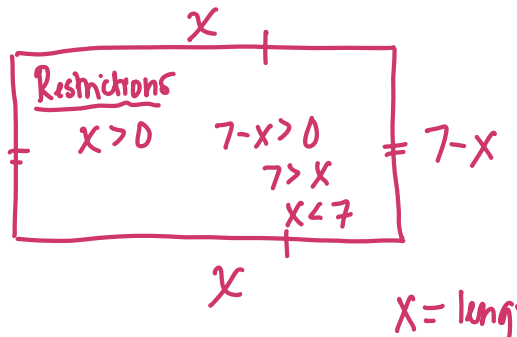
Name:_____ Date:_____

PCH Intro to Modeling with Functions Ms. Loughran

1. My dachshund, Daisie, needs a place to play. I purchased 14 feet of fencing to use to make her an enclosed rectangular play area. Express the area as a function of a single variable.



$A = lw$

$A(x) = x(7 - x)$

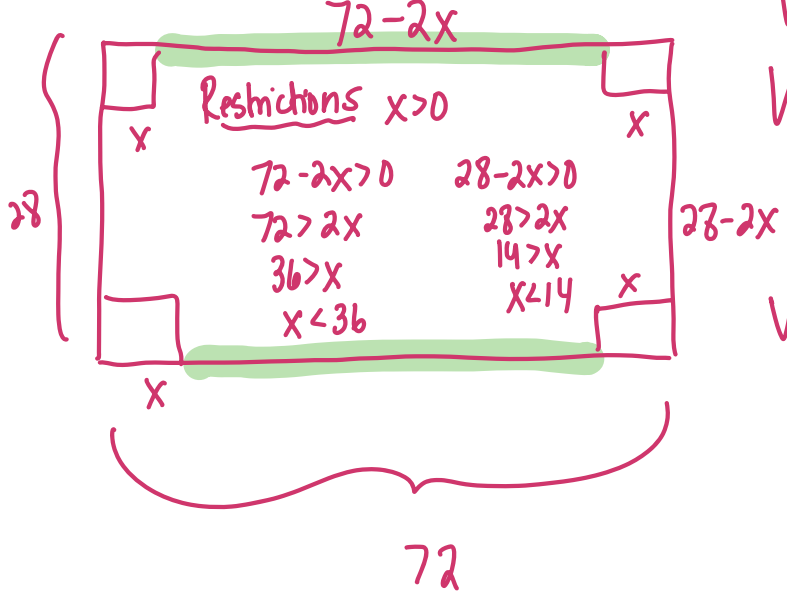
$A(x) = 7x - x^2$, $0 < x < 7$

x = length

$7 - x$ = width

$\frac{14 - 2x}{2} = 7 - x$

2. Now that Daisie has a place to play, she needs to have a place to keep her toys. I want to make an open-top box so that she can reach in and get the toys out herself. I want to use a 72-by-28 inch sheet of tin to make this box. I will cut congruent squares of side length x from the corners of the sheet of tin and bend up the sides to form this box. Express the volume of this box as a function of x.



