A close-up photograph of a hand holding a black pen, writing on a piece of paper. The background is blurred, showing a warm, reddish-brown hue. The text is overlaid on the image in a white, serif font.

**Chang Learning Center**  
**SAT: Studying for the SAT Mathematics Section**  
**Lesson #4: Inequalities**  
**July 11th, 2024**

By Joshua Weiner

Provided by Chang Learning



# SAT Quiz #3

## Review

Questions {#1, #2, #3, #4 and #5}

1) (Easy Level)

Mersenne primes have the form  $2^n - 1$   
for some whole number  $n$ .

How many mersenne prime numbers are less than 100 ?

A) 1

B) 2

C) 3

D) 4

2) (Easy Level)

Let the function  $f$  be defined by  $f(x) = x^2 - 3x + 2$ .

What is the value of  $f(5) - f(-1)$  ?

A) 6

B) 4

C) 15

D) 12

3) (Mid Level)

At Maple Creek High School, some members of the chess club are on the swim team and no members of the swim team are tenth graders. Which of the following must also be true ?

- A) No members of the chess club are tenth graders.
- B) Some members of the chess club are tenth graders.
- C) Some members of the chess club are not tenth graders.
- D) More tenth graders are in the chess club than are on the swim team.

4) (Mid Level)

Carol is having a book sale. Hardcover books are \$3 and softcover books are \$2. All textbooks are \$5.

On Saturday, she sells 10 textbooks, 15 softcover books and 7 hardcover books. On Sunday, she sells 3 hardcover books, 15 softcover books and 18 textbooks.

How much does Carol earn from her book sale ?

A) \$300

B) \$230

C) \$275

D) \$180

5) (Challenge Level)

A right triangle has base 3, height ( $h$ ) and a hypotenuse equal to  $10 - h$ . What is the value of  $h$ ?

Use the pythagorean theorem  $a^2 + b^2 = c^2$

Grid In:

SAT Homework #3  
Review  
Questions {#1, #2, #3, and #4}

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

$$2x - 7y = 25$$

$$x = 2$$

In the given system of equations, what is the value of  $y$ ?

(A)  $-3$

(B)  $-1$

(C)  $2$

(D)  $5$



## Question 2

1 pts

In swim practice, Aidan practices the 100-yard and 500-yard events. If he swims a total of 3,500 yards that includes ten 100-yard events, how many 500-yard events does he practice?



### Question 3

1 pts

$$4x + 5y = 3$$

$$2x - 5y = 6$$

In the given system of equations, what is the value of  $x$ ?

(A)  $\frac{1}{6}$

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

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

(D) 6



#### Question 4

1 pts

Line  $m$  is of the form  $Ax + By = C$ . Line  $n$  is of the form  $Ax + By = D$ . If  $A$ ,  $B$ ,  $C$ , and  $D$  are constants, how many solutions does this system of equations have?

- (A) 0
- (B) 1
- (C) 2
- (D) Infinitely many



### Question 5

1 pts

Dr. Horton wants to buy a total of 14 water bottles and spend a total of \$200. Brand A water bottles cost \$20 and Brand B water bottles cost \$12. If  $a$  represents the number of Brand A water bottles and  $b$  represents the number of Brand B water bottles, which of the following system of equations models this situation?

(A) 
$$\begin{cases} \frac{20}{a} + \frac{12}{b} = 14 \\ a + b = 200 \end{cases}$$

(B) 
$$\begin{cases} a + b = 14 \\ \frac{20}{a} + \frac{12}{b} = 200 \end{cases}$$

(C) 
$$\begin{cases} 20a + 12b = 14 \\ a + b = 200 \end{cases}$$

(D) 
$$\begin{cases} a + b = 14 \\ 20a + 12b = 200 \end{cases}$$

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

$$0.5x + 2y = 8$$

$$x + 1.5y = 1$$

The point  $(x, y)$  is a solution to the given system of equations. Which of the following could be the value of  $(x, y)$ ?

---

(A)  $(-8, 6)$

---

(B)  $(-4, 5)$

---

(C)  $(0, 0)$

---

(D)  $(1, 2)$



### Question 7

1 pts

Tina buys 24 fruit platters. Small platters cost \$5, and large platters cost \$15. If she spends a total of \$160, how many large platters does she buy?

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

$$\begin{aligned}x + 4y &= 5 \\ \frac{x}{q} &= 3 - 2y\end{aligned}$$

If the given system of equations has no solutions, what is the value of  $q$ ?

---

(A)  $-2$

---

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

---

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

---

(D)  $2$

**Question 9**

1 pts

$$9x - 7y = 12$$

$$8x - 1 = 2y$$

In the given system of equations, what is the value of  $x - 5y$ ?

