

**Question 1:**

Discuss the different sources of errors in data samples.

**Question 2:**

Compare the different types of errors in data samples (**in a tabular form**). Your comparison should include: their definition – how to eliminate or reduce their effects? – one example of each type.

**Question 3:**

Compare between precision and accuracy.

**Question 4:**

If the standard deviation of a single angular observation is  $\pm 35''$ , how many times should an angle be measured so that its standard deviation does not exceed  $\pm 7''$ ?

**Question 5:**

If the relative error of the mean of a scaled weight is 13 gm/kg, what would be the standard deviation of this weight (in gm) if the weight equals 59.54 kg?

**Question 6:**

The production of a water treatment plant was measured by 2 researchers (A) and (B). The measurements for 10 days are given in the following table:

- Calculate the best estimate and standard deviation of each observer.
- Which of the two observers is more precise? Why?
- If the true water production rate is assumed to be 50.122 m<sup>3</sup>/day, which of the two observers is more accurate? Why?

Researcher (A)		Researcher (B)	
Day	Production (m <sup>3</sup> )	Day	Production (m <sup>3</sup> )
1	50.142	1	50.123
2	50.123	2	50.125
3	50.131	3	50.125
4	50.131	4	50.122
5	50.131	5	50.123
6	50.142	6	50.123
7	50.119	7	50.212
8	50.954	8	50.122
9	50.129	9	50.123
10	50.111	10	50.124

**Question 7:**

A piece of land has a trapezoidal shape with two parallel sides (a) and (b) and the distance between them (i.e., the height of the trapezoid) is (h). The results of the measurements are:

$$a = 112.33\text{m} \pm 0.10\text{m}$$

$$b = 150.67\text{m} \pm 0.15\text{m}$$

$$h = 20.00\text{m} \pm 0.08\text{m}$$

Compute the area of the land along with its standard deviation if the three observations are uncorrelated.

**Question 8:**

In the triangle ABC, the following quantities were measured as:

$$AB = 58.50\text{m} \pm 3\text{cm}$$

$$BC = 64.85\text{m} \pm 4\text{cm}$$

$$\text{Angle } ABC = 40^\circ 40' 40'' \pm 6''$$

- Compute the area of the triangle ABC and its standard deviation.
- Compute the distance AC and its standard deviation.

**Student Answers should be submitted in tutorials in the scheduled week, then a PDF file including these answers must be uploaded on LMS**