Practise Exam

26 March 2023 11:30

Question 1) 188 babies weight in gram

→ Mean = 2913.293

$\hat{p} = 188$

$qnorm_{96} = 1.75$

CI = 4% = 0.04

$2\varepsilon = 0.04$

$\varepsilon = 0.02$

$\bar{X} = \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$

$S = \sqrt{var}$

288.82 → 0.8

3017.76 → 0.8

$\bar{x} = 2913.293$

$z_\alpha = 1.75\ 0686$

$\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$

$s = \sqrt{486506.6} = 697.5$

qnorm 98 = 2.053749

$2913.293 \pm 2.053749 \cdot \frac{697.5}{\sqrt{188}}$

$2913.293 + 104.400 = 3017.693$

$2913.293 - 104.400 = 2808.893$

$\Big\}$ 210.42 → CI length

578 = 59.58 \
821 = 50.06 ✗
798 = 50.70 /
813 = 50.3 /
830 = 49.72 ✗

Sample size

$\sqrt{n} \geq \frac{2.053749 \cdot 697.5}{0.02}$ 0.04

$\sqrt{71624.47} = 267.62$

CI = 4%

$2\varepsilon = 0.04$

$\varepsilon = 0.02$

$\varepsilon = 0.02$

$z_{\alpha/2} = 2.053749$

$s = 697.5$

$\Rightarrow n \geq \frac{2.053749^2 \cdot 697.5^2}{0.02^2}$

92% CI

p: probability of baby < 2600

$p = \frac{\text{sum}(<2600)}{n}$ → 188

p- 0.35

3 - 6
2

88 63 66 /188

4)

62 < 2600

→ 34 male

28 female

126 > 2600

61 male

65 female

	male	female	
<2600	34	28	62
>2600	61	65	126
	95	93	188

Cholesterol

18 people

Before After

✗ SPEARMAN

1
2
⋮
18

$n = 18$

$z =$ qnorm(0.975)

$m =$ mean

$s =$ sd

$q = \frac{p - 0.25}{\sqrt{\frac{p \cdot (1-p)}{n}}}$

$\frac{0.35 - 0.25}{\sqrt{\frac{0.35 \cdot 0.65}{188}}} = 17.287$

; 1 - 2 (1 - qnorm (q))

1 - 2

pl = 0.25

$p_1 = p + (p - p_1)$

$p_1 = 0.35 + 0.10$

Question 8)

Unif [3, 0] & Expect

→

max $(X_1, \ldots, X_{18}) >$

num_award

int

① for an unif
the expect

$p = 0{,}35$

$p_1 = 0.25$ $\quad = 0.45$

$p_r = p + (p - p_1)$

$p_1 = p - (p - p_r)$

$0.35 + (0.35 - 0{,}45)$

$0.35 + (-0{,}10)$

$= 0.25$

...ction unif $= \dfrac{a+b}{2}$

$\dfrac{3+0}{2}$

$2 \cdot \dfrac{m - 2's}{\sqrt{n}} \quad -3$

...s	predicted by type of program prog	Math
	Vocational	int
	General	
	Academic	

$-2.37 + 0 + 55 \times \quad 0{,}03$

...lom distribution,

...tion = $\dfrac{a+b}{2}$

$\rightarrow \dfrac{3+\theta}{2} \rightarrow$ also the mean

= Confidence interval for $(1-\alpha)$

z = qnorm(0.975)

18

m = mean
s = sd

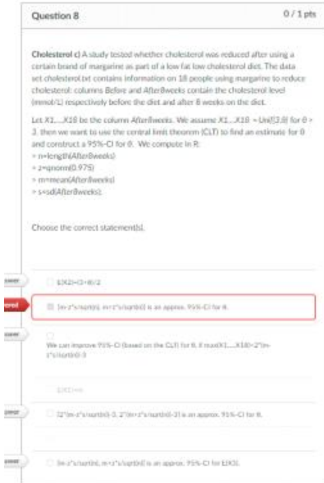
Diet

78 people
3 diets

g1
g2
g3

person	gender	height	preweight	diet	w6w	wl
	1 = m, 0 = f					= preweight − w6w

	1	2	3
m			
f			



Question 8 — 0 / 1 pts

Cholesterol c) A study tested whether cholesterol was reduced after using a certain brand of margarine as part of a low fat low cholesterol diet. The data set cholesterol.txt contains information on 18 people using margarine to reduce cholesterol: columns Before and After8weeks contain the cholesterol level (mmol/L) respectively before the diet and after 8 weeks on the diet.

Let X1,...,X18 be the column After8weeks. We assume X1,...,X18 ~ Unif[3,θ] for θ > 3, then we want to use the central limit theorem (CLT) to find an estimate for θ and construct a 95%-CI for θ. We compute in R:

```
> n=length(After8weeks)
> z=qnorm(0.975)
> m=mean(After8weeks)
> s=sd(After8weeks)
```

Choose the correct statement(s).