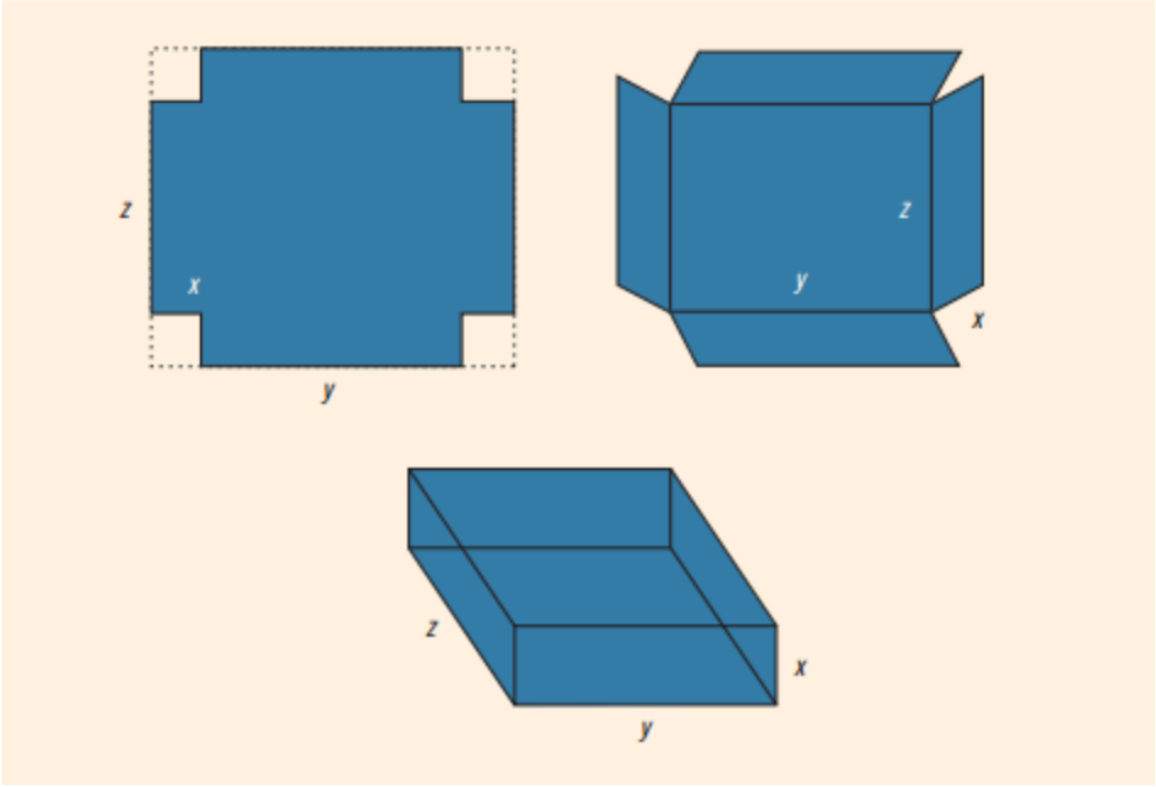
$V = lwh$

$V = l \cdot w \cdot x$

$V(x) = (72 - 2x)(28 - 2x)x$

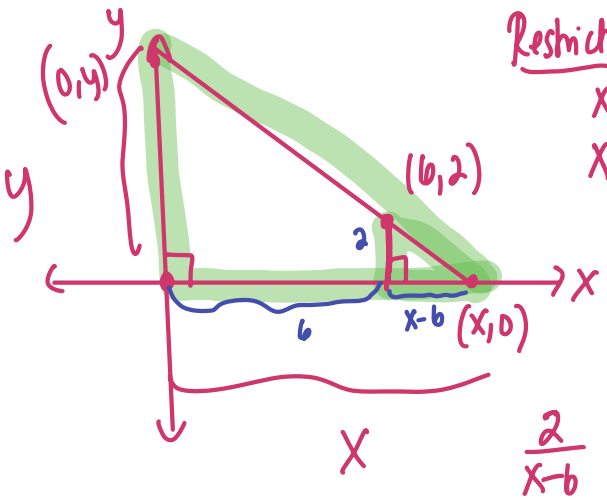
$0 < x < 14$

Visual for creating an open top box from a flat piece of tin (paper, cardboard, etc…) by cutting congruent squares of side *x* from each corner.



* Similar Δs

3. The vertices of a right triangle are $(0,0)$, $(x,0)$, and $(0,y)$. If $(6,2)$ lies on the hypotenuse of the triangle, express the area of the triangle as a function of x.



Restrictions
$x > 0$
$x - 6 > 0$
$x > 6$

$A = \frac{1}{2}bh$ → needs in terms of x
$A = \frac{1}{2}(x)(y)$
$A(x) = \frac{1}{2}(x)\left(\frac{2x}{x-6}\right)$
$A(x) = \frac{x^2}{x-6}$, $x > 6$

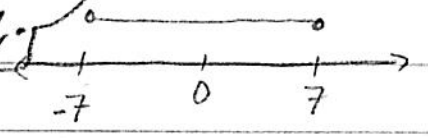
$\frac{2}{x-6} = \frac{y}{x}$
$2x = y(x-6)$
$\frac{2x}{x-6} = y$

4. A right triangle has one vertex on the graph of $y = 7 - x^2$, where $x > 0$ at (x,y), another at the origin, and the third on the positive x-axis at $(x,0)$. Express the area of the triangle as function of x.

