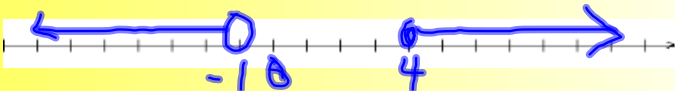


## 6.4 Graph Compound Inequalities

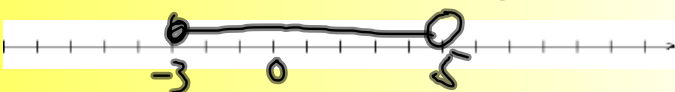
Warmup/Classwork: Work with a partner.

Translate the verbal phrase into an inequality. Then graph the inequality.

1. All real numbers that are less than -1 or greater than or equal to 4.

$$x < -1 \text{ or } x \geq 4$$


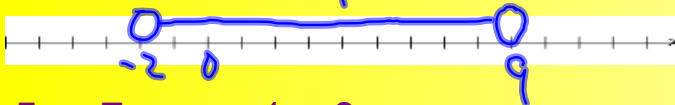
2. All real numbers that are greater than or equal to -3 and less than 5.

$$-3 \leq x < 5$$


Solve the inequality. Graph the solution.

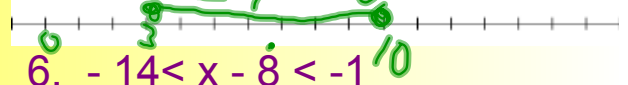
3.  $-7 < x - 5 < 4$

$$\begin{array}{ccc} +5 & +5 & +5 \\ -2 & < x & < 9 \end{array}$$



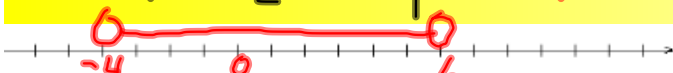
4.  $10 \leq 2y + 4 \leq 24$

$$\begin{array}{ccc} -4 & -4 & -4 \\ 6 & \leq 2y & \leq 20 \\ \frac{6}{2} & \leq y & \leq \frac{20}{2} \\ 3 & \leq y & \leq 10 \end{array}$$

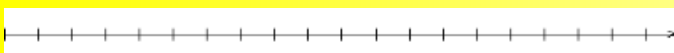


5.  $-7 < -z - 1 < 3$

$$\begin{array}{ccc} +1 & +1 & +1 \\ -6 & < -z & < 4 \\ \frac{-6}{-1} & > z & > \frac{4}{-1} \\ 6 & > z & > -4 \end{array} \rightarrow -4 < z < 6$$

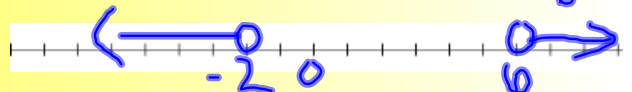


7.  $-1 \leq -5t + 2 \leq 4$

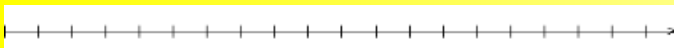


8.  $3h + 1 < -5$  or  $2h - 5 > 7$

$$\begin{array}{ccc} -1 & -1 & \\ 3h & < -6 & \\ \frac{3h}{3} & < \frac{-6}{3} & \\ h & < -2 & \end{array} \quad \text{or} \quad \begin{array}{ccc} +5 & +5 & \\ 2h & > 12 & \\ \frac{2h}{2} & > \frac{12}{2} & \\ h & > 6 & \end{array}$$

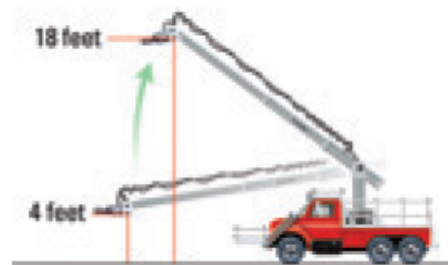


9.  $4c + 1 \leq -3$  or  $5c - 3 > 17$



**EXAMPLE 2** Write and graph a real-world compound inequality

**CAMERA CARS** A crane sits on top of a camera car and faces toward the front. The crane's maximum height and minimum height above the ground are shown. Write and graph a compound inequality that describes the possible heights of the crane.

