

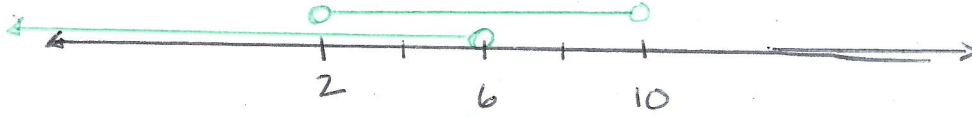
Math 113
Group Quiz 1 Solutions

① a) $(-\infty, 4) \cup (4, \infty)$

(3 points)



b) $(-\infty, 6) \cap (2, 10)$



Intersection

(2 points)



First consider each set individually.

Then find the intersection.

Note the set is open (exclusive) at 2 and 6 because $2 \notin (2, 10)$ and $6 \notin (-\infty, 6)$

② (a) $4 - 3x \leq -(1 + 8x)$

(5 pt) (i) solve for x:

$$\begin{aligned} 4 - 3x &\leq -1 - 8x \\ +3x &\quad +3x \\ 4 &\leq -1 - 5x \\ +1 &\quad +1 \end{aligned}$$

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

$$-1 \geq x$$

$$x \leq -1$$

distribute the -1

add 3x to BOTH sides

add one " " "

divide by -5 on BOTH sides

switch direction of inequality

(1.5 each)

ii) interval notation: $(-\infty, -1]$
set-builder notation: $\{x \mid x \leq -1\}$

(2 pt)



①

② (b) $|x-5| \leq 3$

(5pt) i) \hookrightarrow verbally this means the distance from $(x-5)$ to zero is less than or equal to 3.

Thus we get two cases.

$$\begin{array}{ccc} \textcircled{I} & & \textcircled{II} \\ x-5 \leq 3 & & x-5 \geq -3 \\ \quad \quad \quad \begin{array}{cc} +5 & +5 \end{array} & & \quad \quad \quad \begin{array}{cc} +5 & +5 \end{array} \\ x \leq 8 & \text{AND} & x \geq 2 \end{array}$$

$\underbrace{\hspace{15em}}$
 $2 \leq x \leq 8$

(1.5 each) ii) interval notation: $[2, 8]$
set-builder: $\{x \mid 2 \leq x \leq 8\}$



Note: Sometimes it helps to check one value in the interval to see if it satisfies the inequality

ex: let $x=3$
 $|3-5| = |-2| = 2 \leq 3 \checkmark$

(c) $|x+1| \geq 1$

i) verbally: the distance from $(x+1)$ to zero is at least 1.

2 cases:

$$\begin{array}{ccc} \textcircled{I} & & \textcircled{II} \\ x+1 \geq 1 & & x+1 \leq -1 \\ \quad \quad \quad \begin{array}{cc} -1 & -1 \end{array} & & \quad \quad \quad \begin{array}{cc} -1 & -1 \end{array} \\ x \geq 0 & \text{OR} & x \leq -2 \end{array}$$

$\underbrace{\hspace{15em}}$
 $x \leq -2 \text{ or } x \geq 0$

(1.5 each) ii) Interval notation: $(-\infty, -2] \cup [0, \infty)$
set-builder notation: $\{x \mid x \leq -2 \text{ or } x \geq 0\}$



check: let $x=1$
 $|1+1| = |2| = 2 \geq 1$

let $x=-3$
 $|-3+1| = |-2| = 2 \geq 1$
 \checkmark

$$(3) \quad C = \frac{5}{9}(F-32)$$

a) If $0 < C < 40$, then $\frac{9}{5} \cdot 0 < \frac{9}{5} \cdot \frac{5}{9}(F-32) < 40 \cdot \frac{9}{5}$ mult. on all portions by $\frac{9}{5}$

(12 pt)

now isolate F to find the corresponding range in Fahrenheit.

$$0 < F-32 < 72$$

+32 +32 +32

$$\boxed{32 < F < 104}$$

b) before starting part (b) let's find F in terms of C.

(18 pt)

$$\frac{9}{5} \cdot C = \frac{5}{9}(F-32) \cdot \frac{9}{5}$$

$$\frac{9}{5}C = F-32$$

+32 +32

$$\boxed{F = \frac{9}{5}C + 32}$$

(6 pt)

$$40 \leq F \leq 100$$

$$40 \leq \frac{9}{5}C + 32 \leq 100$$

-32 -32 -32

$$\frac{5}{9} \cdot 8 \leq \frac{5}{9} \cdot \frac{9}{5}C \leq 68 \cdot \frac{5}{9}$$

$$\frac{40}{9} \leq C \leq \frac{340}{9}$$

$$\boxed{4.44 \leq C \leq 37.78}$$

(12 pt)

④

x (\$)	y (seats)
\$200	120 seats
\$203	119 seats
\$206	118 seats
⋮	⋮

[2]

a) use the points from the table to find the equation of the line

(10 points) $(200, 120)$
 $(203, 119)$ $\left. \begin{array}{l} \\ \end{array} \right\} m = \frac{120 - 119}{200 - 203} = \frac{1}{-3} = -\frac{1}{3}$ [2]

point slope form: $y - 120 = -\frac{1}{3}(x - 200)$ [2]

$$y - y_1 = m(x - x_1)$$

$$y - 120 = -\frac{1}{3}x + \frac{200}{3} + 120$$

units for x: \$
 units for y: seats

[1]

$$y = -\frac{1}{3}x + 66.67 + 120$$

$$y = -\frac{1}{3}x + 186.67$$

$$y = -\frac{1}{3}x + 186\frac{2}{3}$$
 [3]

b) (10 pt)

Given $90 \leq y \leq 115$ [1]

$$90 \leq -\frac{1}{3}x + 186\frac{2}{3} \leq 115$$
 [3]

$$y = -\frac{1}{3}x + \frac{560}{3} = -\frac{1}{3}(x - 560)$$

I prefer this notation for this problem

$$(-3) 90 \leq (-3) \left(-\frac{1}{3}(x - 560) \right) \leq (-3) 115$$

$$\begin{array}{ccc} -270 \geq & x - 560 & \geq -345 \\ +560 & +560 & +560 \end{array}$$

note the error

$$290 \leftarrow \cancel{830} \quad 2x \geq 215$$

$$215 \leq x \leq \cancel{830} \leftarrow 290 \quad \longrightarrow \quad \{x \mid 215 \leq x \leq 290\}$$
 [7]