(Key to Practice Section of Geometric Approach to Absolute Value Equations and Ineq.)

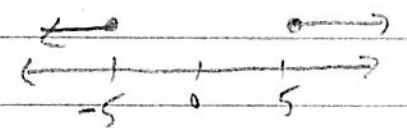
Homework 11-1

① $|x| \leq 7$ x's distance from 0 is ≤ 7



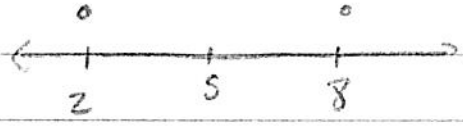
$[-7, 7]$

② $|t| \geq 5$ t's distance from 0 is ≥ 5



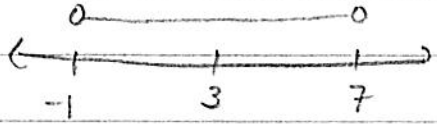
$(-\infty, -5] \cup [5, \infty)$

③ $|y-5| = 3$ y's distance from 5 is 3



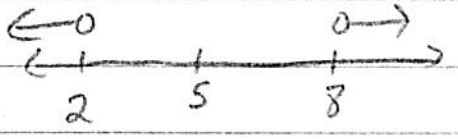
$\{2, 8\}$

④ $|t-3| < 4$ t's distance from 3 is < 4



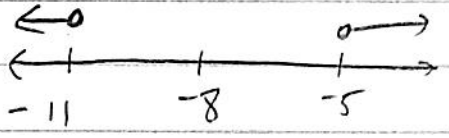
$(-1, 7)$

⑤ $|5-y| > 3$
$|y-5| > 3$
y's distance from 5 is > 3



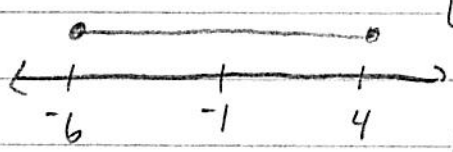
$(-\infty, 2) \cup (8, \infty)$

⑥ $|x+8| \geq 3$ x's distance from -8 is ≥ 3



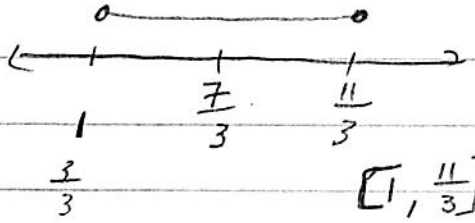
$(-\infty, -11] \cup [-5, \infty)$

⑦ $|x+1| \leq 5$ x's distance from -1 is ≤ 5



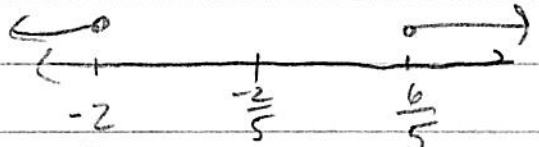
$[-6, 4]$

⑧ $|3x-7| \leq 4$
$3\left|x - \frac{7}{3}\right| \leq 4$
$\left|x - \frac{7}{3}\right| \leq \frac{4}{3}$
x's distance from $\frac{7}{3}$ is $\leq \frac{4}{3}$



$\left[1, \frac{11}{3}\right]$

⑨ $|5y+2| \geq 8$
$5\left|y + \frac{2}{5}\right| \geq 8$
$\left|y + \frac{2}{5}\right| \geq \frac{8}{5}$
y's dist. from $-\frac{2}{5}$ is $\geq \frac{8}{5}$



