Week-2 Assignment 1
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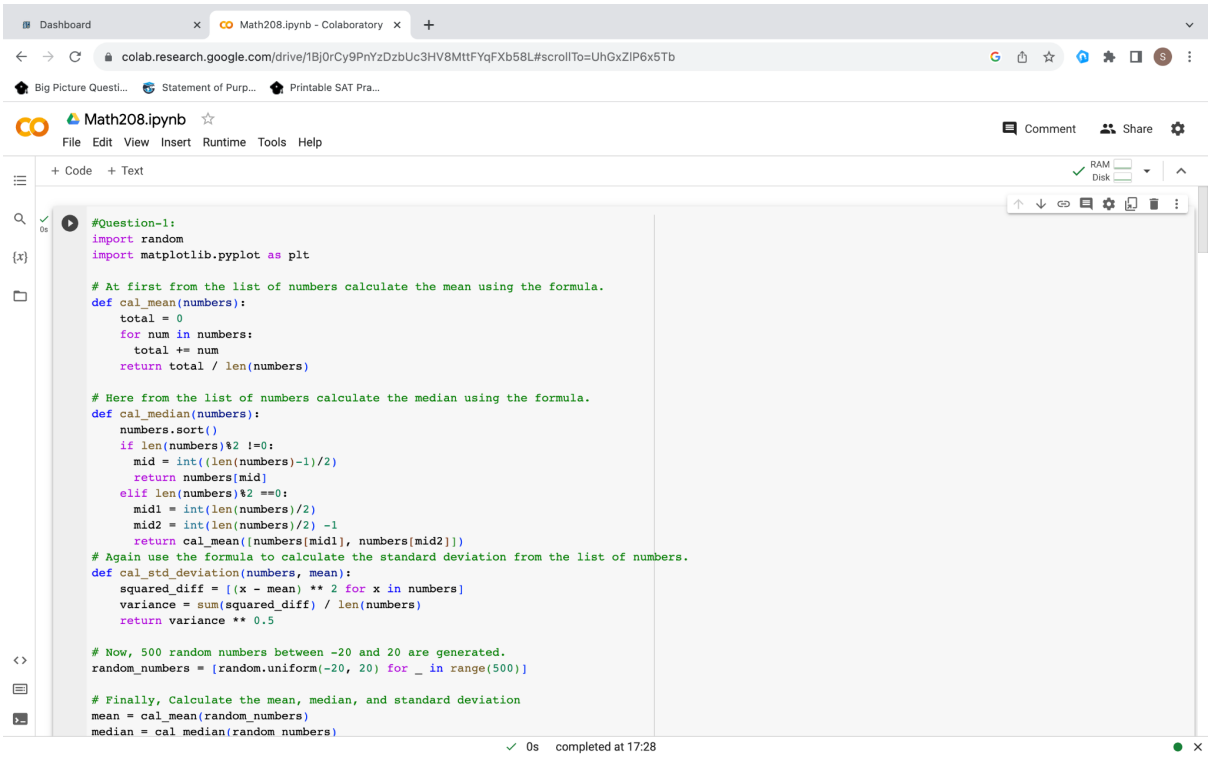
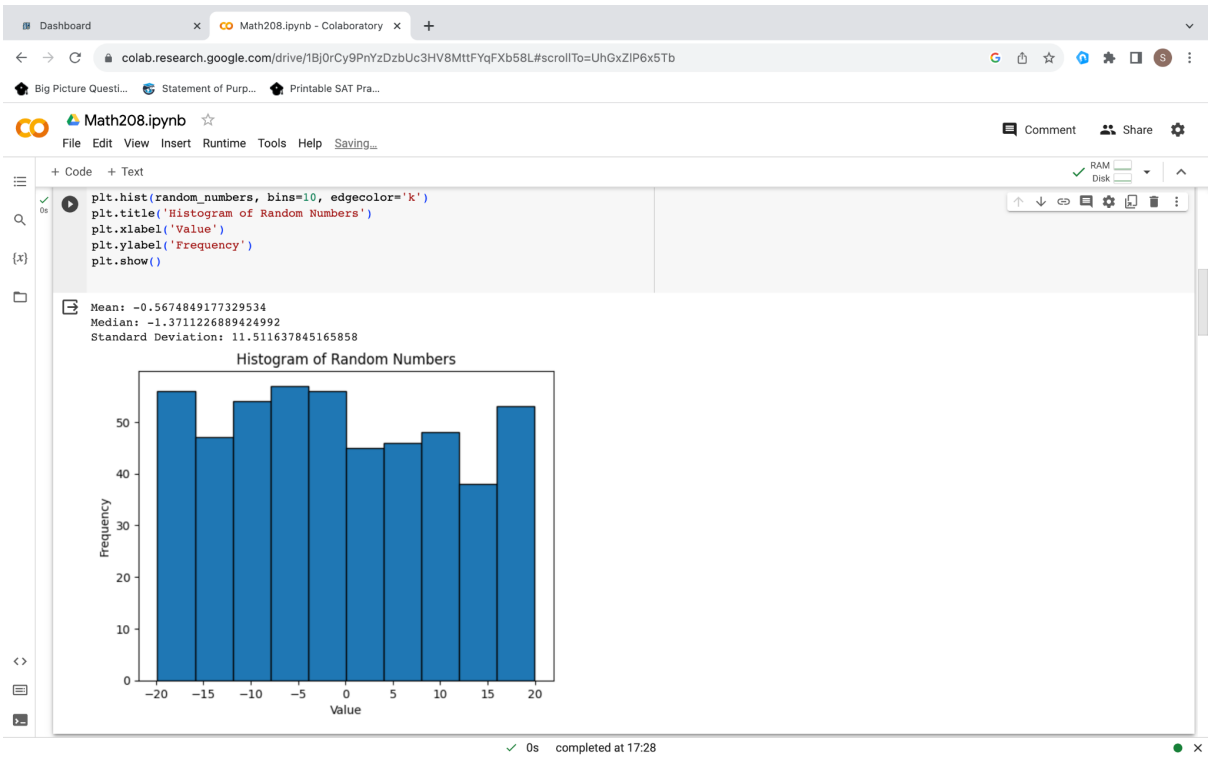
Course : MATH208 - Probability and Statistics





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```
#Question-2
import random
import matplotlib.pyplot as plt
import math

# At first from the list of numbers calculate the mean using the formula.
def cal_mean(numbers):
    total = 0
    for num in numbers:
      total += num
    return total / len(numbers)

# Here from the list of numbers calculate the median using the formula.
def cal_median(numbers):
    numbers.sort()
    if len(numbers)%2 !=0:
      mid = int((len(numbers)-1)/2)
      return numbers[mid]
    elif len(numbers)%2 ==0:
      mid1 = int(len(numbers)/2)
      mid2 = int(len(numbers)/2) -1
      return cal_mean([numbers[mid1], numbers[mid2]])
# Again use the formula to calculate the standard deviation from the list of numbers.
def cal_std_deviation(numbers, mean):
