TWGHs Lo Kon Ting Memorial College
Mathematics
STEM Education

S3 Chapter 6
Applications of Trigonometry
6.4 Angles of Elevation and Depression

Name:______________________________

Class:__________________(________)

Group:______________________________

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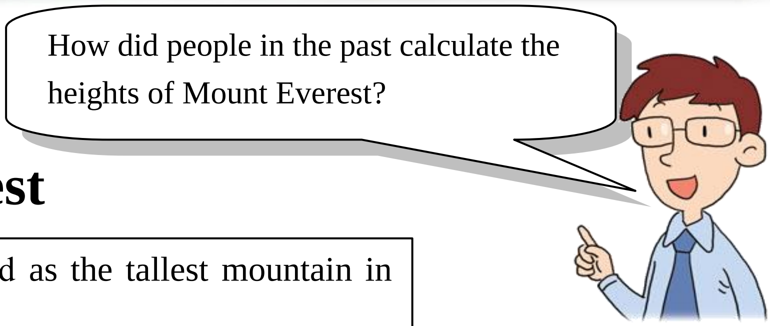
Interesting Trivia: The height of Mount Everest

Figure 1 - Mount Everest (珠穆朗瑪峰)



The height of Mount Everest

Today, Everest's height is widely recognized as the tallest mountain in the world, which is 29,029 feet tall.

The first recorded attempt to measure Everest's height came in the mid-19th century by Sir George Everest, a former surveyor general of India, assembled near India's border with Nepal. He hired a team with Radhanath Sikdar, a young Indian mathematician, and a group of so-called human computers, using triangulation to collect data on the mountain, known then as Peak XV.

In 1856, the height of Peak XV was recorded at 29,002 feet, a number remarkably close to the height recognized by climbing bodies today. But Mr. Sikdar's contributions were pushed to the footnotes, and Peak XV was eventually renamed in honor of Mr. Everest.

A. Cautions and Tips

Pay attention to the cautions and tips below during the process.

- Use the calculator effectively to handle complicated calculations;
- Simplify all the measurement and calculation by using mathematical theories and methods, for instance, *Ratios*, *Estimation* and *Graphing*, to minimize error;
- Avoid measuring the height of the main building directly with a rope, but do it creatively in a mathematical way;
- Avoid any dangerous activities and be accompanied by teachers during the whole process of measurement;
- Use all the information, for example, length, distance, drawing graph, that is measured by your group.
- Use precise wording and sentences for presentation.

