



Contact person during exam:
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Exam KLMED8004 Medical Statistics Part 1

Monday 4. June 2012
Time: 09:00 – 13:00
Exam results: 4. July 2012

Supporting materials:
Any written or printed material. Calculator

Problem 1

Find the correct answer to each question. The calculation need not be included.

- a) Let X be normally distributed with mean 120 and standard deviation 10. What is the probability $P(X < 125|X < 130)$?

A) 0.12 B) 0.42 C) 0.43 D) 0.04 E) 0.82

- b) Ten students are taking a course at NTNU. Each student has a probability of 0.5 of showing up at any given lecture and they act independently. What is the probability that exactly four students attend a given lecture?

A) 0.246 B) 0.623 C) 0.011 D) 0.377 E) 0.205

- c) Let X be a discrete random variable with distribution

| | | | | |
|------------|-----|-----|-----|-----|
| x | 0 | 1 | 2 | 3 |
| $P(X = x)$ | 0.1 | 0.5 | 0.3 | 0.1 |

What is the expected value of X ?

A) 0.5 B) 1.4 C) 2.6 D) 0.8 E) 1.0

- d) Let X be a discrete random variable with distribution

| | | | | |
|------------|-----|-----|-----|-----|
| x | 0 | 1 | 2 | 3 |
| $P(X = x)$ | 0.1 | 0.5 | 0.3 | 0.1 |

What is the standard deviation of X ?

A) 0.5 B) 1.4 C) 2.6 D) 0.8 E) 1.0

Problem 2

A randomized clinical trial was performed to compare two different treatments for tennis elbow: steroid injection and physiotherapy. Six weeks after treatment the pain-free grip force x was measured. Assume that x is normally distributed, with mean μ_1 and standard deviation σ_1 for patients given steroid injection, and with mean μ_2 and standard deviation σ_2 for patients given physiotherapy.

- a) Propose a test of whether mean pain-free grip force for patients given steroids is equal to that of patients given physiotherapy. State the null hypothesis and the alternative hypothesis.

A number $n_1 = 62$ patients were given steroid injections. The sample average for pain-free grip force was $\bar{x}_1 = 83.6$ and the sample standard deviation was $s_1 = 22.9$. A number $n_2 = 65$ patients were given physiotherapy. The sample average for pain-free grip force was $\bar{x}_2 = 70.2$ and the sample standard deviation was $s_2 = 25.4$.

- b) Test whether mean pain-free grip force for patients given steroids and mean pain-free grip force for patients given physiotherapy are equal. Use significance level 5%.
- c) Find a 95% confidence interval for $\mu_1 - \mu_2$. How do you interpret this interval?

Problem 3

Children in the fourth, fifth and sixth grade were asked what they considered important at school. The possible answers were 'good marks', 'success in sports' and 'popularity'.

The answers distributed as below:

| | 4th grade | 5th grade | 6th grade | total |
|-------------------|-----------|-----------|-----------|-------|
| good marks | 49 | 50 | 69 | 168 |
| success in sports | 19 | 22 | 28 | 69 |
| popularity | 24 | 36 | 38 | 98 |
| total | 92 | 108 | 135 | 335 |

- a) Propose a test of whether answer and grade are associated, stating the null hypothesis and the alternative hypothesis.
- b) Perform the proposed test at the 5% significance level.
- c) Find a 95% confidence interval for the proportion that answers 'good marks' among 6th graders.