Problem 1

(a). $0.72-0.4=0.32$

$1-0=1$

$\therefore Pr=\frac{0.32}{1}=0.32$

(b). Since $x=0.4$ is a point, $Pr(0.4)=0$

$0.72-0.4=0.32$

$1-0=1$

$\therefore Pr=\frac{0.32+0}{1}=0.32$

(c). $x=0.1$, 0.2, 0.5, and 0.7 are all points,

so $Pr(0.1)=Pr(0.2)=Pr(0.5)=Pr(0.7)=0$

$\therefore Pr=0+0+0+0=0$

(d). $x=0.1, 0.11, 0.111, 0.1111, \ldots$ are all points,

so $Pr=(0.1)=Pr(0.11)=Pr(0.111)=Pr(0.1111)=\ldots=0$

$\therefore Pr=0+0+0+0+\ldots=0$

(e). rational number between 0 and 1 is 0, 1

$x=0,1$ are two points

so $Pr(0)=Pr(1)=0$

$\therefore Pr=0+0=0$

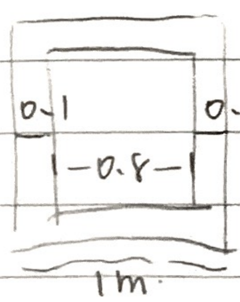
Problem 2

(a). $A(\text{bulleyes})=\pi r^2=\pi(0.1)^2=0.01\pi m^2$

$A(\text{square target})=1^2=1m^2$

$\therefore Pr=\frac{0.01\pi}{1}=0.01\pi\approx 0.0314$

(b).

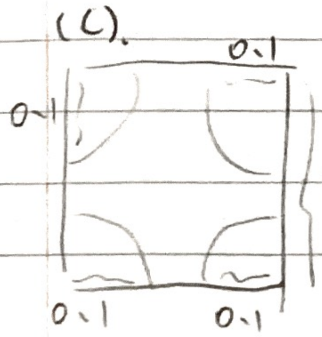


$A(\text{inner square})=(1-2(0.1))^2=(1-0.2)^2=0.8^2=0.64m^2$

$A(\text{square target})=1^2=1m^2$

$Pr=\frac{0.64}{1}=0.64$

(c).



$A(4\text{ quarter circles})=4(\frac{1}{4})\pi r^2=\pi r^2=\pi(0.1)^2=0.01\pi m^2$

$A(\text{square target}=1^2=1m^2$

$Pr=\frac{0.01\pi}{1}=0.01\pi\approx 0.0314$

(d). since exact center of the square is a point, $Pr = 0$

Problem 3.

(a). $|x - \frac{1}{2}| \le \frac{1}{4}$

$-\frac{1}{4} \le x - \frac{1}{2} \le \frac{1}{4}$

$\frac{1}{4} \le x \le \frac{3}{4}$

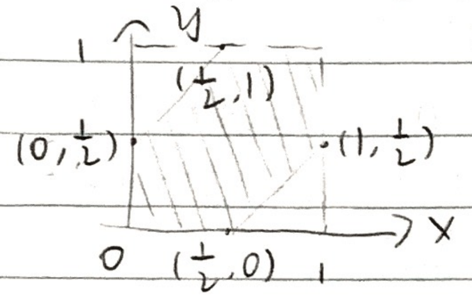
$\therefore Pr = \frac{\frac{3}{4} - \frac{1}{4}}{1-0} = \frac{2}{4} = \frac{1}{2}$

(b). $\because |x-y| < \frac{1}{2}$ and $|x-y| = \frac{1}{2}$ is two points.

$\therefore Pr(|x-y| < \frac{1}{2}) = Pr(|x-y| \le \frac{1}{2})$

Four corners for $Pr(|x-y| \le \frac{1}{2})$ are:

$(x,y) = (0,\frac{1}{2}), (\frac{1}{2},0), (1,\frac{1}{2}), (\frac{1}{2},1)$



$Pr(|x-y| < \frac{1}{2})$

$= 1^2 - \underbrace{2(\frac{1}{2})(\frac{1}{2})(\frac{1}{2})}_{A \text{ of } 2\Delta}$

$= 1 - \frac{1}{4} = \frac{3}{4}$

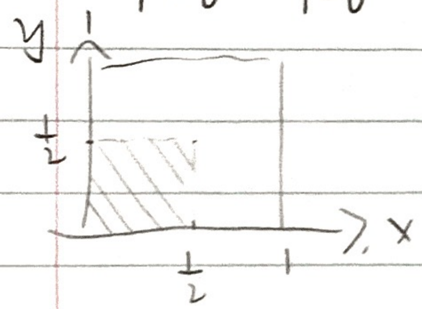
(c). $\max\{x,y\} < \frac{1}{2}$

$\therefore x < \frac{1}{2} \quad y < \frac{1}{2}$

$Pr(\max\{x,y\} < \frac{1}{2})$

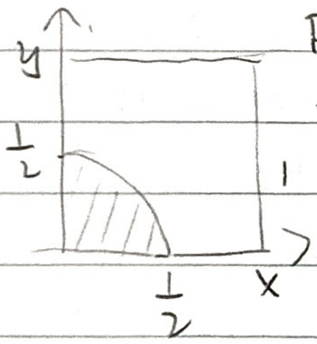
$= Pr(x < \frac{1}{2})\, Pr(y < \frac{1}{2})$

$= \frac{\frac{1}{2} - 0}{1-0}\left(\frac{\frac{1}{2}-0}{1-0}\right) = \frac{1}{2}(\frac{1}{2}) = \frac{1}{4}$



(d). edge of $A(x^2+y^2 < \frac{1}{4})$ is $x^2+y^2 = \frac{1}{4}$

$\frac{1}{4} = r^2 \quad \therefore r = \frac{1}{2}$



$Pr(x^2+y^2 < \frac{1}{4})$

$= \frac{\frac{1}{4}\pi r^2}{1^2} = \frac{\frac{1}{16}\pi}{1} = \frac{1}{16}\pi$

≈ 0.196

Problem 4

$Pr(\text{each student shows up}) = 0.85$

$Pr(\text{at least one shows up to redeem but the cookies run out})$

$= Pr(11 \text{ or more shows up})$

$= Pr(11) + Pr(12)$

$= \binom{12}{11}(0.85^{11})(1-0.85)^1 + \binom{12}{12}(0.85)^{12}(1-0.85)^0$

≈ 0.4435

Problem 5 $\quad Pr(x) = \binom{n}{x} p^x (1-p)^{n-x} \quad n=50. \quad p=0.7$

(a). $\binom{50}{40}(0.7)^{40}(0.3)^{10} \approx 0.0386$

(b). $\binom{50}{41}(0.7)^{41}(0.3)^{9} \approx 0.0219$

(c). $\binom{50}{42}(0.7)^{42}(0.3)^{8} \approx 0.0109$

(d). $P(x \geq 40) = \sum_{x=40}^{50} \binom{50}{n}(0.7)^n(0.3)^{50-n} \approx 0.0788$

$(n = 40, 41, 42, 43, 44, \ldots 50)$.