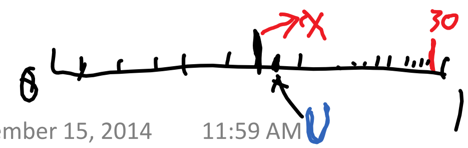

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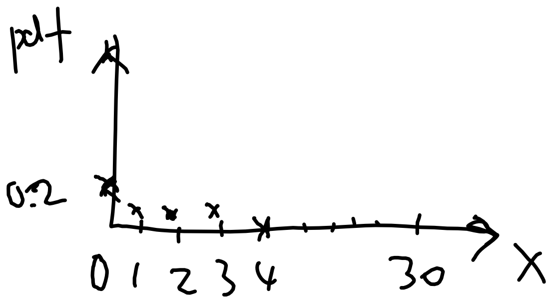
1. $U \to$ rand   one $U \to$ one sample

2. $U > p$?   30 $U \to$ How many of Us $> p$? $\to$ one sample

10 samples $\sim B(n=30, p=0.6)$ $[1, 5, 6, 6, 2, 0, 3, 0, 7, 10]$



$p(X=0) = \frac{2}{10}$ $p(X=1) = \frac{1}{10}$ $p(X=2) = \frac{1}{10}$

$p(X=3) = \frac{1}{10}$ $p(X=4) = 0$

$p(X=1)$: $p(X=2)$ . . . $p(x=k) < \frac{1}{10}$

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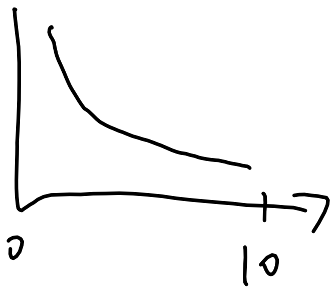

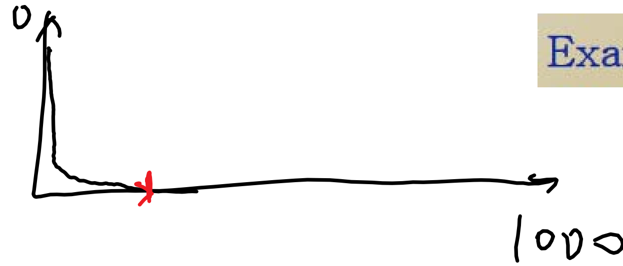

$$x = a + (b-a)y$$

$$g(x) = g(a + (b-a)y)$$

Example: permute (10, 20, 30, 40, 50)

$k=5$ ① $U \to [1,5]$ suppose $U=3$

$30 \Leftrightarrow 50$

[10, 20, 50, 40, 30]

$k=4$ ② $U \to [1,4]$ $U=4$ no change

[10, 20, 50, 40, 30]

$k=3$ ③ $U \to [1,3]$ $U=1$ $10 \Leftrightarrow 50$

[50, 20, 10, 40, 30]

$k=2$ ④ $U \to [1,2]$ $U=1$ $50 \Leftrightarrow 20$

[20, 50, 10, 40, 30]

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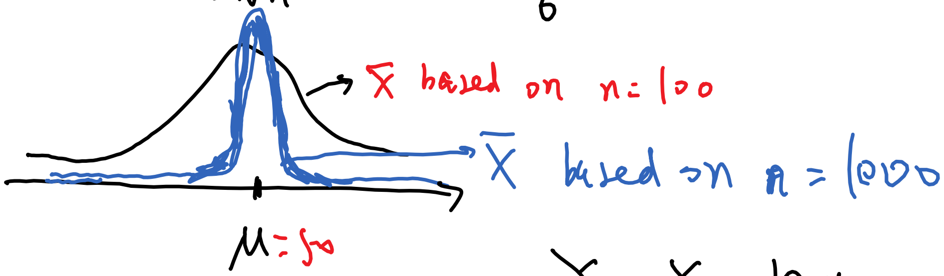
$$Y = \frac{X_1 + X_2 + \cdots + X_n - n\mu}{\sigma\sqrt{n}}$$

$$\bar{X} = \sum_{i=1}^{n} X_i/n$$

$$Y = \frac{n\bar{X} - n\mu}{\sigma\sqrt{n}} = \frac{\bar{X} - \mu}{\sigma}\sqrt{n}$$

$Y \sim N(0,1)$ $\qquad$ $\bar{X} \sim N\left(\mu, \frac{\sigma^2}{n}\right)$



$$P\left(\sum_{i=1}^{10} X_i > 7\right)$$

$\underbrace{\sum_{i=1}^{10} X_i}_{X}$

$E[X_i] = 0.5 \rightarrow \mu$

$Var[X_i] = \frac{1}{12} \rightarrow \sigma^2$

$$Y = \frac{X - 10\cdot\mu}{\sigma\sqrt{10}} \sim N(0,1)$$

$$P(X > 7) = P(\sigma\sqrt{10}\cdot Y + 10\mu > 7)$$

$$= P(Y > 2.2) = 1 - P(Y \leq 2.2)$$

$$= 0.014$$

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p(1,1)=0.5, p(1,2)=0.1, p(2,1)=0.1, p(2,2)=0.3

Q: Calculate the pmf of X given that Y=1

$$p(A|B) = \frac{p(AB)}{p(B)}$$

$p(X=1|Y=1)$? $p(X=2|Y=1)$? $p(X=1|Y=1) = \frac{p(X=1, Y=1)}{p(Y=1)}$

$p_{X|Y}(1|1)$

$p(Y=1) = p(X=1, Y=1) + p(X=2, Y=1)$ $= \frac{0.5}{0.6}$

$= 0.6$

$Y=X_1+X_2+\cdots+X_N$

$E[Y] = E_N[E_X[NX_i]] = E[N]\,E[X]$