Review for Final

Wednesday, December 4, 2019 11:27 AM

breakdown of final exam:

Chapter 1	13%		Test 1 42%
2	22%		
3	7%		
4	23%		Test 2 38%
Sections 5.1 to 5.4	15%		
Section 5.5, Chapter 6	20%		

Topic List for last portion of Course

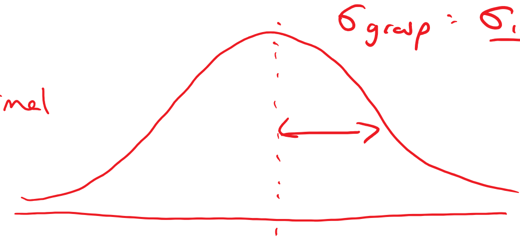
5.5 Central Limit Theorem

- group of size $n \geq 30$

if you take repeated samples, calculate the average for each sample, graph them

will get

normal



$$\sigma_{group} = \frac{\sigma_{individual}}{\sqrt{n}}$$

$$\mu_{group} = \mu_{individual}$$

$$z_{group} = \frac{x_{group} - \mu_{group}}{\sigma_{group}}$$

6.1 & 6.2 confidence intervals

$$\mu = \bar{x} \pm \frac{z\sigma}{\sqrt{n}}$$ for large n

- need to be able to calculate CIs
  - finding z from table (90%, 95%, 98%, 99%) or do calculation using standard normal table for some other confidence level

- Compare
  - a CI to an accepted value
  - two CIs with each other

- calculate the sample size. ROUND UP

There are 30 players on the Vancouver Whitecaps team. The top two players' salaries are \$1 400 000 and \$725 000.

What would happen to the mean, median, std dev, and range of the player salaries if the highest paid player's salary was decreased to \$1 000 000. Would they increase, decrease, or stay the same?

mean — decrease
median — stay the same
std dev — decrease
range — decrease

What sampling plan is used in each of the following situations?

a) A random sample of classes at Camosun is chosen and every student in each of those classes is asked a question.

cluster

b) The Camosun student body is divided up into program areas (Civil Engineering, Nursing, etc.), and a random selection of students from each group is asked a question.

stratified

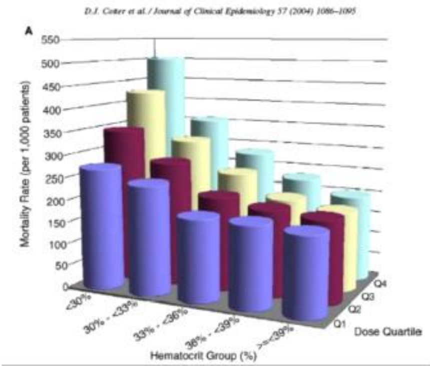
c) A certain number of student records is selected randomly from the entire student record database, and these students are asked a question.

simple random

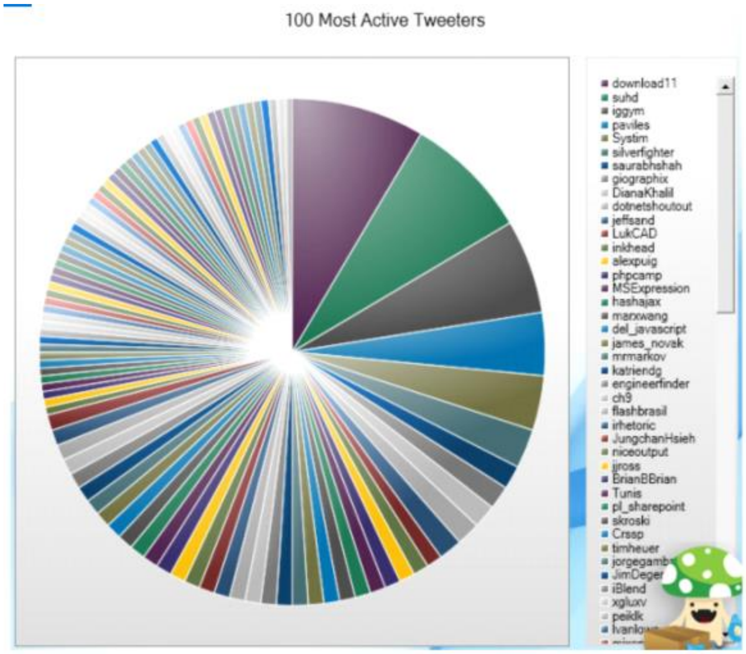
d) The student records are listed in order by student number. The 11th student, 36th, 61st, and so on, are all asked a question.

