13. According to the empirical rule, approximately what percent of the data should lie within $\mu \pm 2\sigma$?
    a) 75%
    b) 68%
    c) 99.7%
    d) 95%
    e) None of the above answers is correct.

14. If the occurrence of one event means that another cannot happen, then the events are
    a) Independent
    b) Mutually exclusive
    c) Dependent
    d) Mutually inclusive
    e) None of the above answers is correct.

15. A listing of the possible outcomes of an experiment and their corresponding probability is called
    a) Random Variable
    b) Sample space
    c) Bayesian table
    d) Probability distribution
    e) None of the above answers is correct

16. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?
    a) 1/12
    b) 2/5
    c) 8/15
    d) 9/20
    e) None of the above answers is correct

17. If X is a continuous random variable, then function $f(X)$ is
    a) Distribution Function
    b) None of these
    c) Probability Density Function
    d) Probability Mass Function
    e) None of the above answers is correct

18. If X is a discrete random variable, the function $f(X)$ is
    a) None of these
    b) Distribution Function
    c) Density Function
    d) Probability Mass Function
    e) None of the above answers is correct

19. The speed of car is an example of
    a) None of these
    b) Absolute Variable
    c) Continuous Variable
    d) Discrete Variable
    e) None of the above answers is correct

20. Two events are said to be independent if
    a) The sum of their probability is zero
    b) Their intersection is less than 1
    c) The occurrence of one does not affect the other
    d) If the two events cannot occur at the same time
    e) None of the above answers is correct.

b) a population
c) influential statistics
d) descriptive statistics
e) None of the above answers is correct.

8. A statistics professor asked students in a class their ages. On the basis of this information, the professor states that the average age of all the students in the university is 21 years. This is an example of
   a) descriptive statistics
   b) sample
   c) an experiment
   d) inferential statistics
   e) None of the above answers is correct.

Exhibit 3
The following is the frequency distribution for the speeds of a sample of automobiles traveling on an interstate highway.

Speed (Miles per Hour)	Frequency
50 - 54	2
55 - 59	4
60 - 64	5
65 - 69	10
70 - 74	9
75 - 79	5

9. Refer to Exhibit 3. The mean is
   a) 35
   b) 10
   c) 670
   d) 67
   e) None of the above answers is correct.

10. Refer to Exhibit 3 The variance is
   a) 6.969
   b) 7.071
   c) 69.69
   d) 50.000
   e) None of the above answers is correct.

11. Which of the following would indicate that a dataset is not bell-shaped?
   a) The range is equal to 5 standard deviations.
   b) The standard deviation is equal to variance
   c) The range is larger than the interquartile range.
   d) The mean is much smaller than the median
   e) None of the above answers is correct

2. The mean of a distribution is 23, the median is 24, and the mode is 25.5 It is most likely that this distribution is:
   a) Positively Skewed
   b) Asymptotic
   c) Negatively Skewed
   d) Symmetrical
   e) None of the above answers is correct

underweight packages
0.001 and each fill is independent. What is the mean...

  a. 3000
  b. 2500
  c. 5200
  d. 500
  e. None of the above

29. From Q28, What is the standard deviation of the number of fills before the line is stopped?

  a. 17.3118
  b. 1731.18
  c. 150.013
  d. 231.900
  e. None of the above

30. Suppose X has a hypergeometric distribution with $N = 100$, $n = 4$, and $K = 20$. Determine $P(X = 1)$

  a. 0.4191
  b. 0.5000
  c. 0.2100
  d. 0.0300
  e. None of the above

$$\frac{\binom{K}{x}\binom{N-K}{n-x}}{\binom{N}{n}}$$

31. A lot of 75 washers contains 5 in which the variability in thickness around the circumference of the washer is unacceptable. A sample of 10 washers is selected at random, without replacement. What is the probability that none of the unacceptable washers is in the sample?

  a. 0.3150
  b. 0.5148
  c. 0.8260

7

$G = np$ $\frac{K}{H}$

f npq / n

13. Data collected directly from source for the purpose required is known as
    A. gathered data
    B. grouped data
    C. primary data.
    D. secondary data

14. An investment club has 200 members 137 of the members invest in either shares or bonds. 94 invest in shares and 73 in bonds. How many members invest in none of these financial investments?
    A. 0
    B. 30
    C. 50
    D. 63

15. What is the probability of a member who invests in only shares but not bonds in question 15.
    A. 0.150
    B. 0.215
    C. 0.320
    D. 0.535

