A.2H Write Linear Inequalities Given a Table, Graph, or Verbal Description

Definitions:

Linear Inequality in Two Variables – a relationship with a constant rate of change represented by a solution set denoted by the graph of a line, that may or may not be included in the solution, and the set of points above or below the line.

Inequality Notation –

Less than, $<$, dashed line with shading below the graph of the line

Greater than, $>$, dashed line with shading above the graph of the line

Less than or equal to, $\leq$, solid line with shading below the graph of the line

Greater than or equal to, $\geq$, solid line with shading above the graph of the line.

For vertical lines, greater than shades the right side of the graph
and less than shades the left side of the graph.

Formulate a linear inequality in two variables for which the points in the table would be in the solution.

x	y
–2	–8
–1	–7
1	1
3	5
5	15

Answers will vary. Points could be graphed and a line determined that is either above or below the points. If none of the points are on the line, the inequality will be > or <. If some of the points fall on the line it could be ≥ or ≤.

Sample responses:

$y < 2x + 8$

$y > x - 9$

$y \geq 3x - 4$

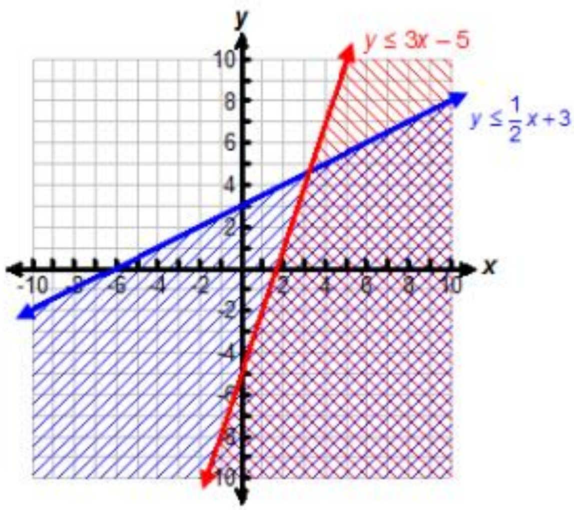
Graph the inequalities on the same coordinate grid.

$x - 2y \geq -6$

$3x - y \geq 5$

$x - 2y \geq -6 \rightarrow y \leq \frac{1}{2}x + 3$

$3x - y \geq 5 \rightarrow y \leq 3x - 5$



Use the graph and algebraic methods as necessary to determine if the given point is in the solution set of the specified inequality. If the point is in the solution set, put "Yes" in the box below the inequality. If the point is not in the solution set, put "No" in the box below the inequality.

Point	$x - 2y \geq -6$	$3x - y \geq 5$
(2, 2)	Yes	No
(2, –2)	Yes	Yes
(0.5, 4.1)	No	No
(3.2, 4.6)	Yes	Yes
(4.8, 6.5)	No	Yes

The table below represents how much Pretty Pies Online charges as a function of the number of pies purchased from the online company. A new online pie company wants to charge no more than Pretty Pies Online. Write an inequality in two variables for the new company to represent the possible region of charges as a function of pies purchased.

Number of Pies	Charge ($)
1	14.50
2	26.50
3	38.50
4	50.50
5	62.50

Sample response:

Slope

$$m = \frac{26.5 - 14.5}{2 - 1}$$

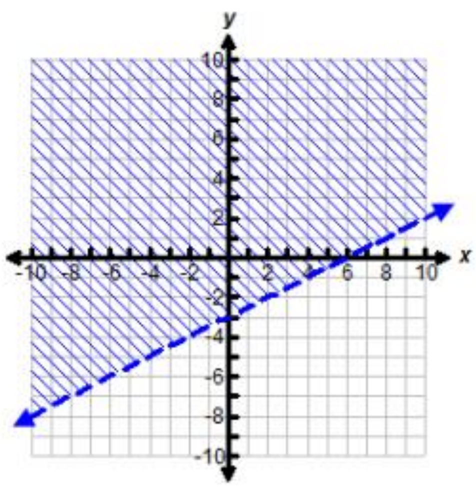
$$m = \frac{12}{1}$$

$$m = 12$$

y-intercept
Find the value at 0 pies by subtracting $12.00 from the value at 1 pie of $14.50.
14.50 – 12.00 = 2.50

Therefore, the inequality can be represented by $y \le 12x + 2.5$.

