Inequalities

Answer Key

1 Express each of the following statements as an inequality.

a) The maximum value of y is 25. — $y \leq 25$

b) The value of x is not smaller than that of y. — $x \geq y$

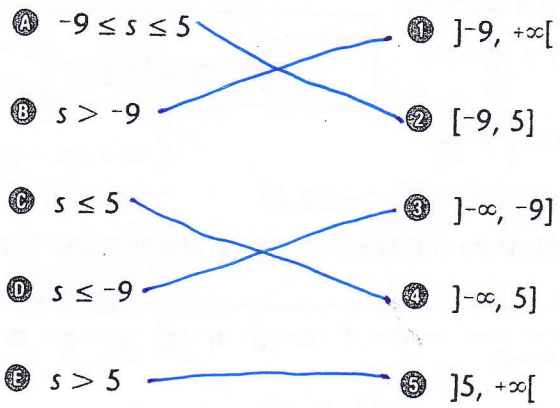
c) Nicolas' age a is greater than 4 years old. — $a > 4$

d) The sum of a and 2 is less than or equal to 13. — $a + 2 \leq 13$

e) Two times d minus 5 is greater than e. — $2d - 5 > e$

f) The maximum speed s allowed on a highway is 100 km/h. — $s \leq 100$

2 Match each expression in the left column with its corresponding interval in the right column.



3 Given that $x \in \mathbb{R}$, illustrate the solution set of each inequality below on a number line.

a) $x > 3$

Answer: $[3, \infty[$

b) $x \leq 5$

Answer: $]-\infty, 5]$

c) $x < \frac{-8}{5}$

$\hookrightarrow = -1.6$

Answer: $]-\infty, -1.6[$

d) $\frac{x}{2} > -4$

multiply by 2

$x > -8$

Answer: $]8, \infty[$

e) $-2x + 6 \leq 26$

$-6 \quad -6$

$\frac{-2x}{-2} \leq \frac{20}{-2}$

$x \geq -10$

Answer: $[-10, \infty[$

f) $-9 < x \leq 2$

between -9 and 2

Answer:

4 Solve the following inequalities. Express your answer as an interval.

a) $3x - 4 > 14$

$+4 \quad +4$

$\frac{3x}{3} > \frac{18}{3}$ $\quad x > 6$

Answer: $]6, \infty[$

b) $2x + 6 \leq 8$

$-6 \quad -6$

$\frac{2x}{2} \leq \frac{2}{2}$ $\quad x \leq 1$

Answer: $]-\infty, 1]$

c) $-4 - 2x \geq 4$

$+4 \quad +4$

$\frac{-2x}{-2} \geq \frac{8}{-2}$ $\quad x \leq -4$

Answer: $]-\infty, -4]$

d) $3x + 5 < 2x - 7$

$-2x \quad -2x$

$1x + 5 < -7$

$-5 \quad -5$

$\frac{1x}{1} < \frac{-12}{1}$

$x < -12$

Answer: $]-\infty, -12[$

e) $5x + 9 > 2x - 3$

$-2x \quad -2x$

$3x + 9 > -3$

$-9 \quad -9$

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

$x > -4$

Answer: $]-4, \infty[$

f) $3x - 5 \geq 3(x - 2) + 2$

$3x - 5 \geq 3x - 6 + 2$

$-3x + 5 \quad -3x + 5$

$0x \geq 1$ NO SOLUTION!

Answer: $\varnothing$

g) $\frac{2(x + 1)}{3} \geq \frac{6x - 9}{2}$

$4(x+1) \geq 3(6x-9)$

$4x + 4 \geq 18x - 27$

$-18x \quad -18x$

$-14x + 4 \geq -27$

$-4 \quad -4$

$\frac{-14x}{-14} \geq \frac{-31}{-14}$ $\quad x \leq 2.21$

Answer: $]-\infty, 2.21]$

h) $4(x + 5) \leq -2(x - 5) + 7$

$4x + 20 \leq -2x + 10 + 7$

$+2x \quad +2x$

$6x + 20 \leq 27$

$-20 \quad -20$

$6x \leq 7$

$x \leq 1.17$

Answer: $]-\infty, 1.17]$

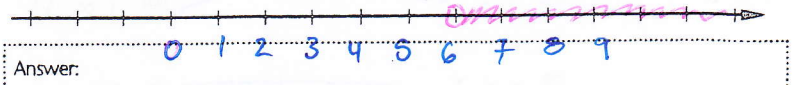
5 Solve each inequality below and illustrate the solution set on the number line.

