Summary statistics for Q1

$\bar{x} = 8.89$ $\quad s = 3.94$ (points)

$Q_1 = 7.5$ $\quad Q_2 = 10$ $\quad Q_3 = 12$

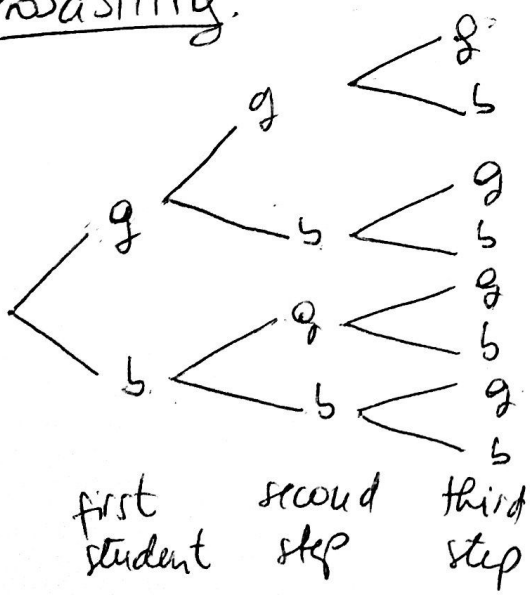
Summary Class 5.

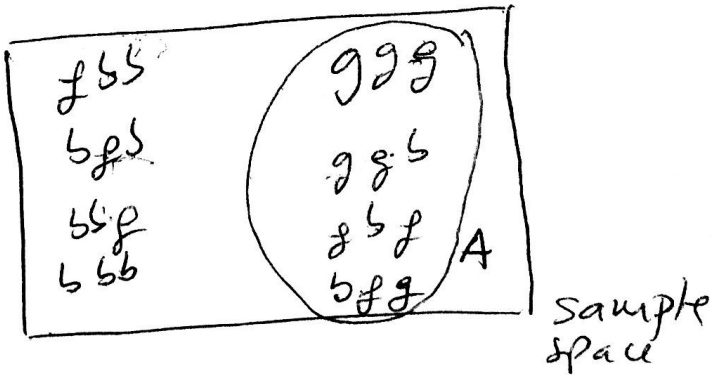
z Score : $z = \frac{x - \bar{x}}{s}$ $\qquad z = \frac{x - \mu}{\sigma}$

a significantly high value has z score > 2
% low % < -2.

outliers : if $Q_3 + 1.5(Q_3 - Q_1)$.
if $Q_1 - 1.5(Q_3 - Q_1)$

Probability.





A = "two or more girls are sampled"

Slide 4.

A = dying when making a skydiving jump

P(A) using frequentist approach.

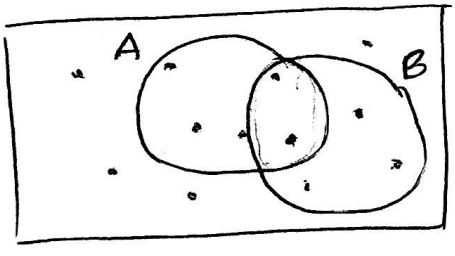
$$P(A) = \frac{\text{number of times A occurred}}{\text{number of repetitions.}}$$

$$= \frac{21}{3{,}000{,}000} = \frac{7}{1{,}000{,}000} = 0.000007$$

we are interested in $\overline{A}$: not dying.

$$P(\overline{A}) = 1 - P(A) = 1 - 0.000007 = 0.999993$$

Slide 8. P(A or B)



sample space

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

Slide 8.

A = "positive test result"

B = "uses drug".

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

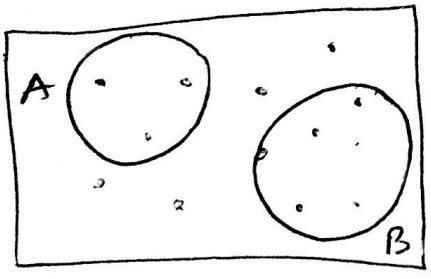
$$P(A) = \frac{45+25}{555} = \frac{70}{555}$$

$$P(B) = \frac{45+5}{555} = \frac{50}{555}$$

$$P(A \text{ and } B) = \frac{45}{555}$$

$$P(A \text{ or } B) = \frac{70}{555} + \frac{50}{555} - \frac{45}{555} = \frac{75}{555} = 0.117117.$$

Slide 9



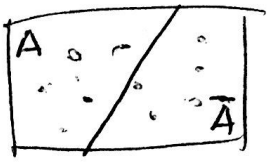
A and B are disjoint

$$P(A \text{ or } B) = P(A) + P(B)$$

Slide 10.

if A is a certain event : $P(A) = 1$

$P(A \text{ or } \bar{A}) = 1$.



also, note that A and $\bar{A}$ are disjoint : $P(A \text{ and } \bar{A}) = 0$.