$(-\infty, -2] \cup \left[\frac{6}{5}, \infty\right)$

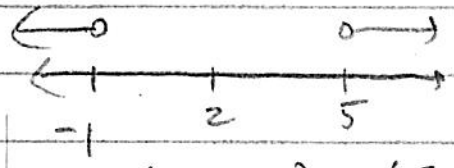
(10) $|4-2t|>6$

$|2t-4|>6$

$2|t-2|>6$

$|t-2|>3$

t's distance from 2 > 3



$(-\infty,-1)\cup(5,\infty)$

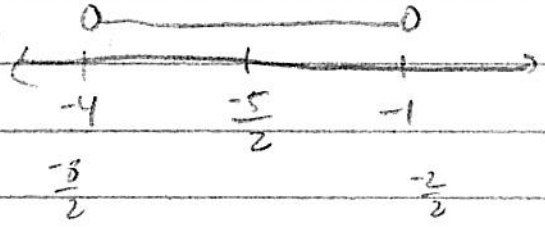
(11) $|4s+10|<6$

$4|s+\frac{10}{4}|<6$

$|s+\frac{10}{4}|<\frac{6}{4}$

$|s+\frac{5}{2}|<\frac{3}{2}$

s's dist. from $-\frac{5}{2}<\frac{3}{2}$



$(-4,-1)$

(12) $|7m+11|=3$

$7|m+\frac{11}{7}|=3$

$|m+\frac{11}{7}|=\frac{3}{7}$

m's dist. from $-\frac{11}{7}=\frac{3}{7}$

$\{-2,-\frac{8}{7}\}$

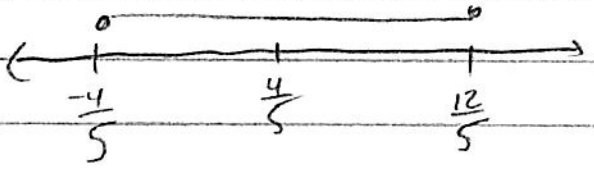
(13) $|4-5n|\leq 8$

$|5n-4|\leq 8$

$5|n-\frac{4}{5}|\leq 8$

$|n-\frac{4}{5}|\leq\frac{8}{5}$

n's dist. from $\frac{4}{5}\leq\frac{8}{5}$



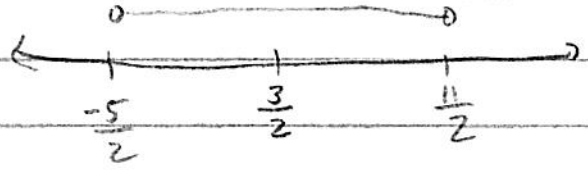
$[-\frac{4}{5},\frac{12}{5}]$

(14) $|\frac{1}{2}x-\frac{3}{4}|<2$

$\frac{1}{2}|x-\frac{3}{2}|<2$

$|x-\frac{3}{2}|<4$

x's dist. from $\frac{3}{2}<4$



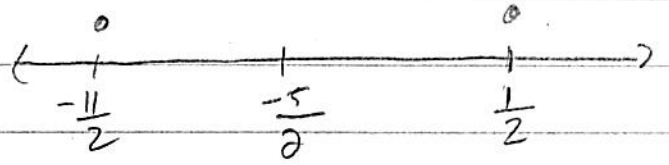
$(-\frac{5}{2},\frac{11}{2})$

$\frac{6}{2}$ $\frac{5}{6}$, 3

(15) $\left|\frac{1}{3}y + \frac{5}{6}\right| = 1$ y's distance from $-5/2 = 3$ ($\frac{6}{2}$)

$\frac{1}{3}\left|y + \frac{5}{2}\right| = 1$

$\left|y + \frac{5}{2}\right| = 3$



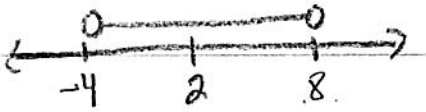
$\left\{\frac{-11}{2}, \frac{1}{2}\right\}$

(16) $\left|\frac{x-2}{3}\right| < 2$

$\frac{1}{3}|x-2| < 2$

$|x-2| < 6$

x's distance from $2 < 6$



$(-4, 8)$

(17) $8 - |2x-1| \geq 6$

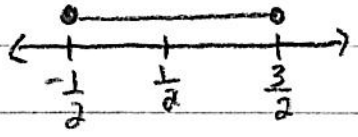
$-|2x-1| \geq -2$

$|2x-1| \leq 2$

$2\left|x - \frac{1}{2}\right| \leq 2$

$\left|x - \frac{1}{2}\right| \leq 1$

x's distance from $\frac{1}{2} \leq 1$



$\left[-\frac{1}{2}, \frac{3}{2}\right]$

(18) $7|x+2| + 5 > 4$

$7|x+2| > -1$

$|x+2| > -\frac{1}{7}$

$|x+2|$ is always positive or zero

$(-\infty, \infty)$