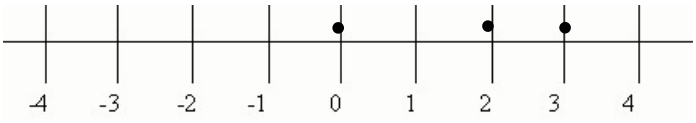
3-9-1 Inequalities

Sometimes its hard to remember which way the symbols < and > go. Think "the alligator eats the larger number." This is a little childish, but you won't forget again.

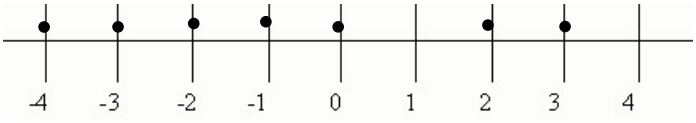
8  13 8<13 Eight is less than 13.

Negative five is greater than negative twenty-three. -5  -23 -5 > -23

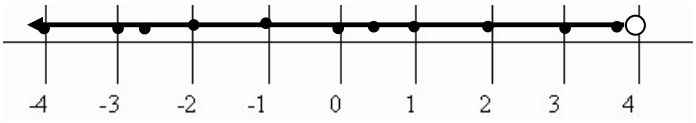
Some numbers that fit for the inequality x < 4 are 3, 2, and 0. These are plotted below.



All the negative numbers also satisfy the inequality.

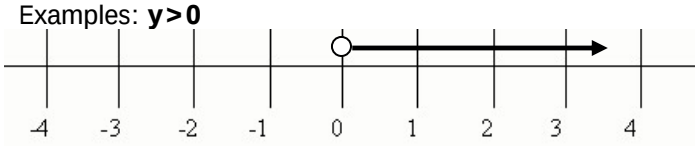


½, 3 ¾, - $^{2}/_{3}$, 3.9, 3.99, and 3.999 also work. 4 is not less than 4 so 4 is not part of the solution. An open circle illustrates getting close but not including the number the circle is on.

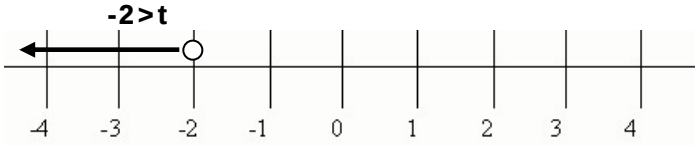


When ≤ and ≥ are involved, use a closed circle to indicate the "or equal to" part of the symbol.

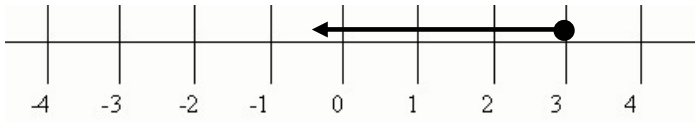
Examples: **y>0**



-2>t



$3 \geq r$

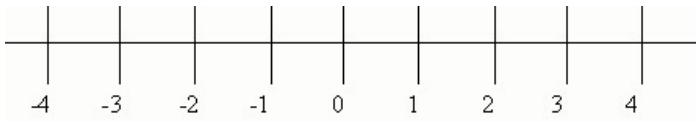


$-3 \leq e$

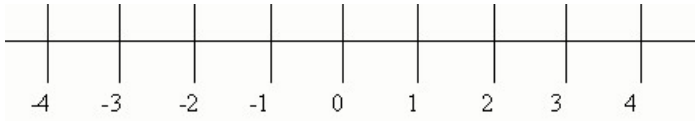
Practice: Plot the solution for each inequality.

$0 \geq r$

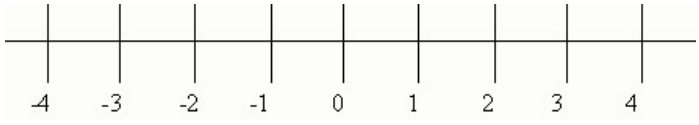
0< u



$-2 \leq x$

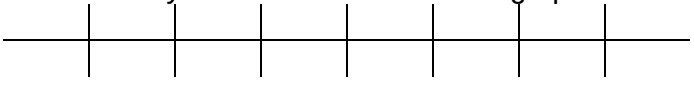


$y \leq -3$

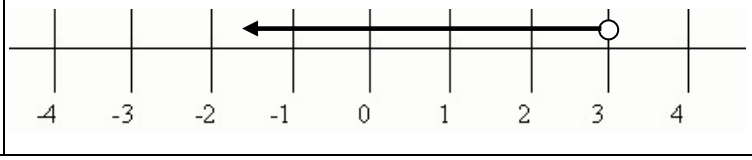


z>-1

x<30 Fill in your own numbers on the graph below.



Notice the steps are the same for solving both an equation and an inequality.

$3x-7=2$ $\underline{+7 \quad +7}$ $3x=9$ $x=3$ $3x-7<2$ $\underline{+7 \quad +7}$ $3x<9$ $x<3$ The solution is then plotted.	