    squared_diff = [(x - mean) ** 2 for x in numbers]
    variance = sum(squared_diff) / len(numbers)
    return variance ** 0.5

# Generate 500 random numbers with mean = 10 and standard deviation = 0.5
```

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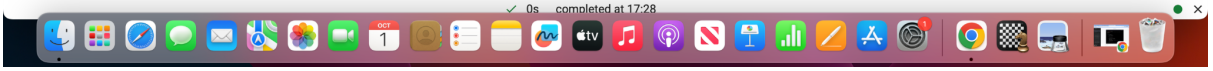

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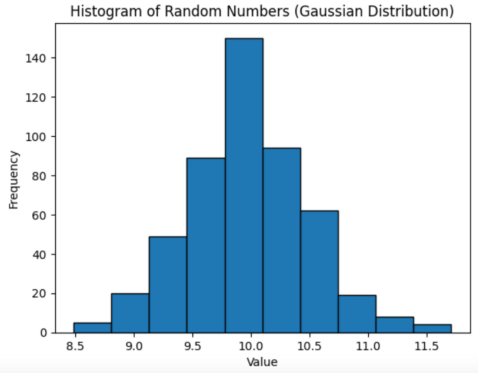
```
plt.show()
```

```
Mean: 9.97721916136183
Median: 9.984634380438285
Standard Deviation: 0.5090161099623043
```



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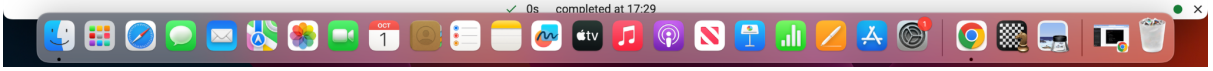

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#Question-3:
import matplotlib.pyplot as plt

# Data for the leading causes of death
causes = [
    "Heart Disease", "Malignant Neoplasms", "Stroke",
    "Chronic Respiratory Disease", "Accidents",
    "Diabetes", "Alzheimer's", "Influenza/Pneumonia",
    "Nephritis/Nephrosis", "Septicemia"
]

deaths = [
    63.2, 56.0, 13.7, 12.5, 12.2,
    7.2, 7.2, 5.6, 4.5, 3.4
]

