Statistics (I) Midterm -Date: November-20-20117

姓名 : **113**

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1. For the following description, classify each variable as qualitative (Q) or numerical (N). (ch1,#19-23.26,p.34)
   a. (Q) Marital status of nurses in a hospital.
   b. (N) Time it takes 10 people to complete a New York Times crossword puzzle.
   c. (N) Weights of lobsters in a tank in a restaurant.
   d. (~~) Colors of automobiles in a shopping center parking lot.~~
   e. (N) Amount of garbage (in pounds) discarded by residents of a high-rise apartment complex.
   f. (Q) The different species of fish sold by a pet shop store.

   5   ±0

2. The frequency distribution shows the waiting times (in minutes) for 50 patients at a walk-in medical facility. Is the distribution skewed? How many patients waited longer than 30 minutes? (ch3,#12,p.67)
   a. Find the class boundary, class midpoint, and cumulative frequency for each group. 6
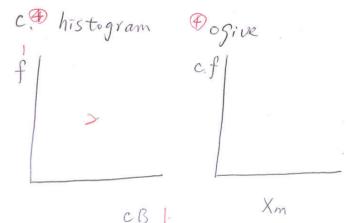   b. Draw the histogram and ogive for the data set. 3 0
   c. Find the population mean and standard deviation of the data.

   22

Class limits	Class boundary	Class midpoint	Frequency	
21-25	20.5->25.5	23	12	12
26-30	25.5-30.5	28	14	26
31-35	30.5-35.5	33	18	44
36-40	35.5-40.5	38	4	48
41-45	40.5-45.5	43	2	50

a,   2   2   2

b. >4 人 (>)

e.
(3) $\mu = 30$

$\sigma^2 = \dfrac{1400}{50} = 428 \times 8$

$\Rightarrow \sigma = \sqrt{428} = 30.69$
5.39

c. ① histogram   ④ ogive

f   c.f

CB | Xm

3. The ages of 20 dogs in a pet shelter are shown. One would like to construct a frequency distribution. (ch2,#16,p.52).
   a. b. Use $2^k \geq n$ to find the number of groups.
   c. Find the **range** of the data and **class width.**
   d. Establish the frequency distribution of the data.
      (Use the smallest data value as the lowest class limit).

5	8	7	6	3	7	12	7	②	13
9	2	12	5	11	3	5	⑮	4	9

$2^5 \geq 20 \Rightarrow k = 5$

Range $= 15 - 2 = 13$

$W = 13/5 = 2.\checkmark$

取 $W = 3$

Class limits	Class boundary	Class midpoint	Frequency
2 - 4			
5 - 67			
8 - 10			
11 - 13			
14 - 1516			

4. An investor calculated these percentages of each of three stock investments with payoffs as shown. Find the average payoff. Use the weighted mean. (ch3,#6,179)

Stock	Percent	Payoff
A	30	$10,000
B	50	3,000
C	20	1,000
	100	

$$\bar{X}_W = \Sigma W_i X_i$$
$$= 4700$$

5. The data show the number of public libraries in a sample of eight states. (ch3,#ex3-6,p.116)
   a. Find the sample mean, median, and variance.
   b. Find the quartiles and IQR.
   c. Is there any outliners?
   d. Find the 60th percentile.
   e. Find the percentile rank of the value of 101.

114 77 21 101 311 77 159 382

21 77 81 101 115 145 159 381

b. Q_1 Me Q_3
      79   108   152.

a. $\bar{X} = 135$

$S^2 = 11717.7$

Me = 108

Outlier = 382.

b. $Q_1 = 79$

$Q_3 = 152$

IQR = 73.

c. $\begin{cases} Q_1 - 1.5 \times IQR \leq 0 = -30.5 \\ Q_3 + 1.5 \times IQR = 261.5 \end{cases}$ ⟹ outlier ⟹ 381

d. $P_{60} \Rightarrow c = 8 \times 0.6 = 4.8 \approx 5$

$P_{60} = X_{(5)} = 115$

e. $\dfrac{(\# \text{ of values below } 101) + 0.5}{n} \times 100\%$

$= \dfrac{3.5}{8} \times 100 = 43.75\%$

6. For a certain type of job, it costs a company an average of $231 to train an employee to perform the task. The standard deviation is $5. Use Chebyshev's theorem. (ch3,#18,p.180)
   a. Find the minimum percentage of data values that will fall in the range of $219 to $243.
   b. Find the range in which at least 88.89% of the data will lie.