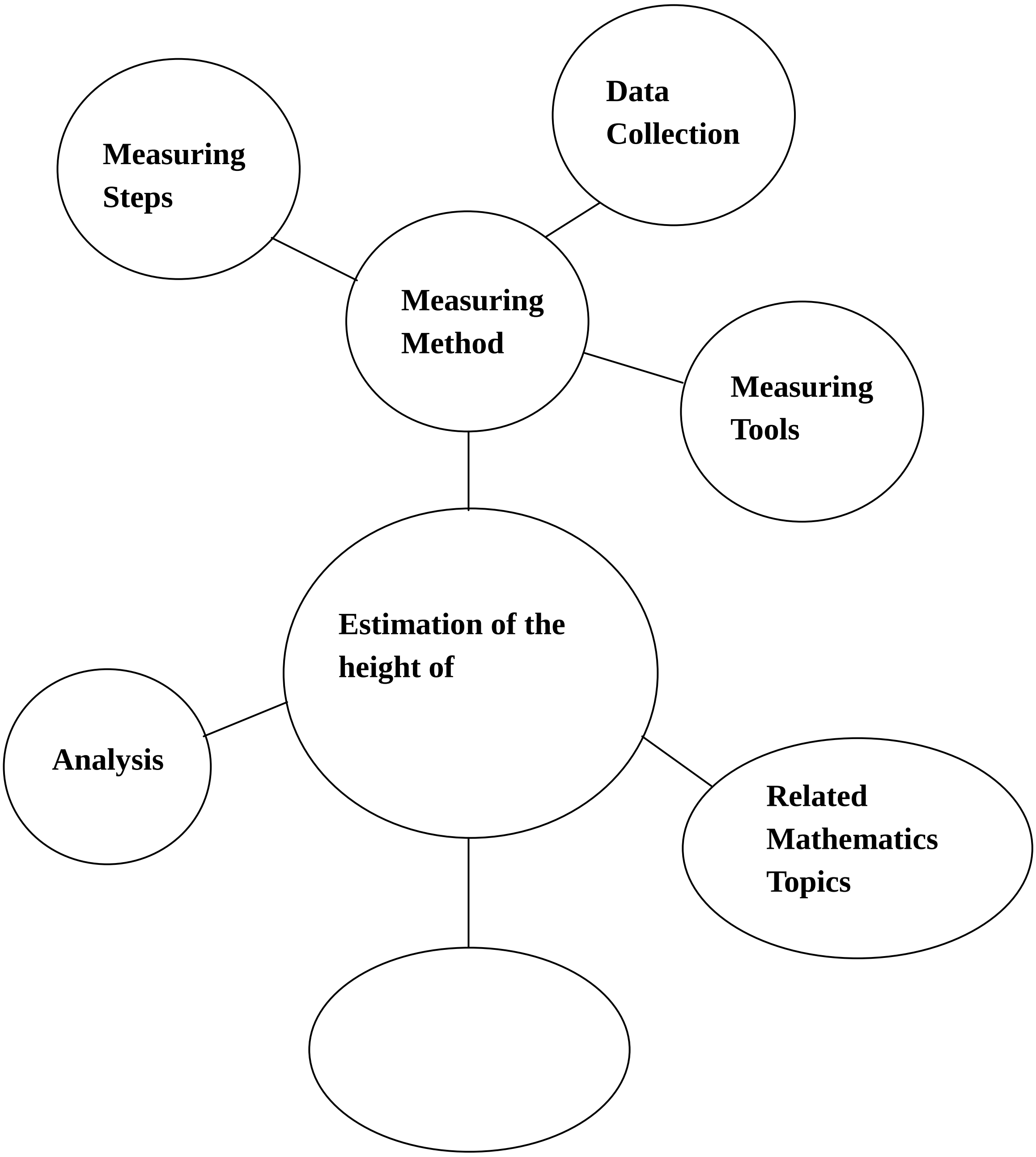
Mission：Estimation of the height of

Main building / Flagpole / Hall / G24 / Hoop of backboard

(Please circle as appropriate)

<u>B. Brainstorm</u>

No good idea ever came out of a brainstorm.



C. Preparation of measurement

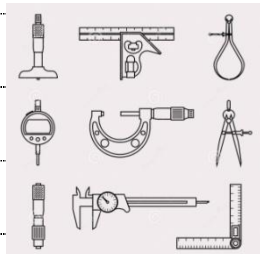
1. Related Mathematics topics applied

(Hints：Methods and content in Chapter 6 are highly recommended)

i.e. *Rate and Ratio*

2. List of Measuring Tools

i.e. *Clinometer* (You can D.I.Y. by following the instructions and using the material in the appendix)



3. Data Collection

(Hints：How can you collect the primary data?)

D. Implementations and Results of measurement

Drawing Area

You can graphically present how you measure the height of target.

1. What are the steps that you are going to use for measurement?

2. How can you calculate the height of the targeted item with the result of measurement?

E. Discussion

1. Are there any limitations during the process of measurement?

i.e. *The accuracy of data*

2. How the limitations influence the process and result of measurement?

(Hints：Are there any influences caused by human error?)

3. How can you enhance the accuracy while collecting the data?

F. Appendix

Materials

	Item	Quantity
1.	Protractor (provided on p.10)	1
2.	String (about 15cm long)	1
3.	Tape roll	1
4.	Straw	1
5.	Hard Carton (A4 size)	1

Instructions of making a Clinometer

1. Fix the protractor, provided on p. 12, on a hard carton.
2. Tape a straight, plastic drinking straw on or near the straight edge of the protractor. Make sure the straw passes through the two 0° marks at the two ends. (See Figure 2.)

