CHAPTER 6 REVIEW FOR QUIZ NAME: Key

2016

The Binomial Probability Distribution and Related Topics

1. Give an example of a discrete random variable.
   a) The number of inches of rainfall in a county
   b) The number of beverages sold at a lemonade stand
   c) The number of gallons of concrete used at a construction site
   d) The time required for a runner to finish a marathon
   e) The temperature of a pot roast cooking in an oven

2. Give an example of a continuous random variable.
   a) The number of fish caught by a fishing boat
   b) The number of coins contained in a slot machine
   c) The number of traffic accidents in a city
   d) The number of gallons of water in a reservoir
   e) The number of tables sold at a furniture store

3. Determine whether the following distribution is a valid probability distribution or not.

x	0	1	2
$P(x)$	0.25	0.62	0.13

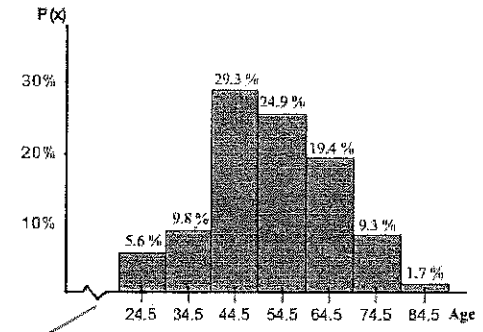
   a) yes
   b) no

4. You can use the random number table to simulate outcomes from a given discrete probability distribution. Jose plays basketball and has probability 0.2 of making a free-throw shot. Let x be the random variable that counts the number of successful shots out of 10 attempts. Consider the digits 0 through 9 of the random number table. Since Jose has a 20% chance of making a shot, assign the digits 0 through 1 to "making a basket from the free-throw line" and the digits 2 through 9 to "missing the shot." Do 20% of possible digits 0 through 9 represent "making a basket"?
   a) no
   b) yes

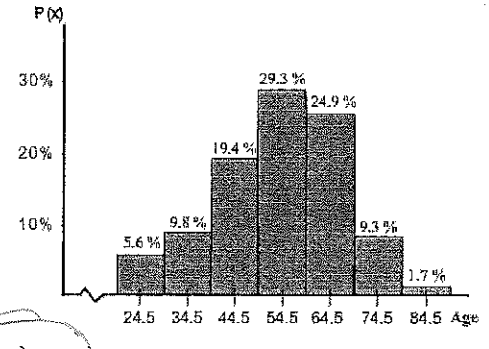
5. Assume that the table below shows the age distribution of nurses in Great Britain in 1851. Make a histogram for the probability distribution.

Age range (yr)	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 +
Midpoint (x)	24.5	34.5	44.5	54.5	64.5	75.5	84.5
Percent of nurses	5.6 %	9.8 %	19.4 %	24.9 %	29.3 %	9.3 %	1.7 %

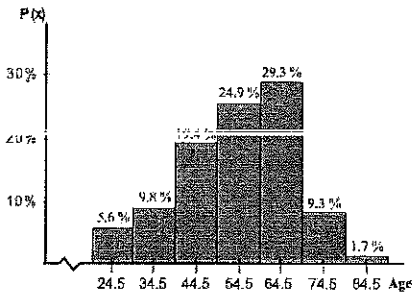
a)



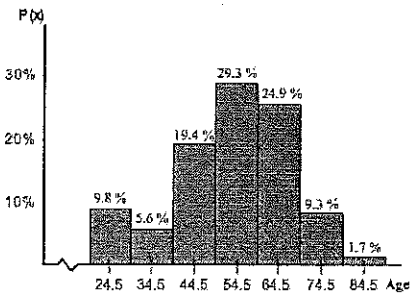
b)



c)



d)



6. What was the age distribution of nurses in Great Britain at the time of Florence Nightingale? Thanks to Florence Nightingale and the British census of 1851, we have the following information (based on data from classic text Notes on Nursing, by Florence Nightingale). *Note:* In 1851 there were 25,466 nurses in Great Britain. Furthermore, Nightingale made a strict distinction between nurses and domestic servants. Find the probability that a British nurse selected at random in 1851 would be 60 years of age or older. Round your answer to nearest thousandth.

Age range (yr)	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 +
Midpoint (x)	24.5	34.5	44.5	54.5	64.5	75.5	84.5
Percent of nurses	5.7%	9.7%	19.5%	29.2%	25.0%	9.1%	1.8%

a) 0.250
b) ~~0.159~~
c) 0.359
d) 0.341
e) 0.358

.25
.091
.018
.359

7. Compute the expected age μ of a British nurse in 1851. Assume that the table below shows the age distribution of nurses in Great Britain in 1851. Round your answer to nearest hundredth.

Age range (yr)	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 +
Midpoint (x)	24.5	34.5	44.5	54.5	64.5	75.5	84.5
Percent of nurses	5.6%	9.7%	19.6%	29.2%	24.9%	9.0%	2.0%

8. Compute the standard deviation σ for ages of British nurses in 1851. Assume that the table above shows the age distribution of nurses in Great Britain in 1851. Round your answer to nearest hundredth.

