A close-up photograph of a hand holding a black pen, writing on a piece of paper. The background is blurred, showing a wooden surface. The text is overlaid on the image.

**Chang Learning Center**  
**SAT: Studying for the SAT Mathematics Section**  
**Lesson #3: Systems of Linear Equations**  
**July 10th, 2024**

By Joshua Weiner

Provided by Chang Learning



SAT Quiz #2  
Review  
Questions {#4 and #5}

1) (Easy Level)

The cost of a 4 color pen is \$3.75.  
If the price is increased by 40 cents,  
how much are 2 pens at the new price ?

- A) \$7.50
- B) \$8.30
- C) \$9.00
- D) \$12.45

2) (Easy Level)

A map scale on a computer screen says  
5 kilometers equals 80 pixels.  
How many pixels equal 300 kilometers ?

A) 18.75

B) 187.5

C) 1875

D) 4800

3) (Mid Level)

What is the solution to the system of equations below ?

$$3x - 7y = 12$$

$$5x + 7y = 20$$

A) (0 , 4)

B) (4 , 0)

C) (- 4, 0)

D) (0, - 4)

4) (Mid Level)

A cylindrical pitcher has a radius of 5 and height 12.  
It is filled four-fifths to the top with orange juice.  
If the pitcher is poured into cups with a radius of 1  
and height 4, each cup filled halfway,  
how many cups of orange juice can be poured ?

- A) 120
- B) 240
- C) 60
- D) It cannot be determined from the given information.

5) (Challenge Level)

Train stations A and B are 800 miles apart. At 9:00 am

Train A leaves station A traveling towards B at 120 mph.

At 10:00 am Train B leaves station B traveling towards A at 152 mph.

How many minutes will train A have traveled when the trains pass each other ?

Grid In:

SAT QUIZ #2  
QUESTION #4

4) (Mid Level)

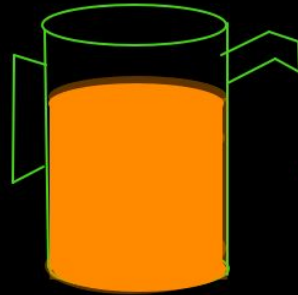
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juice pitcher

$$5 = \text{radius}$$
$$(4/5)12 = 48/5 = \text{height}$$

$$V(\text{juice in pitcher}) = \pi (r^2) h$$



$$= \pi (25) \frac{48}{5}$$

$$= \pi (5)(48)$$
$$= 240 \pi$$

$$V(\text{half cup}) = \pi (1)(2) = 2\pi$$

SAT QUIZ #2  
QUESTION #4

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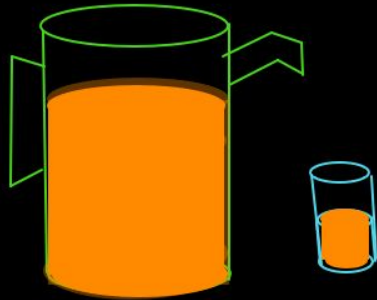
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$$\frac{240\pi}{2\pi} = 120 \text{ cups}$$

$$V(\text{half cup}) = \pi(1)(2) = 2\pi$$

SAT QUIZ #2  
QUESTION #4

4) (Mid Level)

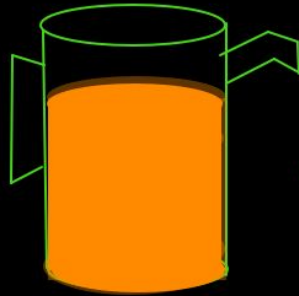
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QUESTION #4

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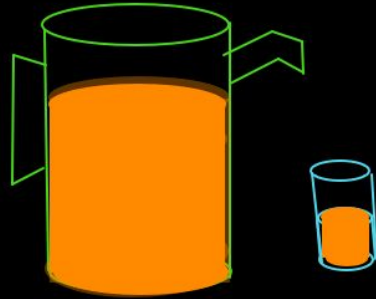
C) 60

D) It cannot be determined from the given information.

juice pitcher

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$$\frac{240\pi}{2\pi} = 120 \text{ cups}$$

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SAT QUIZ #2  
QUESTION #5

5) (Challenge Level)

Grid In:

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At 10:00 am Train B leaves station B traveling towards A at 152 mph.  
How many minutes will train A have traveled when the trains pass each other ?

