

**Examination in ST0101 Probability with applications—Appendix**

Thursday 22 May 2008

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.** Let  $X \sim N(\mu, \sigma)$  and  $Y = e^X$ . What is the probability density of  $Y$  at the point  $e^\mu$ ?

- (a)  $1/(\sqrt{2\pi})$    (b) 1   (c)  $e^{-\mu}/(\sqrt{2\pi}\sigma)$    (d) 0   (e)  $1/(\sqrt{2\pi}\sigma)$

**Problem 2.** The number of black grains in a cubic decimetre of a type of granite is Poisson distributed with expected value (mean) 900. Find an approximate probability that the number of black grains in a sample of one cubic decimetre is greater than or equal to 940.

- (a) 0.14   (b) 0.09   (c) 0.31   (d) 0.23   (e) 0.50

**Problem 3.** In a game the probability that 1, 2 or 3 moves are done is  $1/4$ ,  $7/12$  and  $1/6$ , respectively. What is the expected number of moves in the game?

- (a)  $23/12$    (b) 3   (c) 2   (d)  $1/3$    (e)  $11/12$

**Problem 4.** What is the variance of the number of moves in the last problem?

- (a)  $47/12$    (b)  $35/144$    (c)  $59/144$    (d)  $43/12$    (e)  $15/4$

**Problem 5.** An organism has a survival time that is normally distributed with mean  $\mu$  and standard deviation  $\sigma$ . What is the death rate at the point  $\mu$ ?

- (a)  $\sqrt{\pi}\sigma$    (b)  $\sqrt{\pi}\sigma/2$    (c)  $\sqrt{2/\pi}/\sigma$    (d)  $1/(\sqrt{\pi}\sigma)$    (e)  $1/(\sqrt{2\pi}\sigma)$

**Problem 6.** The probability density  $f$  of a random variable  $X$  is given by  $f(x) = \frac{3}{4}(2x - x^2)$  for  $0 < x < 2$ . Find  $EX$ .

- (a) 0.90   (b) 0.95   (c) 0.85   (d) 1.00   (e) 1.05

**Problem 7.** For the random variables  $X$  and  $Y$  the following hold:  $\text{Var } X = 2$ ,  $\text{Var } Y = 1$  and  $\text{Var}(X + Y) = 5$ . What is the correlation between  $X$  and  $Y$ ?

- (a) 0.50   (b) -0.50   (c) 0.71   (d) -0.71   (e) 0

**Problem 8.** We throw five dice. What is the probability that all of them show the same?

- (a)  $1/7776$    (b)  $1/42$    (c)  $1/720$    (d)  $1/360$    (e)  $1/1296$

**Problem 9.**  $(X, Y)$  is binormally distributed with parameters  $\mu_X = 5$ ,  $\mu_Y = 2$ ,  $\sigma_X = 4$ ,  $\sigma_Y = 2$  and  $\rho = 0.5$ . What is the conditional variance of  $Y$  given that  $X = 10$ ?

- (a) 1.732   (b) 3   (c) 3.625   (d) 4   (e) 1.5

**Problem 10.** We throw a die five times. What is the conditional probability that the first throw gives 6 given that exactly three of the throws give 6?

- (a) 0.12   (b) 0.01   (c) 0.02   (d) 0.60   (e) 0.56

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

Studentnummer

Student number

Studieprogram

Study program

Inspektør

Inspector