

Algebra

1. $4x + 7 = -17$

$$4x = -17 - 7$$

$$\frac{4x}{4} = \frac{-24}{4} \quad x = \underline{\underline{-6}}$$

3. $8 - 4a = 7$

$$\frac{-4a}{-4} = \frac{7-8}{-4}$$

$$a = \frac{4}{-4} \quad a = \underline{\underline{-1}}$$

5. $6n - 17 = -9$

$$6n = -9 + 17$$

$$\frac{6n}{6} = \frac{8}{6} \quad n = \frac{4}{3} = \underline{\underline{1\frac{1}{3}}}$$

7. $5p - 2(p+1) = 7$

$$5p - 2p - 2 = 7$$

$$3p - 2 = 7$$

$$3p = 7 + 2$$

$$\frac{3p}{3} = \frac{9}{3} \quad p = \underline{\underline{3}}$$

9. $3x + 4y = 5$

$$\frac{4y}{4} = \frac{5-3x}{4}$$

$$y = \frac{5-3x}{4}$$

11. $\frac{x}{5} + 3 = 7$

$$x + 15 = 35$$

$$x = 35 - 15$$

$$x = 20$$

$$x = \underline{\underline{20}}$$

13. $\frac{7x-2}{3} = 4$

$$7x - 2 = 12$$

$$7x = 12 + 2$$

$$7x = 14$$

$$x = \underline{\underline{2}}$$

15. $3ab + 2b^2 = 5$

$$\frac{3ab}{3b} = \frac{5-2b^2}{3b}$$

$$a = \frac{5-2b^2}{3b}$$

17. $49\sqrt{7} + 3x = 5$

$$\frac{3x}{3} = \frac{5-49\sqrt{7}}{3}$$

$$x = \frac{5-49\sqrt{7}}{3}$$

19. $3\sqrt{2} + 7(n - 3\sqrt{2}) = 5\sqrt{2}$

$$3\sqrt{2} + 7n - 21\sqrt{2} = 5\sqrt{2}$$

$$7n = 5\sqrt{2} - 3\sqrt{2} + 21\sqrt{2}$$

$$\frac{7n}{7} = \frac{23\sqrt{2}}{7}$$

$$n = \frac{23\sqrt{2}}{7}$$

21. $7m^5 + 4(8k - 3m^5) = -5m^5$

$$7m^5 + 32k - 12m^5 = -5m^5$$

$$32k = -5m^5 - 7m^5 + 12m^5$$

$$\frac{32k}{32} = \frac{0}{32}$$

$$k = \underline{\underline{0}}$$

23. $\frac{2a+3b}{5c} = a$

$$2a + 3b = 5ac$$

$$3b = 5ac - 2a$$

$$\frac{3b}{3} = \frac{a(5c-2)}{3}$$

$$b = \frac{a(5c-2)}{3}$$

25. $\frac{4x+2y}{5} = \frac{1-x}{3}$

$$3(4x+2y) = 5(1-x)$$

$$12x + 6y = 5 - x$$

$$\frac{13x}{13} = \frac{5-6y}{13}$$

$$x = \frac{5-6y}{13}$$

27. $\frac{3x-4y}{2} = \frac{12x-16y}{8}$

$$8(3x-4y) = 2(12x-16y)$$

$$24x - 32y = 24x - 32y$$

$$-32y + 32y = 24x - 24x$$

$$\underline{\underline{0=0}}$$

Undefined.
No. soln.