(9:00 am)



SAT QUIZ #2  
QUESTION #

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Train stations A and B are 800 miles apart. At 9:00 am  
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**(9:00 am)**



**(10:00am)**



SAT QUIZ #2  
QUESTION #

5) (Challenge Level)

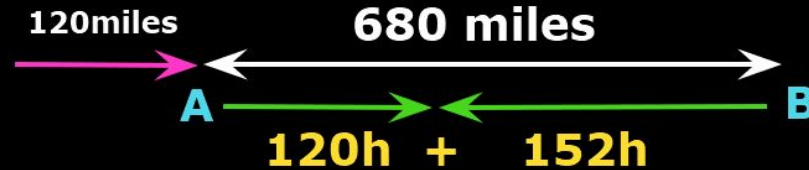
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(9:00 am)



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SAT QUIZ #2  
QUESTION #

5) (Challenge Level)

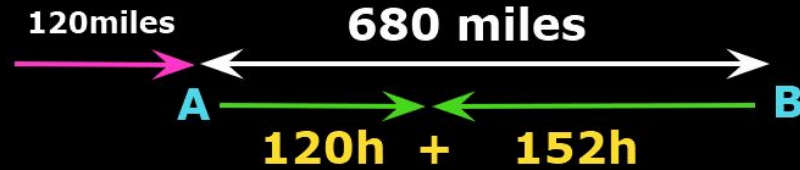
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(9:00 am)



(10:00am)



$$\text{train A} + \text{train B} = 680\text{mi}$$

$$120\text{ h} + 152\text{ h} = 680$$

$$272\text{h} = 680$$

$$136\text{h} = 340$$

$$68\text{h} = 170 \quad \text{h} = 2.5$$

SAT QUIZ #2  
QUESTION #

5) (Challenge Level)

Grid In:

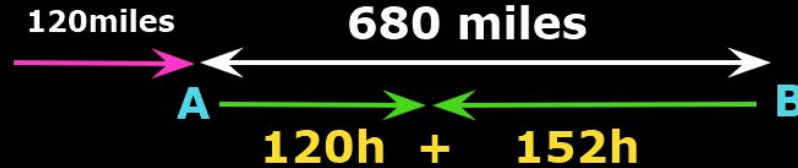
Train stations A and B are 800 miles apart. At 9:00 am  
Train A leaves station A traveling towards B at 120 mph.  
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How many minutes will train A have traveled when the trains pass each other ?

**210**

**(9:00 am)**



**(10:00am)**



$$\begin{aligned} \text{train A} + \text{train B} &= 680\text{mi} \\ 120\text{ h} + 152\text{ h} &= 680 \end{aligned}$$

$$\begin{aligned} 272\text{h} &= 680 \\ 136\text{h} &= 340 \\ 68\text{h} &= 170 \quad \mathbf{h=2.5} \end{aligned}$$

	Rate*Time=distance		
train A	120	* 3.5	= 420
train B	152	* 2.5	= 380
			<b>800</b> total

SAT Homework #2  
Review  
Questions {#4, #9, and #10}



### Question 1

1 pts

$$251 - 2x = 179$$

What is the value of  $x$  in the given equation?

---

(A) 36

---

(B) 72

---

(C) 215

---

(D) 430



## Question 2

1 pts

Brooks agrees to a rent-to-own plan for a saxophone. The deposit is \$110, and the monthly payment is \$50. Which of the following equations gives the total cost,  $t$ , in dollars, to rent the saxophone for  $m$  months?

(A)  $t = 50(m + 110)$

(B)  $t = 110(m + 50)$

(C)  $t = 110 + 50m$

(D)  $t = 50 + 110m$

**Question 3****1 pts**

$$3y = 11x - 15$$

For the given equation, what is the value of  $x$  when  $y = 6$ ?

**Question 4****1 pts**

Line  $p$  passes through the point  $(-1, 8)$  and is parallel to line  $k$ . If the equation of line  $k$  is  $y = 4x$ , what is the equation of line  $p$ ?