- E(X2)=(3+θ)/2
- [m-z*s/sqrt(n), m+z*s/sqrt(n)] is an approx. 95%-CI for θ.
- We can improve 95%-CI (based on the CLT) for θ, if max(X1,...,X18)>2*(m-z*s/sqrt(n))-3
- E(X1)=θ
- [2*(m-z*s/sqrt(n))-3, 2*(m+z*s/sqrt(n))-3] is an approx. 95%-CI for θ.
- [m-z*s/sqrt(n), m+z*s/sqrt(n)] is an approx. 95%-CI for E(X1).

Confidence Interval;

$\bar{X} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$

$\bar{X}$ → mean, s → STD, n → length

Interval
95%
would be
975

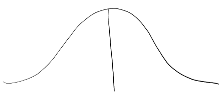
$$\max(X_1, \dots, X18) > \frac{m - 2 \times s}{\sqrt{n}} - 3$$

m → mean, 2 → qnorm, s → STD, n → Lolength(18)

binom.test(sum(birthweight >2800), n, p=0.5, alt="g")
=
binom.test(sum(birthweight <=2800), n, p=0.5, alt="g")

$P_m = 0.35$ & $P_l = 0.65$

0.10 → pl = 0.25

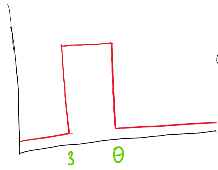


"2800"

$$e(X_x) = (3+\theta)/2$$

$$\rightarrow 2 \times E(x) = 3 + \theta$$

$$2 \cdot E X_x 3 = \theta$$



$\frac{1}{\theta - 3}$ ↓ = p

3 θ

① For an uni... the expect...

② $\bar{X} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$

→ CI = 95...
→ n = leng...
→ m = m...
→ s = s...

→ [m...

③ m =

→ CI_{low} =

CI_{high} =

→ (3+...)/2

→ (3+...

binom.test(succes, total, probability, alternative)

t.test
H_0: mean = 2800
H_1: mean > 2800
→ t.test(birthweight, mu=2800, alt="g")

m: median

L< 2800

H1 : m ≥ 2800

$H_1: m > 6$
Exam.results = birthweight
sum(exam.results>6)
g
binom.test(g, exam.results, p=0.5, alt="g")

$H_1: m > 2800$
sum(birthweight >2800)
x
binom.test(x, birthweight, p=0.5, alt="g")

= sum(birthweight ≤2800)
y
binom.test(y, birthweight, p=0.5, alt="g")

$H_1: m > 6$	$H_1: m > 6$ want $H_0: m =< 6$
exam.results	after8weeks
sum(exam.results>6)	sum(after8weeks)
g	x
binom.test(g, exam_results, p=0.5, alt="g")	binom.test(x, after8weeks, p=0.5, alt="g")
$H_1: m > 6$	
exam_results	
sum(exam_results)	
g	
binom.test(g, exam.results, p=0.5, alt="g")	

sum(after8weeks)

	Before	After
1		X_1
2		X_2
3		X3
⋮		⋮
18		X_{18}

sum(X, ...
1 0 25
0 0
sum(X, ...
= succ...

eam distribution:

tion = $\frac{a+b}{2}$

$\rightarrow \frac{3+\theta}{2} \rightarrow$ also the mean

= Confidence interval for $(1-\alpha)$

$\rightarrow \alpha = 0.5 \rightarrow \alpha/2 = 0.025 = z = \text{qnorm}(0.975)$

th (after d weeks)

ean (after d weeks)

d (after d weeks)

$- 2\frac{s}{\sqrt{n}},\ m + 2\frac{s}{\sqrt{n}}]$ = Confidence interval for $[3, \theta]$

max_value

$m - 2\frac{s}{\sqrt{n}}$

max > confidence-interval (adjusted

$\frac{a+b}{2} = \frac{3+\theta}{2}$

$\frac{(3+\theta)}{2} - \left(2\frac{s}{\sqrt{n}}\right)$

&

$\frac{3+\theta}{2} + \left(2\frac{s}{\sqrt{n}}\right)$

$\theta) - \left(2\frac{s}{\sqrt{n}}\right) \rightarrow 3+\theta - 2\left(2\frac{s}{\sqrt{n}}\right)$

$\theta - 2\left(2\frac{s}{\sqrt{n}}\right) - 3$

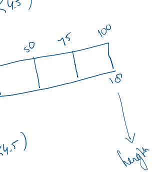
$\rightarrow \theta = 2\left(2\frac{s}{\sqrt{n}}\right) - 3$

&

$\frac{\theta)}{2} + \left(2\frac{s}{\sqrt{n}}\right) \rightarrow 3+\theta + 2\left(2\frac{s}{\sqrt{n}}\right)$

$\theta + 2\left(2\frac{s}{\sqrt{n}}\right) - 3$

$4.5) < 25\%$



4.5)

esses