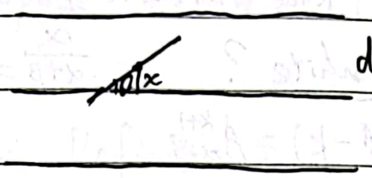
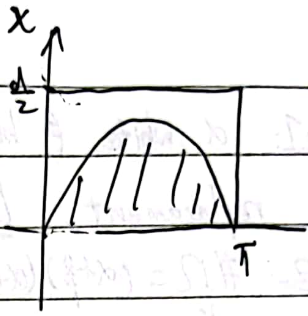
HW 1

Ex 1.3.8





Let A be the event that needle will cross a line.

So x will be range $[0, \frac{d}{2}]$, let θ be the angle between line and need

$\Omega = \{(x,\theta) \mid 0 \le x \le \frac{d}{2},\ 0 \le \theta \le \pi\}$

Since the needle intersects with line if and only if $x \le \frac{l\sin\theta}{2}$

$A = \{(x,\theta) \mid 0 \le x \le \frac{d}{2},\ 0 \le \theta \le \pi,\ x \le \frac{l\sin\theta}{2}\}$

$$P(A) = \frac{L(A)}{L(\Omega)} = \frac{\int_0^{\pi} \frac{l\sin\theta}{2}\,d\theta}{\frac{d}{2}\cdot\pi} = \frac{2l}{\pi d}$$

Ex:

1.5 (a) $\overline{E}\,\overline{F}\,\overline{G}$ (b) $EF\overline{G}$ (c) ~~E+F+G~~ $E\cup F\cup G$

(d) $EF \cup EG \cup FG$ (e) EFG (f) $\overline{E}\,\overline{F}\,\overline{G}$

(g) $\overline{E}\,\overline{F}\,\overline{G} \cup \overline{E}F\overline{G} \cup \overline{E}\,\overline{F}G$ (h) $E\cup F\cup G - EFG$

1.7 No, actually a coin is tossed ten times, it can be a hea both on 1st and 6th.

1.9 (a) $(\frac{1}{6})^2 \times 6 = \frac{1}{6}$ (b) $\frac{6+2}{36} = \frac{2}{9}$

(c) ~~$1-\frac{1}{6}=\frac{5}{6}$~~ $\frac{11+4+8}{6\times6} = \frac{23}{36}$ (d) $\frac{1+2+1}{36} = \frac{1}{9}$

(e) $\frac{(3+6)\times2}{6\times6} = \frac{1}{2}$ (f) $\frac{5\times2+3\times2+1\times2}{6\times6} = \frac{1}{2}$

(g) $\frac{1}{4}$ (h) ~~$6\times2+$~~ $\frac{(6+3+2+1+1+1)\times2}{36} = \frac{7}{9}$

(i) ~~$\frac{5+4+3+2+4+4+3+2+1}{36}$~~ $\frac{5+4+3+2+1}{6\times6} = \frac{5}{12}$ (j) ~~$\frac{6\times}{36}=\frac{1}{6}$~~ $\frac{2\times(6-r)}{6\times6} = \frac{6-r}{18}$

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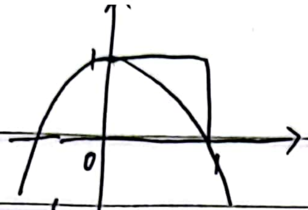

1.12

(a) $P(A) = \frac{\frac{1}{4}\pi}{1} = \frac{\pi}{4}$

(b) $P(A) = 0$

(c) $P(A) = \int_0^1 (1-x^2)dx = x - \frac{x^3}{3}\Big|_0^1 = 1 - \frac{1}{3} = \frac{2}{3}$

(d) $P(A) = 0$

1.16

No. Because the sample space Ω can be infinite.

Easily, we know that B is not impossible event.

Like, we want to take $\frac{1}{2}$ from $[0,1]$, this event may happen.

However, we take a number from $[0,\frac{1}{2})$, $(\frac{1}{2},1]$ both equals to $\frac{1}{2}$, that is to mean $P(\frac{1}{2}) = 0$

By considering the opposite side, A is also not inevitable case.

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