

Examination in ST0101 Probability with applications—Appendix
Thursday 29 November 2007

Permitted aids: Any written and printed material. One calculator.

Mark one answer for each problem on the form overleaf. You will score one point for each right answer and zero points for each wrong answer. Multiple answers will score zero.

Note: There is text on both sides of the sheet. All problems have five alternative answers.

Problem 1. The death rate of an organism is e^x at age $x > 0$. Approximately what is the probability that the survival time of the organism will be 1 or more?

- (a) 0.07 (b) 0.82 (c) 0.63 (d) 0.18 (e) 0.37

Problem 2. Y is a random variable such that $Y = 1/X$, where X is exponentially distributed with expected value $1/\lambda$. What is the probability density for Y at a point $y > 0$?

- (a) $\lambda e^{\lambda/y^2}$ (b) $\lambda e^{-\lambda/y^2}$ (c) $\lambda e^{-\lambda/y}$ (d) $\frac{\lambda}{y^2} e^{-\lambda/y}$ (e) $\lambda e^{-\frac{1}{2}\lambda y}$

Problem 3. A moss throws spores at points of time that follow a Poisson process with intensity 0.9 (per minute). Approximately what is the probability that the moss will throw exactly one spore in the course of one minute?

- (a) 0.77 (b) 0.90 (c) 0.37 (d) 0.41 (e) 0.17

Problem 4. (X, Y) has the bivariate normal distribution with parameters $\mu_X = 5$, $\mu_Y = 2$, $\sigma_X = 4$, $\sigma_Y = 1$ and $\rho = 0.5$. What is the conditional expected value of Y given that $X = 10$?

- (a) 15 (b) 3 (c) 21 (d) 12 (e) 2.625

Problem 5. For the random variables X and Y the following apply: $\text{Var } Y = 4$, $\text{Var}(2X + Y) = 8$ and $\text{Cov}(X, Y) = -2$. What is $\text{Var } X$ equal to?

- (a) 12 (b) 4 (c) 3 (d) 6 (e) 10

Problem 6. Four friends puts one christmas present each in a bag. Then they draw randomly one present each. What is the probability that none of them draws their own present?

- (a) 11/24 (b) 1/3 (c) 5/12 (d) 7/24 (e) 3/8

Problem 7. 80% of red-flowering plants of a plant species give red offspring when crossed with a white-flowering plant, whereas 20% of the red-flowering plants give red offspring with probability 0.5 and white offspring with probability 0.5 when crossed with a white-flowering plant. A red-flowering and a white-flowering plant are chosen randomly and crossed. What is the probability that the offspring is red-flowering?

- (a) 0.9 (b) 0.85 (c) 0.95 (d) 0.75 (e) 0.8

Problem 8. The probability density f of a random variable X is given by $f(x) = e^x/(e - 1)$ for $0 < x < 1$. Approximately what is the probability that $0 < X < 1/2$?

- (a) 0.61 (b) 0.24 (c) 0.50 (d) 0.96 (e) 0.38

Problem 9. Approximately what is the probability of not getting six on any die when we toss ten dice?

- (a) 0.22 (b) 0.28 (c) 0.04 (d) 0.10 (e) 0.16

Problem 10. A mussel has a survival time that is exponentially distributed with expected value 200 years. Approximately what is the probability that the mussel will live for more than 405 years?

- (a) 0.03 (b) 0.18 (c) 0.08 (d) 0.23 (e) 0.13

Problem	a	b	c	d	e
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Studentnummer	Student number

Studieprogram	Study program

Inspektør	Inspector