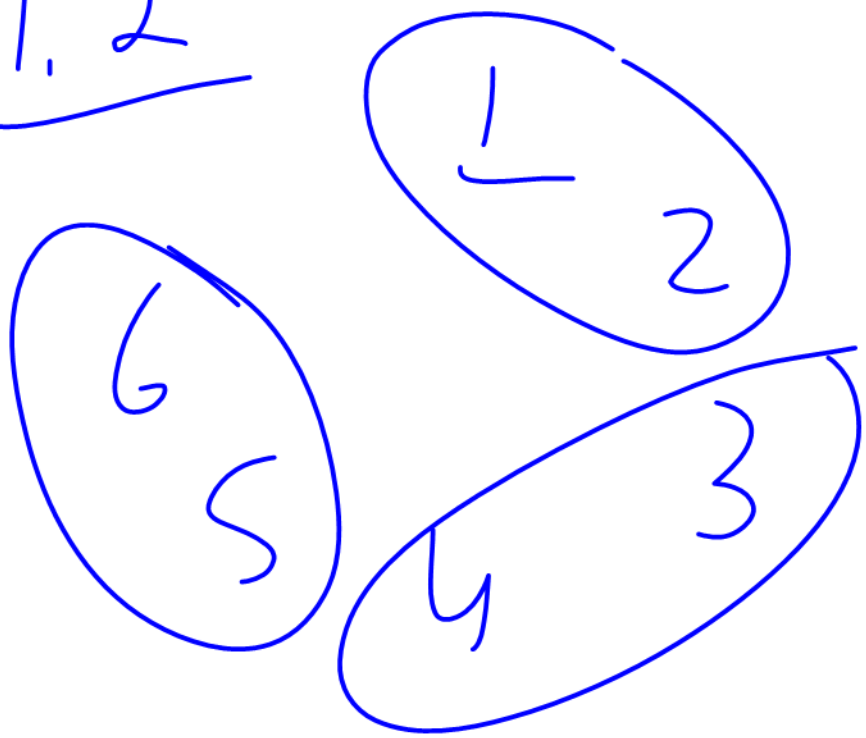
Sp 24 Final #11 (prob)

11.1

$$\frac{1}{5}$$

11.2



$$= \frac{1}{\text{total } \# \text{ of arrangements}}$$

$P(\{6,5\},\{1,2\},\{4,3\}) = P(\{1,2\}$ and the rest$)$

$P(A \text{ and } B) = P(A) * P(B \text{ given } A)$

$\frac{1}{5} * P(\{3,4\},\{5,6\} \text{ given } \{1,2\})$

$$\frac{1}{5} * \frac{1}{3} = \frac{1}{15}$$

↑

(1 2) (3 4)

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10 animals at zoo

6 mammals

4 reptiles

Select 2 animals randomly without replacement

$$\underbrace{\frac{6}{10} * \frac{4}{9}}$$

P(mammal then reptile)

Prob of one of each

P(one of each)

$= P(\text{mammal then reptile OR reptile then mammal})$

$= P(\text{mammal, reptile}) + P(\text{reptile, mammal})$

$$\frac{6}{10} * \frac{4}{9} + \frac{4}{10} * \frac{6}{9}$$

$$= 2 * \frac{6}{10} * \frac{4}{9} = \frac{8}{15}$$

CLT

SD of dist of sample means $= \frac{\text{pop (or sample) SD}}{\sqrt{\text{sample size}}}$

↑ Square root law

95% CLT-based CI

$$\text{Sample mean} \pm 2 \times \frac{\text{sample SD}}{\sqrt{\text{sample size}}}$$

$$\left[\text{Sample mean} - 2 \times \frac{\text{sample SD}}{\sqrt{\text{sample size}}}\right.$$

$$\left.\text{Sample mean} + 2 \times \frac{\text{sample SD}}{\sqrt{\text{sample size}}}\right]$$

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width of 95% CI

$$\text{width} = 4 * \frac{\text{sample SD}}{\sqrt{\text{sample size}}}$$

good to know:
for dataset of 0's & 1's,

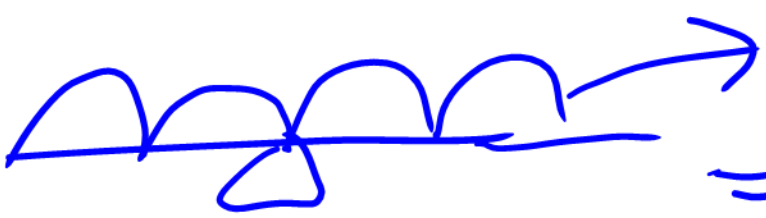
$$\text{sample SD} = \sqrt{\text{prop}_{0\text{'s}} \times \text{prop}_{1\text{'s}}}$$