16. A committee of four is selected randomly from a group consisting of 7 labour and 5 management representatives from an organization. How many different committees are possible?
    A. 495
    B. 595
    C. 11,880
    D. 20,736

17. Find the probability that the committee selected in question 16 includes two representatives each from labour and management.
    A. 0.010127
    B. 0.017677
    C. 0.352941
    D. 0.424242

Let x be a random variable with the probability mass function,

$$f(x) = \frac{7x - x^2}{56}, \text{ for } x = 1, 2, 3, 4, 5 \text{ and } 0, \text{ elsewhere Answer questions } 18 - 20.$$

18. What is/are the mode(s) for the given distribution?
    A. 3
    B. 4
    C. 2 and 4
    D. 3 and 4

19. Determine median and the expected value of x.
    A. 2 and 1.61 respectively
    B. 4 and 2.50 respectively
    C. 3 and 3.25 respectively
    D. 3 and 3.50 respectively

20. Compute the probability that x will exceed 2.
    A. $\frac{3}{28}$
    B. $\frac{2}{7}$
    C. $\frac{5}{7}$
    D. $\frac{25}{28}$

21. Let the random variable x have the moment generating function, $M_x(t) = \frac{e^t}{1-t^2}$, where $-1 < x < 1$. The mean and variance of x are
    A. 1 and 2 respectively
    B. 1 and 3 respectively
    C. 3 and 6 respectively
    D. 3 and 2 respectively

3

Maths

Section A

Answer all questions by circling the correct answers on the question paper and shade the letter
corresponding to the correct answer on the scannable sheet provided. Use the supplementary
sheets for rough work. Do not take any sheet out of the examination hall.

Each of the possible five outcomes of a random experiment is equally likely. The sample space is
{a,b,c,d,e}. Let A denote the event {a,b}, and let B denote the event {c,d,e}. Determine $P(A)$.
a. 0.2
b. 0.6
c. 0.4
d. 0.5
e. None of the above

A part selected for testing is equally likely to have been produced on any one of six cutting tools.
What is the probability that the part is not from tool 4?
a. 0.01
b. 0.12
c. 0.24
d. 0.83
e. None of the above

An injection-molded part is equally likely to be obtained from any one of the eight cavities on a mold.
What is the probability that a part is neither from cavity 3 nor 4?
a. 0.75
b. 0.50
c. 0.25
d. 0.23
e. None of the above

A sample is prepared for a chemical measurement. Several technicians, completed with a minor
error by 70%, and complete with a major by ... technician is selected randomly to complete the preparation, what is the probability that it is
completed with either a minor or a major error.
a. 0.25
b. 0.30
c. 0.61

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI
COLLEGE OF SCIENCE

B.Sc. (Engineering) Mid-Semester Examination, 2007
Third Year
MATH 353: STATISTICS

NAME: _Osafo Nsuani Ross_ INDEX NUMBER: _8033705_

PROGRAMME OF STUDY: _ELECTRICAL ENG_

Answer all questions on the question paper. Write down the answer where you think correct answer is not provided.
One Hour

1. The science of conducting studies to collect, summarize and analyze data as well drawing valid conclusions from the data is known as
   - A. Data Collection
   - B. Descriptive Analysis
   - C. Sample Survey
   - (D). Statistics

2. The following table gives the frequency distribution of average weekly expenditure (thousands of cedis) of a random sample 100 students at KNUST.

Expenditure (x)	58 - 62	63 - 67	68 – 72	73 – 77	78 - 82
Frequency (f)	15	X	10	y	10
fx	900	$65x$	700	$75y$	800

   Assuming that the mean is ¢70,750.00, find the values of x and y.
   - A. $x=10,\ y=55$
   - B. $x=20,\ y=45$ ✓
   - (C) $x=35;\ y=30$
   - D. $x=45,\ y=20$

3. Compute the standard deviation of the distribution in question 2, given that the sum of the data is 54,625.
   - A. 6.14081
   - B. 6.21085
   - C. 6.37868
   - (D) 6.41081

4. A system has two components placed in series so that the system fails if either of the two fails. The second component is twice as likely to fail as the first. If the two components operate independently and if the probability that the entire system fails is 0.28, then what is the probability that the second component fails?
   - A. 0.0933
   - B. 0.1000
   - (C.) 0.1867
   - D. 0.2000

5. A manufacturer of television tubes has two types of tubes, A and B with mean lifetimes of 1495 and 1875 hours and standard deviations, 280 and 310 hours respectively. Which of the following is correct?
   - A. Tube A has lesser relative measure of dispersion.
   - B. Tube B has lesser relative measure of dispersion
   - C. Tubes A and B have approximately equal relative measure of dispersion
   - (D) The data are given are insufficient for meaningful deduction