Practice: Solve the following inequalities and plot the solution.

a) 6< 2x

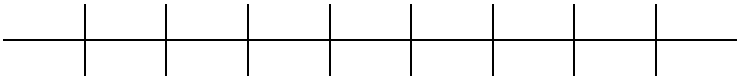
b) 4>t+6

c) $7r \leq 21$

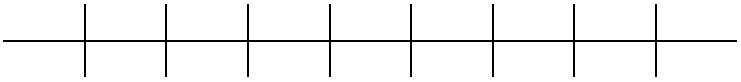
d) $s-8 \geq -12$

e) $2+3x \geq 11$

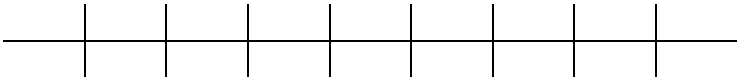
f) $44 < 2x-90$ Label the number line.



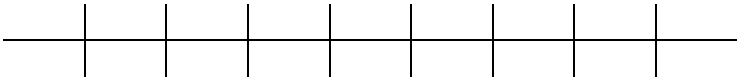
g) 10y-30>15



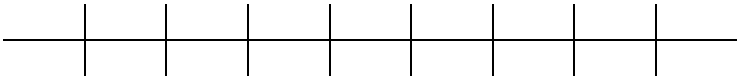
h) 3(2x-12)< 14



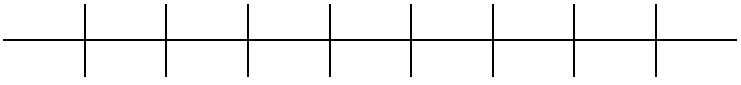
i) $-100 \leq 2(w-7)$



j) 6x-10<3x+26



k) 2w-16>5w+12



The last two questions, j and k, only have one right answer. Look at the solution of j.

$6x-10<3x+26$

$-3x \quad -3x$

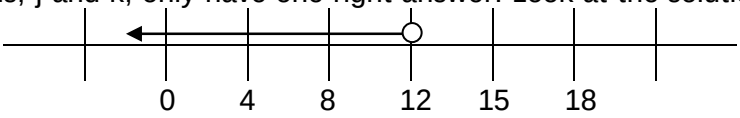
$3x-10<26$

$+10 \quad +10$

$3x<36$

$\frac{3x}{3}<\frac{36}{3}$

$x<12$



No matter which way the problem is done the answer must be the same.

When both sides of an inequality are divided by a negative number (or multiplied), the inequality symbol is flipped. It is changed to the other symbol.

$6x-10<3x+26$

$-6x \quad -6x$

$-10<-3x+26$

$-26 \quad -26$

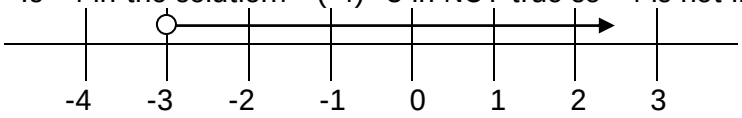
$-36<-3x$

$\frac{-36}{-3}<\frac{-3x}{-3}$

$12<???>x$

12>x

Think through the solution set in the integers for -x<3.
-(-2)<3 is true so –2 is in the solution. –(1)<3 is true so 1 is in the solution.
–2, -1, 0, 1, and 2 are in the solution.
Is 4 in the solution? -(4)<3 is true so 4 is in the solution set. Try 5, 6 and 7.
Is –4 in the solution? –(-4)<3 in NOT true so –4 is not in the solution. Try –5, -6, and –7.



The solution is x> -3. Start with –x<3. Divide both sides by –1 and flip the inequality.

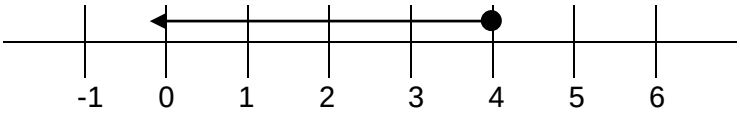
Example: $3-5x \geq -17$

$-3 \quad -3$

$-5x \geq -20$

$\frac{-5x}{-5} \leq \frac{-20}{-5}$

$x \leq 4$



Add 3 didn't flip the sign, but divide by –5 flips the sign.

Practice: Graph the solution set of the following.

a) –t<8

-9<- r

5< 8e - 10e

b) $4-x \leq 12$

$15 \leq 7-t$

$4-5x \leq 54$

c) $-3f>12$

$-28 \leq -7w$

$-4 \geq -12a$

d) $-\frac{w}{5} \leq 30$

$-3\frac{2}{3}-t>5\frac{1}{2}$

$-2\frac{3}{4} \geq -8\frac{2}{3}-\frac{3}{4}k$

e) $7-2x<15$

$-23<4-9x$

$3 \geq -12-5a$

f) $x-3(2+x)>18$

$15-8(2x+6) \leq 42$

$27>8x-3(4x-6)$