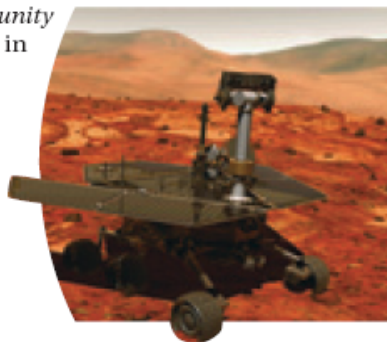


**Solution**

Let  $h$  represent the height (in feet) of the crane. All possible heights are greater than or equal to 4 feet *and* less than or equal to 18 feet. So, the inequality is  $4 \leq h \leq 18$ .



**ASTRONOMY** The Mars Exploration Rovers *Opportunity* and *Spirit* are robots that were sent to Mars in 2003 in order to gather geological data about the planet. The temperature at the landing sites of the robots can range from  $-100^{\circ}\text{C}$  to  $0^{\circ}\text{C}$ .



- Write a compound inequality that describes the possible temperatures (in degrees Fahrenheit) at a landing site.
- Solve the inequality. Then graph your solution.
- Identify three possible temperatures (in degrees Fahrenheit) at a landing site.

**Solution**

Let  $F$  represent the temperature in degrees Fahrenheit, and let  $C$  represent the temperature in degrees Celsius. Use the formula  $C = \frac{5}{9}(F - 32)$ .

**STEP 1** Write a compound inequality. Because the temperature at a landing site ranges from  $-100^{\circ}\text{C}$  to  $0^{\circ}\text{C}$ , the lowest possible temperature is  $-100^{\circ}\text{C}$ , and the highest possible temperature is  $0^{\circ}\text{C}$ .

$-100 \leq C \leq 0$       Write inequality using  $C$ .

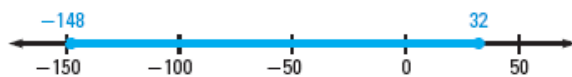
$-100 \leq \frac{5}{9}(F - 32) \leq 0$       Substitute  $\frac{5}{9}(F - 32)$  for  $C$ .

**STEP 2** Solve the inequality. Then graph your solution.

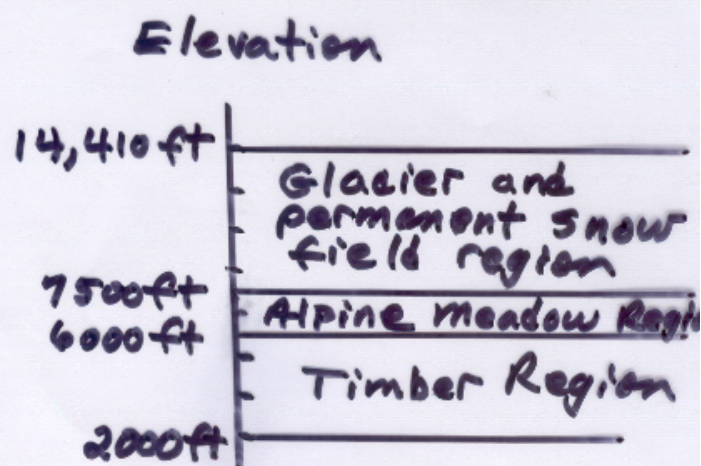
➡  $-100 \leq \frac{5}{9}(F - 32) \leq 0$       Write inequality from Step 1.

$-180 \leq F - 32 \leq 0$       Multiply each expression by  $\frac{9}{5}$ .

$-148 \leq F \leq 32$       Add 32 to each expression.



Example: Write an inequality that describes the elevations of the regions of Mount Rainier (near Seattle).



