Suppose $P(A) = 0.5$, $P(B) = 0.6$

and $P(B - A) = 0.4$

B, not A

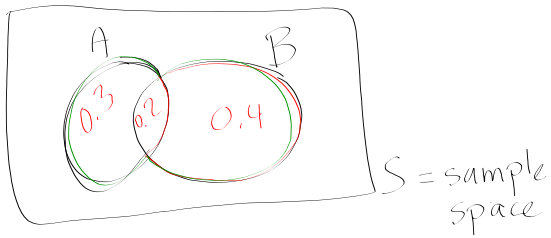
$= 0.2$

Find $P(A \cap B)$, $P(A \mid B)$, $P(A \cup B)$, $P(B \mid A)$

$1/3 = 0.2/0.6$

$0.2/0.5$

0.9 //



$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$A \cap B$ B = new S

Independent

$P(A \cap B) = P(A) \cdot P(B)$

if A is independent of B

Random Variables

X

X upper case

map between sample space and $\mathbb{R}$

continuous or discrete

↳ not listable

$\mathbb{R} = (-\infty, \infty)$

or

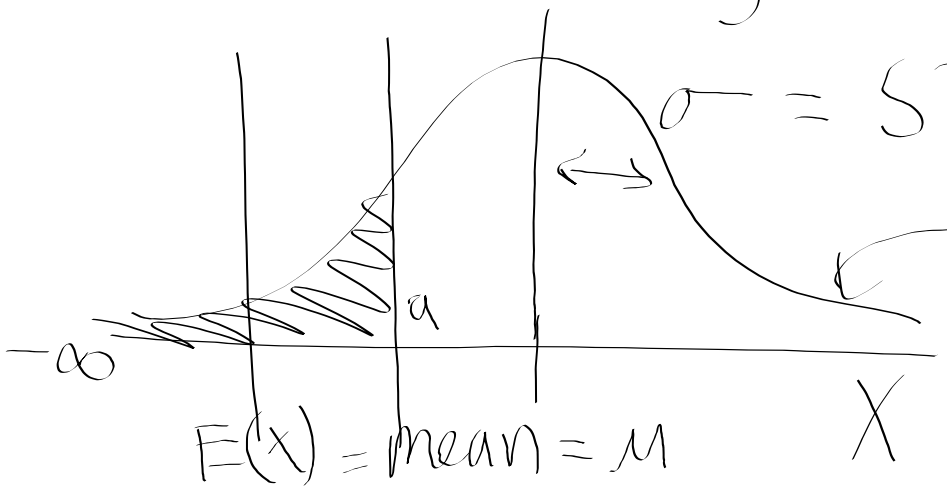
subintervals

$(1, 3.5)$

↳ listable

ctns

ex: normal = gaussian



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

$$P(X \le a) = \int_{-\infty}^{a} f(x)\,dx$$

any ctns X ← pdf

$$f(x) = P(X = x)$$

$$= \binom{n}{x} p^x (1-p)^{n-x}$$

discrete

ex. Binomial

Let X = # passes in n trials, trials are pass/fail

trials are independent

P(pass) = p

n trials

$$P(X=2) = \frac{1}{36} = \binom{2}{2}\left(\frac{1}{6}\right)^2\left(\frac{5}{6}\right)^{2-2}$$

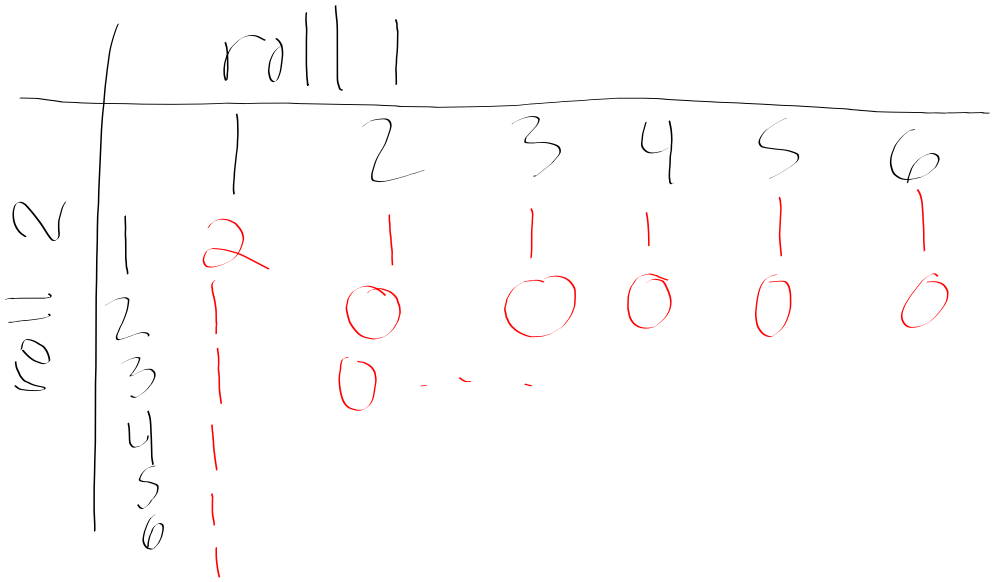
$$P(X=1) = 10/36 = \binom{2}{1}\left(\frac{1}{6}\right)^1\left(\frac{5}{6}\right)^1$$

$$P(X=0) = 25/36 = \binom{2}{0}\left(\frac{1}{6}\right)^0\left(\frac{5}{6}\right)^2$$

Let X = # of 1's in 2 rolls of a six-sided die

$S = \{11, 12, 13, 45, 21, \ldots\}$

$X = 2, 1, 1, 0, 1$



$P(X=1)=0.7$

$P(X=0)=0.3$

What is $E(X)=$?