Part A: Single-Variable Inequalities

Practice 1

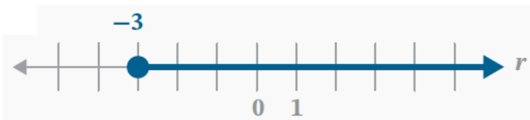
1.

$p > 1$ $\{2\}$

2.

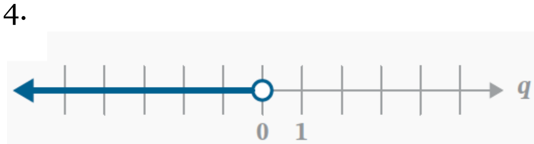
$w \leq 2$ $\{-7, -3, -1.2, 0, \frac{3}{4}, 1, 2\}$

3.



$\{-3, -1.2, 0, \frac{3}{4}, 1, 2\}$

4.



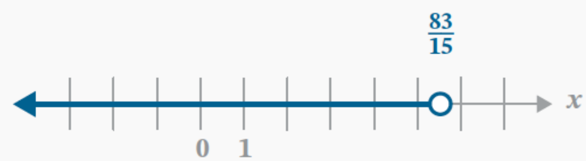
$\{-7, -3, -1.2\}$

5.

$\frac{1}{2}w + 3 \geq 1$	Given
$\frac{1}{2}w \geq -2$	Addition Property of Equality Add −3 to expressions on both sides
$w \geq -4$	Multiplication Property of Equality Multiply expressions on both sides by 2

6.

$\frac{3}{8}(x-5)<\frac{1}{5}$	Given
$40\left(\frac{3}{8}(x-5)\right)<(40)\left(\frac{1}{5}\right)$	Multiply both sides by the LCD
$15(x-5)<8$	
$15x-75<8$	Distribute
$15x<83$	Addition Property of Equality Add 75 to expressions on both sides
$x<\frac{83}{15}$	Multiplication Property of Equality Multiply both sides by $\frac{1}{15}$



7.
Let w = the number of weeks Russell needs to save

$30w + 110 \geq 500$

$30w \geq 390$

$w \geq 13$

Russell must save for at least 13 weeks to have at least $500 saved.

8.
Let d = distance in miles Adia traveled on Friday

$2d$ = distance in miles Adia traveled on Thursday

$2d + d + 70 \leq 250$

$3d + 70 \leq 250$

$3d \leq 180$

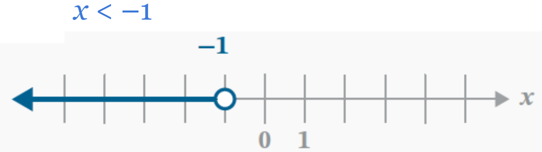
$d \leq 60$

If Adia traveled 60 miles or less on Friday, then she should not have been charged the additional fee.

9.
$-3x + 1 > 4$

$-3x > 3$

$x < -1$

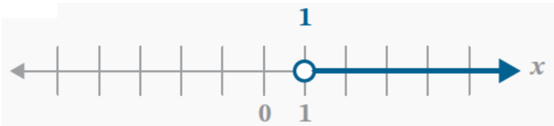


10.

$3x + 1 > 4$

$3x > 3$

$x > 1$



11.

Sample: Both problems are solved by first adding –1 and then multiplying by the reciprocal of the coefficient. The coefficient of the first is negative and the coefficient of the second is positive. The boundaries are on opposite sides of zero, and the solutions are on opposite sides of the number line because when multiplying by a negative, like $-\frac{1}{3}$, ***all*** signs change.

12.

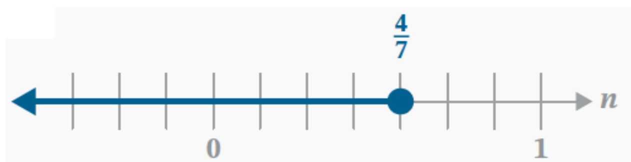
$2n + 1 - 6n - 4 \geq 3n - 7$

$-4n - 3 \geq 3n - 7$

$-3 \geq 7n - 7$

$4 \geq 7n$

$\frac{4}{7} \geq n$ or $n \leq \frac{4}{7}$

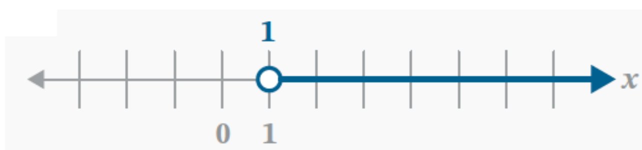


13.