(A)  $y = -\frac{1}{4}x + \frac{31}{4}$

(B)  $y = -\frac{1}{4}x + \frac{33}{4}$

(C)  $y = 4x + 4$

(D)  $y = 4x + 12$



### Question 5

1 pts

The height  $h$ , in inches, of a tree  $y$  years after germination can be represented by the equation  $h = 18y$ . How many feet tall will the tree be 6 years after germination? (Note 1 foot = 12 inches)

- (A) 3
- (B) 9
- (C) 108
- (D) 1,296

**Question 6****1 pts**

A store sells 12 peaches for  $c$  dollars and 10 pears for  $r$  dollars. Which expression represents the cost of one peach and one pear?

(A)  $12c + 10r$

(B)  $10c + 12r$

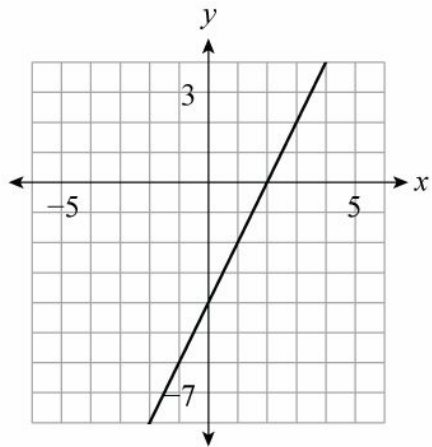
(C)  $\frac{c}{12} + \frac{r}{10}$

(D)  $\frac{12}{c} + \frac{10}{r}$



## Question 7

1 pts



The graph of line  $u$  is shown. If line  $w$  is perpendicular to line  $u$ , which of the following could be the equation of line  $w$ ?

(A)  $y = -2x + 4$

(B)  $y = -\frac{1}{2}x + 4$

(C)  $y = \frac{1}{2}x + 4$

(D)  $y = 2x + 4$

**Question 8****1 pts**

Line  $c$  passes through the points  $(8, 2b)$  and  $(2a, 6)$ . For what value of  $a$  is the slope of line  $c$  undefined?

(A)  $b$

(B)  $0$

(C)  $3$

(D)  $4$



## Question 9

1 pts

$x$	$y$
$h + 1$	$-7$
$h - 5$	$17$

The coordinates of two points on line  $d$  are shown in the table. If the graph of line  $d$  in the  $xy$ -plane intersects the  $y$ -axis at  $(h - 3, b)$ , what is the value of  $b$ ?

**Question 10****1 pts**

The graph of line  $q$  is the result of translating the graph of line  $r$  down 5 units. If the equation of line  $q$  is  $5x + 9y = 90$ , what is the  $x$ -intercept of line  $r$ ?

(A) (0, 15)

(B) (0, 27)

(C) (15, 0)

(D) (27, 0)

## [ CHAPTER 5 ]

# SYSTEMS OF LINEAR EQUATIONS

### LEARNING OBJECTIVES

After completing this chapter, you will be able to:

- Solve systems of linear equations by substitution
- Solve systems of linear equations by combination
- Determine the number of possible solutions for a system of linear equations, if any

## Substitution

### LEARNING OBJECTIVE

After this lesson, you will be able to:

- Solve systems of linear equations by substitution

### To answer a question like this:

If  $3x + 2y = 15$  and  $x + y = 10$ , what is the value of  $y$ ?

- A)  $-15$
- B)  $-5$
- C)  $5$
- D)  $15$

## Substitution

### LEARNING OBJECTIVE

After this lesson, you will be able to:

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If  $3x + 2y = 15$  and  $x + y = 10$ , what is the value of  $y$ ?

- A)  $-15$
- B)  $-5$
- C)  $5$
- D)  $15$

$$\begin{aligned}x &= 10 - y \\3(10 - y) + 2y &= 15 \\30 - 3y + 2y &= 15 \\-y &= -15 \\y &= 15\end{aligned}$$

# Combination

## LEARNING OBJECTIVE

After this lesson, you will be able to:

- Solve systems of linear equations by combination

**To answer a question like this:**

$$\begin{cases} 4x - 5y = 10 \\ 2x + 3y = -6 \end{cases}$$

If the solution to the given system of equations is  $(x, y)$ , what is the value of  $y$ ?