1-in-25

(2 points) The following graph is taken from a medical journal. Without knowing what variables the authors are plotting on each axis, describe one main reason that this graph is badly designed.



inappropriate 3D



too many categories

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An experiment consists of flipping a coin and then rolling a fair six-sided die.

a) How many possible outcomes does this experiment have?

b) What is the probability that the coin toss is TAILS and the die roll is 5?

c) What is the probability that the coin toss is TAILS or the die roll is 5?

d) Are the events "TAILS" and "rolling a 5" independent?

a) method #1:

sample space:

H1 H2 H3 H4 H5 H6
T1 T2 T3 T4 T5 T6

12 outcomes

method #2

mult rule: $\underset{T,\,H}{\underline{2}}\ \underset{\text{die rolls}}{\underline{6}}$

12

b) $P(T5) = \dfrac{n(T5)}{n_{tot}} = \dfrac{1}{12}$

$\underline{1}\ \underline{1}$

$P(T5) = \dfrac{1}{12}$

c) $P(T \text{ or } 5) = \dfrac{7}{12}$

$$P(T \text{ or } 5) = P(T) + P(5) - P(T5)$$
$$= \frac{1}{2} + \frac{1}{6} - \frac{1}{12}$$
$$= \frac{7}{12}$$

d) $P(B) \overset{?}{=} P(B|A)$

$P(T) = \dfrac{1}{2}$

$P(T|5) = \dfrac{P(T5)}{P(5)} = \dfrac{n(T5)}{n(5)} = \dfrac{1}{2}$

same $\therefore$ independent

A computer system requires a case-sensitive, alphanumeric password containing six characters.

a) How many passwords contain no "A"s?
b) " " "a"s?
c) " " "A"s or "a"s or both?

a) $n(\text{no } A) = \underline{61}\ \underline{61}\ \underline{61}\ \underline{61}\ \underline{61}\ \underline{61} = 61^6$

$\uparrow$
$26 \times 2 - 1$
$+ 10$

$= 51\ 520\ 374\ 361$
$\approx 5.15 \times 10^{10}$

b) same

c) $n(\text{no } A \text{ or no } a) = n(\text{no } A) + n(\text{no } a) - n(\text{both})$

$= 61^6 + 61^6 - 60^6$

$\uparrow$
there are two characters that you can't have

$= 5.64 \times 10^{10}$
(56384748722)

A distribution has a mean of 27 and a standard deviation of 5. What can you say about the number of measurements between 22 and 32 if

a) you know nothing about the shape of the distribution?
b) you know the distribution is unimodal but not symmetrical?
c) you know the distribution is unimodal and symmetrical?
d) you know the distribution is normal?