And it's max is 0.5
(happens when prop 0's = prop 1's)

Problem 5 from Fall 25 Final

5.3

sample mean $= \frac{70}{10} = \frac{7}{10}$



jump

$$= \frac{\text{sample SD}}{\sqrt{\text{sample size}}}$$

$$= \frac{\sqrt{\text{prop 0's} * \text{prop 1's}}}{\sqrt{\text{sample size}}}$$

$$= \frac{\sqrt{\frac{30}{100} * \frac{70}{100}}}{\sqrt{100}}$$

$$\frac{7}{10} \pm \frac{2.1}{10} \sqrt{\frac{30}{100} \times \frac{70}{100}}$$

$$\frac{7}{10} \pm 2 \cdot \frac{1}{10} \sqrt{\frac{2100}{10000}}$$

$$\frac{7}{10} \pm 2 \cdot \frac{1}{10} \sqrt{100 * \frac{21}{10000}}$$

$$\frac{7}{10} \pm 2 \sqrt{\frac{21}{10000}}$$

5.4

$$\text{width} = 4 * \frac{\text{sample SD}}{\sqrt{\text{sample size}}}$$

$$0.1 = 4 * \frac{0.5}{\sqrt{x}}$$

$$0.1 = \frac{2}{\sqrt{x}}$$

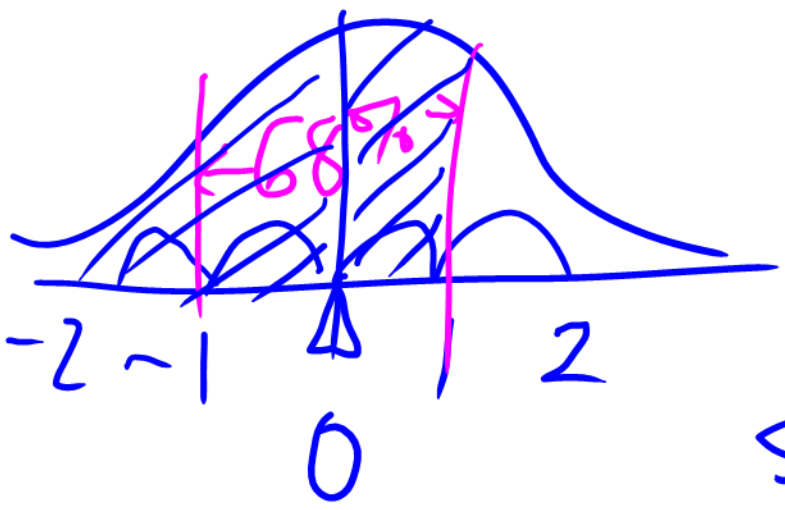
$$\frac{1}{10} = \frac{2}{\sqrt{x}}$$

$$1 = \frac{20}{\sqrt{x}}$$

$$\sqrt{x} = 20$$

$$x = 400$$

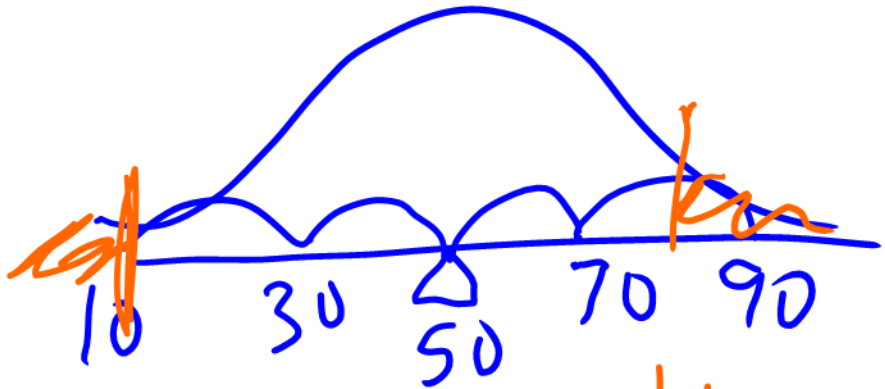
Wi25 Final problem 4



stats.norm.cdf(z) tells you area under standard normal curve to left of z

$$cdf(1) = 0.34 + 0.5$$
$$= 0.84$$

$$100 - 68$$
$$= 32$$



-2 SU

1.5 SU

SU = # SDs above mean