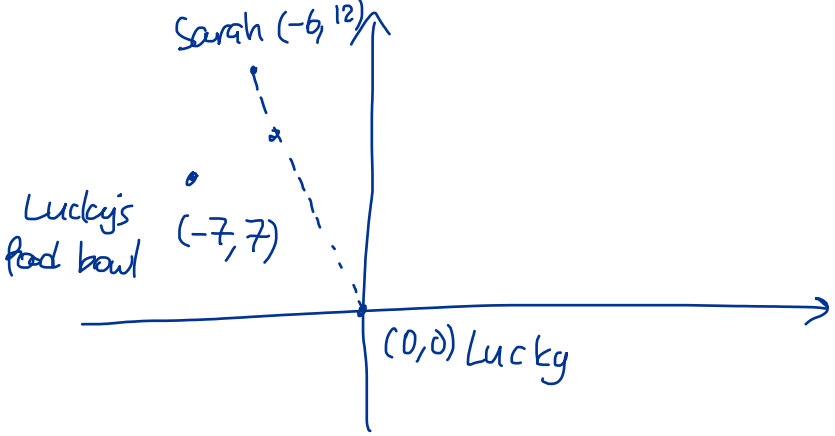
Quiz 2

Name: _____

Sarah is 12 feet north and 6 feet west of Lucky, and Lucky's food bowl is 1 foot west and 5 feet south of Sarah.

(i) Draw a picture of the situation, imposing a coordinate system so that Lucky is at the origin. Clearly mark the coordinatees of **Lucky**, **Lucky's food bowl** and **Sarah**.



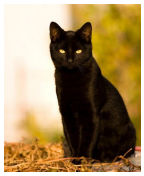


Figure 1: Lucky

(ii) Lucky walks straight towards Sarah with constant speed. He reaches the point on his path which is closest to his food bowl after 2 seconds.

(a) Find the coordinates of this point.

Line between Lucky and Sarah:

$y = \frac{0-12}{0-(-6)}(x-0) \Rightarrow y = -2x$

Line perp. to path through food bowl:

slope: $\frac{1}{2}$

$y = \frac{1}{2}(x-(-7))+7 \Rightarrow y = \frac{1}{2}x + 7 + \frac{7}{2} \Rightarrow y = \frac{1}{2}x + \frac{21}{2}$

Intersect: $-2x = \frac{1}{2}x + \frac{21}{2}$

$\Rightarrow -4x = x + 21$

$\Rightarrow 5x = -21$

$\Rightarrow x = -\frac{21}{5}$

$y = 2 \cdot \frac{21}{5}$

So $\left(-\frac{21}{5}, \frac{42}{5}\right)$

(b) Find Lucky's equations of motion.

$x = a + bt$

$y = c + dt$

At $t=0$ he's at $(0,0)$ so $a = c = 0$

At $t=2$ he's at $\left(-\frac{21}{5}, \frac{42}{5}\right)$

$-\frac{21}{5} = 2b \Rightarrow b = -2.1$

$\frac{42}{5} = 2d \Rightarrow d = 4.2$

So $\boxed{x = -2.1t, \quad y = 4.2t}$