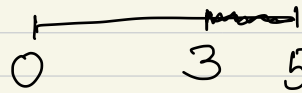
$,X,$

Ex: Waiting time for a bus $\sim U[0,5]$

① $P(X \geq 3) = \frac{2}{5}$



② Took the bus 20 times.

P(at least 3 times, you had to wait > 4 minutes)

$p(X>4) = 0.2$

$Y \sim Bin(20, 0.2)$

$P(Y \geq 3) = 1 - P(Y=0,1,2)$

$= 1 - 0.8^{20} - \binom{20}{1} 0.2\, 0.8^{19} - \binom{20}{2} 0.2^2\, 0.8^{18}$

$= \boxed{}$

③ P(the 6th time is the 1st time you didn't have to wait >1 min).

$= \left(\frac{4}{5}\right)^5 \frac{1}{5}$

④ P(10th time is the 3rd time that you didn't have to wait >1 min) $= \binom{9}{2} \left(\frac{4}{5}\right)^7 \left(\frac{1}{5}\right)^3$

$\underbrace{\_\ \_\ \_\ \_\ \_\ \_\ \_\ \_\ \_}_{9 \text{ times}}$ $\underset{10^{th}}{\_}$ ↙ S (3^{rd})

$\binom{9}{2} p^2 q^7$ 2 S's

7 F's

p

Ex: ~~clothes of yard wide~~

The flaws occur $\sim$ Poisson.

on average 2/yard.

① P(there are 9 or 10 on a 4 yard piece) $= e^{-8}\dfrac{8^{10}}{10!} + e^{-8}\dfrac{8^9}{9!}$

② acceptable if it has 1 or 0 flaw. (1 yard long)

$$P(\text{acceptable}) = e^{-2}\left(\frac{2^0}{0!} + \frac{2^1}{1!}\right)$$

$$= 3e^{-2} \approx 0.4$$

③ 30 1-yard pieces, 12 are acceptable. Randomly select 4 pieces, P(2 acceptable)

$$\frac{\binom{12}{2}\cdot\binom{18}{2}}{\binom{30}{4}}$$

(30 pieces, 12 are good)

④ You are inspecting these 1 yard pieces. What's the prob the 20th piece was the 5th accep. piece you find?

$$\binom{19}{4}\left(\frac{12}{30}\cdot\frac{11}{29}\cdot\frac{10}{28}\cdot\frac{9}{27}\cdot\frac{18}{26}\cdot\frac{17}{25}\cdots\frac{4}{12}\right)\cdot\frac{8}{11}$$

better

$$\boxed{\frac{\binom{12}{4}\binom{18}{15}}{\binom{30}{19}}\cdot\left[\frac{8}{11}\right]}$$

Ex

X	-3	4	6
$f(x)$	0.3	0.2	0.5

$$E(X) = \sum x f(x) = -3 * .3 + 4 * .2 + 6 * 0.5$$

$$= 2.9$$

$$Var(X) = E(X^2) - \mu^2$$

$$= (-3)^2 \cdot 0.3 + (4^2) \cdot 0.2 + (6^2) \cdot 0.5 - 2.9^2$$

$$= 2.7 + 3.2 + 18 - 2.9^2$$

$$= \sim -$$

$$E(\underbrace{20 - 4X}) = 20 - 4 * 2.9$$

$$= 8.4$$

$$E(a + bX) = a + bE(X)$$

$$\mathrm{Var}(a+bX) = b^2\,\mathrm{Var}(X)$$

$$\mathrm{Var}(20-4X) = (-4)^2\,\mathrm{Var}(X) = 16\cdot\mathrm{Var}X$$

$$f(x) = c\,(x-1)^2 \qquad 0 \le x \le 3$$

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

$$= \frac{c}{3}\big(8-(-1)\big) = 3c$$

$$\Rightarrow c = \frac{1}{3}$$

$0 \le x \le 3$: $F(x) = P(X \le x) = \int_0^x \frac{1}{3}(t-1)^2\,dt$

$$= \frac{1}{9}(t-1)^3\Big|_0^x = \frac{1}{9}(x-1)^3 + \frac{1}{9}$$

$$0 \le x \le 3$$

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{9}(x+1)^3 + \frac{1}{9} & 0 \le x \le 3 \\ 1 & x > 3. \end{cases}$$

$$E(X) = \int_0^3 x \cdot \frac{(x+1)^2}{3}\, dx$$

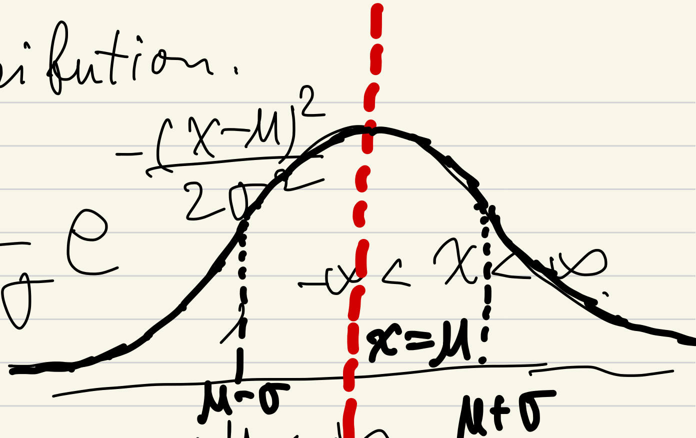
$$\boxed{\begin{array}{c} \text{9–10 pm} \\ \text{Tuesday} \end{array}}$$

Normal Distribution.

$N(\mu,\sigma^2)$

$$f(x)=\frac{1}{\sqrt{2\pi}\,\sigma}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

$-\infty<x<\infty$



$-\infty<\mu<\infty$

$\sigma>0$

$$E(X)=\mu$$

$$Var(X)=\sigma^2$$

example: $\mu=5$, $\sigma=2$

$$f(x)=\frac{1}{2\sqrt{2\pi}}e^{-\frac{(x-5)^2}{8}}$$

$-\infty<x<\infty$

$$P(X<8)=\int_{-\infty}^{8} \qquad dx$$

The Standard Normal Dist. $N(0,1)$

$$N(0,1) = Z.$$

$$f(z) = \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}}$$

$-\infty < z < \infty.$

Table:

$P(Z \le z)$ for $0 \le z \le 3.49$