8. find $P(\bar{A}\cup B)$ $P(\bar{A}) + P(B)$ $P(\bar{A}\cap B)$ $P(\bar{A}\cap B)$

     a. 0.82 $0.18 + 0.67$ 0.10

     b. 0.90

     c. 0.96

     d. 0.45

     e. None of the above

Samples of emissions from three suppliers are classified for conformance to air quality specifications. The results from 100 samples are summarized as follows:

		Conforms		
		yes	no	A
	1	22	8	
Suppliers	2	25	5	
	3	30	10	

B

Let A denote the event that a sample is from supplier 1, and let B denote the event that a sample conforms to specifications. If a sample is selected at random.

9. find $P(\bar{A}\cup B)$ $= P(\bar{A}) + P(B) - P(\bar{A}\cap B)$

     a. 0.10 $0.7 + .77 - 0.55$

     b. 0.22

     c. 0.25

     d. 0.92

     e. None of the above

10. If $P(A) = 0.3$, $P(B) = 0.2$, and $P(A\cap B) = 0.1$, determine $P(A\cap B')$

     a. 0.52

     b. 0.13 $P(A\cap B') + P(A\cap B) = P(A)$

     c. 0.20

     d. 0.31

     e. None of the above

11. Computer keyboard failures are due to faulty electrical connects (12%) or mechanical defects (88%). Mechanical defects are related to loose keys (27%) or improper assembly (73%). Electrical connect defects are caused by defective wires (35%), improper connections (13%) or poorly welded wires (52%). Find the probability that a failure is due to loose keys

     a. 0.5021

     b. 0.2376

     c. 0.0320

     d. 0.3246

     e. None of the above

12. From Q11, find the probability that a failure is due to improperly connected or poorly soldered wires

     a. 0.078

     b. 0.003

21. Let X denote the number of bits received in error in a digital communication channel, and assume that X is a binomial random variable with $p = 0.001$. If 1000 bits are transmitted, determine $P(X \geq 1)$

   a. 0.6319
   b. 0.9198
   c. 0.0023
   d. 0.4182
   e. None of the above

22. An electronic product contains 0 integrated circuits. The probability that any integrated cir defective is 0.01, and the integ ed circuits are independent. The product operates only if al are no defective integrated cir s. What is the probability that the product opci....?

   a. 0.6690
   b. 0.0076
   c. 0.5412
   d. 0.5000
   e. None of the above

23. Let X denote the number of bits received in error in a digital communication channel, and assume that X is a binomial random variable with $p = 0.001$. If 1000 bits are transmitted, determine $P(X \leq 2)$

   a. 0.3091
   b. 0.0912
   c. 0.9198
   d. 0.8010
   e. None of the above

$p = 0.001$
$n = 1000$
$\sum (0.00)^3 (1 - 0.000)^{n-2}$
0.368

24. The phone lines to an airline reservation system are occupied 40% of the time. Assume that th events that the lines are occupied on successive calls are independent. Assume that 10 calls are placed to the airline. What is the probability that for exactly three calls the lines are occupied?

   a. 0.215
   b. 0.994
   c. 0.005
   d. 0.231
   e. None of the above

25. A particularly long traffic light on your morning commute is green 20% of the time that you approach it. Assume that each morning represents an independent trial. Over five mornings wh is the probability that the light s green on exactly one day?

   a. 0.312
   b. 0.410
   c. 0.218
   d.
   e. None of the above

d 0.22

e. None of the above

5.

A message can follow different paths through servers on a network. The senders mess to one of five servers for the first step, each of them can send to five servers at the secon at that each can send five servers at the third step, and then the message goes to the re server. How many paths are possible?

a. 100
b. 1000
c. 150
d. 125
e. None of the above

6. From Q5, if all paths are equally likely, what is the probability that a message passes throu first of four servers at the third step?

a. 0.10
b. 0.20
c. 0.25
d. 0.06
e. None of the above

Disks of polycarbonate plastic from a supplier are analyzed for scratch and shock resistance results from 100 disks are summarized as follows:

Scratch Resistance		Shock resistance		
		high	low	
	high	70	9	B
	low	16	5	B̄

Let A denote the event that a disk has high shock resistance, and let B denote the event disk has high scratch resistance. If a disk is selected at random.