a. $\begin{cases} 219 = 231 - K \times 5 \\ 243 = 231 + K \cdot 5 \end{cases}$

⟹ $K = 2.4$

$1 - \dfrac{1}{K^2} = 0.826 = 82.6\%$

b. $K = 3$

$231 - 3K = 216$
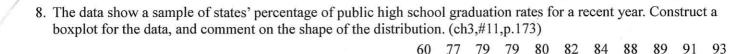$231 + 3K = 246$

⟹ $(216, 246)$

7. Marriage Ages In a recent study, the mean age at which men get married is said to be 32.2 years with a standard deviation of 4 years. The mean age at which women marry is 30.0 years with a standard deviation of 2.4 years. Find the relative positions for a man who marries at age 30 and a woman who marries at age 27. (ch3,#ex3-28,p.149)

$Z_M = \dfrac{X - \mu}{\sigma}$ $Z_F = \dfrac{27 - 30}{2.4}$

$= -0.55$ $= -1.25$

8. The data show a sample of states' percentage of public high school graduation rates for a recent year. Construct a boxplot for the data, and comment on the shape of the distribution. (ch3,#11,p.173)

$$60 \quad 77 \quad 79 \quad 79 \quad 80 \quad 82 \quad 84 \quad 88 \quad 89 \quad 91 \quad 93$$

$$\uparrow Q_1 \qquad \overline{?} \; Me \qquad \uparrow Q_3$$

有 outlier

5

$$IQR = 10$$

$$79 - 1.5 \times 10 = 64$$

$$\Rightarrow 89 + 1.5 \times 10 = 104$$

9. The mean speed for the five fastest wooden roller coasters is 69.16 miles per hour, and the variance is 19.76. The mean for the five tallest roller coasters is 177.80 feet, and the variance is 157.70. Compare the variations of the two data sets. (ch3,#ex3-24,p.138)

$$CV_s = \frac{S}{\overline{X}} \times 100\%$$

$$CV_t = \frac{S}{\overline{X}} = \frac{\sqrt{157.7}}{177.8} \times 100\%$$

$$= \frac{\sqrt{19.76}}{69.16} \times 100\%$$

$$= 7.1\%$$

$$\Rightarrow \text{more var.}$$

$$= 6.4\%$$

$$CV_t > CV_s \Rightarrow$$

10. Of a company's mailings 1.5% are returned because of incorrect or incomplete addresses. In a mailing of 200 pieces, find the probability (a) none will be returned, (b) exactly one piece will be returned. (§5-4,#13,p.299)

$$\lambda = 200 \times 1.5\% = 3$$

$$e = 2.718.$$

(a) $$P(X=0) = \frac{e^{-\lambda} \cdot \lambda^x}{0!}$$

(b) $$P(X=1) = \frac{e^{-\lambda} \cdot \lambda^x}{1!} = \frac{e^{-3} \cdot 3^1}{1!}$$

$$= 0.0498$$

$$= 0.149.$$

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11. Computer Help Hot Line receives, on average, 5 calls per hour asking for assistance. The distribution is Poisson. For any randomly selected hour, find the probability that the company will receive (§5-4,#27,p.306)
   a. Exactly 5 calls
   b. At most 4 calls
   c. 30 min

(a)

$$P(X=5) = \frac{e^{-4} \cdot 4^5}{5!}$$

$$P(X \le 4) = P(0) + P(1) + P(2) + \cdots + P(4)$$

(b) two $\lambda' = 0.5x = 2$

$$P(X=5) = \frac{e^{-\lambda} \cdot \lambda^x}{5!}$$

$$= 0.1954$$

$$0.156.$$

$$= 0.629$$

$$= \frac{e^{-2} \cdot 2^5}{5!}$$

$$= 0.0668$$

$$= 0.036.$$

12. A survey found that 10% of Americans believe that they have seen a UFO. For a sample of 6 people, find each probability: (a) None believe that they have seen a UFO.   (§5-3,#7,p.283)
    (b) Exactly one person believes that he or she has seen a UFO.
    (c) At least 2 people believe that they have seen a UFO.

$n = 6. \quad p = 10\%$

(a) $P(X=0) = C_0^6 \; 0.1^0 \times 0.9^6$

$= 0.531$

(b) $P(X=1) = C_1^6 \times 0.1 \times 0.9^5$

$= 0.354$

(c) $P(X \geq 2) = 1 - P(X=0) - P(X=1)$

$= 0.115$

13. Which of the following description are binomial experiments or can be reduced to binomial experiments?
                                                    (§5-3,#1 &#2, p.282)

   a. Surveying 100 people to determine if they like Sudsy Soap
   b. Drawing a card with replacement from a deck and getting a heart
   c. Testing four different brands of aspirin to see which brands are effective
   d. Testing one brand of aspirin by using 10 people to determine whether it is effective

   a. Yes,   Ans → Y, N

   b. Y,   a heart,   not a heart

   c. N,   Brand.

   d. Yes,   effective or non-effective

14. Find the area under the standard normal distribution curve. (ch6,#21,23,p.323)
    a. To the left of z = 1.12   b. To the right of z = −0.18

    0.8686   1 − 0.4286

                                        = 0.5714

1.12

1.12   −0.18