$-3x + 2 < -1$

$-3x < -3$

$x > 1$

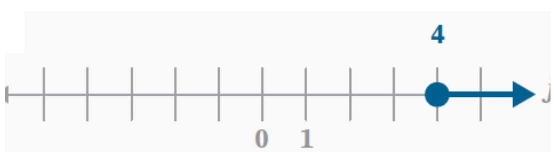


14.

$-5(j - 2) \leq -10$

$j - 2 \geq 2$

$j \geq 4$



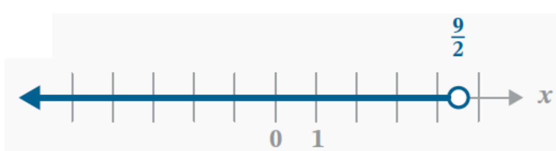
15.

$-6 - 8x < -10x + 3$

$2x - 6 < 3$

$2x < 9$

$x < \frac{9}{2}$



16.

n: unknown number

$\frac{n}{-5} + 8 \leq -3$

$\frac{n}{-5} \leq -11$

$n \geq 55$

Part A: Single-Variable Inequalities

Practice 2

1.

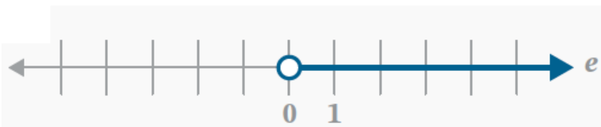
$c < -2$ $\{-7, -3\}$

2.

$n \geq -1$ $\{0, \frac{3}{4}, 1, 2\}$

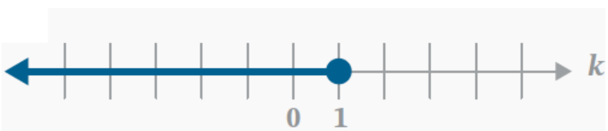
3.

$\{\frac{3}{4}, 1, 2\}$



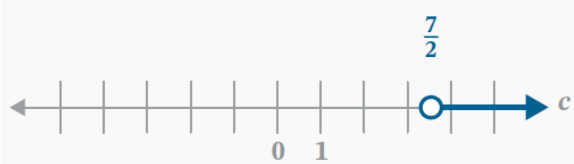
4.

$\{-7, -3, -1.2, 0, \frac{3}{4}, 1\}$



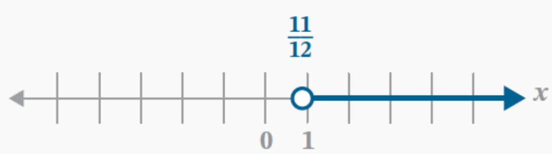
5.

$0.2c - 0.3 > 0.4$	Given
$10(0.2c - 0.3) > 10(0.4)$	Multiplication Property of Equality Multiply expressions on both sides by 10 [LCD]
$2c - 3 > 4$	Distributive Property Distribute 10 through parentheses
$2c > 7$	Addition Property of Equality Add 3 to expressions on both sides
$c > \frac{7}{2}$	Multiplication Property of Equality Multiply expressions on both sides by $\frac{1}{2}$



6.

