REVIEW (EXAM III)
(sections 4.1-4.2, 5.1-5.2)

1. The random variable x represents the number of final exams that a college junior will need to take during Fall semester their junior year along with the corresponding probabilities:

x	0	1	2	3	4	5
P(x)	0.02	0.07	0.13	0.35	0.30	0. 13

Verify that this is a probability distribution.
Find the mean and standard deviation for the random variable.

2. 1,500 raffle tickets are sold at 3$ each for 4 prizes valued at $1,000, $750, $500, and $200. You buy one ticket. What is the expected value of your gain/loss.

3. State whether the variable is discrete or continuous:
   a) the blood pressures of a group of students an hour before their exam
   b) the temperature in degrees Fahrenheit on December 25th in Los Angeles
   c) the number of goals scored in a soccer game
   d) the number of phone calls to the math dept. on a given day
   e) the height of a player on a basketball team

4. Decide whether the experiment is binomial experiment. If it is not, explain why.
   a) You observe the gender of 70 kindergarteners at a local elementary school. The random variable represents the number of boys.
   b) You roll a die 800 times. The random variable represents the number that appears on each roll of the die.
   c) The local news station is conducting a survey asking 500 households "How many times have you used any form of public transportation within the last 2 years"?
   d) Each day, Sam plays a computer game in which he has a 42% chance of winning. The random variable is the number of times Sam wins in 100 days.

5. A card is selected from a standard deck and replaced. This experiment is repeated 6 times. Identify a trial, a success, and a failure. Identify n, p, q, and x. Create a binomial probability distribution for the number of hearts that you draw (from 6 trials). Find the probability of selecting exactly 3 hearts.

6. A test consists of 20 true or false questions. To get an A, you must answer at least 18 questions correctly. If you guess on each question, what is the probability that you will get an A?

7. The probability that an individual is left-handed is 0.11. In a class of 50 students, find the probability of finding 6 left-handed students.

8. A card is selected from a standard deck and replaced. This experiment is repeated 6 times.
a) Create a binomial probability distribution for the number of hearts that you draw (from 6 trials).
b) Find the probability of selecting: i) exactly 4 hearts, ii) at least 4 hearts.

Find the mean and standard deviation.

9. You take exam that consists of 12 multiple-choice questions. Each questions has 6 possible answers, and only one answer is correct. You will randomly guess the answer to each question. Find the probability that you answer:
a) 5 questions correctly,
b) less than 3 questions correctly.

10. The probability that an individual is left-handed is 0.11. In a class of 30 students, find the probability of finding 3 left-handed students.
Find the mean and standard deviation.

11. One in four adults is currently on a diet. In a random sample of seven adults, what is the probability that the number currently on a diet is:
a) exactly three   b) at least six

12. Use the Standard Normal Table to find the indicated probabilities:
a) $P(z < 1.28)$ b) $P(z > -0.74)$ c) $P(-2.15 < z < 1.55)$
d) $P(z < -1.5 \text{ or } z > 1.74)$

13. IQ test scores are normally distributed with a mean of 100 and a standard deviation of Find the probability that a randomly selected person has an IQ score:
a) less than 90
b) between 97 and 118
c) greater than 125.

14. According to the U.S. National Center for Health Statistics, the distribution of cholesterol levels in teenage boys is approximately normally distributed with a mean of 170, and a standard deviation of 30. Levels above 200 need attention. Find the probability that a teenage boy has a cholesterol level:
a) greater than 200
b) less than 120.

15.The lengths of pregnancies of humans are normally distributed with
$\mu = 268 \text{ days and } \sigma = 15 \text{ days}$. A baby is premature if it is born three weeks early.
a) What percent of babies are born prematurely?
b) Out of 50 pregnancies, how many would you expect to last less than 250 days?
c) Out of 85 pregnancies, how many would you expect to last between 250 and 270 days?

16. Find the z-score for which 92% of the distribution's area lies between –z and z.

17. Find the z-score for which 70% of the distribution's area lies to its right?

18. For the standard normal curve, find the z-score that corresponds to the a) 7th percentile, b) 98th percentile.

19. Assume that the salaries of elementary school teachers in the U.S. are normally distributed with a mean of $36,000 and a standard deviation of $3,800. What is the cutoff salary for teachers in the top 10%.

20. A tire company finds the lifespan for one brand of its tires is normally distributed with a mean if 47,500 miles and a standard deviation of 3,000 miles. If the manufacturer is willing to replace no more than 10% of the tires, what should be the approximate number of miles for the warranty?

21. The body temperatures of adults are normally distributed with a mean of 98.6^{o} F and a standard deviation of 0.44^{o} F. Find the temperature that would correspond to z=1.75. What percentage of adults will have the temperature higher than the value that corresponds to z=1.75?

22. In a survey of men in the U.S. (ages 20-29), the mean height was 69.9 inches with a standard deviation of 3.0 inches.
   a) What height represents the 87th percentile?
   b) If 350 men are randomly selected, about how many would have a height greater than 76 in?

SOLUTIONS:

1. $0 \le P(x) \le 1 \ and \ \sum P(x) = 1$
   $\mu = 3.23 \approx 3.2$
   $\sigma = 1.18 \approx 1.2$

2. expected value $= \mu = -1.36\$$
   You can expect to lose an average
   Of $1.36 for each ticket you buy.

3. a) continuous
   b) continuous
   c) discrete
   d) discrete
   e) continuous

4. a) binomial
   b) not binomial (more than 2 outcomes)
   c) not binomial (more than 2 outcomes)
   d) binomial

5. trial: drawing a card with replacement
   success: card drawn is a heart
   not success: card drawn is not a heart
   n=6, p=0.25, q=0.75, x=0,1,2,3,4,5,6

x	0	1	2	3	4	5	6
P(x)	0.1780	0.3560	0.2966	0.1318	0.0330	0.0044	0.0002

   P(3) = 0.1318

6. 0.0002 (or 0.02%)

7. $P(6) = {}_{50}C_6(0.11)^6(0.89)^{44} = 0.167$

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P(x)	0.1780	0.3560	0.2966	0.1318	0.0330	0.0044	0.0002

   P(4) = 0.0330, P(at least 4)=0.0376
   $\mu = 1.5, \sigma = 1.06$

9. a) 0.0284   b) 0.67743   10. 0.2324 $\mu = 3.3, \sigma = 1.71$
11. .a) 0.173 , b) 0.00134   12. a) 0.8997, b) 0.7704,   c) 0.9236 ,   d) 0.1077
13. a) 0.2514, b) 0.4642, c) 0.0475
14. a) 0.1587   b) 0.0475
15. a) 8.08%   b) about 6   c) about 37   16. (-1.75,1.75)   17. –0.52
18. a) –1. 48   b) 2.05   19. $40,864   20. 43,660
21. 99.37 degrees, 4.01%   22. a) 73.29 in   b) about 7