---

(A)  $-11$

---

(B)  $-\frac{87}{38}$

---

(C)  $-\frac{17}{38}$

---

(D)  $11$

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

$$\frac{3}{4}x + \frac{7}{2}y = 1$$
$$3x = 4 - 7my$$

If the given system of equations has an infinite number of solutions, what is the value of  $m$ ?

(A) 1

(B) 2

(C) 3

(D) 4

# SAT Lesson #4 Inequalities

# INEQUALITIES

## LEARNING OBJECTIVES

After completing this chapter, you will be able to:

- Solve an inequality for a range of values
- Identify the graph of an inequality
- Identify the graph of a system of inequalities
- Solve for the point of intersection of the boundary lines of a system of inequalities
- Solve algebraically a system of one inequality with two variables and another inequality with one variable
- Identify one or more inequalities that match a real-life situation

## Linear Inequalities

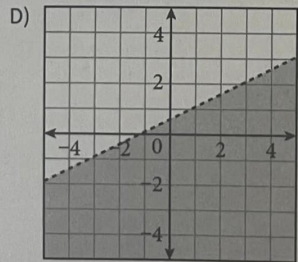
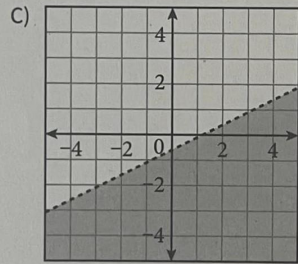
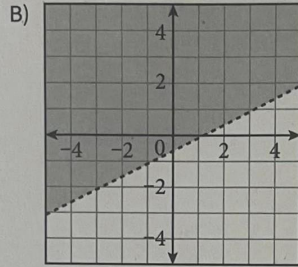
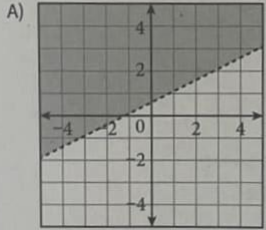
### LEARNING OBJECTIVES

After this lesson, you will be able to:

- Solve an inequality for a range of values
- Identify the graph of an inequality

To answer a question like this:

Which of the graphs represents the solution set for  $5x - 10y > 6$ ?



**You need to know this:**

Linear inequalities are similar to linear equations but have two differences:

- You are solving for a **range of values** rather than a single value.
- If you multiply or divide both sides of the inequality by a negative, you must **reverse the inequality sign**.

While linear equations graph as simple lines, inequalities graph as shaded regions. Use solid lines for inequalities with  $\leq$  or  $\geq$  signs because the line itself is included in the solution set. Use dashed lines for inequalities with  $<$  or  $>$  signs because, in these cases, the line itself is not included in the solution set. The shaded region represents all points that make up the solution set for the inequality.

# Systems of Inequalities

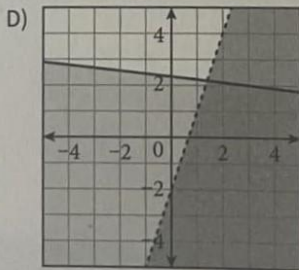
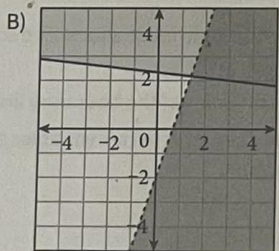
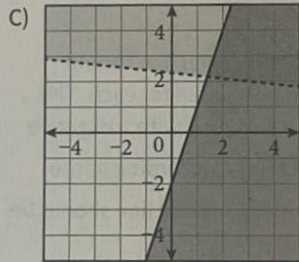
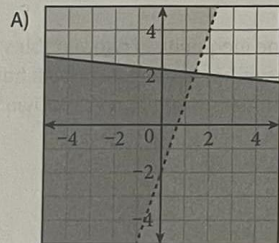
## LEARNING OBJECTIVES

After this lesson, you will be able to:

- Identify the graph of a system of inequalities
- Solve for the point of intersection of the boundary lines of a system of inequalities
- Solve algebraically a system of one inequality with two variables and another inequality with one variable

To answer a question like this:

If  $12x - 4y > 8$  and  $\frac{2}{3}x + 6y \geq 14$  form a system of inequalities, which of the graphs shows the solution set for the system?



## You need to know this:

The solution set for a system of inequalities is not a single point (a single  $x$ -value and  $y$ -value) but a region of overlap between the two inequalities: that is, a range of  $x$ -values and  $y$ -values. It is easiest to see this graphically.

Systems of inequalities can be presented graphically with multiple boundary lines and multiple shaded regions. Follow the same rules as for graphing single inequalities, but keep in mind that **the solution set is the region where the shading overlaps**.