   * **If you don't have a straw, roll a piece of paper into a tight cylinder and use that instead.**

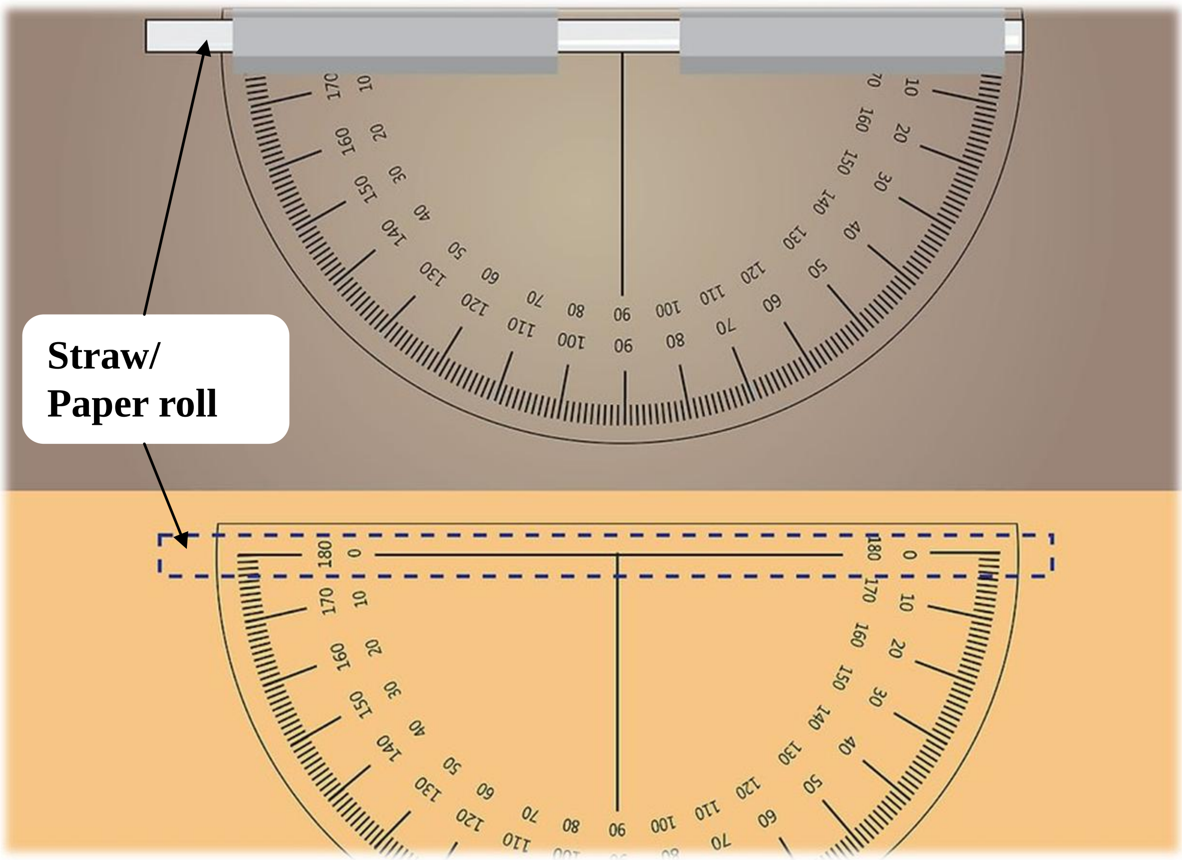


Figure 2

3. As shown in Figure 3, tie a string through the small hole on the straight edge, which is directly between the 0° marks on the protractor, across from the 90° mark on the curved edge of the protractor.

