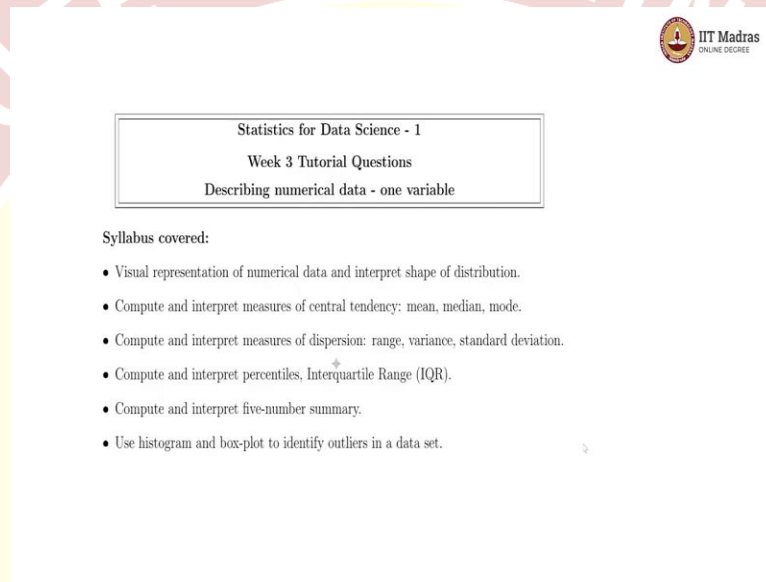



**IIT Madras**  
ONLINE DEGREE

**Statistics for Data Science – 1**  
**Professor Usha Mohan**  
**Prathyush P(Support team)**  
**Department of Management Studies**  
**Indian Institute of Technology, Madras**  
**Week 3**

**Tutorial – 01**

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 IIT Madras  
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Statistics for Data Science - 1  
Week 3 Tutorial Questions  
Describing numerical data - one variable

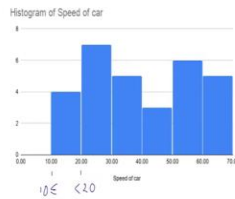
Syllabus covered:

- Visual representation of numerical data and interpret shape of distribution.
- Compute and interpret measures of central tendency: mean, median, mode.
- Compute and interpret measures of dispersion: range, variance, standard deviation.
- Compute and interpret percentiles, Interquartile Range (IQR).
- Compute and interpret five-number summary.
- Use histogram and box-plot to identify outliers in a data set.

Hello statistics students. In this tutorial we want to solve problems based on topics related to week 3. These are the topics, let us look at our first question now.

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1. A traffic policeman records the speeds of vehicles on a busy road with a 40 kmph speed limit. The histogram represents the results.



- Estimate the average speed of the vehicles.
- Calculate the number of vehicles that were exceeding the speed limit by at least 10 kmph.
- Calculate the number of vehicles having speed greater than or equal to 20 kmph but less than the speed limit.

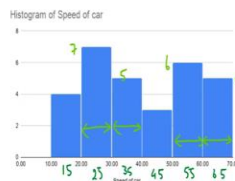
This is our question number 1. A traffic policeman records the speeds of vehicles on a busy road with a 40 km/h speed limit. The histogram of this data is shown here, this is the histogram of speeds of cars and this is actual speed. So these are the number of vehicles in that class of speeds. So we have 10 to 20, so there are 4 vehicles which went from 10. So we are looking at lesser than, sorry greater than or equal to 10 but lesser than 20. So the left side is what we take as the included boundary. So here let us estimate the average speed of the vehicles.

(Refer Slide Time: 1:33)

1. A traffic policeman records the speeds of vehicles on a busy road with a 40 kmph speed limit. The histogram represents the results.



$$\begin{aligned}
 &4 \times 15 \\
 &+ 7 \times 25 \\
 &+ 5 \times 35 \\
 &+ 3 \times 45 \\
 &+ 6 \times 55 \\
 &+ 5 \times 65
 \end{aligned}$$



$$\begin{aligned}
 &5 [(4 \times 3) + (6 \times 5) + \\
 & (5 \times 7) + (3 \times 9) \\
 & + (6 \times 11) + \\
 & (5 \times 13)] \\
 &= 5 [12 + 35 + 35 \\
 & + 27 + 66 + 65] \\
 &= 5 [240] = 1200
 \end{aligned}$$

- Estimate the average speed of the vehicles.  $= \frac{1200}{30} = 40 \text{ kmph}$
- Calculate the number of vehicles that were exceeding the speed limit by at least 10 kmph. 11 vehicles.
- Calculate the number of vehicles having speed greater than or equal to 20 kmph but less than the speed limit. 12 vehicles.

For this we are going to use a midpoint of each class, so for this class it is going to be 15, for this one it is going to be 25, for this one it is going to be 35, it is 45, this is 55 and this is 65. And now

how many are there; 4 for the first class, so we are going to do  $4 \times 15$  plus, this is between 6 and 8, so this must be 7,  $7 \times 25$  plus, this is 5, we have  $5 \times 35$  plus this is 3, so  $3 \times 45$  plus 6, so  $6 \times 55$  and last one, this is 5. So  $5 \times 65$ .

$[4 \times 15] + [7 \times 25] + [5 \times 35] + [3 \times 45] + [6 \times 55] + [5 \times 65]$ . This is the total calculation we are supposed to be doing.

Taking 5 common out of this stuff, we can write this as

$5([4 \times 3] + [7 \times 5] + [5 \times 7] + [3 \times 9] + [6 \times 11] + [5 \times 13])$ . We have slightly more manageable numbers, so we will get  $5(12 + 35 + 35 + 27 + 66 + 65)$ . So let us sum these up, we will get this is equal to 5 times  $35 + 35 = 70$ ,  $70 + 12 = 82$ ,  $82 + 27 = 109$ ,  $109 + 66 = 175$ ,  $175 + 65 = 240$ ,  $5[240] = 1200$ . So this is the sum of observations, so all of these put together I will get 1200 divided by, now what is the total number of observations here, that would be these numbers, right?  $4 + 7 + 5 + 3 + 6 + 5$ .  $4 + 7 = 11$ ,  $11 + 5 = 16$ ,  $16 + 3 = 19$ ,  $19 + 6 = 25$ ,  $25 + 5 = 30$ .

So we are getting  $\frac{1200}{30}$  and this can get cancelled off to give us 40, so we have  $40 \text{ km/h}$  is the average, which incidentally is also the speed limit given for these vehicles. So the average is at this speed limit, so the number of them which have crossed the speed limit and that is what the next question is, calculate the number of vehicles that were exceeding the speed limit by at least  $10 \text{ km/h}$ .

So that would be from 50. So we have interested in the number for this class and this class, which as we can see is 6 and 5, so we get 11, so 11 vehicles. For the last part, we have calculate the number of vehicles having speed greater than or equal to  $20 \text{ km/h}$  but less than the speed limit. So that would be this and this, this, this, both of these are lesser than 40 but greater than or equal to 20, that gives us  $7 + 5$  again, so this is then 12 vehicles.