Note that you generally cannot use substitution or combination to solve a system of two inequalities in which both have two variables. You won't be able to come up with a single statement that describes all possible solutions to the system. That said, the SAT may ask for the maximum or minimum  $x$ - or  $y$ -value of a system of inequalities. These questions are actually asking about the intersection of the **boundary lines** of the system. If you see one of these questions, use substitution or combination to solve for the point of intersection, as you learned to do in chapter 5. For an example of this type of question, see question number 8 in the "Try on Your Own" set for this lesson.

You may also see a question without a graph asking you to solve a system of one inequality in two variables and another inequality in one variable. As long as both inequalities have the same symbol (for instance, both have the greater-than sign), you can do this by substitution. Question number 6 in this lesson's "Try on Your Own" set is an example of this question type.

## Modeling Real-Life Situations with Inequalities

### LEARNING OBJECTIVE

After this lesson, you will be able to:

- Identify one or more inequalities that match a real-life situation

### To answer a question like this:

A toy company sells toy hoops for \$8 and basketballs for \$25. The company hopes to sell more than three times as many basketballs as toy hoops to meet its sales goal of at least \$10,400. If  $h$  represents the number of toy hoops and  $b$  represents the number of basketballs, which of the following systems of inequalities describes this situation?

A)  $8h + 25b \geq 10,400$

$b > 3h$

B)  $8h + 25b \geq 10,400$

$h > 3b$

C)  $25h + 8b \geq 10,400$

$b > 3h$

D)  $25h + 8b \geq 10,400$

$h > 3b$

ENGLISH	SYMBOL
more, greater, longer, heavier	$>$
less, fewer, shorter, lighter	$<$
no less than, no fewer than, at least	$\geq$
no more than, no greater than, at most	$\leq$

**Explanation:**

"At least \$10,400" means  $\geq 10,400$ . It's the money from the sales of toy hoops and basketballs that has to be greater than or equal to \$10,400, so that's what needs to go on the left of the  $\geq$  sign. Each toy hoop costs \$8, so the money generated by sales of toy hoops will be  $8h$ . Each basketball costs \$25, so basketballs will generate  $25b$ . Add them:  $8h + 25b \geq 10,400$ . Eliminate (C) and (D).

The company wants to sell "*more than* three times as many basketballs as toy hoops," so write down  $>$  and work out what needs to go on each side. The company wants to sell more basketballs than toy hoops, so  $b$  should go on the left. Specifically, they want basketball sales to be more than 3 times toy hoop sales, so the final statement is  $b > 3h$ . **(A)** is correct.

# SAT Classwork #4

**#1 to #5      Page 78**

**#6 to #10     Page 81**

**#11 to #15    Page 85**

$$-\frac{a}{6} - a > -\frac{4}{3}$$

Which of the following is equivalent to the given inequality?

(A)  $a < \frac{7}{8}$

(B)  $a > \frac{7}{8}$

(C)  $a < \frac{8}{7}$

(D)  $a > \frac{8}{7}$

HINT: For Q2, save time by solving for the entire expression, not  $c$ .

If  $-5c - 7 \leq 8$ , what is the least possible value of  $15c + 7$ ?

(A)  $-38$

(B)  $-4$

(C)  $15$

(D)  $22$

HINT: For Q3, be careful not to "lose" a negative sign.

$$-\frac{1}{8}(8 - 10x) > 3x - 2$$

Which of the following describes all possible values of  $x$ ?

(A)  $x < -\frac{12}{7}$

(B)  $x > -\frac{4}{7}$

(C)  $x < \frac{4}{7}$

(D)  $x > \frac{4}{7}$

$$\frac{1}{4}a - \frac{1}{16}b + 3 < 5$$

Which of the following is equivalent to the inequality shown?

(A)  $4a - b < 8$

(B)  $4a - b < 32$

(C)  $a - 4b < 32$

(D)  $4b - a < 4$

If  $4c + 20 \geq 31$ , what is the least possible value of  $12c + 7$ ?

(A) 18

(B) 40

(C) 51

(D) 58

$$a < 6b + 4$$

$$3b < 8$$

Which of the following consists of all the  $a$ -values that satisfy the given system of inequalities?

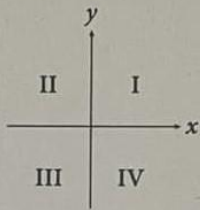
(A)  $a < 20$

(B)  $a < 16$

(C)  $a < 12$

(D)  $a < \frac{8}{3}$

HINT: For Q7, remember that the solution set is the overlap between both inequalities. Make a sketch or use a graphing calculator.



If the system of inequalities  $y \leq -x + 1$  and  $y < \frac{1}{2}x$  is graphed on the coordinate plane, which of the quadrants contain(s) no solution to the system?

- (A) Quadrant I
- (B) Quadrant II
- (C) Quadrant III
- (D) Quadrants I and II

$$-y \leq 6x - 2,200$$

$$3y \geq 9x - 1,500$$

Given this system of inequalities, if point  $(a, b)$  lies within the solution set, what is the minimum possible value of  $b$ ?

$$x < 4 - 2y$$

$$y \leq -2x + 1$$

Which of the following ordered pairs satisfies both of the given inequalities?