7. find. $P(\bar{A})$

a. 0.84
b. 0.14
c. 0.79
d. 0.50
e. None of the above

Samples of a cast aluminium part are classified on the basis of surface finish (microinches). edge finish. The results of 100 parts are summarised as follows:

		Edge finish		
		excellent	good	
surface finish	excell	80	2	A
	good	10	8	Ā

Let A denote the event that a sample has excellent surface finish, and let B denote the e that a sample has excellent length. If a part is selected at random.

2

32. Printed circuit cards are placed in a functional test after being populated with semiconductor chips. A lot contains 140 cards, and _____ are selected without replacement for functional testing. 5 cards are defective, what is the pr___ability that at least 1 defective card appears in the sample

 a 0.5429
 b 0.0912
 c 0.0324
 d 0.0003
 e None of the above

33. Suppose X has a Poisson distribution with a mean of 4. Determine $P(X = 3)$

 a. 0.0298
 b. 0.0038
 c. 0.9002   0.195
 d. 0.2381
 e None of the above

34. The number of telephone calls that arrive at a phone exchange is often modeled as a Poisson random variable. Assume that on the average there are 10 calls per hour. What is the pr___ility that there are exactly 15 calls in two hours?

 a 0.0021
 b 0.9010
 ● c 0.0516
 d. 0.0532
 e. None of the above

35. When a computer disk manufacturer tests a disk, it writes to the disk and then tests it using a certifier. The certifier counts the number of missing pulses or errors. The number of errors on a test area on a disk has a Poisson distribution with $\lambda = 0.2$. What percentage of test areas have two or fewer errors?

 a. 0.92%
 F b. 80.08%
 c. 99.89%
 d. 0.37%
 e. None of the above

< 30

36. The probability that your call to a service line is answered in ' s than 30 seconds is 0.75 Assume that your calls are independent. If you call 10 times, what is the probability that e___ 9 of your calls are answered within 30 seconds?

 a 0.0073
 b 0.1877
 c 0.7215
 d 0.0056
 e None of the above

$\dfrac{10^{15}e^{-10}}{15!}$

10×2

light-leaking were twice as likely as non-leaking to have engine dead during the five year study but only half as likely as heavy-leaking cars. A randomly selected car from the study has a dead engine over the five year study period. Calculate the probability that the participant's car was a heavy-leaking?

(a) 0.25

(b) 0.35

(c) 0.42 ✓

(d) 0.2

6. Evaluate

$$\sum_{x=0}^{5} {}^{5}C_x \left(\frac{1}{3}\right)^x \left(\frac{2}{3}\right)^{5-x}$$

(a) 1 ✓

(b) 2

(c) 0

(d) 3

7. If $A \subseteq B$, which of the following is true?

(a) $P(A \cup B) - P(A)$

(b) $P(B \cap A') = P(B) - P(A)$

(c) $P(A \cap B) - P(B)$

(d) $P(B \cap A') = -P(B) + P(A)$

8. A marketing survey indicates that 60% of the population owns an automobile, 30% own house and 20% own both an automobile and a house. Calculate the probability that a person chosen at random owns an automobile or a house but not both.

(a) $\frac{1}{2}$ ✓

(b) $\frac{7}{10}$

(c) $\frac{2}{5}$

(d) $\frac{9}{10}$

9. Pollsters wanted to determine the proportion of registered voters who approved of president Mahama's performance. They called 5000 randomly selected registered voters and ask 4123 of those ??do you approve of the president Mahama ' s performance?". Using this information to perform an IVPPSS, which of the following is not true.

(a) Individual(I) A registered voter

3

certifier that detects missing pulses. The number of errors found in an eight-bit byte

$$\begin{cases} 0. & x < 1 \\ 0.7. & 1 \leq x < 4 \\ ... & 1 \end{cases}$$

variable with the following distribution $f(x)$

Find $P(X \leq 3)$

a. 0
b. 0.7
c. 0.9
d. 1
e. None of the above

17. The range of the random variable X is {0,1,2,3,...} where x is unknown. If each value is equally likely and the mean of X is 7.5, determine x

a. 4
b. 24
c. 20
d. 5
e. None of the above

18. If the range of X is the set {0, 1, 2, 3, 4} and $P(X = x) = 0.2$ determine the mean μ and variance (σ^2) of the random variable.

a. 2, 2
b. 2, 4
c. 4, 3
d. 2, 3
e. None of the above

19. The lengths of plate glass parts are measured to the nearest tenth of a millimeter. The length uniformly distributed, with values at every tenth of a millimeter starting at 590.0 and conti... through 590.9. Determine the mean and variance of lengths.

a. 590.45, 0.0825
b. 509.78, 0.0863
c. 508.67, 0.0042
d. 712.45, 0.0005
e. None of the above

