independent -

two variables are independent if the probability of one is not affected by the occurance of the other

$$P(Y) = P(Y \mid G)$$

$\{a, b, c, d, e, f, g, h, i\}$

$P(a, b, c, d, e)$ $P(\text{vowel})$ are these independent?

vowels $\{a, e, i\}$

$P(a, b, c, d, e) = \frac{5}{9}$

$P(a, b, c, d, e \mid \text{vowel}) = \frac{2}{3}$ NOT the same

$\therefore$ not independent

2 c.) $P(\text{vowel} \mid \{a, b, c, d, e\}) = \frac{2}{5}$

know we have this

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

$P(A \text{ OR } B)$
$P(A \cup B)$ $= P(A) + P(B) - P(A \cap B)$

(3)

	BR	BO	NB	total
M	78	40	22	140
F	40	88	32	160
total	118	128	54	300

f) $P(M \text{ or } BO) = P(M) + P(BO) - P(M \cap BO)$

$= \frac{140}{300} + \frac{128}{300} - \frac{40}{300}$

add

$= P(M) + P(BO) - [P(M) \cdot P(BO|M)]$

$= \frac{140}{300} + \frac{128}{300} - \left[\frac{\cancel{140}^{1}}{300} \cdot \frac{40}{\cancel{140}_{1}}\right]$

$P(M \cap BO) = P(M) \cdot P(BO \mid M)$

$= \frac{\cancel{140}}{300} \cdot \frac{40}{\cancel{140}}$

e) $P(NB \mid F) = \frac{32}{160} \approx .20$

h) $P(M \mid F) = 0$

$P(M \text{ or } F) = P(M) + P(F) + \underline{\quad}$

~~g)~~ $P(NB \text{ \& } F) = P(NB) \cdot P(F \mid NB)$

not g

$= P(F) \cdot P(NB \mid F)$

$= \frac{160}{300} \cdot \frac{32}{160}$

$= \frac{32}{300}$

g) Are NB and Fem independent?

$P(NB) = P(NB \mid F)$

$\frac{54}{300} = \frac{32}{160}$

$.1800 = .20$ ∴ not independent

5.3 The Mean of a Discrete Random Variable

mean denoted by μ

↳ also called the expected value

$$\mu = E(x)$$

(ex) The avg American family has 2.3 children.

Calculate $\mu = \sum x\, P(x)$

$$E(x) = \sum x\, P(x)$$

Our student table

Prob of x students with math anxiety

x	$P(x)$	$x\,P(x)$
0	.027	0
1	.189	.189
2	.441	.882
3	.343	1.029

$\sum P(x) = 1.000$ $\sum (x)P(x) = 2.1$

$\mu = 2.1 = E(x)$

expected value

5.4 Standard Deviation

Spread

$$\sigma^2 = \sum [(x-\mu)^2 \cdot P(x)]$$

$$\sigma = \sqrt{\sum [(x-\mu)^2 \cdot P(x)]}$$

OR

$$\sigma^2 = \sum x^2 P(x) - \mu^2$$

$$\sigma = \sqrt{\sum x^2 P(x) - \mu^2}$$

Back to math anxiety

x	$P(x)$	x^2	$x^2 P(x)$
0	.027	0	0
1	.189	1	.189
2	.441	4	1.764
3	.343	9	3.087

$\mu = 2.1$

$\mu^2 = 4.41$

$$\sum x^2 P(x) = 5.04$$

$$\sigma^2 = \sum x^2 P(x) - \mu^2$$
$$= 5.04 - 4.41$$
$$= .63$$

$$\sigma = \sqrt{.63}$$
$$\approx .7937$$