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

## Combination

### LEARNING OBJECTIVE

After this lesson, you will be able to:

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

$$2(2x + 3y = -6)$$

$$4x + 6y = -12$$

$$4x - 5y = 10$$

$$-(4x + 6y = -12)$$

---

$$0x - 11y = 22$$

$$-11y = 22$$

$$y = -2$$

7. McCoy Max Speed, Inc. makes custom skateboards for its customers. Two wooden skateboards and five composite skateboards cost \$900. Three wooden skateboards and two composite skateboards cost \$750. How much would McCoy Max Speed charge a customer who purchases five wooden skateboards and seven composite skateboards?

- A) \$1,150
- B) \$1,400
- C) \$1,500
- D) \$1,650

$$2W + 5C = 900$$

$$3W + 2C = 750$$

**Q: At a toy store, a customer bought 3 toy cars and 4 dolls for \$27. Another customer bought 4 toy cars and 5 dolls for \$35. What is the cost for one toy car and one doll ?**

Setup the system of two equations:  $C = \text{Toy Car}$  and  $D = \text{Doll}$

$$\begin{array}{r} (4C + 5D = \$35) \\ - (3C + 4D = \$27) \\ \hline \end{array}$$

Simply SUBTRACT the two equations TOGETHER !

$$C + D = \$8$$

Done!

**ANSWER: 1 TOY CAR + 1 DOLL = \$8**

7. McCoy Max Speed, Inc. makes custom skateboards for its customers. Two wooden skateboards and five composite skateboards cost \$900. Three wooden skateboards and two composite skateboards cost \$750. How much would McCoy Max Speed charge a customer who purchases five wooden skateboards and seven composite skateboards?

A) \$1,150

B) \$1,400

C) \$1,500

D) \$1,650

$$2W + 5C = 900$$

$$3W + 2C = 750$$

---

$$5W + 7C = 1650$$

**SAT Shortcut!**

Simply add the two equations together.

The combined order is “5 wooden” & “7 composite” skateboards.

## Number of Possible Solutions

### LEARNING OBJECTIVE

After this lesson, you will be able to:

- Determine the number of possible solutions for a system of linear equations, if any

## Number of Possible Solutions

### LEARNING OBJECTIVE

After this lesson, you will be able to:

- Determine the number of possible solutions for a system of linear equations, if any

To answer a question like this:

$$\begin{cases} 5x - 3y = 10 \\ 6y = kx - 42 \end{cases}$$

In the given system of linear equations,  $k$  represents a constant. If the system of equations has no solution, what is the value of  $2k$ ?

- A)  $\frac{5}{2}$
- B) 5
- C) 10
- D) 20

## You need to know this:

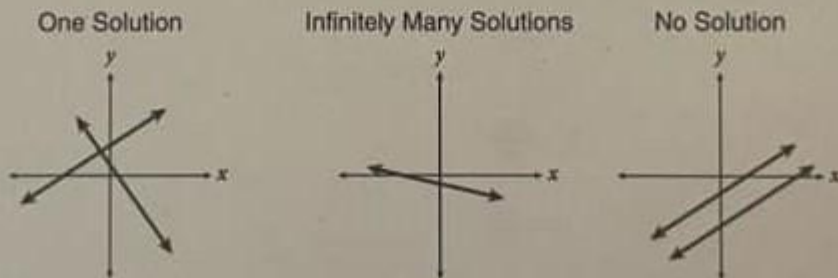
The solution to a system of linear equations consists of the values of the variables that make both equations true.

A system of linear equations may have one solution, infinitely many solutions, or no solution.

If a system of equations represents two lines that intersect, then the system will have exactly **one solution** (in which the  $x$ - and  $y$ -values correspond to the point of intersection).