   ***Make sure the string dangles a few inches (several centimeters) below the protractor.**

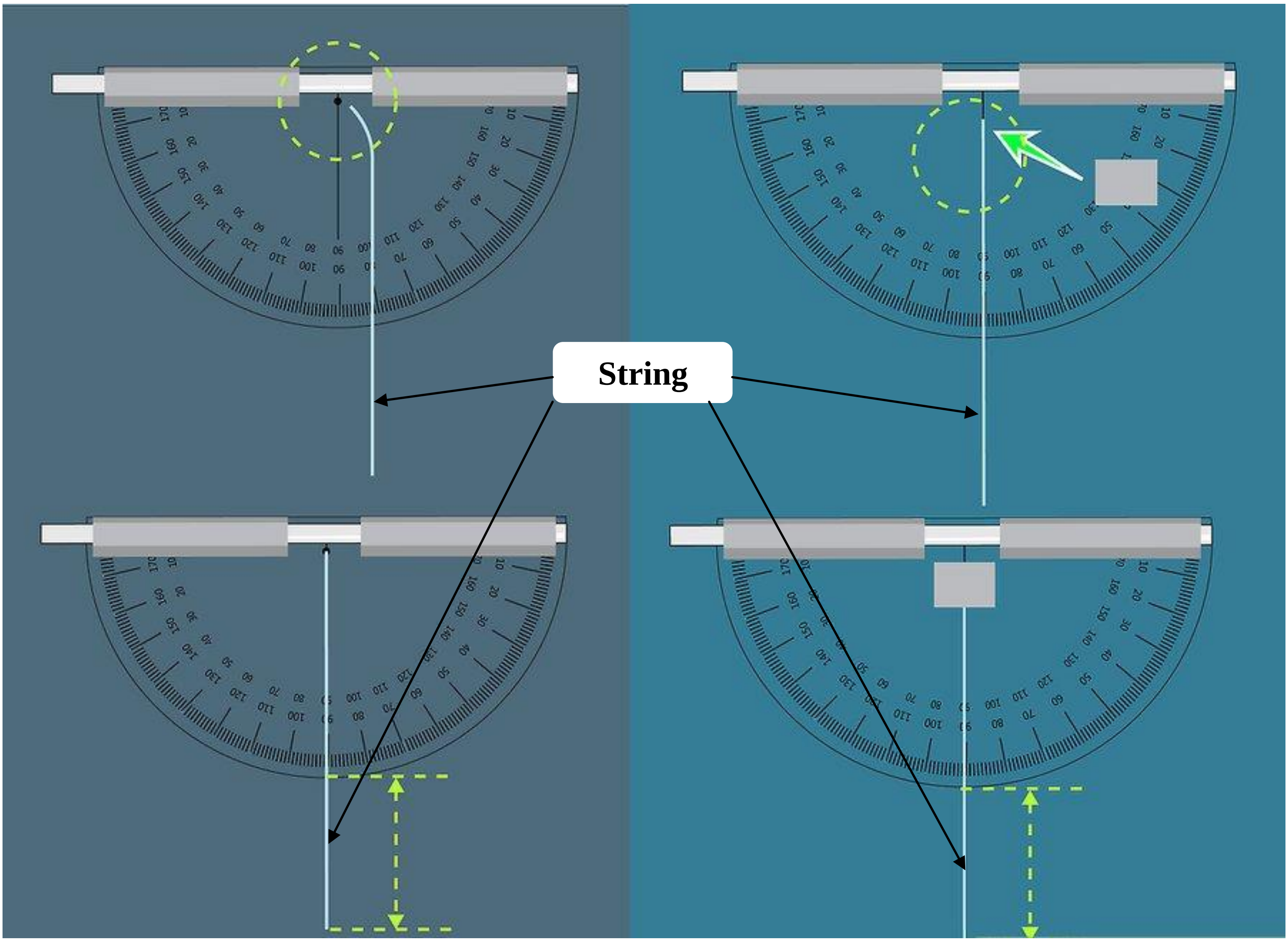


Figure 3

4. As shown in Figure 4, attach a tape roll to the dangling end of the string. When you hold the clinometers, the string falls past the circular rim of the protractor. The weight will pull the string straight down past an angle mark on the protractor, such as 60°. This tells you what angle the clinometer is being held at.

