1. **Given a list of numbers: [9, 7, 3.5, -13, 2, 2, 5, 6.6, -1, 0, 88.1, -5, 33]:**
   1. **use 3σ rule to identify which values are outliers (1.5 points)**
   2. **use IQR with factor 1.5 to identify which values are outliers (1.5 points)**

**Please write down the steps of calculations.**

a.

*Mean*:

µ = (9 + 7 + 3.5 + -13 + 2 + 2 + 5 + 6.6 + -1 + 0 + 88.1 + -5 + 33) / 13 = **10.554**

*Standard Deviation*:

= = **24.521**

*Range* = (µ - 3, µ + 3)

= (10.554 - 3(24.521), 10.554 + 3(24.521))

= **(-63.009, 84.117)**

Since the data point [88.1] is not in the range of (-63.009, 84.117), the probability of generating this data point from the Gaussian distribution is less than 0.3%. It is very small and therefore we can consider it an outlier.

*Sort data set*:

[-13, -5, -1, 0, 2, 2, 3.5, 5, 6.6, 7, 9, 33, 88.1]

*Split data set in half (total number is odd, ignore the number in the middle)*:

[-13, -5, -1, 0, 2, 2]

[5, 6.6, 7, 9, 33, 88.1]

*Median of each half and IQR calculation*:

Q1 = (-1 + 0) / 2 = **-0.5**

Q3: (7 + 9) / 2 = **8**

IQR = Q3 – Q1 = 8 - (-0.5) = **8.5**

*Median of entire list*:

**3.5**

*Factor of IQR = 1.5:*

Range = (3.5 - (1.5 x 8.5), 3.5 + (1.5 x 8.5))

= **(-9.25, 16.25)**

Since the data points [-13, 33, 88.1] are not in the range of (-9.25, 16.25), they can be considered outliers.