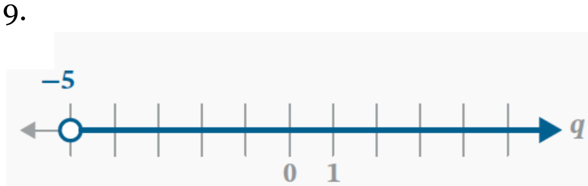
$2x+\frac{1}{2}>\frac{7}{3}$	◂ Given
$6\left(2x+\frac{1}{2}\right)>(6)\left(\frac{7}{3}\right)$	◂ Multiplication Property of Equality Multiply expressions on both sides by 6 [LCD]
$12x+3>14$	◂ Distributive Property Distribute 10 through parentheses
$12x>11$	◂ Addition Property of Equality Subtract 3 from both sides
$x>\frac{11}{12}$	◂ Multiplication Property of Equality Multiply expressions on both sides by $\frac{1}{12}$



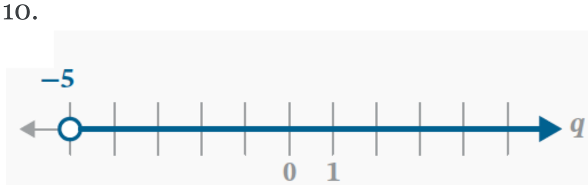
7.
h: hours to work
$800 + 10h \geq 3{,}250$
$10h \geq 2{,}450$
$h \geq 245$
Branson will need to work at least 245 hours to have enough money to buy the car.

8.
Let f = the number of packages of food
$4 + 1\frac{1}{2} + 8\frac{1}{2} + 3 + 2f \leq 35$
$17 + 2f \leq 35$
$2f \leq 18$
$f \leq 9$
Jackson can bring at most 9 packages of food.

9.

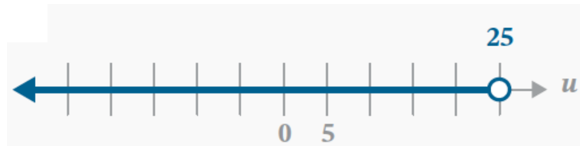


10.

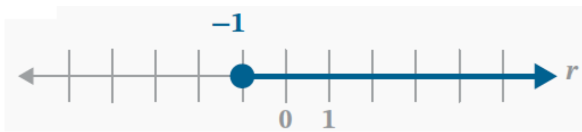


11.
Sample: Yes, the graphs are the same because when solving for q in the second inequality, the relationship between $-q$ and 5 changed, so the symbol changed as well. These two inequalities, $-q < 5$ and $q > -5$, are equivalent.

12.
$2(u + 7) + 1 > 3(u - 4) + 2$
$2u + 14 + 1 > 3u - 12 + 2$
$2u + 15 > 3u - 10$
$15 > u - 10$
$25 > u$ OR $u < 25$



13.
$-6(r - 3) \leq 24$
$r - 3 \geq -4$
$r \geq -1$



14.
The last step is incorrect. The inequality sign does not change when multiplying or dividing by positive numbers. Correct: $g \geq -\frac{3}{2}$

15.
$-6x + 11 < -(4x + 3)$
$-6x + 11 < -4x - 3$
$11 < 2x - 3$
$14 < 2x$
$x > 7$

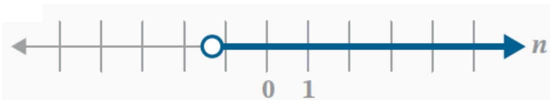
16.
n: unknown number
$3n + 10 - 7n \geq 12$
$-4n + 10 \geq 12$
$-4n \geq 2$
$n \leq -\frac{1}{2}$

Part B: Compound Inequalities

Practice 1

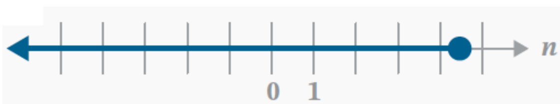
1.

$\{-\frac{3}{4}, 0, 0.5, \frac{10}{3}, 5, 10\}$



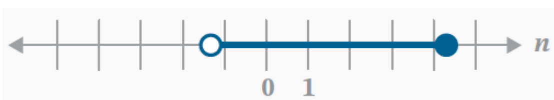
2.

$\{-8, -4, -1.2, -\frac{3}{4}, 0, 0.5, \frac{10}{3}\}$



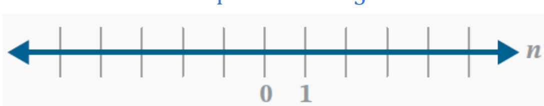
3.

$\{-\frac{3}{4}, 0, 0.5, \frac{10}{3}\}$



4.

