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BIRZEIT UNIVERSITY
MATHEMATICS DEPARTMENT
Stat236 Summer I 2015

MIDTERM TEST

Time: 90 minutes

- Name... ~~XXXXXXXXXXXX~~ an
- Number... ~~XXXXXXXXXX~~ 3

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Formulas

Discrete Random Variable

$$E(X) = \mu = \sum x f(x)$$

$$Var(X) = \sum (x - \mu)^2 f(x)$$

Binomial Probability Distribution

$$P(x = x) = {}^n C_x p^x (1 - p)^{n-x}$$

$$E(X) = np, \sigma(X) = \sqrt{np(1 - p)}$$

Poisson Probability Distribution

$$f(x) = \frac{\mu^x e^{-\mu}}{x!}$$

Exponential Probability Distribution

$$f(x) = \frac{1}{\mu} e^{-\frac{x}{\mu}}$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B).$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)}.$$

Question 1. Circle the best answer.

1. The grade level (k-12) of a student is an example of a(an)..... scaled variable.

- a) nominal.
 قوس ✓ b) ordinal.
 c) interval.
 d) ratio.

2. If the correlation is -0.9 , then

- a) there is a strong positive linear relationship.
 b) there is a strong negative linear relationship.
 c) there is a weak positive linear relationship.
 d) there is a weak negative linear relationship.

(3,4,5) A survey in Birzeit University was conducted to determine the number of studying hours per a week. The stem-and-leaf display of the data is shown below

Stem	Leaves
0	5 7 8
1	0 2 5 6 7 9
2	0 1 1 1 3 7 8
3	0 5 6 7

3. The mode of the data is

- a) 2.
 b) 7.
 c) 27.
 d) 21.

5 7 8 10 12 15 16 17 19
 20 21 21 21 23 27 28
 30 35 36 37

4. The range is

- a) 3.
 b) 2.
 c) 31.
 d) 32.

Largest - Smallest

37 - 5

~~32~~ 19

5. What percentage of students who have spent more than 29 hours in study?

- a) 0%.
- b) 5%
- c) 20%.
- d) 25%.

6. If the coefficient of variation is 50% and the mean is 30, then the variance is

- a) 15.
- b) 225.
- c) 60.
- d) 3600.

$$\frac{S}{30} = 0.5$$

$$S = 15$$

$$S^2 =$$

$$\frac{SD}{X} = CV = 50$$

$$\frac{15/30}{1} = 50$$

7. A student gets quiz grades 60, 70, 75, 80. She gets 80 on her final exam. Find the weighted mean if the quizzes each count for 5% and the final counts for 80%

- a) 71.25.
- b) 72.
- c) 73.
- d) 78.25.

$$\bar{x} = \frac{\sum x w_i}{\sum w_i}$$

60	0.05	3
70	0.05	3.5
75	0.05	3.75
80	0.05	4
80	0.80	64
		78.25

(8,9) The following table shows the probability distribution for a discrete random variable X

X	1	2	3	4	5
P(x)	0.1	0.1	0.4	0.2	0.2

8. $E(x) =$

- a) 0.2.
- b) 3.
- c) 3.3
- d) None of the above

$$\mu = 0.1 \cdot 1 + 0.1 \cdot 2 + 0.4 \cdot 3 + 0.2 \cdot 4 + 0.2 \cdot 5$$

$$\mu = 3.3$$

$$\sum x f x$$

$$(x - \mu)^2 f x$$

9. $Var(X) =$

- a) 0.17.
- b) 1.19.
- c) 1.41
- d) None of the above.

~~$$0.081$$~~

$$0.529$$

$$0.169$$

$$0.036$$

$$0.098$$

$$1.$$

10. According to Chebyshev's rule, at least 65% of all observations in any data set are contained within a distance of how many standard deviations

- a) 1.5
- b) 1.7
- c) 2.5
- d) 2.8

$$1 - \frac{1}{z^2} = 0.65$$

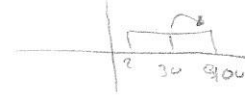
$$z(z-1) = 0.65 \quad z^2 - 1 = 0.65 z^2$$

(11,12) The weekly expenditure of a student at BZU is uniformly distributed from 200 NIS to 400 NIS. One student is randomly selected

11. Find the probability that the expenditure of the selected student is more than 350 NIS.

- a) 0.
- b) 0.25.
- c) 0.75.
- d) 50.

$$\frac{1}{200} (400 - 350)$$



12. The 85th percentile of the expenditure of a student of BZU is

- a) 170 NIS.
- b) 180 NIS.
- c) 370 NIS.
- d) 380 NIS.

$$\frac{1}{200} (k - x) = 0.85$$

$$\frac{1}{200} (k - 200) = 0.85$$

$$\frac{1}{b-a} (b-a)$$

$x < k$
 $k - x$

13. The time it takes a worker to complete a task is exponentially distributed with a mean of 8 minutes. What is the probability that it will take a worker between 6 and 10 minutes to complete the task?

- a) 0
- b) 0.19
- c) 0.51
- d) 1

$$\mu = 8$$

$$(6 < x < 10)$$

$$(x < 10) - (x < 6)$$

$$1 - e^{-\frac{x}{\mu}}$$

$$\left(1 - e^{-\frac{10}{8}}\right) - \left(1 - e^{-\frac{6}{8}}\right)$$

$$= 0.18$$

$$\approx 0.19$$

14. If events A and B cannot occur at the same time, then events A and B are said to be independent events *mutual exp* $(A \cap B) = 0$

a) True.

b) False.

