

Use the information below to answer the following two questions (1-2)  
 Disks of polycarbonate plastic from a supplier are analyzed for scratch and shock resistance. The results from 100 disks are summarized as follows:

		Shock resistance	
		High	Low
Scratch resistance	High	70	9
	low	16	5
		86	14

⇒ Venn diagrams  
 79  
 21  
 100

1. If a disk is selected at random, what is the probability that its scratch resistance is high or its shock resistance is high?

- A. 70/100
- B. 79/100
- C. 86/100
- D. 95/100

~~70/100~~  

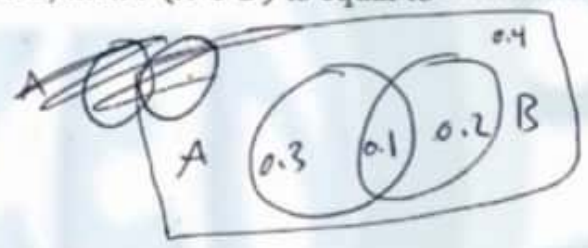
$$\frac{79}{100} + \frac{86}{100} - \frac{70}{100}$$

2. If a disk is selected at random, what is the probability that its scratch resistance is high and its shock resistance is high?

- A. 70/100
- B. 9/100
- C. 16/100
- D. 5/100

3. If  $P(A) = 0.4$ ,  $P(B) = 0.3$  and  $P(A \cap B) = 0.1$ , then  $P(\overline{A \cup B})$  is equal to -----

- A. 0.4
- B. 0.5
- C. 0.6
- D. 0.7



4. If  $P(A) = 0.4$ ,  $P(B) = 0.3$  and  $P(A \cap B) = 0.1$ , then  $P(B \cup \overline{A})$  is equal to -----

- A. 0.4
- B. 0.5
- C. 0.6
- D. 0.7

5. How many different numbers can be formed by rearranging 2212562?

- A. 5040
- B. 210
- C. 840
- D. 144

~~5040~~  

$$\frac{7!}{4!}$$

6. Which one of these variables is a continuous random variable

- A. The number of cars sold by a car dealer in one month
- B. The number of students who
- C. The amount of water in a 600 ml bottle
- D. The grade given to a student, as a letter.

7. A batch of 30 injection-molded parts contains 6 parts that have suffered excessive shrinkage. If two parts are selected at random and without replacement, what is the probability that the second part selected is one with excessive shrinkage?

- A. 0.1667
- B. 0.2
- C. 0.0345
- D. 0.8

A = 1<sup>st</sup> Shrinkage  
B = 2<sup>nd</sup> Shrinkage

$$P(A/B)P(B) + P(A'/B)P(B)$$

$$P(B) = \cancel{P(B/A)P(A)} + \cancel{P(B'/A)P(A)}$$

$$P(B/A)P(A) + P(B/A')P(A')$$

$$(5/29)(6/30) + (6/29)(24/29)$$

Use the information below to answer the following two questions (8-9)  
Given the following probability distribution

X	75	80	85	90	95
P(x)	0.12	0.23	0.42	0.11	0.12

q                      18.4                      35.7                      9.9                      11.4

8. The mean of the random variable X is

- A. 85
- B. 83.2
- C. 87.1
- D. 84.4

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

9. The variance of the random variable X is

- A. 32.14
- B. 5.67
- C. 1032.98
- D. 85

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

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

10. If two events, ( each with probability greater than zero ), are independent then

- A. They also must be complements.
- B. They also could be complements.
- C. They cannot be complements.

4/6

Question 2:

Suppose a statistic class contains 70% male and 30% female students. It is known that in a test, 5% of males and 10% of females got an "A" grade,

- A. If one student from this class is randomly selected, what is the probability that the selected student has an "A" grade?

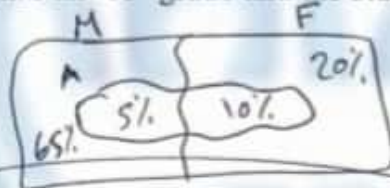
$$\begin{aligned}
 P(A) &= P(M \cap A) + P(F \cap A) \\
 &= P(A|M)P(M) + P(A|F)P(F) \\
 &= 0.05(0.7) + 0.1(0.3) \\
 &= \cancel{0.065} 0.065
 \end{aligned}$$

M = male  
F = Female

- B. If one student from this class is randomly selected and observed to have an "A" grade, what is the probability that this is a male student?

$$\begin{aligned}
 P(M|A) &= \frac{P(M \cap A)}{P(A)} = \frac{P(A|M)P(M)}{P(A)} \\
 &= \frac{(0.05)(0.7)}{0.065} = \boxed{0.538}
 \end{aligned}$$

- C. If one student from this class is randomly selected, what is the probability that the student has an "A" grade and the student is male?