$\{-8, -4, -1.2, -\frac{3}{4}, 0, 0.5, \frac{10}{3}, 5, 10\}$



5.

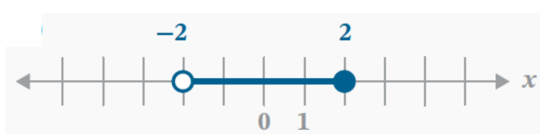
$x \leq -2$ OR $x \geq 1$

6.

$-1 < 5x + 9 \leq 19$

$-10 < 5x \leq 10$

$-2 < x \leq 2$



7.

$-4x + 1 \leq 5$

$-4x \leq 4$

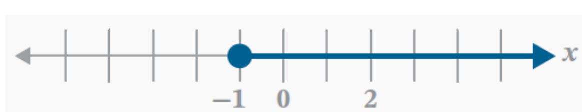
$x \geq -1$

OR

$-3x + 2 < -4$

$-3x < -6$

$x > 2$



Solution: $x \geq -1$ OR $x > 2$, which means all solutions can be rewritten as $x \geq -1$.

8.

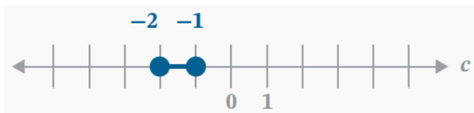
Your student may need a reminder that AND means all values must be true for both inequalities. They can use $x = 0$ to substitute into both inequalities to show that all values must be greater than 2, since 0 is not true for $-3x + 2 < -4$.

9.

$0 \leq 6c + 12 \leq 6$

$-12 \leq 6c \leq -6$

$-2 \leq c \leq -1$



10.

Samples: $c = -2$, $c = -\frac{3}{2}$, $c = -1.25$

(i.e., all values between −2 and −1 and including −2 or −1)

11.

$2m > 14$

$m > 7$

OR

$-2m > 10$

$m < -5$

Solution: $m < -5$ OR $m > 7$. This solution can not be rewritten as a single inequality.

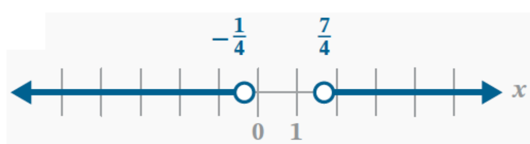
12.

It would have no solution, because there are no common points between these two inequalities.

13.

$|4x - 3| > 4$

$4x - 3 > 4$	OR	$-(4x-3) > 4$
	OR	$4x - 3 < -4$
$4x > 7$	OR	$4x < -1$
$x > \frac{7}{4}$	OR	$x < -\frac{1}{4}$



14.

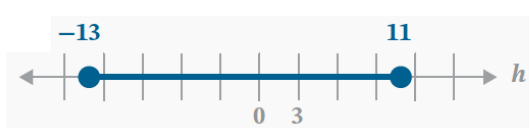
$\frac{1}{2}|h + 1| - 4 \leq 2$

$\frac{1}{2}|h + 1| \leq 6$

$|h + 1| \leq 12$

$h + 1 \leq 12$	AND	$-(h + 1) \leq 12$
	AND	$h + 1 \geq -12$
$h \leq 11$	AND	$h \geq -13$

or $-13 \leq h \leq 11$



15.

16.

$-5\|p\| - 3 > -3$	◀ Given
$-5\|p\| > 0$	◀ Addition Property of Equality Add 3 to expressions on both sides
$\|p\| < 0$	◀ Multiplication Property of Equality Multiply expressions on both sides by $-\frac{1}{5}$ [All signs change]
no solution	◀ Distance must be non-negative.

17.
Sample: This inequality has no solution. Nothing would be marked on the number line since no number will make this true.

18.
Sample 1: $|b| \geq 0$; Sample 2: $|n| > -3$
The absolute value must be greater than or equal to ($\geq$) zero, or the absolute value must be greater than (>) or greater than or equal to ($\geq$) a negative number.

19.
Sample 1: $|b| < 0$; Sample 2: $|n| \leq -3$
The absolute value must be less than (<) zero, or the absolute value must be less than (<) or less than or equal to ($\leq$) a negative number.

