Examination in ST0101 Probability with applications—Appendix
Monday 11 December 2006

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 $1/(x+1)$ at age $x > 0$. What is the probability that the survival time of the organism will be 4 or less?

(a) 0.5 **(b)** 0.2 **(c)** 0.6 **(d)** 0.4 **(e)** 0.8

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

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

Problem 3. A chemical experiment is performed twice. The probability that it succeeds is 0.8 each of the two times. Assume that the outcome of the experiments are independent. What is the probability that the experiment succeeds at least one of the two times?

(a) 0.64 **(b)** 0.81 **(c)** 0.90 **(d)** 0.96 **(e)** 1.60

Problem 4. The pair (X, Y) of two random variables takes the value $(0, 0)$ with probability 0.1, the value $(1, 1)$ with probability 0.1, the value $(0, 1)$ with probability 0.4 and the value $(1, 0)$ with probability 0.4. What is the covariance of X and Y?

(a) -0.15 **(b)** 0.06 **(c)** -0.24 **(d)** 0.24 **(e)** -0.06

Problem 5. In how many ways can a gold medal, a silver medal and a bronze medal be distributed to three out of eight participants in a competition?

(a) 6 **(b)** 336 **(c)** 56 **(d)** 6561 **(e)** 512

Problem 6. We have 5 red and 5 blue balls, and draw 5 balls randomly. Approximately what is the probability that 4 or 5 of them are red?

(a) 0.50 **(b)** 0.16 **(c)** 0.14 **(d)** 0.10 **(e)** 0.12

Problem 7. Y is a random variable such that $Y = X^2$, where X is exponentially distributed with expected value $1/\lambda$. What is the probability density of Y at the point $y > 0$?

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

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

(a) 0.50 **(b)** 0.25 **(c)** 1.00 **(d)** 0.33 **(e)** 0.75

Problem 9. The yield of a chemical reaction is normally distributed with expected value 12 mg and standard deviation 2 mg. Approximately what is the probability that the yield will be greater than 10 mg?

(a) 0.92 **(b)** 0.62 **(c)** 0.16 **(d)** 0.84 **(e)** 0.76

Problem 10. What is the probability of getting exactly two fives and two sixes when throwing five dice?

(a) 1/1944 **(b)** 5/648 **(c)** 5/54 **(d)** 5/324 **(e)** 5/3888

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

Studentnummer Student number

Studieprogram Study program

Inspektør Inspector