§**1.** Let X be normal with mean $\mu_X = 0$ and $\sigma_X = 2$. What is the probability X is less than 0.5?

(a) 1 (b) 2 (c) 3 (d) 4 (e) 5

§**2.** Suppose I roll a fair six-sided die 150 times. (whew!) Let X be the number of times I rolled a 6. Which is a good estimate of $P(X > 30)$? (Z is a standardized normal random variable.)

(a) $P(Z \geq \frac{29.5-25}{20.83})$

(b) $P(Z \geq \frac{29.5-25}{4.56})$

(c) $P(Z \geq \frac{30.5-25}{4.56})$

(d) $P(Z \geq \frac{30-25}{20.83})$

(e) $P(Z \geq \frac{30-3}{2.48/\sqrt{150}})$

§**3.** Consider the function

$$f(x) = \begin{cases} \frac{2}{9}x, & \text{if } 0 \le x \le c \\ 0, & \text{otherwise} \end{cases}$$

(1) What value of c makes f a probability density function?

(a) 2 (b) 1 (c) $\sqrt{2}$ (d) 3 (e) $9/2$

(2) Using the value of c you found in the previous question, let X be a random variable having f as its probability density function. What is the mean of X?

(a) 1 (b) 1.5 (c) 2 (d) 2.5 (e) 0.5

(3) What is the standard deviation of X?

(a) $1/\sqrt{2}$ (b) $3/4$ (c) 1 (d) $\sqrt{2}$ (e) $\sqrt{c}$

§**4.** Voter turnout is usually lower for mid-term elections. We wish to see if the percentage of young voters (18–29 years old) in South Bend is different from the population as a whole. We sample a randomly selected group of young people and a group from the population at large.

(1) Which test statistic is appropriate for this task?

(a) $(X - \mu)/\sigma$

(b) $\bar{x}$

(c) $\hat{p}$

(d) $\bar{x}_1 - \bar{x}_2$

(e) $\hat{p}_1 - \hat{p}_2$

(2) Suppose both samples are the same size n. How large should n be if we want to be within 3% of the true value 90% of the time?

(a) 30

(b) 752

(c) 1504

(d) 925

(e) not enough information

(3) We did the survey, but we couldn't get as many samples as we wished. Which expression below gives a 90% confidence interval for the data below?[1]

	Young People	At Large
surveyed	257	313
voted	83	94

(a) $0.31 \pm (1.645)(0.019)$

(b) $0.31 \pm (1.96)(0.019)$

(c) $0.023 \pm (1.645)(0.039)$

(d) $0.023 \pm (1.645)(0.019)$

(e) $0.5 \pm (1.285)(83 + 94)/(\sqrt{257 + 313})$

[1]This data is made up. I don't know how many young people voted in last Tuesday's election.

§**5.** (Short Answer) A packaging machine fills boxes of nails by weight. Each box should be 5 pounds. We take a sample of 50 boxes and find the average weight per box is 4.89 pounds, with a standard deviation of 0.3 pounds. What is a 95% confidence interval for the average weight of boxes filled by the machine?

Using the 95% confidence interval can you conclude whether the machine is working correctly? Why or why not?

§**6.** (Short Answer) In Toronto I took a streetcar to work everyday. If the streetcar comes every 10 minutes, then the amount of time I need to wait is uniformly distributed between 0 and 10. Let T be the amount of time I spent waiting for the streetcar over 60 trips.

(1) What is the approximate distribution of T? Justify your answer.

(2) What is the mean of T?

(3) What is the standard deviation of T?