20. The random variable X has a binomial distribution with $n = 10$ and $p = 6.5$
Determine $P(X \geq 9)$

a. 0.3330
b. 0.2340
c. 0.0107
d. 0.5223
e. None of the above

c. 0.054

d. 0.123

- e. None of the above

13. The following circuit operates if and only if there is a path of each functional devices from left right. The probability that each device fuctions is as shown. Assume that the probability that a device is functional does not depend on whether or not other devices are functional. What is the probability that the circuit does not operates?
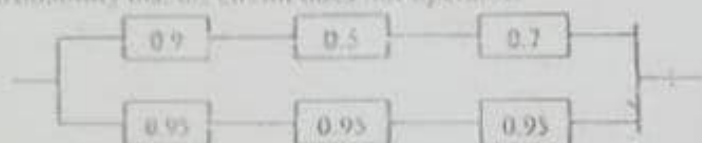
a. 0.0707
b. 0.1923
c. 0.3245
d. 0.5962
e. None of the above

14. The following circuit operates if and only if there is a path of each functional devices from left right. The probability that each device fuctions is as shown. Asssume that the probability that a device is functional does not depend on whether or not other devices are functional. What is the probability that the circuit does not operates?
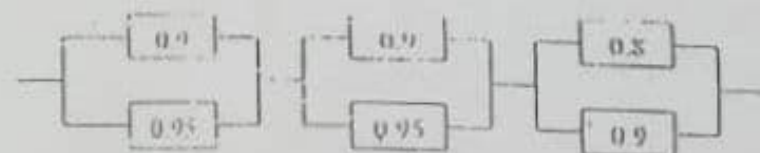
a. 0.0295
b. 0.7932
c. 0.9231
d. 0.1233
e. None of the above

15. An inspector working for a manu   uring company has a 99% chance of correctly identifying defective items and 0.5% chance   incorrectly classifying a good item as defective. The company   .... ucates 0.9% of nonconforming items. If an item selected at random is classified as nondefective, what is the probability that it is indeed good?

a. 0.2364
b. 0.0138
c. 0.0230
d. 0.9999
e. None of the above

An electrical system (shown below) consists of 4 components which work independently.

The system works if components A and B work and either C or D works. The reliability of each component (probability of each working) is as indicated in the diagram. Find the probability that the entire system works.

A. 0.2224

C. 0.6336

B. 0.3664

D. 0.7776

What is the probability that the component C (in question 6) does not work, given that the entire system works.

A. 0.09091

C. 0.83333

B. 0.16667

D. 0.90909

If two events, A and B are such that $P(A \cap B) = P(A).P(B|A)$, then

A. A and B are said to be equally likely.

B. A and B are said to be conditionally independent

D. A and B are said to be independent.

A and B are said to be mutually exclusive.

Let x have the probability density function, $f(x) = e^{x-1}$, for $x \leq 2$ and 0, elsewhere. What is the 75th percentile of x?

A. $2 - \ln \frac{3}{4}$

C. $2 + \ln \frac{1}{4}$

B. $2 + \ln \frac{3}{4}$

D. $\ln\left(1 + \frac{3}{4} e^2\right)$

Two students A and B work independently on a probability question. The probability that student A will solve it is $\frac{3}{4}$ and that of student B is $\frac{2}{3}$. The probability that the problem will be solved is given by

A. $P(A \cap B)$.

C. $1 - P(A \cup B)$

B. $P(A) + P(B)$

D. $P(A) + P(B) - P(A).P(B)$

Evaluate your probability obtained in question 10

A. $\frac{1}{12}$

B. $\frac{1}{2}$, $\frac{1}{3} \cdot \frac{1}{4} -$

C. $\frac{3}{4}$

D. $\frac{11}{12}$ $\frac{1}{4} - \frac{1}{3}$

Let A, B and C be mutually exclusive events with the probabilities 0.07, 0.23 and 0.12 respectively. What is the probability that none of these events occurs?

A. 0.002

C. 0.420

B. 0.418

D. 0.580 ●

2

1. The mean of a sample is
    a) used to estimate the population
    b) used to estimate the sample
    c) used to estimate sample mean
    d) used to estimate population mean
    e) None of the above answers is correct.
2. Since the mode is the most frequently occurring data value, it
    a) can never be larger than the mean
    b) is always larger than the median
    c) is always equal to the median
    d) is always larger than the mean
    e) None of the above answers is correct.

