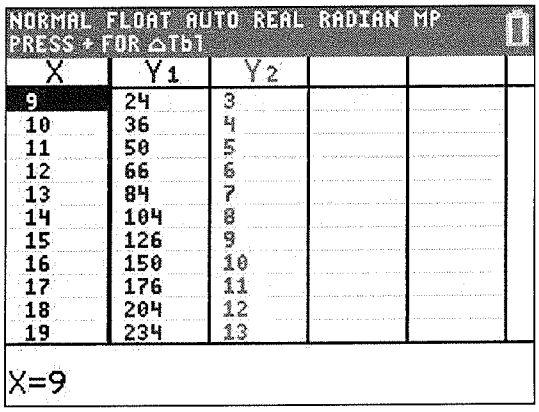




NOTE: A great way to test for **equivalency** (without needing to do the algebra) is to use the graphing component. Put one expression into Y1 and the other expression into Y2 and graph them both. If the functions are truly equivalent, they will have the same graphs.

They will also have the same table values. Viewing the table might be quicker than letting the calculator graph the entire functions. To locate a table:

1) Press "2nd"
2) Press "graph"



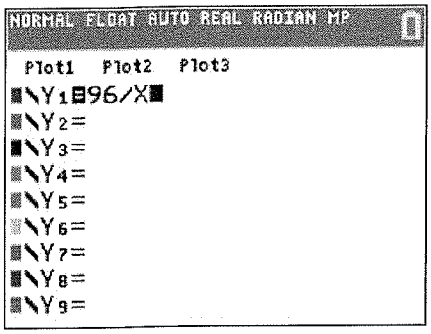
NOTE: The physical graphs, trace functions, and table values can help you determine several features about a function without needing to perform any operations by hand. You can simply *observe* them. These features include:

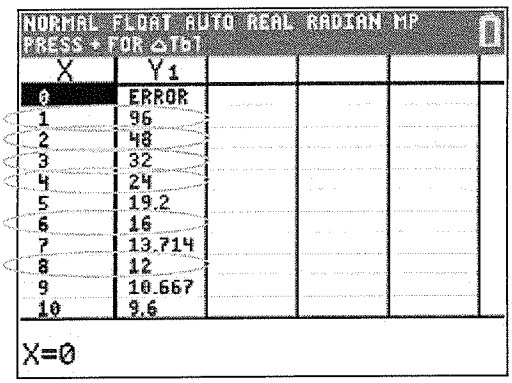
1) Y- Intercepts and X- Intercepts (zeros)
2) Maximums & Minimums
3) Points of Intersection
4) Points of Discontinuity
5) Asymptotes
6) Limits
7) Equivalencies to other functions

To determine the factors of a number:

1) Press "y="
2) Input that number divided by x into Y1
3) Press "2ND" and then "graph" to bring you to the table
4) Any x-y pairs that are whole numbers are factors of that initial value

2 →



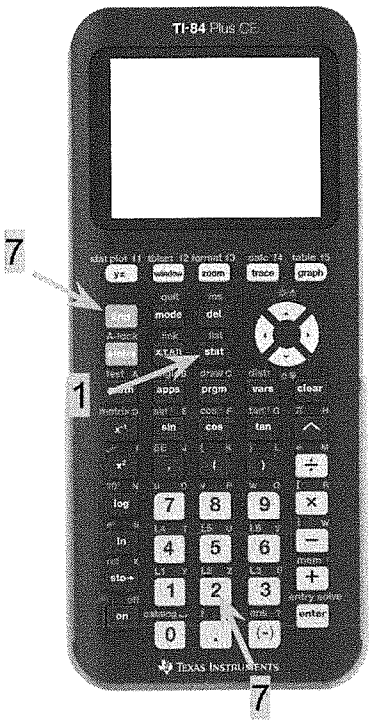


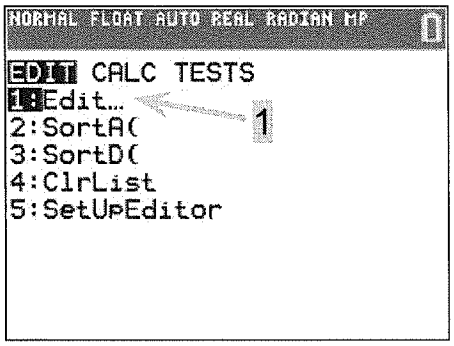
To find mean, median, and standard deviation for a data set.

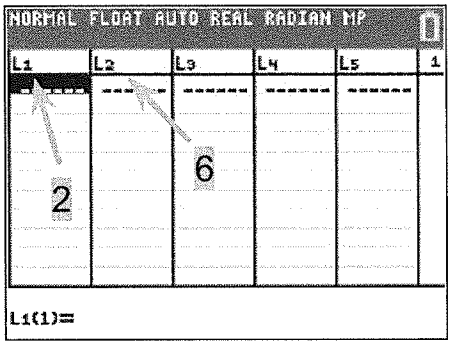
1) Press "stat" and select "edit"
2) If it is a single list with no frequency, add the values into list 1 (L1)
3) Press "stat" and scroll right to "CALC" menu
4) Select "1-Var Stats"
5) Make sure "Freqlist" is blank and then push "enter" 3 times

   x = mean (average)
   σx = standard deviation
   med = median

6) If the list ***does*** have a frequency, enter the frequency of each term into list 2 (L2) and continue with steps 3 and 4
7) Scroll down to "FreqList" and input (L2) by pressing "2nd" and the number "2"
8) Press "enter" twice







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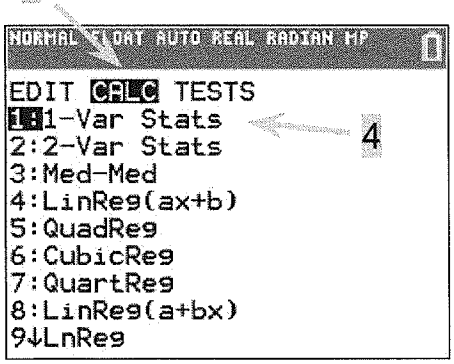

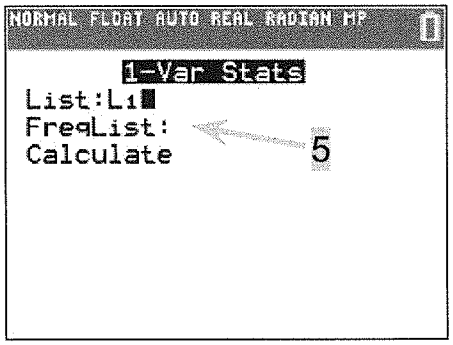

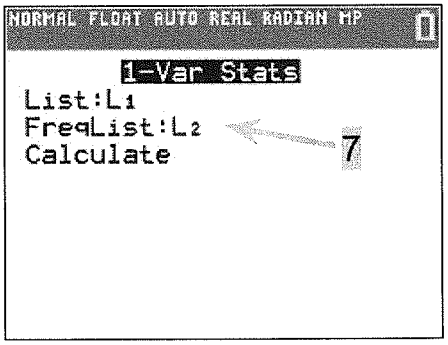

What you will see:

Scroll down to see more information (like the median)