Write an inequality in two variables to represent the inequality graphed below.



Representative inequality

$$y > \frac{1}{2}x - 3$$

Ferry's Photos takes pictures and mounts them in memory capturing photo albums. They charge $10 per picture plus a set fee of $20 for the album. Howard's Studio is always higher than Ferry's Photos. Write a function to represent the possible region of charges as a function of pictures for Howard's Studio.

The charge per picture is the slope, $m = 10$, and the set fee is the *y*-intercept, $b = 20$.
$y > 10x + 20$

1 Baseball fans can buy tickets for seats in the lower deck or upper deck of the stadium. Tickets for the lower deck cost $42 each. Ticket prices for the upper deck are 75% of the cost of tickets for the lower deck. Which inequality represents all possible combinations of x, the number of tickets for the lower deck, and y, the number of tickets for the upper deck, that someone can buy for no more than $800?

F $42x + 56y \leq 800$

G $42x + 31.5y \leq 800$

H $42x + 56y > 800$

J $42x + 31.5y > 800$

Let's first find the cost of the tickets in the upper deck as we are told that they are 75% of the cost of the tickets for the lower deck. To find the price we need to take $42 X 75% or after we convert the percentage to a decimal $42 X .75 = $31.50.

So the tickets for the upper deck will cost $31.50.

We are letting x represent the number of tickets for the lower deck and y represent the number of tickets for the upper deck. Depending on the amount of tickets that we buy we can determine the cost by taking the price of each ticket and multiplying it to the amount of tickets.

Since the cost of lower deck tickets is $42 and x represents the number of lower deck tickets and $31.50 is the cost of upper deck tickets and y represents the number of upper deck tickets we can use the following to find the <u>total cost</u> of the tickets:

$\$42x + \$31.5y$

Now, we want someone to spend no more than $800 on the tickets which in other terms means we want the total cost of the tickets to be less than or equal to $800.

Therefore, the following would be the correct way to write an inequality explaining the situation above: $\$42x + \$31.5y \leq \$800$.

Answer choice G would be the correct answer.

2 Six data points are given in the table below.

x	y
−1	1
8	6
−4	0
6	4
−8	−1
3	2

Which linear inequalities in two variables can be used to represent the data set?

I. $x - 2y > -6$
II. $x - 3y \leq -3$
III. $x - 2y \geq -6$
IV. $x - 3y < -3$

F I and III only

G II and IV only

H II and III only

J I, II, III, and IV

In order for the linear inequalities to represent the data set we must be able to take each and every point and plug it into the inequality and the result needs to make a true statement. If a true statement does not result with all the points in the table then the inequality does not represent the data set.

	Equation	Point plug-in (-1, 1)	Solve True √/False X	Equation	Point plug-in (8, 6)	Solve True √/False X
I.	x − 2y > -6	-1 − 2(1) > -6	-3 > -6 √	x − 2y > -6	8 − 2(6) > -6	-4 > -6 √
II.	x − 3y ≤ 3	-1 − 3(1) ≤ 3	-4 ≤ 3 √	x − 3y ≤ 3	8 − 3(6) ≤ 3	-10 ≤ 3 √
III.	x − 2y ≥ -6	-1 − 2(1) ≥ -6	-3 ≥ -6√	x − 2y ≥ -6	8 − 2(6) ≥ -6	-4 ≥ -6√
IV.	x − 3y < 3	-1 − 3(1) < 3	-4 < 3 √	x − 3y < 3	8 − 3(6) < 3	-10 < 3 √