29. $\frac{4+x}{y} = k$

$$4+x = yk$$

$$\frac{yk}{k} = \frac{4+x}{k}$$

$$y = \frac{4+x}{k}$$

31. $\frac{x-y}{a-3b} = c$

$$x-y = c(a-3b)$$

$$x-y = ac - 3bc$$

$$\frac{3bc}{3c} = \frac{ac-x+y}{3c}$$

$$b = \frac{ac-x+y}{3c}$$

33. $|p-1| = 3$

$$p = 3+1$$

$$p = \underline{\underline{4}}$$

35. $\frac{x+1}{y} = \frac{x-5}{-y}$

$$y(x+1) = y(x-5)$$

$$x+1 = x-5$$

$$x-x = -5-1$$

$$\underline{\underline{0=-6}}$$

(undefined)
No. solution.

$$37. |10-6|-2d=|d|$$

$$4-2d=d$$

$$4=d+2d$$

$$\frac{4=3d}{3 \quad 3}$$

$$d=\frac{4}{3} \quad d=\underline{\underline{\frac{4}{3}}}$$

$$39. 3-5(x+2)=-52$$

$$3-5x-10=-52$$

$$3-10=-52+5x$$

$$-7=0 \quad \text{Undefined.}$$

No solution.

$$41. |a-5|=a+11$$

$$a-5=a+11$$

$$0=16$$

No solution.

$$41. |a-5|=a+11$$

The intervals for $|a-5|$

$$a-5 \geq 0; a \geq 5 \quad |a-5|=a-5$$

$$a-5 < 0; a < 5; \quad |a-5|=-(a-5)$$

$ a-5 $	$a < 5$	$a \geq 5$
	-	+

for $a < 5$; rewrite $|a-5|=a+11$ as

$$-(a-5)=a+11 \quad -a+5=a+11$$

$$-a+5=a+11 \quad -2a=6$$

$$-a+5=a+11 \quad \frac{-2a}{2}=\frac{6}{-2}$$

$$a=\underline{\underline{-3}}$$

$$43. \frac{|n+6|}{3}=4$$

$$|n+6|=12$$

apply rule if $|u|=a$, $a \geq 0$ then $u=a$
or $u=-a$

$$\therefore n+6=-12 \quad \text{or} \quad n+6=12$$

$$n=-12-6$$

$$n=12-6$$

$$\underline{\underline{n=-18}}$$

$$\underline{\underline{n=6}}$$

$$45. \frac{y}{|y-2|}=\frac{1}{5}$$

$$5y=|y-2|$$

Intervals for $|y-2|$

$$y-2 \geq 0; y \geq 2, \quad |y-2|=y-2$$

$$y-2 < 0; y < 2, \quad |y-2|=-(y-2)$$

for $y \geq 2$.

$y < 2$ we rewrite $5y=|y-2|$ as

$$5y=-(y-2)$$

$$5y=-y+2$$

$$\frac{6y}{6}=\frac{2}{6} \quad y=\frac{1}{3}$$

for $y \geq 2$ we rewrite as $5y=|y-2|$

$$\text{as } 5y=y-2$$

$$5y-y=-2$$

$$\frac{4y}{4}=\frac{-2}{4} \quad y=\underline{\underline{-\frac{1}{2}}}$$

$$47. 4-5|q-4|=14$$

subtract 4 from both sides

$$4-5|q-4|-4=14-4$$

$$-5|q-4|=\frac{10}{-5}$$

$$|q-4|=-2$$

No solution since absolute

value can't be less than 0.

$$49. 3x+1 < 16$$

$$3x < 16-1$$

$$\frac{3x}{3} < \frac{15}{3}$$

$$\underline{\underline{x < 5}}$$

$$51. 8n-(5n+1) \leq 8n$$

$$8n-5n-1 \leq 8n$$

$$-2n-1 \leq 8n$$

$$-2n-8n \leq 1$$

$$\frac{-10n}{-10} \leq \frac{1}{-10}$$

$$n \geq \underline{\underline{-\frac{1}{10}}}$$

$$53. 5-\frac{k}{3} \leq 7$$

$$15-k \leq 21$$

$$-k \leq 21-15$$

$$\frac{-k}{-1} \leq \frac{6}{-1}$$

$$\underline{\underline{k \geq -6}}$$

$$55. 4m-5(m+y) \leq 2y$$

$$4m-5m-5y \leq 2y$$

$$-m \leq 2y+5y$$

$$\frac{-m}{-1} \leq \frac{7y}{-1}$$

$$m \geq \underline{\underline{-7y}}$$

$$57. 7-3x \leq -5$$

$$7-3x \leq -5$$

$$-3x \leq -5-7$$

$$\frac{-3x}{-3} \leq \frac{-12}{-3}$$

$$\underline{\underline{x \geq 4}}$$

$$59. 18-5(x+1) > 2x-7x$$

$$18-5x-5 > -5x$$

$$13-5x > -5x$$

$$-5x+5x > 13$$

$$0 > 13$$

No solution.

