# Unit 4 - Week 1: Basics of Probability Theory

Course outline

How does an NPTEL online course work?

MATLAB

Week 0: Prerequisite

Week 1: Basics of Probability Theory

- Lec 1: Probability space and their properties, Random variables
- Lec 2: Mean, variance, covariance and their properties
- Lec 3: Linear regression; Binomial and normal distribution; Central Limit Theorem
- Quiz : Assignment 1
- Feedback form
- Assignment solution

Week 2: Basics of Financial Markets

Week 3: Mean-Variance Portfolio Theory

Week 4: Mean-Variance Portfolio Theory- II

Week 5: Non-Mean-Variance Portfolio Theory

Week 6: Non-Mean-Variance Portfolio Theory- II

Week 7: Non-Mean-Variance Portfolio Theory- III

Week 8: Optimal Portfolio and Consumption

Week 9: Optimal Portfolio and Consumption- II

Week 10: Bond Portfolio Management

Week 11: Risk Management

Week 12: Applications with market data

Live Session: Mathematical Portfolio Theory

Text Transcripts

## Assignment 1

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-09-30, 23:59 IST.

1) If two unbiased dice are rolled, the probability that the sum of the outcomes from the two dice is odd, equals: *1 point*

- $\frac{1}{3}$
- $\frac{1}{2}$
- $\frac{1}{4}$
- $\frac{2}{3}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{2}$

2) State whether the following statement is TRUE or FALSE: *1 point*
If $\Omega$ is a sample space with $\Omega = \cup_{k=1}^{n} E_k$ and $E_i \cap E_j = \phi$, for $i \neq j$, then for any event $A \subseteq \Omega$,

$$\mathbb{P}(A) = \sum_{k=1}^{n} \mathbb{P}\left(A \cup E_k\right).$$

- TRUE
- FALSE

No, the answer is incorrect.
Score: 0
Accepted Answers:
FALSE

3) $F_{\mathbb{P}}(t) - F_{\mathbb{P}}(t-1)$ is given by : *1 point*

- $\int_{-\infty}^{t} f(x)dx$
- $\int_{-\infty}^{t-1} f(x)dx$
- $\int_{t-1}^{t} f(x)dx$
- $\int_{t}^{t-1} f(x)dx$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\int_{t-1}^{t} f(x)dx$

4) Consider a stock whose current price (at time $t = 0$) is 100. At a future time of $t = 1$, the stock price is a random variable, which can take the values 90, 95, 100 and 105 with probabilities 0.1, 0.2, 0.3 and 0.4, respectively. Then the expected value of the stock at time $t = 1$ equals : *1 point*

- 90
- 95
- 100
- 105

No, the answer is incorrect.
Score: 0
Accepted Answers:
100

5) Let $X$ and Y be two independent random variables, with $Var(X) = 8$ and $Var(Y) = 11$.
We define a new random variable $Z = 3X + 2Y$. Then the Standard Deviation of $Z$ equals :

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
*(Type: Range) 10.70,10.85*

*1 point*

6) If four unbiased coins are tossed, then the probability of getting at least two tails equals : *1 point*

- $\frac{11}{16}$
- $\frac{9}{16}$
- $\frac{7}{16}$
- $\frac{10}{16}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{11}{16}$

7) *1 point*
We have the pdfs, $\phi_1(x) = \frac{1}{\sqrt{8\pi}} \int_{-\infty}^{x} e^{-\frac{(t-3)^2}{8}} dt$ and $\phi_2(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{t^2}{2}} dt$.
If the independent random variables $z_1$ and $z_2$ have the pdf of $\phi_1(x)$ and $\phi_2(x)$, respectively and let $z = \sqrt{3}z_1 + \sqrt{2}z_2$, then the value of $Var(z)$ equals :

- 13
- 14
- 12
- 11

No, the answer is incorrect.
Score: 0
Accepted Answers:
14

8)
Let $X$ and $Y$ be random variables with the following values:

| $X$ | Probability | $Y$ | Probability |
|---|---|---|---|
| 2 | 0.2 | 18 | 0.2 |
| 3 | 0.2 | 22 | 0.2 |
| 7 | 0.2 | 30 | 0.2 |
| 5 | 0.2 | 26 | 0.2 |
| 8 | 0.2 | 24 | 0.2 |

If we approximate $Y$ using $\beta X + \alpha$, then the value of $\beta$ equals:

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
*(Type: Range) 1.25,1.35*

*1 point*