a) Tcheby

$$\geq \left(1 - \frac{1}{k^2}\right)$$

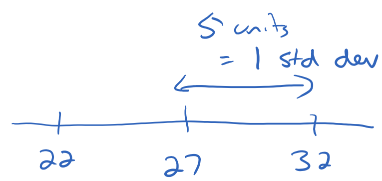
k = number of std dev from the mean

$= 1$

$$\geq \left(1 - \frac{1}{k^2}\right)$$

$$\geq \left(1 - \frac{1}{1^2}\right)$$

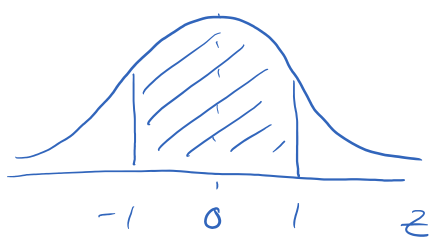
$$\boxed{\geq 0\%}$$



b) same

c) Empirical $\sim 68\%$

d) standard normal table



area = 0.3413

$$P = 2(0.3413)$$
$$= 0.6826$$
$$= 68.26\%$$

$$\boxed{68\%}$$

A physics class calculated the mean height of all students in lab that day with a result of 165 cm on average for 14 students. One student then walked in late. What is the new average height for all students if the latecomer is 185 cm tall?

$$\bar{X}_{old} = 165 = \frac{\text{sum of 14 students}}{}$$

$$\frac{\qquad\qquad}{14}$$

$165 \cdot 14$ = sum of 14 students

$$\bar{x}_{new} = \frac{\text{sum of 15 students}}{15}$$

$$= \frac{165 \cdot 14 + 185}{15} = 166.\overline{3} \text{ cm}$$

Suppose that vehicle speeds on the Malahat can be represented by a normal distribution with mean 98 km/h and a std dev 16 km/h.

a) What is the probability that a randomly selected vehicle's speed is under 100 km/h?

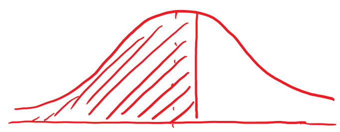
b) What speed separates the fastest 10% of all speeds from the slowest 90%?

a) $$z = \frac{x - \mu}{\sigma}$$

$$= \frac{100 - 98}{16}$$

$$= 0.125$$

Can use either 0.12 or 0.13 here



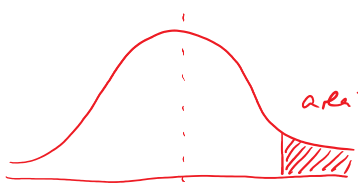
area = 0.0478 if $z = 0.12$

= 0.0517 — 0.13

$$p = 0.5 + 0.0478 = 0.5478 \text{ or } \boxed{55\%}$$

(or 0.0517) (or 0.5517)

b)



area 0.4

$z = 1.28$

$$z = \frac{x - \mu}{\sigma}$$

$$z\sigma = x - \mu$$

$$\mu + z\sigma = x$$

$$x = 98 + 1.28(16)$$
$$= 118.48 \text{ km/h}$$
$$= 118 \text{ km/h}$$

c) What is the probability that the average speed for the next 35 cars is under 100 km/h?

	individual	group
μ	98	98
σ	16	$\frac{16}{\sqrt{35}} = 2.705$

$$z = \frac{x - \mu}{\sigma}$$
$$= \frac{100 - 98}{2.705}$$
$$= 0.73951$$
$$= 0.74$$

area = 0.2704

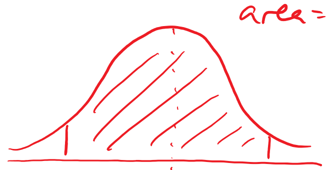
$$p = 0.5 + 0.2704$$
$$= 0.7704$$

$\boxed{77\%}$

Fifty pipes were stressed for failures and we found that the failure pressure on average was 5150 psi. It is known from long experience with similar pipes that $\sigma = 250$ psi.

a) Find a 96% confidence interval for the mean failure pressure for pipes of this kind.

area = 0.96



area $= \frac{0.96}{2} = 0.48$

$z = 2.055$ or 2.05 or 2.06

$\mu = \bar{x} \pm \frac{z\sigma}{\sqrt{n}}$

$= 5150 \pm \frac{2.055\,(250)}{\sqrt{50}}$

$= 5150 \pm 72.6552$

$= 5150 \pm 73$ (or ± 72.6 or ± 70)

CI: 5077 to 5223 psi