Exhibit 1

The following data show the number of hours worked by 200 statistics students

Number of Hours	Frequency
0 - 9	40
10 - 19	50
20 - 29	70
30 - 39	40

3. Refer to Exhibit 1. The class width for this distribution is
    a) 9
    b) 1.0
    c) 10
    d) 50
    e) None of the above answers is correct.
4. Refer to Exhibit 1. The number of students working 19 hours or less is
    a) 40
    b) 70
    c) 50
    d) 90
    e) None of the above answers is correct.
5. Refer to Exhibit 1. The relative frequency of students working 9 hours or less is
    a) 0.2
    b) 0.4
    c) 2.0
    d) 40
    e) None of the above answers is correct
    Refer to Exhibit 1 The cumulative relative frequency for the class of 10 – 19 is
    a) 90
    b) 0.9
    c) 0.25
    d) 0.45
    e) None of the above answers is correct.

In a sample of 800 students in a university, 160, or 20%, are Business majors. Based on the above information, the school's paper reported that "20% of all the students at the university are Business majors" This report is an example of
    a) a sample

a. 95.00
b. 50.51
c. 67.42
d. 56.00
e. None of the above

$$\frac{(0.0)^x \, e^{-0.02}}{x!} \quad c)$$

40. From Q39. If 50 panels are inspected, what is the probability that the number of panels that has one or more flaws is less than or equal to 2?

a. 0.9234
b. 0.0031
c. 0.0034
d. 0.0032
e. None of the above

41 Determine the value of c that makes the function $f(x, y) = c(x + y)$ a joint probability mass function over the nine points with $x = 1, 2, 3$ and $y = 1, 2, 3$

a. 0.0278
b. 0.0023
c. 0.0216
d. 0.0510
e. None of the above

42. Determine the value of c such that the function $f(x, y) = cxy$ for $0 < x < 3$ and $0 < y < 3$ satisfies the properties of a joint probability density function

a. 0.051
b. 0.012
c. 0.049
d. 0.561

$$\{E\}$$

if A and B are not-mutually exclusive events, then:
a) $P(A \cup B) + P(A \cap B) = P(A) + P(B)$
b) $P(A \cup B) = P(A) + P(B)$
c) $P(A \cup B) = P(A).P(B)$
d) $P(A \cap B) = P(A) + P(B)$
e) None of the above answers is correct.

22. Given P(A)=2/3, P(B)=3/8 and P(A∩B)=1/4, then A and B are:
a) Independent
b) Dependent
c) Mutually exclusive
d) Equally likely
e) None of the above answers is correct.

23. If $P(B/A) = 0.50$ and $P(A \cap B) = 0.40$, then p(A) will be equal to:
a) 0.40
b) 0.50
c) 0.80
d) 1
e) None of the above answers is correct.

24. Given $P(A) = 0.4$, $P(B) = 0.5$ and $P(A \cup B) = 0.9$, then:
a) A and B are not mutually exclusive events
b) A and B are independent events
c) A and B are equally likely events
d) A and B are mutually exclusive events
e) None of the above answers is correct.

Exhibit 4
The number of calls received per day at a crisis hot line is distributed as follows:

X	30	31	32	33	34
$P(X = x)$	0.05	0.21	0.38	0.25	0.11

25. Refer to Exhibit 4. Find the mean
a) 30.1
b) 32.2   32-16
c) 21.1
d) 23.2
e) None of the above answers is correct

6. Refer to Exhibit 4. Find the standard deviation
a) 1.0
b) 2.0
c) 3.0   1.6361
d) 4.0
e) None of the above answers is correct

1.6794

Given the following joint probability mass function

x	y	$f_{xy}(x,y)$
1	1	0.25
1.5	2	0.125
1.5	3	0.25
2.5	4	0.25
3	5	0.125

Use this to answ   Q47-50

47. Determine $P(X < 2.5, Y < 3)$
   a. 0.052
   b. 0.537
   c. 0.735
   d. 0.375
   e. None of the above

48. Determine $E(X)$ and $E(Y)$
   a. $E(X) = 1.8025$ $E(Y) = 2.855$
   b. $E(X) = 1.4125$ $E(Y) = 2.875$
   c. $E(X) = 1.8125$ $E(Y) = 2.875$
   d. $E(X) = 1.8120$ $E(Y) = 2.865$
   e. None of the above

49. Determine $E(Y \mid X = 1.5)$
   a. 1.60
   b. 3.01
   c. 0.05
   d. 3.09
   e. None of the above

50. Find $P(X < 2.5)$
   a. 0.625
   b. 0.634
   c. 0.562
   d. 0.064
   e. None of the above

169

e. None of the above

43. Using Q42, determine the marginal probability distribution of the random variable X

a. $f_x(x) = \frac{2x}{9}$ for $0 < x < 3$.