~~$P(M \cap A) = \frac{P(M \cap A)}{P(A)}$~~

.538 x 0.065 =

Good luck 😊

15. Suppose we toss a fair coin five times. What is the probability that the sequence of five tosses yields three heads and two tails?

- A. 0.3125
- B. 0.03125
- C. 0.375
- D. 0.25

$$\binom{5}{3} (0.5)^3 (0.5)^2 =$$

16. For a geometric random variable  $X$  with parameter  $(p)$ , one of the following statements is true.

- A. As the value of the random variable  $x$  increases, the probability mass function increases.
- B. As the value of the random variable  $x$  increases, the probability mass function decreases.
- C. As the value of the random variable  $x$  increases, the cumulative distribution function decreases.

17. A can company reports that the number of breakdowns per 8-hour shift on its machine-operated assembly line follows a Poisson distribution with a mean of 1.5. Assuming that the machine operates independently across shifts, what is the probability of no breakdowns during three consecutive 8-hour shifts?

- A. 0.0744
- B. 0.0498
- C. 0.6065
- D. 0.2231
- E. 0.0111

$\lambda = \lambda T = 1.5$

$e^{-1.5}$

$2 \times 2 = 4$

$4 \times 1.5 = 6$

$6 \times 1.5 = 9$

18. A class consists of 45 students. Ten of these students received an "A" for the final exam. Five students are selected at random from this group. what is the probability that at least one of the five students selected received an "A" for the final exam?

- A. 0.6993
- B. 0.7343
- C. 0.2657
- D. 0.4286

$\binom{45}{5}$

$\binom{45}{0} \binom{10}{45}^1 \binom{35}{45}^4$

$\binom{45}{5} \binom{10}{45}^1 \binom{35}{45}^4$

$\frac{\binom{45}{5} - \binom{45}{5} \binom{10}{45}^1 \binom{35}{45}^4}{\binom{45}{5}}$

$\left(1 - \frac{10}{45}\right)^4 \binom{35}{45}$

Use the following cumulative distribution function to answer the following two questions (11-12)

$$F(x) = \begin{cases} 0 & x < 3.5 \\ 0.35 & 3.5 \leq x < 5 \\ 0.5 & 5 \leq x < 7.5 \\ 0.6 & 7.5 \leq x < 12 \\ 1 & 12 \leq x \end{cases}$$

11.  $P(4 < x < 12)$

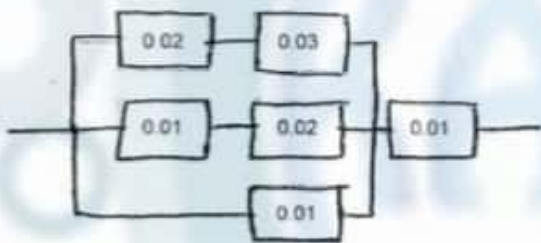
- A. 0.25
- B. 0.35
- C. 0.6
- D. 0.95

3.5	5	7.5	12
0.35	0.5	0.6	1

12.  $P(x > 12)$

- A. 0
- B. 0.4
- C. 0.6
- D. 1

13. The following circuit operates if and only if there is a path of functional devices from left to right. Assume that the devices fail independently and the probability of failure of each device is as shown. What is the probability that all devices in this circuit operate?



$$\left\{ \left[ 1 - (0.02)(0.03) \right] + \left[ 1 - (0.01)(0.02) \right] + 0.99 \right\} \times 0.99$$

- A. 0.903919
- B. 0.989985
- C. 0.95
- D. Zero
- E. None of the above

14. The range of the random variable X is [1, 2, 3, x] where x is unknown. If each value is equally likely and the mean ( $\mu = 1.75$ ). Determine x.

- A. 0.0625
- B. 0.25
- C. 1
- D. 4

$$1.75 = \frac{1 + 2 + 3 + x}{4}$$

**Question 1:**

Select the best answer for each of the following questions, and fill your answer in the table below

Question	Solution
1	D ✓
2	A ✓
3	A ✓
4	D ✓
5	B ✓
6	C ✓
7	B ✓
8	D ✓
9	B ✗

Question	Solution
10	<del>A</del> B ✗
11	A ✓
12	<del>B</del> A ✓
13	E ✗
14	C ✓
15	A ✓
16	B ✓
17	D ✗
18	C ✗

19.5  
27