$$61. 4a+2a(b+3) \geq -1$$

$$4a+2ab+6a \geq -1$$

$$10a+2ab \geq -1$$

$$\frac{2ab}{2a} \geq \frac{-1-10a}{2a}$$

$$b \geq \underline{\underline{\frac{-1-10a}{2a}}}$$

$$63. \begin{aligned} 14 &\geq 2b + 3ac \\ -3ac &\geq 2b - 14 \\ \hline -3c &\geq 2b - 14 \\ \hline a &\leq \frac{2b - 14}{-3c} \end{aligned}$$

$$65. \begin{aligned} 8p + 5(p-1) &\leq 8p + 4 \\ 8p + 5p - 5 &\leq 8p + 4 \\ 8p - 5 &\leq 8p + 4 \\ 8p - 8p &\leq 4 + 5 \\ 0 &\leq 9 \end{aligned}$$

$$67. \begin{aligned} 4a + a(2-3n) &\geq 7 \\ 4a + 2a - 3an &\geq 7 \\ 6a - 3an &\geq 7 \\ a(6-3n) &\geq 7 \\ \hline a &\geq \frac{7}{(6-3n)} \end{aligned}$$

$$69. \begin{aligned} 4 - 5a(2k+1) &\leq -29 \\ 4 - 10ak - 5a &\leq -29 \end{aligned}$$

$$67. \begin{aligned} 4a + a(2-3n) &\geq 7 \\ 4a + 2a - 3an &\geq 7 \\ 6a - 3an &\geq 7 \\ \hline -3an &\geq 7 - 6a \\ \hline -3a &\geq 7 - 6a \\ \hline n &\leq \frac{7-6a}{-3a} \end{aligned}$$

$$69. \begin{aligned} 4 - 5a(2k+1) &\leq -29 \\ 4 - 10ak - 5a &\leq -29 \\ \hline -10ak &\leq -29 - 4 + 5a \\ \hline -10a &\leq -109 \\ \hline k &\geq \frac{-29 - 4 + 5a}{-10a} \end{aligned}$$

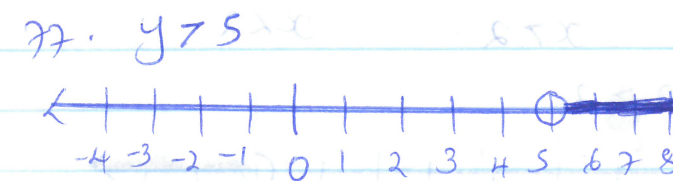
$$k \geq \frac{3a-4}{-10a}$$

$$71. \begin{aligned} 7 &\geq 5 - \frac{3w}{4} \\ \hline 28 &\geq 20 - 3w \\ 28 - 20 &\geq -3w \\ \hline 8 &\geq -3w \\ \hline -\frac{8}{3} &\leq w \\ \hline w &\geq -\frac{8}{3} = -2\frac{2}{3} \end{aligned}$$

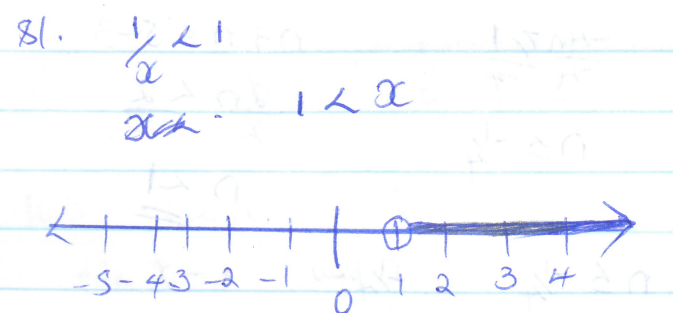
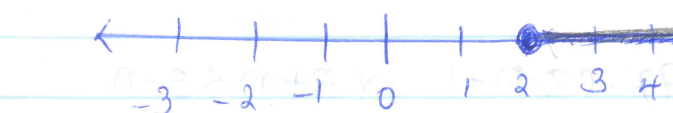
$$73. \begin{aligned} 1 - \frac{y}{x} &\leq -6 \\ x - y &\leq -6x \\ -y &\leq -6x - x \\ \hline -y &\leq -7x \\ \hline y &\geq 7x \end{aligned}$$