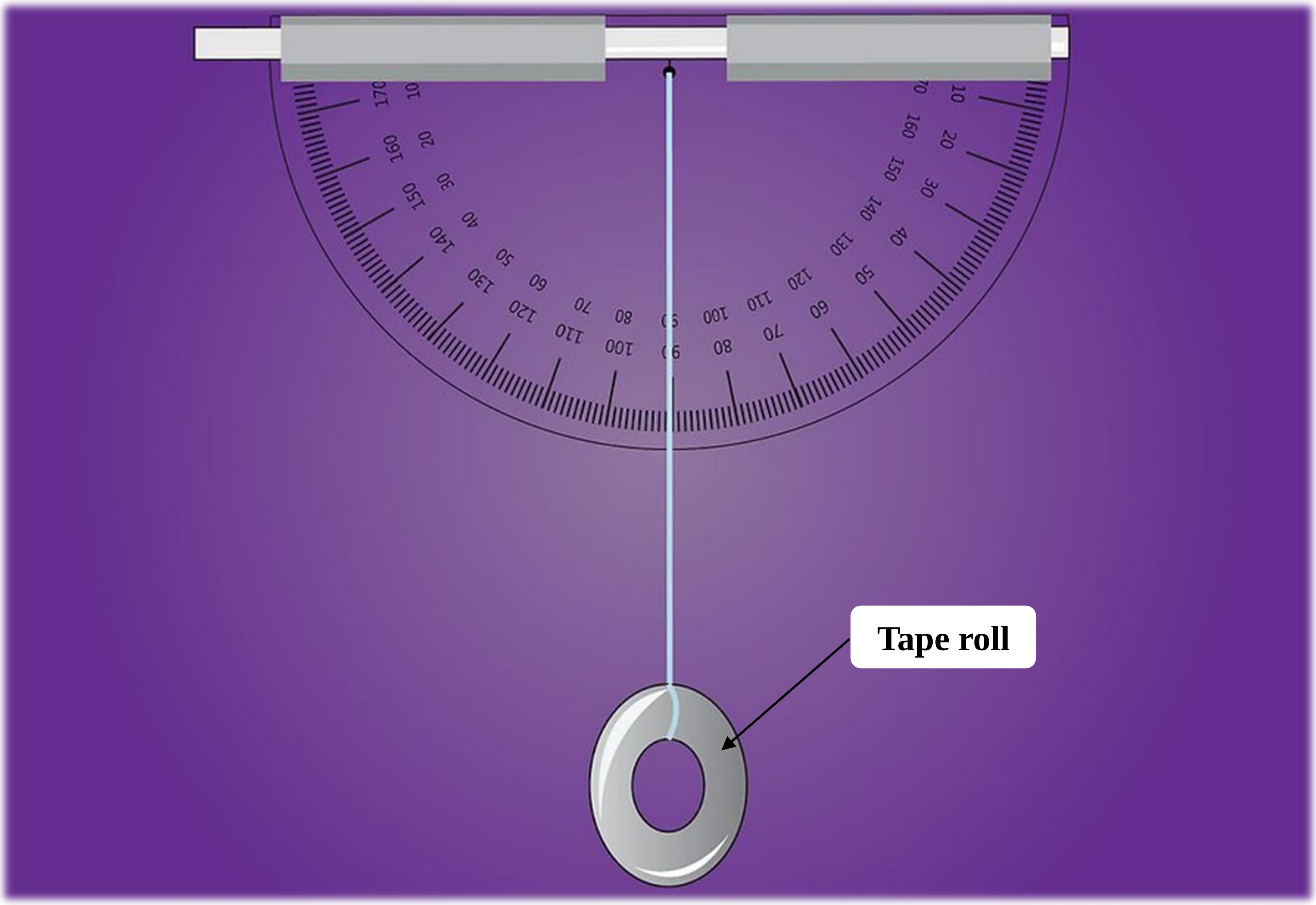
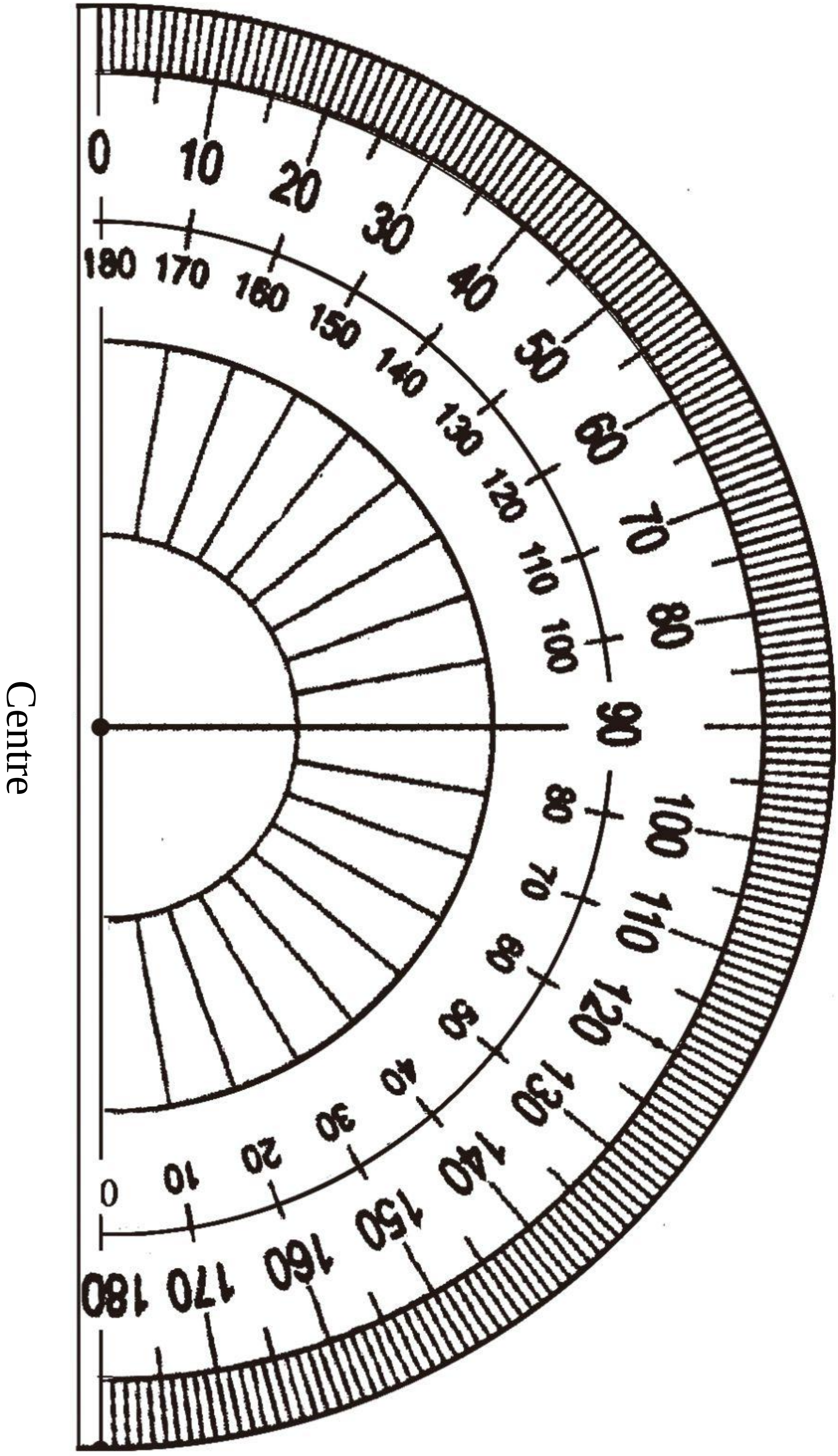


Figure 4

Protractor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