	Equation	Point plug-in (-4, 0)	Solve True √/False X	Equation	Point plug-in (6, 4)	Solve True √/False X
I.	x − 2y > -6	-4 − 2(0) > -6	-4 > -6 √	x − 2y > -6	6 − 2(4) > -6	-2 > -6 √
II.	x − 3y ≤ 3	-4 − 3(0) ≤ 3	-4 ≤ 3 √	x − 3y ≤ 3	6 − 3(4) ≤ 3	-6 ≤ 3 √
III.	x − 2y ≥ -6	-4 − 2(0) ≥ -6	-4 ≥ -6 √	x − 2y ≥ -6	6 − 2(4) ≥ -6	-2 ≥ -6 √
IV.	x − 3y < 3	-4 − 3(0) < 3	-4 < 3 √	x − 3y < 3	6 − 3(4) < 3	-6 < 3 √

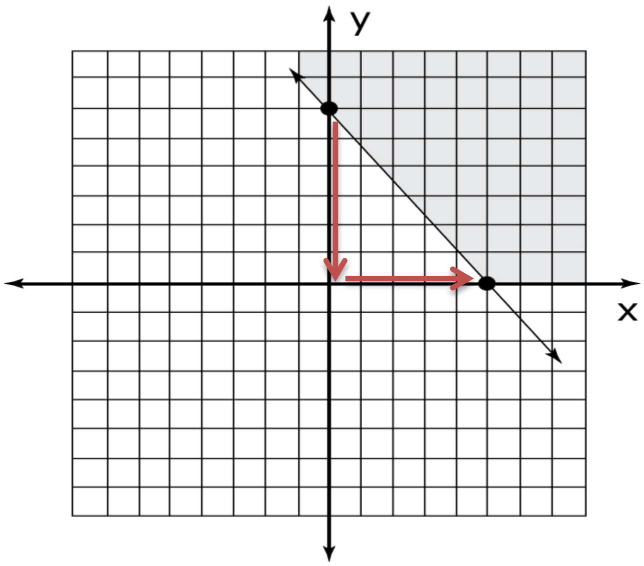
	Equation	Point plug-in (-8, -1)	Solve True √/False X
I.	$x - 2y > -6$	$-8 - 2(-1) > -6$	$-6 > -6$ X
II.	$x - 3y \leq 3$	$-8 - 3(-1) \leq 3$	$-5 \leq 3$ √
III.	$x - 2y \geq -6$	$-8 - 2(-1) \geq -6$	$-6 \geq -6$ √
IV.	$x - 3y < 3$	$-8 - 3(-1) < 3$	$-5 < 3$ √

Equation	Point plug-in (3, 2)	Solve True √/False X
$x - 2y > -6$	$3 - 2(2) > -6$	$-1 > -6$ √
$x - 3y \leq 3$	$3 - 3(2) \leq 3$	$-3 \leq 3$ √
$x - 2y \geq -6$	$3 - 2(2) \geq -6$	$-1 \geq -6$ √
$x - 3y < 3$	$3 - 3(2) < 3$	$-3 < 3$ X

So referring to the tables above we can see that inequality I. fails at the point (-8, -1) and inequality IV. fails at the point (3, 2). Therefore, the inequalities that satisfy the data set are II. and III.

Answer choice H is the correct answer.

3 Write the linear inequality that describes the graph below.



To find the inequality for the graph let us first find the slope by using m = $\frac{rise}{run}$. Starting at the point (0, 6) and ending at the point (5, 0) we see that we went down 6 units(rise) and to the right 5 units(run).

$$m = \frac{rise}{run} = \frac{-6}{5}$$

Therefore, our slope(m) is $\frac{-6}{5}$ and our y-intercept is 6 as we determine our y-value when our x-value is 0.

Now, using slope-intercept form and plugging in our known slope and y-intercept we get the following equation:

$y = \frac{-6}{5}x + 6$. However, since our graph is shaded we are trying to find an inequality. Since the line is solid(equal) and we are shaded above(greater) then:

$$\mathbf{y \geq \frac{-6}{5}x + 6}$$