15. The measure of variation that is influenced **most** by extreme values is the standard deviation

Range.

a) True.

b) False.

16. If electricity power failures occur according to a **Poisson distribution** with an average of 4 failures every month, the probability that there will not be more than one failure during a particular week

a) 0.0183.

b) 0.0916.

c) 0.3679.

d) 0.7357.

$$\frac{\mu^x e^{-\mu}}{x!}$$

$4 \rightarrow 1m \rightarrow 4.w$

τ

$4 \rightarrow$

$4w \ll e$

$4 \rightarrow$

$f(0) + f(1)$

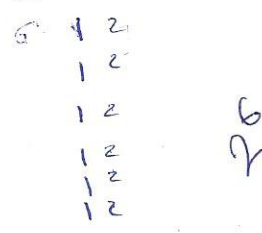
17. An experiment consists of tossing 6 coins successively. The number of sample points in this experiment is

a) 6.

b) 12.

c) 32.

d) 64.



18. Sixty percent of the students in a class of 80 are planning to go to the graduation ceremony. The variance of this **binomial distribution** is

a) 0.4.

b) 4.38

c) 19.2

d) 48

$\mu = np$

$V = np(1-p)$

$48(1-0.6)$

19. How many 4-digit numbers can be formed from the digits 2, 3, 4, 5, 6, 7 and 8, which are **odd without repeating**?

- a) 90.
- b) 120.
- c) 147.
- d) 196.

(

6 5 ~~7~~ 3

20. If $P(A) = 0.6$, $P(B) = 0.3$ and $P(A \cap B) = 0.18$, then events A and B are

- a) mutually exclusive.
- b) independent events.
- c) not independent events.
- d) can't tell.

$$P(A|B) \stackrel{?}{=} P(A)$$
$$\frac{P(A \cap B)}{P(B)} = 0.6 = 0.6$$
$$\frac{0.18}{0.3} = 0.6 = 0.6$$

21. In a left-skewed distribution

- a) the mean is larger than the median.
- b) the mean is smaller than the median.
- c) the mean and the median are equal.
- d) can't tell.

mean < med.

Question 2 A sample of 100 students at BZU was taken after their stat 236 final exam to ask them whether they did well or poorly on the final. The following table contains the results.

	Did Well in Final	Did Poorly in Final
Female	31	23
Male	34	12

A student selected randomly

a) What is the probability that this student is female?

$$P(F) = \frac{31 + 23}{100} = 0.54$$

b) What is the probability that this student is female and did poorly in the test?

$$P(F \cap P) = \frac{23}{100} = 0.23$$

c) What is the probability that this student is male or did well in the test?

$$P(M \cup D_{will}) = P(M) + P(D) - P(M \cap D) \\ = 0.46 + 0.65 - 0.34 = 0.77$$

d) If this student did well in the test, what is the probability she is female?

$$P(F|D) = \frac{P(F \cap D)}{P(D)} = \frac{0.31}{0.65} = 0.476$$

e) Are the two variables Gender and the student level independent? Why?

$$P(\text{Female} | \text{Did well}) \stackrel{?}{=} P(F)$$

$$\frac{P(F \cap D)}{P(D)}$$

$$= 0.476$$

\neq

$$0.54$$

~~Yes, they are~~

No.. they are Dependent..

Question 3. Stat236 grades are normally distributed with $\mu = 65$ and $\sigma = 10$.

a) How many students got less than 55, if the number of the enrolled students is 200

$$z = \frac{x - \mu}{\sigma} = \frac{55 - 65}{10} = -1$$

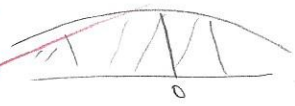
$$(x < 55) = (z < -1)$$

$$(z < -1) = 1 - (z < 1)$$

$$= 1 - 0.8413 = 0.1587$$

$$\text{how many} = 0.1587 \times 200 = 31.74$$

≈ 32



b) If a student is selected at random, what is the probability that he/she gets at least 90

$$(x \geq 90)$$

$$= (x > 2.5)$$

$$= 1 - (x \leq 2.5)$$

$$= 1 - 0.9938$$

$$= 0.0062 = 6.2 \times 10^{-3}$$

$$z = \frac{90 - 65}{10} = 2.5$$

c) Find $P_{0.67}$.

$$\% = 1 - \frac{1}{z^2} = 0.67$$

$x = ?$

$z = ?$

$$= z^2 - 1 = 0.67z^2$$

$$z(z-1) = 1.67$$

$$1.67 = \frac{x - 65}{10}$$

$$16.7 = x - 65$$

$$x = 81.7$$

$$z = \frac{x - \mu}{\sigma}$$

$$z_{45} = \frac{45 - 65}{10} = -2$$

$$z_{85} = \frac{85 - 65}{10} = 2$$

~~$x - 2\sigma$, $x + 2\sigma$~~

~~$(65 - 2(10))$, $65 + 2(10)$~~

~~$(45$, $85)$~~

$$P_{0.67} = 0.7486$$

normal = Empirical Rule

approximately 68% = 1SD

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