b. $f_x(x) = \frac{9x}{2}$ for $0 < x < 3$

c. $f_y(y) = \frac{2y}{9}$ for $0 < x < 3$.

d. $f_x(x) = \frac{x}{9}$ for $0 < x < 3$.

e. None of the above

44. Using Q42, Determine the conditional probability distribution of Y given that $X = 1.5$

a. $f_{m,s}(x) = \frac{2x}{9}$ for $0 < x < 3$

b. $f_{1m,s}(y) = \frac{y}{9}$ for $0 < y < 3$.

c. $f_{m,s}(y) = \frac{2y}{9}$ for $0 < y < 3$.

d. $f_{m,s}(y) = \frac{y}{3}$ for $0 < y < 3$.

e. None of the above

45. Determine the value of c that m: is the function $f(x, y) = c(x + y)$ a joint probability dens function over the range $0 < x < 3$ and $x < y < x + 2$.

a. 0.019
b. 0.042
c. 0.062
d. 0.003
e. None of the above

46. Determine the value of c that makes the function $f(x, y) = ce^{-x-y}$ a joint probability density function over the range $0 < x$ and $0 < y < x$

a. 7
b. 12
c. 9
d. 10
e. None of the above

10

(c) Statistic (S): proportion of 4123 that approve of President Mahama

(d) Sample (S): the 5000 registered voters that were sampled ✓

10. As a research fellow at ECG, in Sunyani, you operate two machines. The probability that the newer machine breaks down on a given day is 0.02 and the probability that the older machine breaks down on any given day is 0.05, assuming that status of two machines are independent, calculate the probability that exactly one machine breaks down on at least on day in the next 20 days.

(a) 0.69

(b) 0.76

(c) 0.65

(d) 0.59

11. Which of the following is not a location measure?

(a) Trimmed mean

(b) Mean Absolute Deviation ✓

(c) Mode

(d) Quantiles

12. Let $X_1, X_2, \cdots, X_n$ be some data values, then

$$\sum_{i=1}^{n}(X_i - \bar{X}) = 0$$

where

$\bar{X}$

is the average of X_is

(a) False

(b) Cannot be determined

(c) Values of X_i must be known

(d) True ✓

2. Determine the moment generating function for the random variable x in the density fun...

$$f(x) = \begin{cases} kxe^{-2x}, & x \geq 0 \\ 0, & \text{elsewhere} \end{cases}$$

3. Determine the value of c that makes the function $f(x,y) = ce^{-2x-3y}$ a joint probability density function over the range $0 < x$ and $x < y$.

4. Using Q3, determine the conditional probability distribution of Y given that $X = 1$.

Using Q3, determine $P\{Y < 2 | X = 1\}$.

AC A. ADJEI
SAMOAH OWUSU

| 40

(b) $\frac{23}{26}$

(c) $\frac{2}{13}$

(d) $\frac{5}{26}$ ✓

14. You are given the following information

$$P[(A \cap B \cap \cap C)'] = 0.91$$

$$P[(A \cup B \cup C)'] = 0.13$$

$$P[(B \cup C)'] = 0.36$$

$$P[(A \cap B' \cap C)] = 0.07$$

$$P[(A' \cap B \cap C)] = 0.06$$

$$P[(A \cap B \cap C')] = 0.15$$

$$P[(A \cup C)] = 0.78$$

Calculate

$$P[(A' \cap B' \cap C)]$$

(a) 0.18 ✓

(b) 0.23

(c) 0.05

(d) 0.09

15. Give an example of an experiment that has a discrete infinite sample space.

1. You are given that $P(A') = 0.2$, $P(B') = 0.3$ and $P(A' \cap B') = 0.1$. Find the $P(A \cap B) = 0.2$

   (a) 0.6 ✓
   (b) 0.7
   (c) 0.4 ⊙
   (d) 0.5

2. A bag contains r red balls and $17 - r$ blue balls. There are more red balls in the bag. Two balls are drawn from the bag. You are told that the probability that the two balls are the same color is $\frac{31}{68}$. What is the value of r

   (a) 10 ✓
   (b) 11
   (c) 9 ⊙
   (d) 12

3. A garage sells three models of cars in proportion of 1:2:5. In a week the garage sells 16 cars and two of them breakdown within a month of being sold. Calculate the probability that the two breakdown are on the same model of car.