20.
Let c = the speed of the cruise control
$|c - 35| \leq 2$

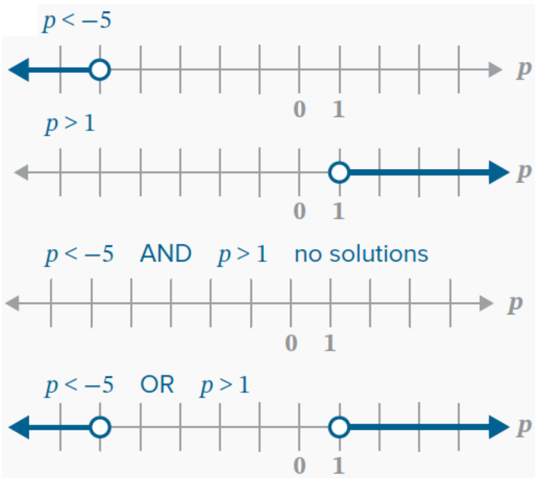
$$c - 35 \leq 2 \quad \text{AND} \quad -(c - 35) \leq 2$$
$$c \leq 37 \quad \text{AND} \quad c - 35 \geq -2$$
$$c \geq 33$$
$$33 \leq c \leq 37$$

21.
Let w = the number of words Abul still needs to write
$400 \leq w + 150 \leq 500$
$250 \leq w \leq 350$
Abul must still write between 250 and 350 words.

Part B: Compound Inequalities

Practice 2

1.



2.

$-1 \le x$ AND $x \le \frac{3}{4}$

$-1 \le x \le \frac{3}{4}$

3.

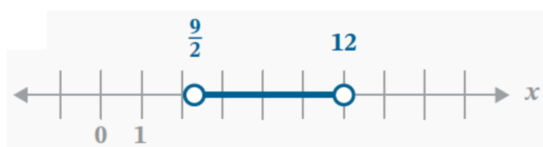
$5 < \frac{2}{3}x + 2 < 10$

$5 < \frac{2}{3}x + 2$ AND $\frac{2}{3}x + 2 < 10$

$3 < \frac{2}{3}x$ AND $\frac{2}{3}x < 8$

$\frac{9}{2} < x$ AND $x < 12$

$\frac{9}{2} < x < 12$

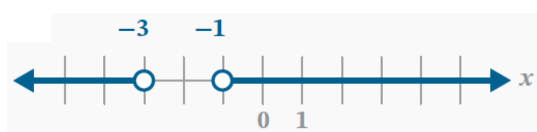


4.

$-3x + 1 > 10$ OR $2x - 3 > -5$

$-3x > 9$ OR $2x > -2$

$x < -3$ OR $x > -1$

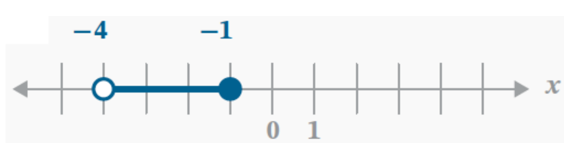


5.

$3 \le -4x - 1 < 15$

$4 \le -4x < 16$

$-4 < x \le -1$

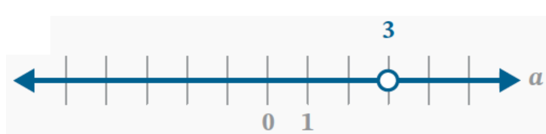


6.

$4a < 12$ OR $7a > 21$

$a < 3$ OR $a > 3$

All real numbers except 3.



7.

$|\frac{5}{3}c + 9| \leq 6$

$\frac{5}{3}c + 9 \leq 6$ AND $-(\frac{5}{3}c + 9) \leq 6$

$\frac{5}{3}c + 9 \geq -6$

$\frac{5}{3}c \leq -3$ AND $\frac{5}{3}c \geq -15$

$c \leq -\frac{9}{5}$ $c \geq -9$

$-9 \leq c \leq -\frac{9}{5}$

8.

The inequality symbol would need to change from ≤ to ≥ for the solution to have an OR statement.