$$75. \begin{aligned} 47/4 - a\left(\frac{m}{3} - 5\right) &\geq -5 \\ 47/4 - \frac{am}{3} + 5a &\geq -5 \\ \hline 12 \geq 12 - am + 5a \end{aligned}$$

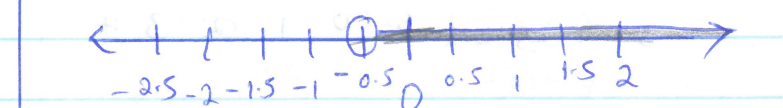
$$\begin{aligned} am &\geq 5a + 12 - 12 \\ \frac{am}{a} &\geq \frac{5a}{a} \\ m &\geq 5 \end{aligned}$$



$$79. \begin{aligned} 4c + 17 &\geq 9 \\ 4c &\geq 9 - 17 \\ \hline 4c &\geq -8 \\ \hline c &\geq -2 \end{aligned}$$



$$83. \begin{aligned} 5 - 2x &\leq 3 + 2(x+2) \\ 5 - 2x &\leq 3 + 2x + 4 \\ 5 - 2x &\leq 7 + 2x \\ 5 - 7 &\leq 2x + 2x \\ \hline -2 &\leq 4x \\ \hline -\frac{1}{2} &\leq x \\ x &\geq -\frac{1}{2} \end{aligned}$$

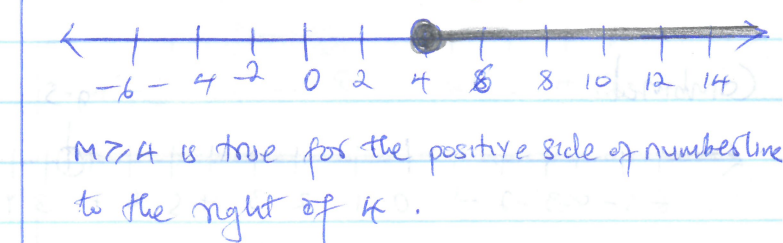


$$85. \begin{aligned} 5n - 5(n+2) &\neq 5 \\ 5n - 5n - 10 &\neq 5 \\ 0 - 10 &\neq 5 \\ 0 &\neq 5 + 10 \\ 0 &\neq 15 \end{aligned}$$

No solution.

$$87. \begin{aligned} m + 17 &\geq 5 \quad \text{and} \quad m - 17 \leq 5 \\ m &\geq 5 - 17 \quad m \geq 5 + 1 \\ m &\geq -12 \quad m \geq 6 \end{aligned}$$

The combined numberline graph.



89. $C+3 > 2C$ or $C+5 < 4$

$C-2C > -3$ or $C < 4-5$

$-C > -3$ or $C < -1$

$-1 < -1$

$C < 3$



91. $y - \frac{1}{3}y < 5$ or $y \neq 3$

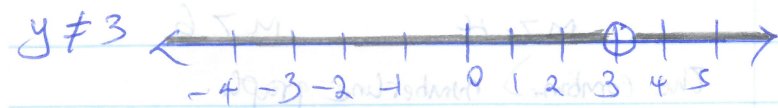
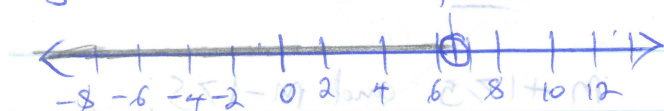
$\frac{2}{3}y < 5$

$y < \frac{15}{2}$

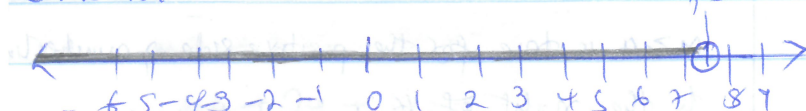
$y \neq 3$

$y < 7.5$

$y < 7.5$



Combined.



