

# MATH 254 – Final Exam – In-class part

due 31 March 2009

You must show all your work to receive full credit. You may use a calculator or Excel for routine calculations. However, your written work should make clear what calculations Excel or your calculator is performing. The total number of points on this test is 100. GOOD LUCK!

1) A professor decides to assign grades to his class “on a curve”. What exactly does this mean? The professor determines the mean  $\mu$  and the standard deviation  $\sigma$  of the raw scores, numbers which are between 0 and 100. The raw scores are:

72, 75, 77, 80, 81, 82, 83, 84, 85, 86, 87, 88

The professor decides to assign grades via the following chart, where  $x$  is the raw score:

$A$	$x > \mu + \frac{3}{2}\sigma$
$B$	$\mu + \frac{1}{2}\sigma < x \leq \mu + \frac{3}{2}\sigma$
$C$	$\mu - \frac{1}{2}\sigma < x \leq \mu + \frac{1}{2}\sigma$
$D$	$\mu - \frac{3}{2}\sigma < x \leq \mu - \frac{1}{2}\sigma$
$F$	$x \leq \mu - \frac{3}{2}\sigma$

a) Under this paradigm, determine what letter grade gets assigned to each raw score.

b) What is your opinion about assigning grades in this way?

2) Consider the data set

17, 34, 12, 23, 16, 31, 98, 21, 41.

- a) Find the five-number summary for this data set
- b) Apply the “ $1.5 \times \text{IQR}$ ” rule to this data set. What do you conclude?

3) Assume the length of human pregnancy is normally distributed with mean 266 days and standard deviation 16 days.

- a) What percent of pregnancies last longer than 250 days?
- b) How long do the shortest 25% of pregnancies last?

4) Data were collected to see the relationship between the amount of TV that students watched and their grade-point average (GPA). The equation for the regression line for these data was found to be

$$y = \frac{13 - x}{3},$$

where  $x$  is the number of hours of TV watched per day and  $y$  is the GPA (measured on a scale from 0 to 4).

- a) According to this model, if a student watches 5 hours of TV per day, what is his/her GPA?
- b) Within the context of this model, give an interpretation of the slope.
- c) Within the context of this model, give an interpretation of the intercept.
- d) Are there any limitations of this model? Explain.

5) Suppose that there is a 0.125 percent probability that babies born in the United States have Down's Syndrome. In your own words, what does this mean?

6) The issue of whether or not to grant benefits to unmarried domestic partners needs to be decided by a committee of three people. The committee is selected randomly and each member of the committee votes independently. Suppose that 40% of the population is in favor of granting benefits to unmarried domestic partners. What is the probability that a majority of the committee votes in favor of granting the benefits?

7) We define a game as follows. You roll a fair, standard die. If the die shows a 1 or a 2, you lose \$3. If the die shows a 3, you win \$2. Otherwise, you win \$1. On average, how much money do you win or lose per play of this game?

8) All people are either male or female and some people have at least one tattoo. Suppose that 51% percent of the people are female, that 15% of the people have at least one tattoo, and that 6% of the people are tattooed females.

- a) Find the probability that a randomly chosen person is a tattooed male.
- b) Find the probability that a person is male, given that he/she is tattooed.
- c) Are the events “person is tattooed” and “person is male” independent? Explain.

9) Suppose that 40% of the population has gone skiing or snowboarding at least once. We select a sample of 30 people. What is the probability that 20 people in this sample have gone skiing or snowboarding at least once?