# Sort causes and deaths in descending order
sorted_causes, sorted_deaths = zip(*sorted(zip(causes, deaths), key=lambda x: x[1], reverse=True))

# Calculate the cumulative percentage
total_deaths = sum(sorted_deaths)
cumulative_percentage = [100 * sum(sorted_deaths[:i+1]) / total_deaths for i in range(len(sorted_deaths))]

# Create the Pareto chart
fig, ax1 = plt.subplots()

ax1.bar(sorted_causes, sorted_deaths, color='b', alpha=0.7)
ax1.set_xlabel('Cause of Death')
ax1.set_ylabel('Number of Deaths (x 10,000)', color='b')
```

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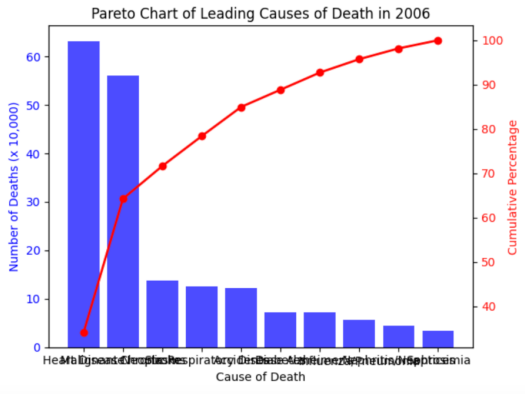
```
plt.tight_layout()
plt.show()
```



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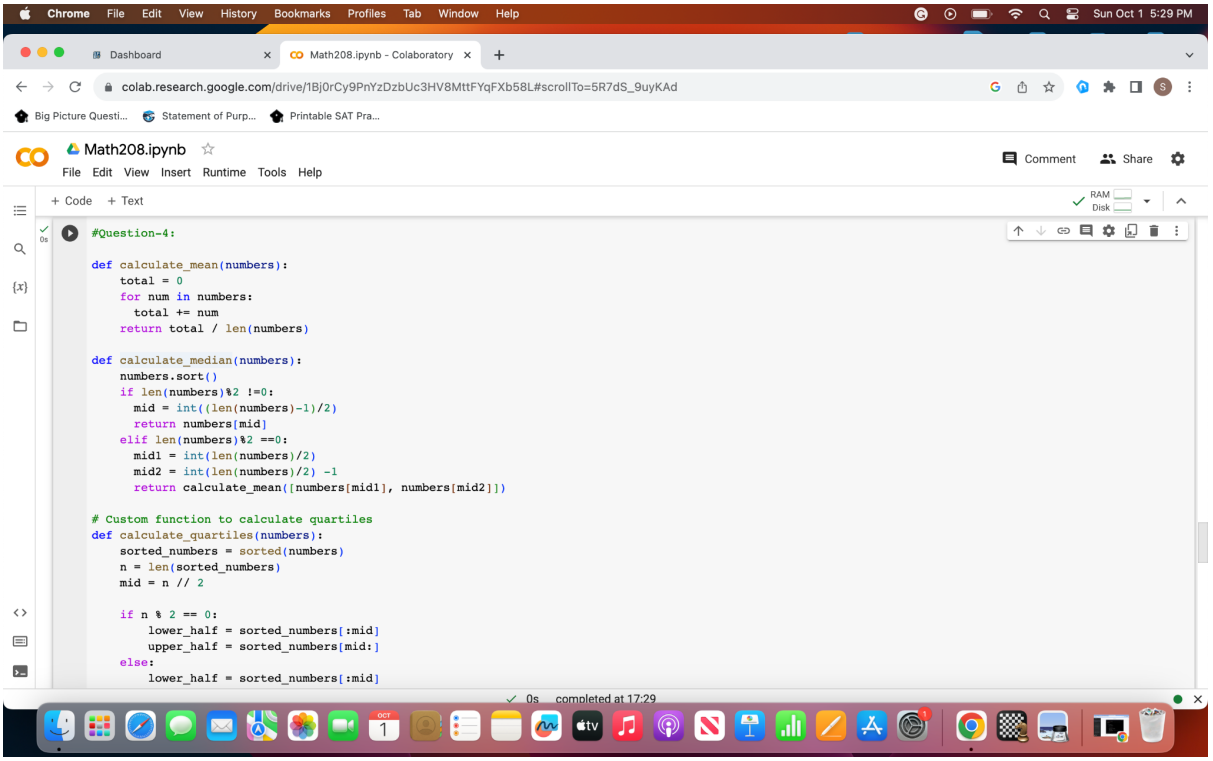
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#Question-4:
def calculate_mean(numbers):
total = 0
for num in numbers:
total += num
return total / len(numbers)
def calculate_median(numbers):
numbers.sort()
if len(numbers)%2 !=0:
mid = int((len(numbers)-1)/2)