(A)  $(-1, 3)$

(B)  $(1, 1)$

(C)  $(2, -3)$

(D)  $(4, 4)$

HINT: For Q10, remember that “solution” means an  $(x, y)$  pair that is true for both inequalities.

$$y > x + r$$

$$y < s - x$$

If  $x = y = 1$  is a solution to the system of inequalities shown, which of the following ordered pairs could correspond to  $(r, s)$ ?

Ⓐ  $(-1, 1)$

Ⓑ  $(-\frac{1}{2}, 2)$

Ⓒ  $(-\frac{1}{10}, 3)$

Ⓓ  $(3, -1)$

HINT: For Q11, set up one inequality for the number of ads and a second inequality for the money the ads bring in.

To qualify for a prize, a student has to sell at least \$1,500 worth of yearbook advertisements consisting of no fewer than 15 individual ads. If  $x$  is the number of full-page ads sold for \$100 each,  $y$  is the number of half-page ads sold for \$70 each, and  $z$  is the number of quarter-page ads sold for \$50 each, which of the following systems of inequalities represents this situation?

(A)  $110x + 70y + 50z \geq 1,500$   
 $x + y + z \leq 15$

(B)  $110x + 70y + 50z \leq 1,500$   
 $x + y + z \leq 15$

(C)  $110x + 70y + 50z \geq 1,500$   
 $x + y + z \geq 15$

(D)  $110x + 70y + 50z \leq 1,500$   
 $x + y + z \geq 15$

A farmer needs to sell at least \$200 of produce each day. The cart she uses for transport can hold no more than 250 pounds. Which inequality represents this scenario, if  $w$  is the number of pounds of watermelons sold at \$0.50 per pound,  $c$  is the number of pounds of cantaloupes sold at \$1 per pound, and  $t$  is the number of pounds of tomatoes sold at \$2.50 per pound?

(A)  $0.5w + 1c + 2.5t \geq 200$   
 $w + c + t \leq 250$

(B)  $0.5w + 1c + 2.5t \leq 200$   
 $w + c + t \leq 250$

(C)  $0.5w + 1c + 2.5t \geq 200$   
 $w + c + t \geq 250$

(D)  $0.5w + 1c + 2.5t \leq 200$   
 $w + c + t \geq 250$

A garden will be planted with at least 15 trees. There will be  $x$  apple trees, which cost \$120 each, and  $y$  pear trees, which cost \$145 each. The budget for purchasing the trees is no more than \$2,050. There must be at least 5 apple trees and at least 3 pear trees. Which of the following systems of inequalities represents the situation?

(A)  $120x + 145y \geq 2,050$

$$x + y \leq 15$$

$$x \geq 5$$

$$y \geq 3$$

(B)  $120x + 145y \geq 2,050$

$$x + y \geq 15$$

$$x \leq 5$$

$$y \leq 3$$

(C)  $120x + 145y \leq 2,050$

$$x + y \geq 15$$

$$x \leq 5$$

$$y \leq 3$$

(D)  $120x + 145y \leq 2,050$

$$x + y \geq 15$$

$$x \geq 5$$

$$y \geq 3$$

A utility shelf is used to store  $x$  containers of paint, which weigh 50 pounds each, and  $y$  containers of varnish, which weigh 35 pounds each. The shelf can hold up to 32 containers, the combined weight of which must not exceed 1,450 pounds. Which of the following systems of inequalities represents this relationship?

(A)  $50x + 35y \leq 32$   
 $x + y \leq 1,450$

(B)  $50x + 35y \leq 1,450$   
 $x + y \leq 32$

(C)  $85x + y \leq 1,450$   
 $x + y \leq 32$

(D)  $50x + 35y \leq 1,450$   
 $x + y \leq 85$

HINT: For Q15, read carefully. *At least* is a minimum, so which way should the inequality sign point?

A bakery is buying  $f$  50-pound bags of flour and  $s$  20-pound bags of sugar. The supplier will deliver no more than 750 pounds in a shipment. The bakery wants to buy at least three times as many bags of sugar as bags of flour. Which of the following systems of inequalities represents this situation?

(A)  $50f + 60s \leq 750$   
 $f \leq 3s$

(B)  $50f + 20s \leq 750$   
 $f \leq 3s$

(C)  $50f + 20s \leq 750$   
 $3f \leq s$

(D)  $150f + 20s \leq 750$   
 $3f \leq s$

# SAT Classwork #4: Inequalities

1st Set  
One Inequality

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

2nd Set  
Two Inequalities

6)	A
7)	B
8)	400
9)	C
10)	C

3rd Set  
Word Problems

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

# 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