Solution: Let  $y$  represent the approximate elevation (in feet).

a. Timber Region

$$2000 \leq y < 6000$$

b. Alpine Meadow Region

$$6000 \leq y < 7500$$

c. Glacier and Permanent Snow Field Region

$$7500 \leq y \leq 14,410$$

9.  $6 < x + 5 \leq 11$   $1 < x \leq 6$

HW ANS

10.  $-7 > y - 8 \geq -12$   $-4 \leq y < -1$

11.  $-1 \leq -4m \leq 16$   $-4 \leq m \leq \frac{1}{4}$

12.  $-6 < 3n + 9 < 21$   $-5 \leq n < 4$

13.  $-15 \leq 5(3p - 2) < 20$   $-\frac{1}{3} \leq p < 2$

14.  $7 > \frac{2}{3}(6q + 18) \geq -9$   $-5\frac{1}{4} \leq q < -1\frac{1}{4}$

15.  $2r + 3 < 7$  or  $-r + 9 \leq 2$   $r < 2$  or  $r \geq 7$

16.  $16 < -s - 6$  or  $2s + 5 \geq 11$   $s < -22$  or  $s \geq 3$

17.  $v + 13 < 8$  or  $-8v < -40$   $v < -5$  or  $v > 5$

18.  $-14 > w + 3$  or  $5w - 13 > w + 7$

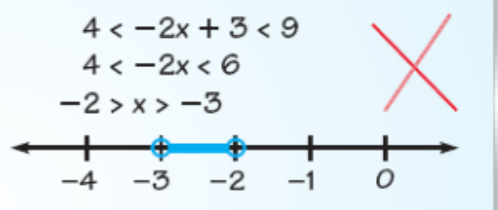
$w < -17$  or  $w > 5$

19.  $9g - 6 > 12g + 1$  or  $4 < -\frac{2}{5}g + 8$   
 $g < -2\frac{1}{3}$  or  $g > 10$

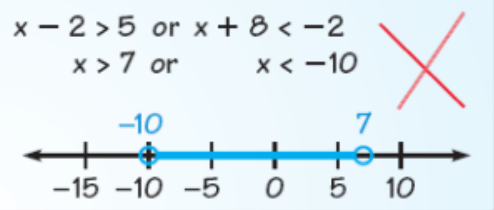
20.  $-2h - 7 > h + 5$  or  $\frac{1}{4}(h + 8) \geq 9$   
 $h < -4$  or  $h \geq 28$

**ERROR ANALYSIS** Describe and correct the error in solving the inequality or in graphing the solution. 21, 22. See margin for art.

21.



22.



**TRANSLATING SENTENCES** Write the verbal sentence as an inequality. Then solve the inequality and graph your solution. 23–26. See margin for art.

23. Five more than  $x$  is less than 8 or 3 less than  $x$  is greater than 5.

$x + 5 < 8$  or  $x - 3 > 5$ ;  $x < 3$  or  $x > 8$

24. Three less than  $x$  is greater than  $-4$  and less than  $-1$ .  $-4 < x - 3 < -1$ ;  $-1 < x < 2$

25. Three times the difference of  $x$  and 4 is greater than or equal to  $-8$  and less than or equal to 10.  $-8 \leq 3(x - 4) \leq 10$ ;  $1\frac{1}{3} \leq x \leq 7\frac{1}{3}$

26. The sum of  $-2x$  and 8 is less than or equal to  $-5$  or 6 is less than  $-2x$ .  
 $-2x + 8 \leq -5$  or  $6 < -2x$ ;  $x < -3$  or  $x \geq 6\frac{1}{2}$

41. **ANIMALS** A deer can eat 2% to 4% of its body weight in food per day. The percent  $p$  of the deer's body weight eaten in food is given by the equation

$p = \frac{f}{d}$  where  $f$  is the amount (in pounds) of food eaten and  $d$  is the weight

(in pounds) of the deer. Find the possible amounts of food that a

160 pound deer can eat per day.  $3.2 \text{ lb} \leq f \leq 6.4 \text{ lb}$