93. $\frac{t}{2} > -1$ and $1 - \frac{3t}{2} > -2$

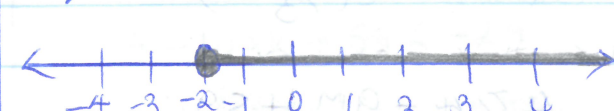
$t > -2$ and $2 - 3t > -4$

$-3t > -6$

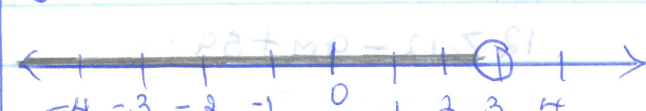
$t < 2$

$t < 2$

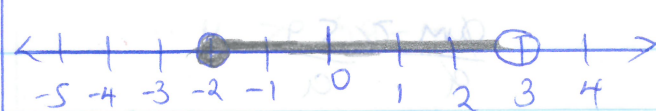
$t > -2$



$t < 3$



Combined.

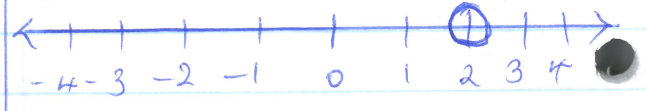
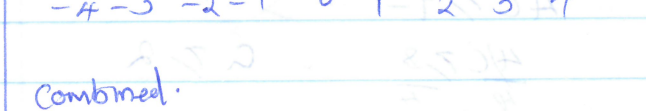
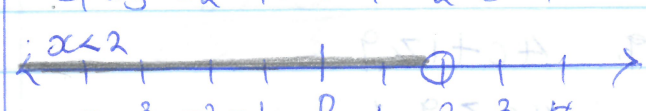
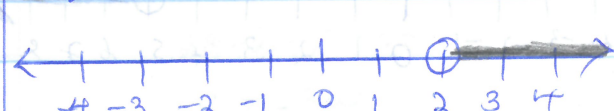


95. $x+3 > 5$ and $x+3 < 5$

$x > 2$

$x < 2$

$x > 2$



97. $n+7 > n+1$ or $3+n < 5-n$

$n-5n > 1$

$n < 5-n-3$

$-\frac{4n}{4} > \frac{1}{4}$

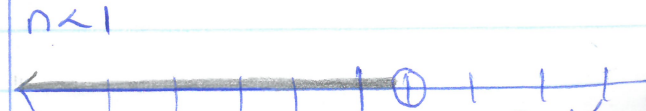
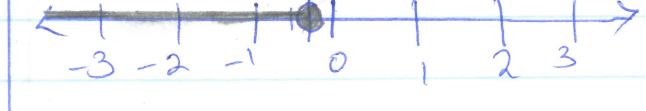
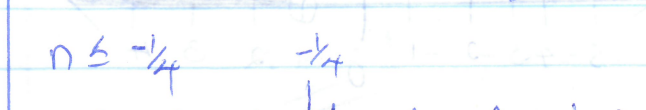
$n+n < 5-3$

$n < -\frac{1}{4}$

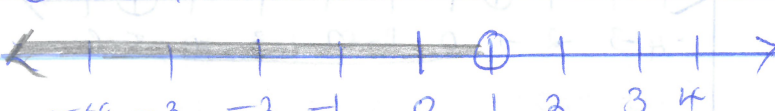
$\frac{2n}{2} < \frac{2}{2}$

$n < -\frac{1}{4}$

$n < 1$



Combined



99. $4p+3 > 4p-3$ and $3(p-1) > 5$

$4p-4p > -3-3$

$3p-3 > 5$

$0 > -6$

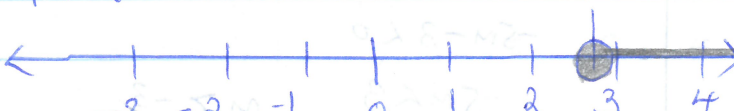
$3p > 5+3$

No soln.