return numbers[mid]
elif len(numbers)%2 ==0:
mid1 = int(len(numbers)/2)
mid2 = int(len(numbers)/2) -1
return calculate_mean([numbers[mid1], numbers[mid2]])
# Custom function to calculate quartiles
def calculate_quartiles(numbers):
sorted_numbers = sorted(numbers)
n = len(sorted_numbers)
mid = n // 2
if n % 2 == 0:
lower_half = sorted_numbers[:mid]
upper_half = sorted_numbers[mid:]
else:
lower_half = sorted_numbers[:mid]
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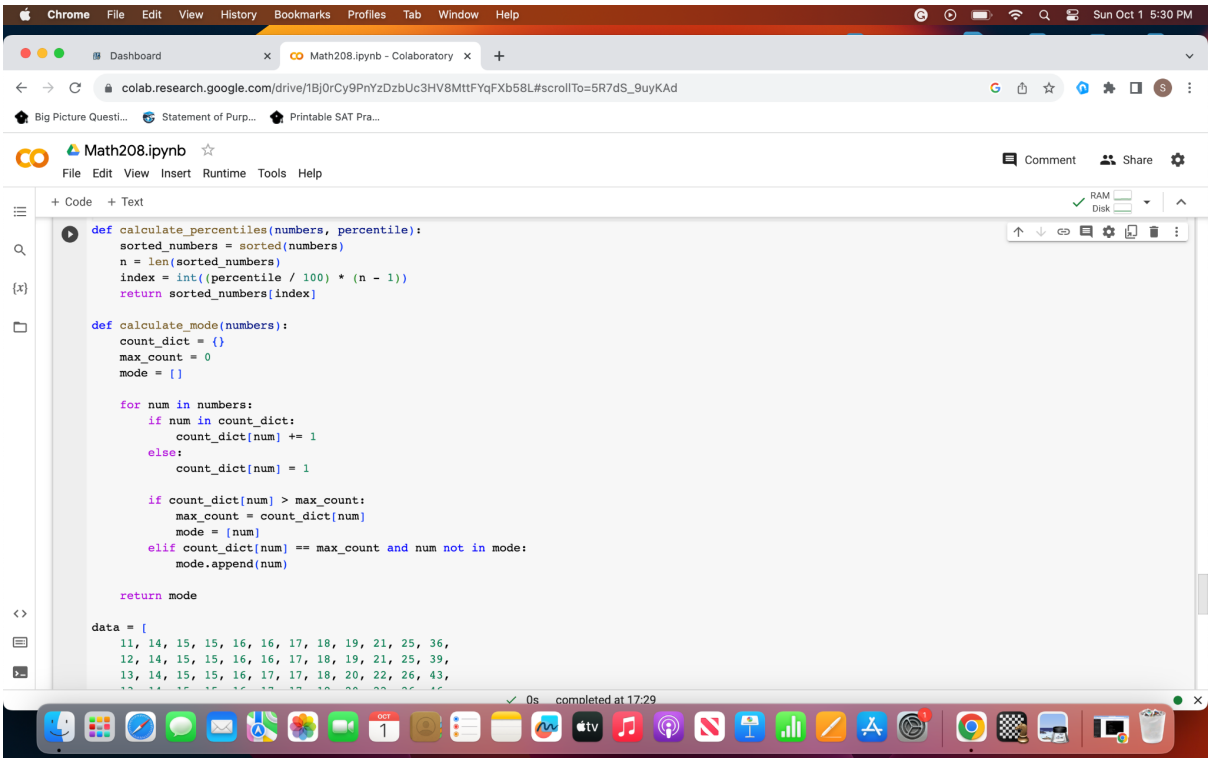
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def calculate_percentiles(numbers, percentile):
sorted_numbers = sorted(numbers)
n = len(sorted_numbers)
index = int((percentile / 100) * (n - 1))
return sorted_numbers[index]
def calculate_mode(numbers):
count_dict = {}
max_count = 0
mode = []
for num in numbers:
if num in count_dict:
count_dict[num] += 1
else:
count_dict[num] = 1
if count_dict[num] > max_count:
max_count = count_dict[num]
mode = [num]
elif count_dict[num] == max_count and num not in mode:
mode.append(num)
return mode
data = [
11, 14, 15, 15, 16, 16, 17, 18, 19, 21, 25, 36,
12, 14, 15, 15, 16, 16, 17, 18, 19, 21, 25, 39,
13, 14, 15, 15, 16, 17, 17, 18, 20, 22, 26, 43,
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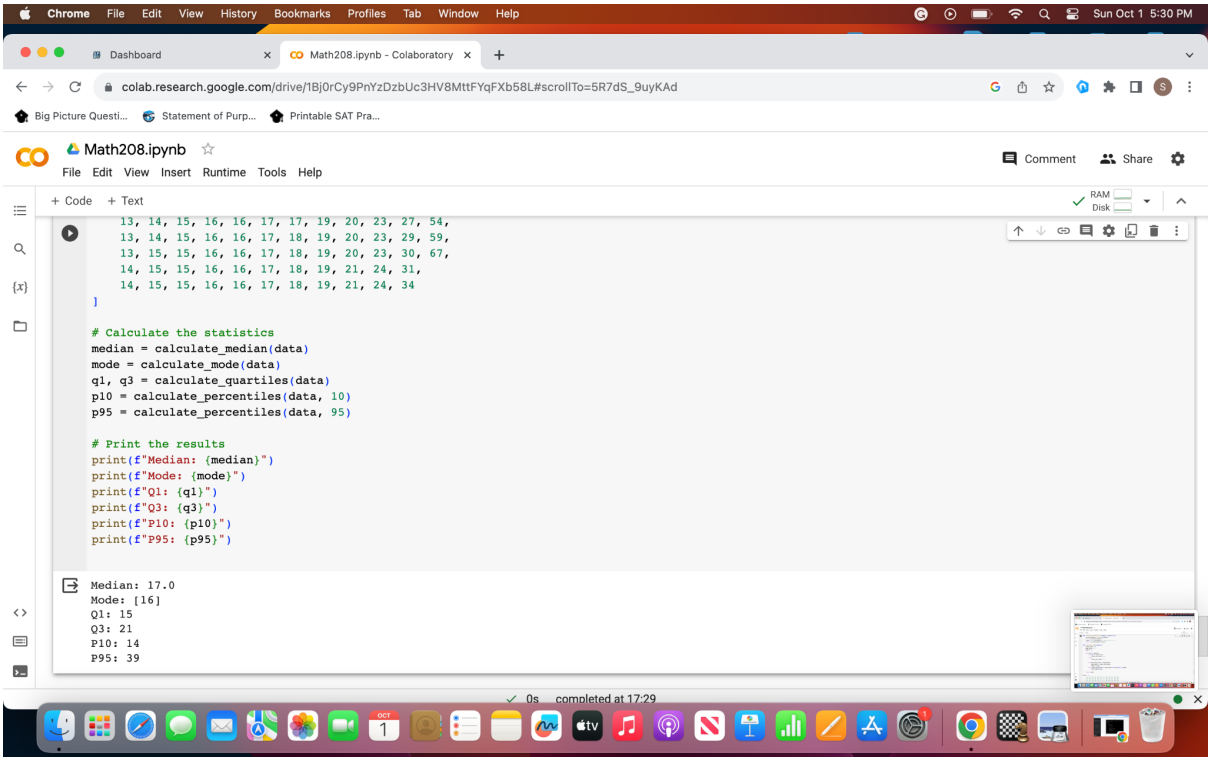
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13, 14, 15, 16, 16, 17, 17, 19, 20, 23, 27, 54,
13, 14, 15, 16, 16, 17, 18, 19, 20, 23, 29, 59,
13, 15, 15, 16, 16, 17, 18, 19, 20, 23, 30, 67,
14, 15, 15, 16, 16, 17, 18, 19, 21, 24, 31,
14, 15, 15, 16, 16, 17, 18, 19, 21, 24, 34
]
# Calculate the statistics
median = calculate_median(data)
mode = calculate_mode(data)
q1, q3 = calculate_quartiles(data)
p10 = calculate_percentiles(data, 10)
p95 = calculate_percentiles(data, 95)
# Print the results
print(f"Median: {median}")
print(f"Mode: {mode}")
print(f"Q1: {q1}")
print(f"Q3: {q3}")
print(f"P10: {p10}")
print(f"P95: {p95}")
Median: 17.0
Mode: [16]
Q1: 15
Q3: 21
P10: 14
P95: 39
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