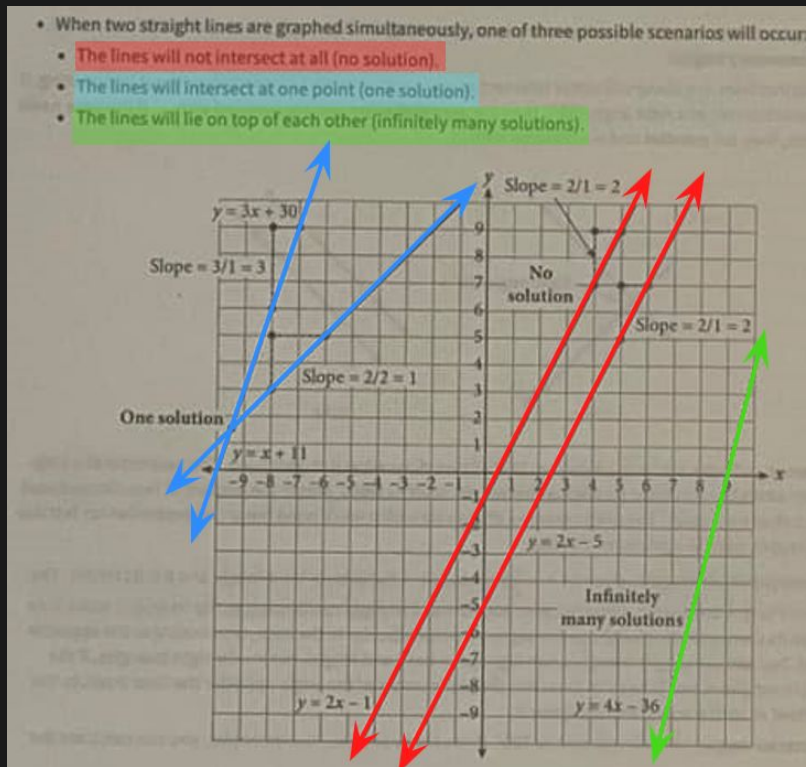
If a system of equations has **infinitely many solutions**, the two equations actually represent the same line. For example,  $2x + y = 15$  and  $4x + 2y = 30$  represent the same line. If you divide the second equation by 2, you arrive at the first equation. Every point along this line is a solution.

If a system of equations has **no solution**, as in the question above, the lines are parallel: there is no point of intersection.



# SAT Mathematics Test

## GEOMETRY: SYSTEMS OF LINEAR EQUATIONS



## Number of Possible Solutions

### LEARNING OBJECTIVE

After this lesson, you will be able to:

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- A)  $\frac{5}{2}$
- B) 5
- C) 10
- D) 20

$$kx - 6y = 42$$

$y = 10$ , is 3. Divide th

$$\frac{k}{2}x - 3y = 21$$

efficient in the first equ

$$\frac{k}{2} = 5$$

$$k = 10$$

1

HINT: For Q1, which equation is the easier one to solve for one variable in terms of the other?

---

If  $7c + 8b = 15$  and  $3b - c = 2$ , what is the value of  $b$ ?

HINT: For Q2, the second equation is in a convenient form for substitution. But look at the first equation: what can you learn quickly about  $x$  and  $y$ ?

$$\begin{cases} 3x - 3y = 0 \\ y = 2x + 5 \end{cases}$$

Given this system of equations, what is the sum of  $x$  and  $y$ ?

(A)  $-10$

(B)  $-5$

(C)  $0$

(D)  $5$

$$\begin{cases} 4x + 3y = 14 - y \\ x - 5y = 2 \end{cases}$$

If  $(x, y)$  is a solution to the given system of equations, then what is the value of  $x - y$ ?

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

(B) 1

(C) 3

(D) 18

4

If  $5a = 6b + 7$  and  $a - b = 3$ , what is the value of  $\frac{b}{2}$ ?

(A) 2

(B) 4

(C) 5.5

(D) 11

5

The owner of a snack stand purchases nuts in cases of 24 bags and granola bars in cases of 20 bars. She sells nuts for \$1.25 a bag and granola bars for \$1.75 each. If the snack stand sold 112 items for a total of \$160, how many cases of granola bars did the owner purchase?

(A) 2

(B) 3

(C) 40

(D) 72

HINT: For Q6, should you add or subtract these equations to eliminate a variable?

If  $2x - 3y = 14$  and  $5x + 3y = 21$ , what is the value of  $x$ ?