$\frac{3p}{3} > \frac{8}{3}$

$p > \frac{8}{3}$

$p > \frac{8}{3}$



101. $2-(x+1) \leq 5-x$ and $4-3x < 7$

$2-x-1 \leq 5-x$

$4-3x < 7$

$1-x \leq 5-x$

$-3x < 7-4$

$-x+2 \leq 5-1$

$-3x < 3$

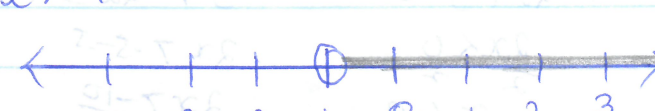
$0 \leq 4$

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

No solution.

$x > -1$

$x > -1$



108. $-1 < x-1 < 5$

$-1 < x-1$

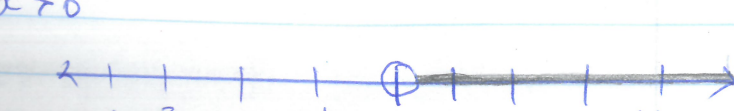
and $x-1 < 5$

$-1+1 < x$

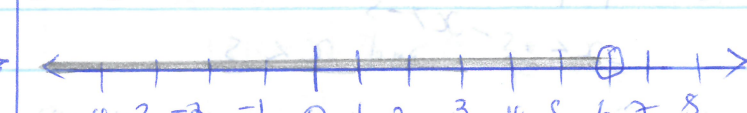
$x < 6$

$0 < x$

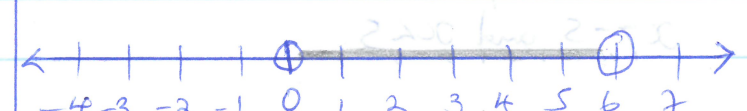
$x > 0$



$x < 6$



Combined $-1 < x-1 < 5$



105. $2 \leq 1-3a \leq 7$

$2 \leq 1-3a$

and $1-3a \leq 7$

$2-1 \leq -3a$

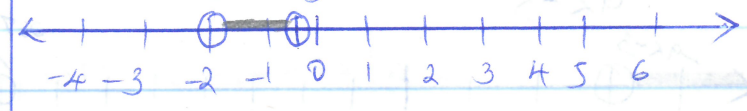
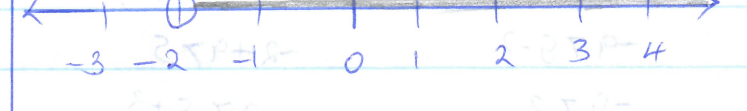
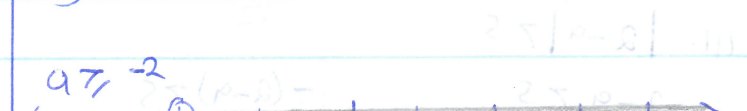
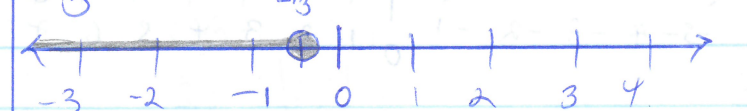
$-3a \leq 7-1$

$\frac{1 \leq -3a}{-3} \frac{-3}{-3}$

$\frac{-3a \leq 6}{-3} \frac{-3}{-3}$

$-\frac{1}{3} \geq a$

$a \geq -2$



107. $|x| < 5$
 $-x < 5$ and $x < 5$
 $x > -5$ and $x < 5$

109. $|y-3| > 4$
 $-(y-3) > 4$ and $y-3 > 4$
 $-y+3 > 4$ and $y > 7$
 $-y > 1$ and $y > 7$
 $y < -1$ and $y > 7$

