



## **EXEMPLAR 1:**

### **Estimation Strategies**

**Objective:** To develop estimation strategies in measurement

**Key Stage:** 3

**Learning Unit:** Estimation in Measurement

**Materials Required:** Rulers and protractors

**Prerequisite Knowledge:** Using a protractor to measure angles

#### **Description of the Activity:**

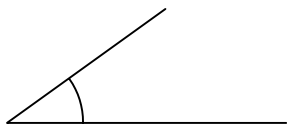
1. The teacher distributes the worksheet to students and asks them to estimate the sizes of the angles / lengths of the line segments on the worksheet without using any measuring instruments.
2. The teacher asks some students to report their estimates to the whole class and write down their estimates on the blackboard. Afterwards, the teacher requests students to discuss which estimate is the best for each item.
3. The teacher can pose the following questions for the discussion.
  - (a) How can you get your estimation?
  - (b) What angle can you consider as a referent?
  - (c) Can an obtuse angle be less than  $90^\circ$ ?
  - (d) Can you draw a line segment of height 1 cm or 5 cm as the "benchmark" for estimation?
4. The teacher asks students to use measuring instruments to find the answers to each question on the worksheet. The teacher helps students to form groups. Discussion can be held in class or in groups to evaluate how close students' estimates are when compared with the measured values.
5. The teacher summarizes the estimation strategies used by students.

6. The teacher introduces the typical estimation strategies in measurement through the following activities:
  - (a) estimate the height of the ceiling of the classroom
  - (b) estimate the length of the corridor of a school building
  - (c) estimate the height of the school building
  - (d) estimate the size of a rectangular bedroom
  - (e) guess the length of the footpath adjacent to the school campus
  - (f) guess the distance between 2 students in opposite corners of the classroom
  - (g) guess the distance between 2 towns from a map with a given scale
  - (h) guess the area of a classroom/ hall/ laboratory/ flat
  - (i) estimate the volume of a container
  - (j) describe the distance of 10m
  - (k) draw a line segment of 20cm
  - (l) guess the time required to walk 100m
  - (m) guess the number of people standing in a football field
  - (n) guess the number of dots drawn on a sheet of paper
7. The teacher gives comments to students' strategies at appropriate times and draws conclusion if necessary.

**Worksheet : Estimation of angles and lengths**

1. Estimate the sizes of the following angles and write them down on the dotted lines under the diagrams.

(a)



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(b)



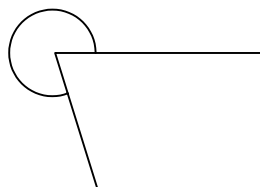
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(c)



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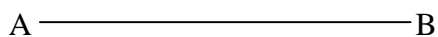
(d)



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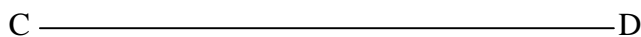
2. Estimate the lengths of the following line segments in cm and write them down on the dotted lines next to the diagrams.

(a)



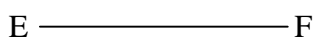
AB = ----- cm

(b)



CD = ----- cm

(c)



EF = ----- cm

**Notes for Teachers:**

1. This exemplar is a new topic. It is expected that students have an intuitive impression on the sizes of angles or the lengths of line segments. Through this activity, students can analyze and reorganize their estimation strategies systematically. Teachers can also guide students to learn the "benchmark strategies" and "decomposition-recomposition strategies".
2. It is not difficult to find out that students are quite weak at the sense of some common measures such as angle, time, length etc. The worksheet can then be considered as a motivation exercise for students to start the discussion on the sense of measures. Afterwards, they may be more willing to study the estimation strategies in measurement.
3. The techniques used in the worksheet by students can be served as a good point for the discussion of the "benchmark strategies" and "decomposition-recomposition strategies" if students have applied these strategies in the worksheet.
4. In the discussion of point 6 in question (a), "estimate the height of the ceiling of the classroom", it is expected that students can use the "Benchmark strategies" to solve the problem. That is, to apply a known standard (benchmark or referent) to the item to be estimated. Usually the benchmark will be the height of the door or the height of a student.
5. If the benchmark is not available or not easy to find in question (a), the teacher can use question (b), (c) and (d) in point 6 to introduce the "Decomposition-recomposition strategies". It is expected to decompose the corridor into a number of classrooms; the height of the building into the height of each level and the length and width of the bedroom into a number of 1 foot×1 foot tiles.