Midpoint (x)	P(x)	xP(x)	x - μ	$(x - \mu)^2$	$(x - \mu)^2 P(x)$
24.5	.056	1.37	-29.4	864.36	48.40
34.5	.097	3.35	-19.4	376.36	36.51
44.5	.196	8.72	-9.4	88.36	17.32
54.5	.292	15.91	0.6	.36	0.11
64.5	.249	16.06	10.6	112.36	27.98
75.5	.09	6.80	21.6	466.56	41.99
84.5	.02	1.69	30.6	936.36	18.73

7. μ: 53.9 $\quad \mu = \Sigma x P(x) = 53.9$ $\quad \sigma = \sqrt{\Sigma (x-\mu)^2 P(x)}$

$\sqrt{191.04}$

9. σ: 13.82

9. Jim has a 5-year-old car in reasonably good condition. He wants to take out a $40,000 term (that is, accident benefit) car insurance policy until the car is 10 years old. Assume that the probability of a car having an accident in the year in which it is x years old is as follows:

x = age	5	6	7	8	9
P (accident)	0.01182	0.01282	0.01386	0.01513	0.01602

Jim is applying to a car insurance company for his car insurance policy. Using the probabilities that the car will have an accident in its 5th, 6th, 7th, 8th, or 9th year, and the $40,000 accident benefit, what is the expected loss to Car Insurance Company for the respective years? Round your answers to the nearest dollar.

a) $473, $513, $554, $605, $641
b) $463, $513, $554, $595, $641
c) $473, $518, $554, $595, $641
d) $463, $518, $554, $605, $641
e) $473, $513, $554, $595, $641

473, 513, 554, 605

10. Jim has a 5-year-old car in reasonably good condition. He wants to take out a $20,000 term (that is, accident benefit) car insurance policy until the car is 10 years old. Assume that the probability of a car having an accident in the year in which it is x years old is as follows:

x = age	5	6	7	8	9
P (accident)	0.01182	0.01282	0.01386	0.1602	0.01513

Jim is applying to a car insurance company for his term insurance policy. What would be the total expected loss to the insurance company over the years 5 through 9? Round your answer to the nearest dollar.

a) $4274
b) $4267
c) $4272
d) $4277
e) $4270

20,000 · .01182 = 236.4
20,000 · .01282 = 256.4
20,000 · .01386 = 277.2
20,000 · .1602 = 3204
20,000 · .01513 = 302.6

11. What does it mean to say that the trials of an experiment are independent?

a) The trials of an experiment are independent if they have the same probability of success.
b) The trials of an experiment are independent if they do not have the same probability of success.
c) The trials of an experiment are independent if they have probability zero.
d) The trials of an experiment are independent if the outcome of one trial does not affect the probability of success on another trial.
e) The trials of an experiment are independent if the outcome of one trial affects the probability of success on another trial.

12. Suppose in a carnival game, there are ten identical boxes, one of which contains a prize. A contestant wins the prize by selecting the box containing it. Before each game, the old prize is removed and another prize is placed at random in one of the ten boxes. What values of n, r, and p of a binomial probability distribution do you use to find the probability that a contestant who plays the game six times wins exactly three times? Round p to two decimal places if necessary.

a) $n = 3$; $r = 10$; $p = 0.1$
b) $n = 6$; $r = 3$; $p = 0.1$
c) $n = 10$; $r = 3$; $p = 0.5$
d) $n = 3$; $r = 10$; $p = 0.5$
e) $n = 6$; $r = 3$; $p = 0.17$

n = 6 r = 3 p = .1

13. Richard has been given a 6-question multiple-choice quiz in his history class. Each question has three answers, of which only one is correct. Since Richard has not attended the class recently, he doesn't know any of the answers. What is considered the success?

a) number of questions
b) Richard answers a question correctly.
c) number of questions answered
d) Richard is unable to answer a question correctly.
e) none of the choices

14. Richard has been given a 7-question multiple-choice quiz in his history class. Each question has five answers, of which only one is correct. Since Richard has not attended the class recently, he doesn't know any of the answers. What is considered the failure?

a) number of questions
b) Richard answers a question correctly.
c) number of questions Richard is unable to answer
d) Richard is unable to answer a question correctly.
e) none of the choices

$p = \frac{1}{5} = .2$

$q = \frac{4}{5} = .8$

15. Richard has been given a 6-question multiple-choice quiz in his history class. Each question has three answers, of which only one is correct. Since Richard has not attended the class recently, he doesn't know any of the answers. What is the value of n?

a) 0.5
b) 6.0
c) 3.0
d) 18.0
e) 2.0

16. Richard has been given a 5-question multiple-choice quiz in his history class. Each question has four answers, of which only one is correct. Since Richard has not attended the class recently, he doesn't know any of the answers. The success occurs if Richard answers a question correctly and the failure occurs if Richard is unable to answer a question correctly. Assuming that Richard guesses on all 5 questions, find the probability that he will answer all questions incorrectly? Round your answer to the nearest thousandth.

a) 0.750
b) 0.237
c) 0.410
d) 0.800
e) 0.500

$n = 5$

$p = 1/4$

$r = 0$

17. Richard has been given a 5-question multiple-choice quiz in his history class. Each question has five answers, of which only one is correct. Since Richard has not attended the class recently, he doesn't know any of the answers. The success occurs if Richard answers a question correctly and the failure occurs if Richard is unable to answer a question correctly. Assuming that Richard guesses on all 5 questions, find the probability that he will answer at least 4 questions correctly? Round your answer to the nearest thousandth.

a) 0.006
b) 0.500
c) 0.800
d) 0.160

$n = 5$

$p = \frac{1}{5} = .2$

$r = 4$