111. $|2-a| > 5$
 $2-a > 5$ and $-(2-a) > 5$
 $-a > 3$ and $a > 7$
 $a < -3$ and $a > 7$

113. $3 > |c-2|$
 $3 > c-2$ and $3 > -(c-2)$
 $3+2 > c$ and $3 > -c+2$
 $5 > c$ and $1 > -c$
 $c < 5$ and $c > -1$

115. $7 - |5m+3| > 7$
 $-|5m+3| > 0$
 $|5m+3| < 0$
 $5m+3 < 0$
 $5m < -3$
 $m < -\frac{3}{5}$

There is no solution since absolute value cannot be less than zero.
 $|5m+3| < 0$

117. $7 > |2x+5| + 2$
 $7-2 > |2x+5|$
 $5 > |2x+5|$ and $5 > -(2x+5)$
 $2x+5 < 5$ and $5 > -2x-5$
 $2x < 0$ and $2x > -10$
 $x < 0$ and $x > -5$

119. $2|5a+3| + 1 < 7$
 $2|5a+3| < 6$
 $|5a+3| < 3$
 $5a+3 < 3$ and $-(5a+3) < 3$
 $5a < 0$ and $-5a-3 < 3$
 $a < 0$ and $-5a < 6$
 $a > -\frac{6}{5}$ or $-1\frac{1}{5}$

121. $|3p+5| < -2$
 There is no solution since absolute value cannot be less than zero.

123. $5 - 2|3d+1| \leq 1$
 $-2|3d+1| \leq 1-5$
 $-2|3d+1| \leq -4$
 $|3d+1| \geq 2$
 $3d+1 \geq 2$ and $-(3d+1) \geq 2$
 $3d \geq 1$ and $-3d-1 \geq 2$
 $d \geq \frac{1}{3}$ and $-3d \geq 3$
 $d \geq \frac{1}{3}$ and $d \leq -1$

125. $4 + |5k-3| > 1$
 $|5k-3| > 1-4$
 $|5k-3| > -3$
 There is no solution since absolute value cannot be less than zero.

127. $2 - 3|y-6| < 4$
 $-3|y-6| < 4-2$
 $-3|y-6| < 2$
 $|y-6| > -\frac{2}{3}$
 No solution since absolute value cannot be less than zero.

129. $5 \leq 3 - |2p|$
 $5-3 \leq -|2p|$
 $2 \leq -|2p|$
 $-2 \geq |2p|$
 No solution since absolute value is less than zero.

131. $5 - |4-7q| < 2$
 $-|4-7q| < 2-5$
 $-|4-7q| < -3$
 $|4-7q| > 3$

$$4 - 7q > 3 \quad | -4 \quad | : (-7) \quad | +1 \quad | : (-1) \quad |$$

$$-7q > -1 \quad | : (-7) \quad |$$

$$q < \frac{1}{7}$$

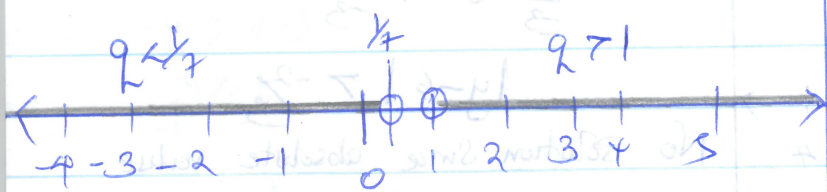
$$-(4 - 7q) > 3$$

$$-4 + 7q > 3$$

$$7q > 3 + 4 \quad | +4 \quad | : 7 \quad |$$

$$q > \frac{7}{7}$$

$$q > 1$$



$$|9q - 8| \geq 2$$

$$|9q - 8| \geq 2$$

$$|9q - 8| \geq 2$$

$$|9q - 8| \geq 2$$

$$|9q - 8| \geq 2$$

$$|x+1| + |x+2| \geq 1$$

$$|x+1| + |x+2| \geq 1$$

$$|x+1| + |x+2| \geq 1$$

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