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[joinpd.com](https://joinpd.com)  
code: see above

# Statistics for Data Science-I

Week 7 Solve with Instructor (graded)

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# Statistics I: Week 7 Solve with Instructor

- Keep a notebook and pen ready for solving problems
- How to join?
  - Audio/screenshare on webex - click on link sent to you
    - Doubts? Use webex chat. Do not answer questions on webex chat.
  - Join on pear deck - joinpd.com (enter code seen on top right)
    - Answer questions only here
- For every question - 5 to 15 minutes allotted
  - Question will be shown in a slide for solving
  - If you are done solving, enter your answer at joinpd.com
  - Presenter will provide a solution
  - Questions and discussion

# Example Screenshots

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## Laptop/Desktop

The screenshot shows a presentation slide with a question and an interactive answer area.

Q1 (a)

Is this function even or odd or neither even nor odd?

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Portion for Answering

☐ Even

☐ Odd

☐ Neither even nor odd

Students choose an option

Pear Deck Interactive Slide  
Do not remove this bar

## Mobile

The screenshot shows the same presentation slide on a mobile phone screen.

2:50 PM

app.peardeck.com/stud...

Q3

A chemical substance A is the reactant in a chemical reaction which gets converted into a product B. The concentrations (in mol/L) of A and B depend on the reaction time  $t$  (min) as  $C_A(t) = 20 - 2t^2 - 42t + 90$ ,  $C_B(t) = 20 + 2t^2 + 44t$ .

How much time (in min) elapses after the reaction starts before the concentrations of A and B become equal?

Portion for Answering

Answer Question

# Q1

In a horse race, six horses numbered from 1 to 6 are participating.

Q. What is the probability that all the even numbered horses complete the race at first, second, and third places? (Enter the answer correct to two decimal places)



Students, enter a number!

# Solution

There are three even numbered horses numbered 2, 4, and 6.

The number of ways these even numbered horses can occupy first three places is  $3!$ .

The remaining last three places can be occupied by odd numbered horses in  $3!$  ways.

Total number of ways in which the race can turn out in which even numbered horses complete first 3 places is  $3! \times 3! = 36$ .

Total number of ways race can be completed is  $6!$  Ways = 720 ways.

So, the probability that even numbered horses complete race first is  $36/720 = 0.05$

Q2.

If  $P(C) = 0.3$ ,  $P(A \cup B) = 0.6$ , and  $P(A \cup B \cup C) = 0.8$ .

What is the value of  $P((A \cup B) \cap C)$ ?

# Solution

Given  $P(C) = 0.3$ ,  $P(A \cup B) = 0.6$ , and  $P(A \cup B \cup C) = 0.8$ .

We need to find out the  $P((A \cup B) \cap C)$ .

Let us consider  $(A \cup B)$  as set  $D$ .

$\Rightarrow P(D) = 0.6$  and  $P(D \cup C) = 0.8$ .

we know that  $P(D \cup C) = P(C) + P(D) + P(D \cap C)$

$\Rightarrow P(D \cap C) = P(C) + P(D) - P(D \cup C)$

$\Rightarrow P(D \cap C) = 0.35 + 0.6 - 0.8 = 0.1$

But  $D$  is  $A \cup B \Rightarrow P((A \cup B) \cap C) = 0.1$

# Prelude 1 to Q3

In an exam, there are 10 multiple select questions. In each multiple select question, there are 4 options for each question, more than one option could be correct,

Q. Find the number of ways to answer one question.



# Solution

Given that, for a multiple select question more than one option is correct. So, a student need to select atleast one option and at the most 4 options. All possible ways are:

Only one option could be selected in  $4C_1 = 4$  ways.

Only two options could be selected in  $4C_2 = 6$  ways.

Only three options could be selected in  $4C_3 = 4$  ways.

## Continued..

All the four options could be selected in  $4C1 = 4$  way.

So, Total ways in which an option could be selected =  $4+6+4+1=15$

# Prelude 2 to Q3

In an exam, there are 10 multiple select questions. In each multiple select question,

there are 4 options for each question, more than one option could be correct,

What is the probability of answering one question correctly ?

# Solution

Probability of answering one question correctly

$$= 1/15$$

### Q3.

In an exam, there are 10 multiple select questions. In each multiple select question, there are 4 options. For each question, more than one option could be correct, if a student chooses all the correct options then he/she gets 4 marks for that question, else he/she will not get any marks for the question.

Q. What is the probability that he/she will score 40 marks in the exam?

## Solution:

She can get 40 marks in only one condition and that is when she will correctly answer all the 10 questions.

As we already know, Probability of answering one question correctly =  $1/15$

Hence to answer all questions correctly , the probability will be  $(1/15)^{10}$ .

## Q4.

In a particular game, the player needs to throw a dart onto a circular board whose radius is 8.5 units. The points allotted to the player are based on where the dart lands. Let  $r$  be the distance at which dart lands from the centre of the board. Then the points allotted are as follows:

$0 \leq r < 1 \Rightarrow 10$  points

$1 \leq r < 3 \Rightarrow 8$  points

$3 \leq r < 5 \Rightarrow 6$  points

$5 \leq r < 7 \Rightarrow 4$  points

$7 \leq r < 8 \Rightarrow 2$  points

$r \geq 8 \Rightarrow 0$  points

Q. Assuming the player is not a professional and that there is an equal chance that the dart could land anywhere on the board, what is the probability that the points scored by the player in one throw is 4?

Enter the answer up to 2 decimals accuracy.

(Assume the dart lands on the board always)

# Solution

In this game points awarded depends on the place dart lands. The probability that it lands in between particular radius  $r_1$  and  $r_2$  is directly proportional to the area enclosed between radius  $r_1$  and  $r_2$ .

So, it would be equal to area enclosed between radius  $r_1$  and  $r_2$  divided by total area.

According to the given problem, dart board is of radius 8.5 units.

Therefore, total area =  $\pi \times (8.5)^2$

$$= 72.25 \times \pi.$$



## Continued...

To score 4 points:

Area in which player will score 4 points:  $r_1 = 5$ ,  $r_2 = 7$ .

$$\text{Area enclosed} = \pi \times (7)^2 - \pi \times (5)^2 = 24 \times \pi$$

$$\begin{aligned} \Rightarrow \text{Probability that player will score 4 points} &= 24 \times \pi / 72.25 \times \pi \\ &= 0.3321 \end{aligned}$$

Q5.

A letter is selected from the letters of the word “ABCDEFGHI”.

Q. What is the probability that the letter selected is not a vowel?

Enter the answer up to 2 decimals accuracy.

## Solution:

The number of letters in a word "ABCDEFGHI" is 9.

The number of vowels in a word are 3, A, E and I.

So, the number of consonants in a word "ABCDEFGHI" is 6.

⇒ The probability that selected letter is not a vowel is  $\frac{6}{9}$

Thank You