a) $3x - 7 > 11$

$+7 \quad +7$

$\frac{3x}{3} > \frac{18}{3}$ $\quad x > 6$

Answer:



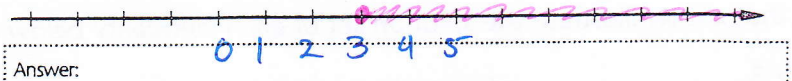
b) $3(2x - 3) \geq 9$

$6x - 9 \geq 9$

$+9 \quad +9$

$\frac{6x}{6} \geq \frac{18}{6}$ $\quad x \geq 3$

Answer:



c) $6(3x + 7) < 4(5 - x) + 6$

$18x + 42 < 20 - 4x + 6$

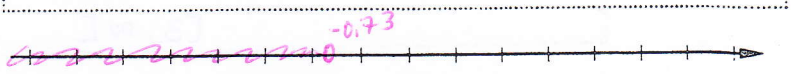
$+4x \quad +4x$

$22x + 42 < 26$

$-42 \quad -42$

$\frac{22x}{22} < \frac{-16}{22}$ $\quad x < -0.73$

Answer:



d) $2(x + 3) \leq \frac{4x}{5}$

$2x + 6 \leq 0.8x - 6$

-6

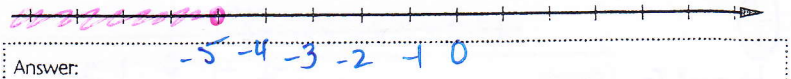
$2x \leq 0.8x - 6$

$-0.8x \quad -0.8x$

$1.2x \leq -6$

$x \leq -5$

Answer:



e) $\frac{4(x - 1)}{8} \leq \frac{3(x + 2)}{2}$

$8(x-1) < 24(x+2)$

$8x - 8 < 24x + 48$

$-24x \quad -24x$

$-16x - 8 < 48$

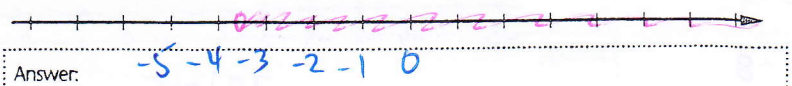
$+8 \quad +8$

$-16x < 56$

$-16 \quad -16$

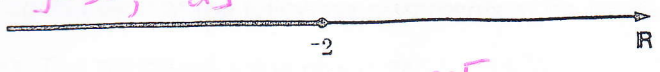
$x > -3.5$

Answer:



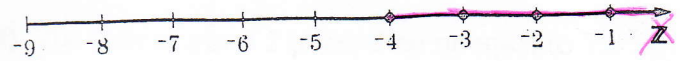
6 Use an inequality to represent each of the following solution sets.

a) $]-\infty, -2]$



b) $]7, \infty[$

c) $[-4, \infty[$



Bonus

7 Solve the following inequalities. Express the solution sets using interval notation, knowing that x represents a real number.

a) $2x + 9 + 0.5(2 + 4x) \leq 3x - 5$

b) $0.2x - 0.3(x - 5) > 4x + 1.5$

c) $4 - 2x - (x + 7) > 5(7 - 2x)$

d) $3 - 2(x + 1) \geq 2(9x + 4) - 4x + 2$

a) $2x + 9 + 1 + 2x \leq 3x - 5$

$4x + 10 \leq 3x - 5$

$1x \leq -15$ $\quad]-\infty, -15]$

b) $0.2x - 0.3x + 1.5 > 4x + 1.5$

$-0.1x + 1.5 > 4x + 1.5$

$-4.1x > 0$

$x < 0$ $\quad]-\infty, 0[$

c) $4 - 2x - x - 7 > 35 - 10x$

$-3x - 3 > 35 - 10x$

$7x > 38$

$x > -5.43$ $\quad]-5.43, \infty[$

d) $3 - 2x - 2 \geq 18x + 8 - 4x + 2$

$-2x + 1 \geq 14x + 16$

$\frac{-16x}{-16} \geq \frac{9}{-16}$ $\quad x \leq -0.5625$ $\quad]-\infty, -0.5625]$