$P(A \text{ or } \bar{A}) = P(A) + P(\bar{A}) = 1$

- $P(A) + P(\bar{A}) = 1$
- $P(\bar{A}) = 1 - P(A)$ ←
- $P(A) = 1 - P(\bar{A})$.

Example:

Let A = "someone has sleepwalked"

$P(A) = 0.292$

$P(\bar{A}) = 1 - P(A) = 1 - 0.292 = 0.708$

$\bar{A}$ is "someone has not sleepwalked".

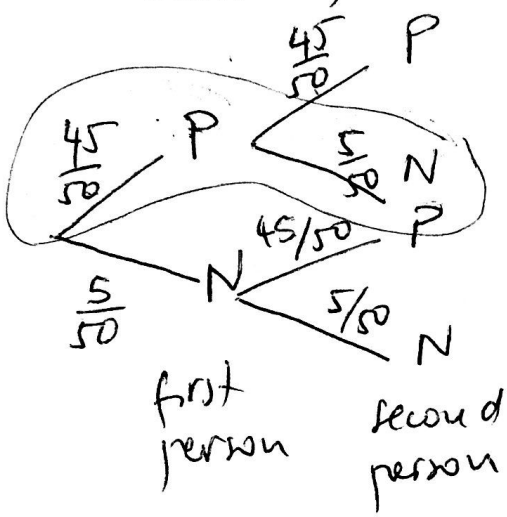
Slide 12

50 suspects that use drugs
45 positive test result
5 negative test result.

A = "first person has a positive test"

B = "second person has a negative.

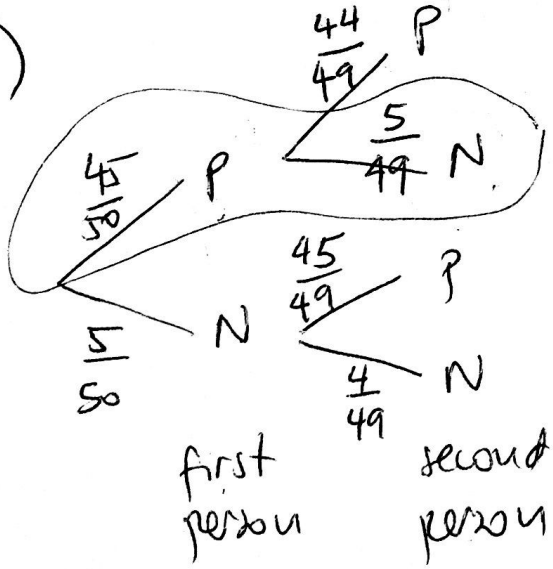
a)



with replacement

$$P(A \text{ and } B) = P(A)\,P(B \mid A) = \frac{45}{50} \cdot \frac{5}{50}$$

b)



without replacement

$$P(A \text{ and } B) = P(A)\,P(B \mid A) = \frac{45}{50} \cdot \frac{5}{49}$$

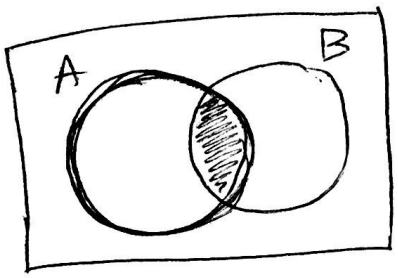
Slide 16: conditional probabilities.

$$P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)}$$

(Independent: $P(B \mid A) = P(B)$)

Recall the multiplication rule:

$$P(A \text{ and } B) = P(A)\,P(B \mid A)$$
$$P(A \text{ and } B) = P(B)\,P(A \mid B)$$



$P(B \mid A)$

$P(B)$

Slide 17.

B = "positive test result"

A = "subject uses drugs"

$$P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)}$$

$$= \frac{45/555}{50/555} = \frac{45}{555} \cdot \frac{555}{50} = \frac{45}{50} = 0.9$$