

## Lab 1. Dimensional Measurements

Name-Surname :

Date :

Student No. :

Group :

### Tools

**ATTENTION! – All equipment and samples will be given during the experiment.**

- **Vernier Caliper:** Vernier caliper is a slide type caliper consists of a main scale and a vernier scale. It is used to perform length, depth, inside and outside measurements (Figure 1).



Figure 1. A vernier caliper.

- **Micrometer:** Micrometer provides more accurate measurements (in microns) for small lengths. Figure 2 shows a micrometer caliper with 0.01 mm precision.



Figure 2. A micrometer.

- **Hexagonal Head Bolt, Allen Bolt and Nut**



(a)



(b)

Figure 3. a) Hexagonal head bolt and its nut, b) Allen bolt

- **Plain Washer and Spherical Ball**



(a)



(b)

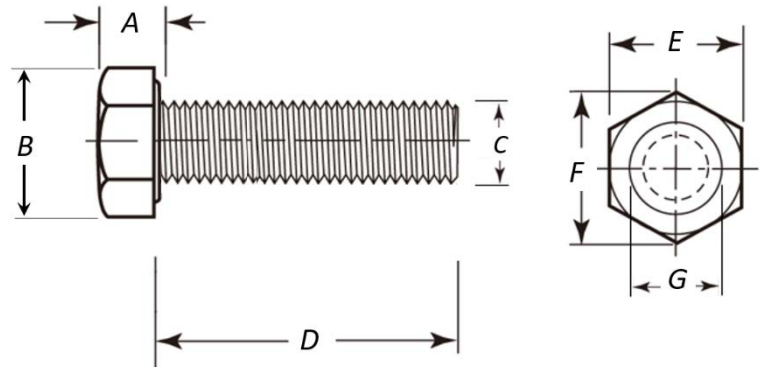
Figure 4. a) Plain washers, b) Spherical balls

## Lab 1. Dimensional Measurements

### Instructions

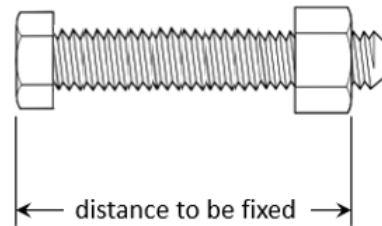
1. Measure parts of the hexagonal head bolt and its nut given to you with **vernier caliper**. Then, fill the table with your results.

Parameter	Vernier Caliper (mm)
A	
B	
C	
D	
E	
F	
G	



2. According to your student number, determine  $X^*$ . Then fix the distance between head and nut of hexagonal head bolt to "X" with **micrometer**. If it is not possible, fix it to the closest value to "X" that you can measure.

Value (mm)



Note that;

$X^* = (\text{first two number of your student number}). (\text{last two number of your student number}) \text{ mm}$

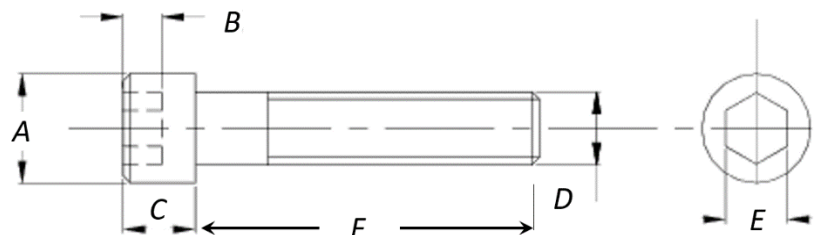
For example;

Student number=180412092

$X=18.92 \text{ mm}$

3. Dimensions of an allen bolt can be specified as below. Measure parts of the allen bolt given to you with **micrometer**. Then, fill the table with your results.

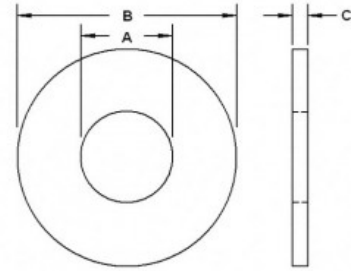
Parameter	Micrometer (mm)
A	
B	
C	
D	
E	
F	



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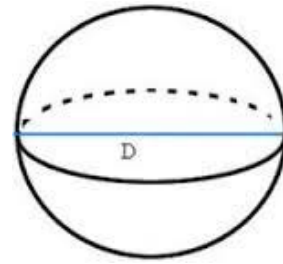
4. Measure the specified dimensions of a plain washer with **vernier caliper**. Then, fill the table with your results.

Parameter	Vernier Caliper (mm)
A	
B	
C	



5. Measure the diameter of spherical ball three times with both **vernier caliper** and **micrometer**. Then, fill the table with your results.

No.	Vernier Caliper (mm)	Micrometer (mm)
1st		
2nd		
3rd		



### Homeworks

1. Briefly describe purpose of the experiment.
2. Briefly describe measurement procedure of vernier caliper and micrometer.
3. Calculate the volume of hexagonal head bolt and nut that you measured at Instruction 1.
4. Include a photo of fixed hexagonal head bolt and nut at Instruction 2.
5. Calculate the total surface area of allen bolt that you measured at Instruction 3.
6. Calculate the total surface area of plain washer that you measured at Instruction 4.
7. Calculate the volume of spherical ball for both cases, i.e, vernier caliper and micrometer, by considering the average value of your three diameter measurement at Instruction 5.
8. Compare and comment on precision of vernier caliper and micrometer.
9. Comment on your diameter measurement at Instruction 5. Is there any difference between measurements? Why such differences occurs and how you can solve this problem? Compare micrometer and vernier caliper results of your spherical ball diameter measurement.

\* You can access report format from website [lcetin.github.io](https://github.com/lcetin)