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Question No. 1:

A box contains 7 red balls and 3 green balls. A sample of 4 balls was selected randomly in succession and with replacement (each ball being replaced in the box before the next draw is made). Let 'R' denotes a red ball and 'G' denotes a green ball, and suppose that the random variable X represents the number of red balls in the sample.

(1) The number of elements of the sample space 'S' is:

(A) 6
(B) 8
(C) 27
(D) 16

(2) The probability P({RRRR}) equals:

(A) 0.2401
(B) 0.5401
(C) 0.3401
(D) 0.6401

(3) The event (X=1) is equivalent to the event:

(A) {RGGG}
(B) {GGGR}
(C) ϕ
(D) {RGGG, GRGG, GGRG,GGGR}

(4) The probability P(X = 1) equals:

(A) 0.3756
(B) 0.6756
(C) 0.0756
(D) 0.4756

Question No. 2:

500 adult people are classified according to their gender and size as follows:

Size	Male (M)	Female (F)
(A) Large	150	50
(B) Medium	100	60
(C) Small	50	90

Suppose that one person is randomly selected from this group of people.

(5) The probability that the size of the selected person is large is:

(A) 0.7
(B) 0.4
(C) 0.1
(D) 0.5

(6) If it is known that the selected person is male, then the probability that his size is large equals:

(A) 0.5
(B) 0.3
(C) 0.6
(D) 0.4

(7) The events (B) and (F) are:

(A) Disjoint
(B) Independent
(C) Not independent
(D) Mutually exclusive

Question No. 3:

Suppose that the events A and B are disjoint (mutually exclusive) and that P(A)=0.5 and $P(B\cap A^C)=0.3$. Then:

(8) $P(A\cap B^C)$ equals:

(A) 0
(B) 0.3
(C) 0.2
(D) 0.5

(9) P(A|B) equals:

(A) 0.5
(B) 0
(C) 0.2
(D) 1.0

Question No. 4:

Suppose that the random variable X has a mean $\mu = 12$ and a standard deviation $\sigma = 2$, then:

(10) The approximated value of P(2<X<22) is:

(A) 0.96
(B) 0.9375
(C) 0.8889
(D) 0.75

(11) $Var(7X - 2)$ equals:

(A) 194
(B) 192
(C) 196
(D) 12

Question No. 5:

If the probability density function of the random variable X is given by:

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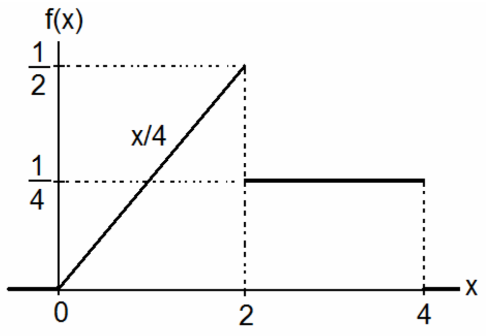

$$f(x)=\begin{cases}\frac{x}{4}, & 0<x\le 2\\ \frac{1}{4}; & 2<x\le 4\\ 0; & elsewhere\end{cases}$$

(12) P(X>1) equals:
- (A) 0.575
- **(B) 0.875**
- (C) 0.175
- (D) 0.775

(13) If F(x) is the cumulative distribution function (CDF) of X, then F(3) equals:
- **(A) 0.75**
- (B) 0.55
- (C) 0.95
- (D) 0.65

(14) The mean of X is:
- (A) 1.1667
- (B) 2.0000
- (C) 1.5667
- **(D) 2.1667**

<u>Question No. 6:</u>

The probability function of the random variable X is given by:

$$f(x)=\begin{cases}\frac{k}{x}; & x=1,2,3,4\\ 0; & elsewhere\end{cases}$$

(15) The value of k equals:
- (A) 0.88
- (B) 1.88
- **(C) 0.48**
- (D) 1.48

(16) The mean of X is:
- (A) 2.50
- **(B) 1.92**
- (C) 2.92
- (D) 1.50

(17) The Variance of X is:
- (A) 2.1136
- (B) 3.1136
- (C) 0.1136
- **(D) 1.1136**

<u>Question No. 7:</u>

From the past experience, the owner of a fashion store noticed that the percentages of the customers with large size, medium size, and small size are 25%, 40%, and 35%, respectively. He also noticed that 20% of the large-sized customer are females, 50% of the medium-sized customer are females, and 60% of the small-sized customer are females. If a new customer has arrived to the store, then:

(18) The probability that the customer is female is:
- (A) 0.36
- (B) 0.16
- **(C) 0.46**
- (D) 0.26

(19) If it is known that the customer is female, then the probability that her size is large is:
- (A) 0.7087
- **(B) 0.1087**
- (C) 0.4087
- (D) 0.2087

<u>Question No. 8:</u>

Suppose that X has a binomial distribution with mean $\mu=2$ and variance $\sigma^2=1.96$, then:

(20) The values of n (number of trials) and p (the probability of success) are respectively:
- (A) 10 and 0.3
- **(B) 100 and 0.02**
- (C) 30 and 0.1
- (D) 75 and 0.05

(21) Using Poisson approximation to binomial distribution, the approximated value of P(X=3) is:
- **(A) 0.1804**
- (B) 0.2804
- (C) 0.3804
- (D) 0.4804

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Question No. 9:

A box contains 8 black balls and 2 white balls. A sample of 4 balls was selected randomly and without replacement. Suppose that the random variable X represents the number of black balls in the sample.

(22) The set of possible values of X is:

(A) {2, 3, 4}
(B) {0, 1, 2, 3, 4}
(C) {1, 2, 3, 4}
(D) {3, 4}

(23) The probability of getting at least 3 black balls is:

(A) 0.7667
(B) 0.0667
(C) 0.5667
(D) 0.8667

Question No. 10:

(24) Suppose that the number of telephone calls received every hour by the secretary in certain company has a Poisson distribution with an average of 8 calls per hour. The probability that the secretary will receive 5 calls during a period of 30 minutes is:

(A) 0.9563
(B) 0.1563
(C) 0.4563
(D) 0.2463

(25) Suppose that the random variable X has an exponential distribution with a mean of 4, and suppose that F(x) is the CDF of X. Then F(8) equals:

(A) 0.7647
(B) 0.1647
(C) 0.8647
(D) 0.5647

(26) If $Z \sim N(0,1)$ and $P(0<Z<a)=0.437$, then the value of a equals:

(A) 0.53
(B) -1.53
(C) -0.53
(D) 1.53

(27) Suppose that X~Uniform(5, 10). The mean and the variance of X are, respectively:

(A) 7.5 and 2.0833
(B) 7.0 and 2.5833
(C) 8.0 and 1.0833
(D) 7.8 and 1.5833

Question No. 11:

Suppose that the random variable X, representing the lifespan of a certain electronic device, is normally distributed with a mean of 18 months and a standard deviation of 4 months. Then:

(28) $P(X<11)$ equals:

(A) 0.9599
(B) 0.3485
(C) 0.0401
(D) 0.1973

(29) The percentage of electronic devices that will last for more than 11 months is:

(A) 95.99%
(B) 34.85%
(C) 4.01%
(D) 19.73%

(30) If the manufacture is willing to replace no more that 2.5% of the devices in case of malfunctioning, then the warranty time (in months) must be no more than:

(A) 7.16
(B) 8.16
(C) 9.16
(D) 10.16

THE END

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