   (a) $\frac{45}{120}$ ⊙
   (b) $\frac{33}{50}$
   (c) $\frac{198}{240}$ ✓
   (d) $\frac{33}{85}$

4. 4. A bar tender has recorded the ordering pattern of his customers over a long period. He knows that 65% of his customers are males, of these, 5% order cocktail, 70% order a beer and the rest order a different drink; the proportion for females is 75% for cocktail and 10% for beer. Given that a customer has ordered a beer, calculate the probability that the customer was female.

   (a) 0.092 ⊙
   (b) 0.125
   (c) 0.035
   (d) 0.071 ✓

5. 5. A mechanical engineer tracked a car made for five years. At the beginning of the study 20% were classified as heavy-leaking gasoline fumes, 30% as light-leaking gasoline fumes and the rest non-leaking gasoline fumes. The results of the study shows that

2

PCT/CCIE/MID 113-13/16

2. A 4-digit code number is created by randomly selecting the digits, with replacement, from the set {1, 2, 3, 4, 5, 6, 7, 8, 9}. Find the probability that the code number has at least one digit repeated.

(A) $\dfrac{6}{9^4}$

B. $\dfrac{336}{9^4}$

C. $\dfrac{4}{9}$

D. $\dfrac{131}{243}$

3. What is the moment generating function of a random variable with the probability distribution, $f(x) = \dfrac{1}{3}x$, for $x = 0, 1, 2$?

(A) $\dfrac{1}{3}(1 + e^t + e^{2t})$

B. $\dfrac{1}{3}(e^t + e^{2t})$

C. $\dfrac{1}{3}(1 + e^t + 2e^{2t})$

D. $\dfrac{1}{3}(1 + e^t + 2e^{2t} + e^{3t})$

4. During construction of a new office building, a contractor estimates that there is a chance 8% of a shortage of materials, a 10% chance of a strike and a 20% chance of delays due to bad weather. If these events are independent, what is the probability at least one of these problems occurs?

A. 0.0376

(C) 0.6624

B. 0.3376

D. 0.7624

An investment analyst anticipates that during the next year the value of a certain stock will decrease by 10% with probability 0.1, remain unchanged with probability 0.2, increase by 10% with probability 0.4 and increase by 20% with probability 0.3. What would be the expected gain for this stock during the next?

A. 0.9%

(D) 9%

B. 5%

D. 10%

A negatively skewed distribution contains

A. extremely high values of the observations made.

B. extremely low values of the observations made.

C. fairly distributed values of the observations made.

(D) extremely negative values of the observations made.

The loss of production, x due to frequent industrial actions in a construction firm has the cumulative distribution function,

$$F(x) = \begin{cases} 0 & , x < 0 \\ k\left(2x - x^2/4\right) & , 0 \le x \le 3 \\ 1 & , x > 3 \end{cases}$$

What are the values of k and the mode?

A. $\dfrac{1}{9}$ and 2 respectively

(B) $\dfrac{1}{9}$ and $\dfrac{3}{2}$ respectively

C. $\dfrac{2}{9}$ and $\dfrac{3}{4}$ respectively

D. $\dfrac{5}{11}$ and 3 respectively

27. Suppose that the error in the reaction temperature in °C for a controlled laboratory experiment is a continuous random variable X having the probability density function

$$f(x) = \begin{cases} \dfrac{x^2}{3}, & -1 < x < 2 \\ 0, & \text{elsewhere} \end{cases}$$

Find $P(0 < X \le 1)$
  a) 1/3
  b) 1/9
  c) 2/3
  d) 2/9
  e) None of the above answers is correct

Exhibit 7

Suppose that X is a continuous random variable with a probability density function (pdf) given by:

$$f(x) = \begin{cases} \lambda(4x - 2x^2) & 0 < x < 2 \\ 0, & \text{elsewhere} \end{cases}$$

28. Refer to Exhibit 7. What is the value of ?
  a) 0.375
  b) 0.075
  c) 0.500
  d) 0.050
  e) None of the above answers is correct

29. Refer to Exhibit 7. Find $P(x > 1)$
  a) 0.375
  b) 0.075
  c) 0.500
  d) 0.050
  e) None of the above answers is correct

30. Refer to Exhibit 7. What is the variance of x
  a) 0.4427
  b) 0.4247
  c) 0.4472
  d) 0.4427
  e) None of the above answers is correct

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$$\text{Median} = L + \dfrac{\frac{n}{2} - CF}{f_m} \,(W)$$

$$= 20.5 + \dfrac{\frac{20}{2} - 6}{5} \cdot 5$$

$$P_k = L_k + \dfrac{C_k}{f_k}(nk - f_k)$$