

# Math 153 - Quiz 7

October 22, 2015

Name key

Score \_\_\_\_\_

Show all work to receive full credit. Supply explanations when necessary.

1. (10 points) The lifetime risk of developing pancreatic cancer is about one in 78 (1.28%). Suppose we randomly select 200 people. Let  $x$  represent the number of people who will develop pancreatic cancer.

- (a) What is the probability distribution for  $x$ ?

THE DISTRIBUTION IS BINOMIAL WITH  $n = 200$  &  
 $p = \frac{1}{78}$

- (b) Compute the mean and standard deviation of the distribution of  $x$ ?

$$\mu = (200)\left(\frac{1}{78}\right) \approx 2.56 \quad \sigma = \sqrt{(200)\left(\frac{1}{78}\right)\left(\frac{77}{78}\right)} \approx 1.59$$

- (c) In a sample of 200, what would be an unusually large number of people who develop pancreatic cancer? What would be an unusually small number?

$$\mu + 2\sigma \approx 5.74 \quad \mu - 2\sigma \approx -0.62$$

$\Rightarrow$  6 or more is unusual  $\Rightarrow$  No unusually small numbers

- (d) In the sample of 200, what is the probability that at most eight develop pancreatic cancer?

$$P(X \leq 8) = \text{binomcdf}(200, \frac{1}{78}, 8) \approx 0.9988$$

- (e) Is it more likely that five people or six people develop pancreatic cancer?  $\leftarrow$  We should expect this because 5 is closer to mean.

$$P(X=5) = \text{binompdf}(200, \frac{1}{78}, 5) \approx 0.0709 \quad P(X=6) = \text{binompdf}(200, \frac{1}{78}, 6) \approx 0.0299$$

- (f) In the sample of 200, what is the probability that no fewer than ten develop pancreatic cancer?

$$P(X \geq 10) = 1 - \text{binomcdf}(200, \frac{1}{78}, 9) \approx 0.0003$$

Very unlikely!