

Solve the inequalities. Write your solution in interval notation.

1. (5pts) $2 \leq 5 - 3x < 11$ $|-5$

$$-3 \leq -3x < 6 \quad | \div -3$$

$$1 \geq x > -2 \quad \begin{array}{c} \text{---} \\ -2 \quad 1 \end{array}$$

$$(-2, 1]$$

2. (7pts) $2x + 7 < 5$ or $5x - 2 > 13$

$$2x < -2 \quad 5x > 15$$

$$x < -1 \quad \text{or} \quad x > 3$$

$$\begin{array}{c} \text{---} \\ -1 \quad 3 \end{array}$$

$$(-\infty, -1) \cup (3, \infty)$$

3. (6pts) Find the domain of the function in interval notation: $f(x) = \frac{\sqrt{9-2x}}{2x-6}$

Must have:

$$9 - 2x \geq 0$$

$$9 \geq 2x$$

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

Can't have:

$$2x - 6 = 0$$

$$2x = 6$$

$$x = 3$$

$$\begin{array}{c} \text{---} \\ 3 \quad \frac{9}{2} \end{array}$$

$$(-\infty, 3) \cup (3, \frac{9}{2})$$

4. (14pts) Two computer-maintenance freelancers charge for their services in this way: George charges \$150 for the first three hours and then \$40 per hour for hours after the first three; Yuri charges \$200 for the first five hours and then \$45 per hour for hours after the first five. Assuming at least five hours of work are needed, for which number of hours is it preferable to hire George? Solve as an inequality.

$x =$ number of hours worked ($x \geq 5$)

George's cost is $150 + 40(x-3)$

Yuri's cost is $200 + 45(x-5)$

George is preferable if

$$150 + 40(x-3) \leq 200 + 45(x-5)$$

$$150 + 40x - 120 \leq 200 + 45x - 225$$

$$40x + 30 \leq -25 + 45x \quad | -45x + 25$$

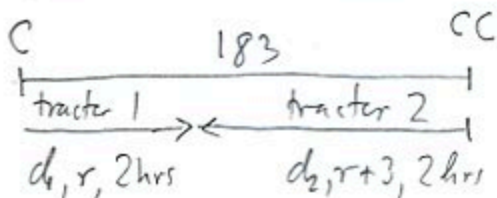
$$55 \leq 5x \quad | \div 5$$

$$11 \leq x$$

George costs less for jobs over 11 hours.

5. (14pts) A 183-mile-long road joins cities Charlestown and Crown City. At the same time, one tractor leaves Charlestown and drives toward Crown City, and another tractor, driving 3mph faster than the first tractor, leaves Crown City and drives toward Charlestown. After 2 hours they meet on the road.

- a) What are the speeds of the tractors?
 b) How far from Charlestown did they meet?



$$d_1 = r \cdot 2$$

$$d_2 = (r+3) \cdot 2$$

$$d_1 + d_2 = 183$$

$$2r + 2(r+3) = 183$$

$$2r + 2r + 6 = 183$$

$$4r + 6 = 183$$

$$4r = 177$$

$$r = 44.25$$

a) speed of tractor from Charlestown:

$$44.25 \text{ mph}$$

speed of tractor from Crown City

$$47.25$$

b) distance from Charlestown:

$$d_1 = 44.25 \cdot 2 = 88.5 \text{ miles}$$

6. (14pts) How many liters of a 7% solution of sulphuric acid must be mixed with 3 liters of an 12% solution of sulphuric acid in order to get a 9% solution of sulphuric acid?

$$\left[\begin{array}{c} x \\ 7\% \end{array} \right] + \left[\begin{array}{c} 3 \\ 12\% \end{array} \right] = \left[\begin{array}{c} x+3 \\ 9\% \end{array} \right]$$

$x = \text{amount of } 7\% \text{ solution in liters}$

$$0.07x + 0.12 \cdot 3 = 0.09(x+3)$$

← amount of pure sulphuric acid in each container

$$0.07x + 0.36 = 0.09x + 0.27$$

$$0.09 = 0.02x$$

$$x = \frac{0.09}{0.02} = \frac{9}{2} = 4.5 \text{ liters}$$