(A)  $-1$

(B)  $0$

(C)  $\frac{7}{3}$

(D)  $5$

7

If  $7c - 2b = 15$  and  $3b - 6c = 2$ , what is the value of  $b + c$ ?

(A)  $-27$

(B)  $-3$

(C)  $8$

(D)  $17$

8

HINT: For Q8, there's no need to solve for  $x$  and  $y$  separately.

If  $y = -x - 15$  and  $\frac{5y}{2} - 37 = -\frac{x}{2}$ , what is the value of  $2x + 6y$ ?

9

If  $5x + 3y = 13$  and  $8x + 5y = 21$ , what is the value of  $\frac{y}{x}$ ?

Restaurant A sells tacos for \$2.20 and bags of chips for \$1.95. Restaurant B sells tacos for \$3.00 and bags of chips for \$1.50. A certain purchase of tacos and chips would cost \$18.55 at restaurant A or \$19.50 at restaurant B. How many bags of chips are in this purchase?

$$\begin{cases} 21x - 6y = 54 \\ 9 + y = 3.5x \end{cases}$$

The system of equations shown has how many solutions?

- (A) Zero
- (B) One
- (C) Two
- (D) Infinitely many

HINT: For Q12, if a system of equations has infinitely many solutions, what do you know about the two equations?

$$\begin{cases} 6x + 3y = 18 \\ qx - \frac{y}{3} = -2 \end{cases}$$

In the given system of linear equations,  $q$  is a constant. If the system has infinitely many solutions, what is the value of  $q$ ?

(A)  $-9$

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

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

(D)  $9$

HINT: For Q13, the point of intersection is the solution to the system of equations. Use those concrete  $x$ - and  $y$ -values.

$$hx - 4y = -10$$

$$kx + 3y = -15$$

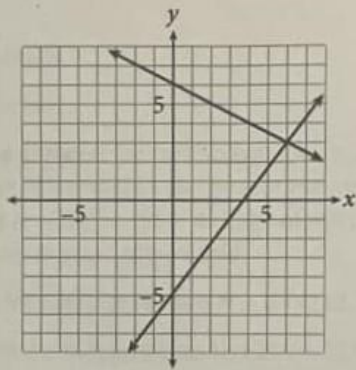
If the graphs of the lines in this system of equations intersect at  $(-3, 1)$ , what is the value of  $\frac{k}{h}$ ?

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

(B) 2

(C) 3

(D) 6



What is the  $y$ -coordinate of the solution to the system of equations shown in the graph?

(A) -5

(B) 3

(C) 5

(D) 6

$$3x - 9y = -6$$

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

If the system of linear equations shown has infinitely many solutions, and  $c$  is a constant, what is the value of  $c$ ?

(A)  $-6$

(B)  $-3$

(C)  $-2$

(D)  $-1$

# SAT Classwork #3: Systems of Linear Equations

1st Set  
Substitution

1)	1
2)	A
3)	C
4)	B
5)	A

2nd Set  
Combination

6)	D
7)	D
8)	59
9)	$1/2$
10)	5

3rd Set  
Other

11)	D
12)	B
13)	C
14)	B
15)	D

# SAT Math Module 1

Calculators allowed

35 minutes to complete 22 questions



# SAT Math Module 2

Use your calculator

35 minutes to complete 22 questions





# A few Test-Taking Strategies

- Prepare in an organized way: Focus on ALGEBRA, GEOMETRY, COORDINATE PLANE, CHARTS & GRAPHS and STATISTICS lessons from Grades 9-10
- Be comfortable with the SAT Level of questions by exposure to as many practice questions as possible. The SAT is a patterned exam.
- Work on Time Management. Be sure to complete “easy to mid” level questions first.
- Some multiple choice questions can be solved by PLUG IN of the answer choices.
- Some multiple choice questions can be simplified by PLUG IN A VALUE for the variable (Plug in “1,2,3,4 or 5”)
- ESTIMATE the answer to save procedural time on questions.
- Study and MEMORIZE FORMULAS and SOLUTION METHODS before the exam.
- Look for SHORTCUTS

# Chang Learning Center

## SAT Preparation

Mathematics

Quiz

Lesson

Homework