9.

$2|c - 2| + 3 > 11$

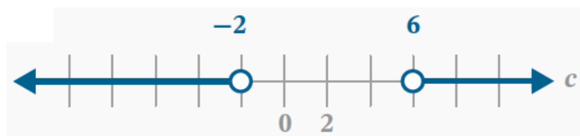
$2|c - 2| > 8$

$|c - 2| > 4$

$c - 2 > 4$ OR $-(c - 2) > 4$

OR $c - 2 < -4$

$c > 6$ OR $c < -2$



10.

$|\frac{3}{7}k| < -18$

no solution

11.

The second equation of the absolute value is written incorrectly. The inequality $-(2x) \leq 0$ should be $-(2x) \geq 0$. The inequality symbol should only be changed after multiplying or dividing by a negative.

The correct solutions are $x \geq 0$ OR $x \leq 0$. Therefore, the solution is *all real numbers*.

12.

The correct solution:

$y - 3 \leq 4$

$y \leq 7$

When multiplying both expressions by −1, all signs including the inequality sign must change. The solutions are $y \geq -1$ OR $y \leq 7$, so the solution is *all real numbers*.

13.

Let s = the number of students

$|s - 25| \leq 8$

$s - 25 \leq 8$ AND $-(s - 25) \leq 8$

AND $s - 25 \geq -8$

$s \leq 33$ AND $s \geq 17$

The solution is $s \geq 17$ AND $s \leq 33$, which can be rewritten as $17 \leq s \leq 33$. The class size can range from 17 students to 33 students.

Targeted Review

Problem	1	2	3	4	5	6	7	8	9	10	11	12
Lesson Origin	2, 3	2, 3	PA	PA	1	1	2	2	FS	FS	3	1

1.
$|2h - 3| = 5$
$2h - 3 = 5$ OR $-(2h - 3) = 5$
$2h - 3 = -5$
$2h = 8$ OR $2h = -2$
$h = 4$ OR $h = -1$
two solutions

2.
$-3(x + 3) = 2x - 3 - (x + 4)$
$-3x - 9 = 2x - 3 - x - 4$
$-3x - 9 = x - 7$
$-9 = 4x - 7$
$-2 = 4x$
$-\frac{1}{2} = x$
one solution

3.
$(-8)^2 = (-8)(-8) = 64$
$-8^2 = -1 \cdot ((8)(8)) = -1 \cdot (64) = -64$

4.
Sample: Order of operations says to work with numbers inside parentheses first. On the left, you multiply negative eight by itself. On the right, you multiply eight by itself and then the product by –1.

5.
Reflexive Property

6.
Inverse Property (of Multiplication)

7.
b: balance of account
–20 (starting balance) – 40 (fee) = –$60
$-60 + 35 + 2(35) = \$45$
$45 + 75 - 22.50 = \$97.50$
b = withdrawals + deposits
$b = (-20 + -40 + -22.50) + (3(35) + 75)$
$b = 97.50$ Ida's account now has a balance of $97.50

8.
n: unknown number

$\frac{1}{2}n + 7 = 3(n - 6)$

$\frac{1}{2}n + 7 = 3n - 18$

$7 = \frac{5}{2}n - 18$

$25 = \frac{5}{2}n$

$n = 10$

9.
2.54 cm = 1 inch

10.
$y = mx + b$

11. B

$|x - 2| = 6$

$x - 2 = 6$ OR $-(x - 2) = 6$

$x - 2 = -6$

$x = 8$ OR $x = -4$

A) This makes the midpoint 6 rather than 2.
C) This treats “2” as 0 on the number line. The distance from −6 to 2 = 8 spaces, from 2 to 6 = 4 spaces.
D) This makes −2 the midpoint but ignores equal distances. The distance from −6 to −2 = 4 spaces, from −2 to 6 = 8 spaces.

12.
The square root of 3 multiplied by −9 OR $\frac{2}{9}$ is irrational. The square root of 27 multiplied by −9 or $\frac{2}{9}$ is irrational. The only two numbers that result in a rational number are $\sqrt{3} \cdot \sqrt{27} = \sqrt{81} = 9$.