



Figure it Out - Questions & Solutions

Ganita Prakash | Grade 6 | Chapter 2: Lines and Angles

Included complete exercise sets beginning on book pages 35, 40 and 45:

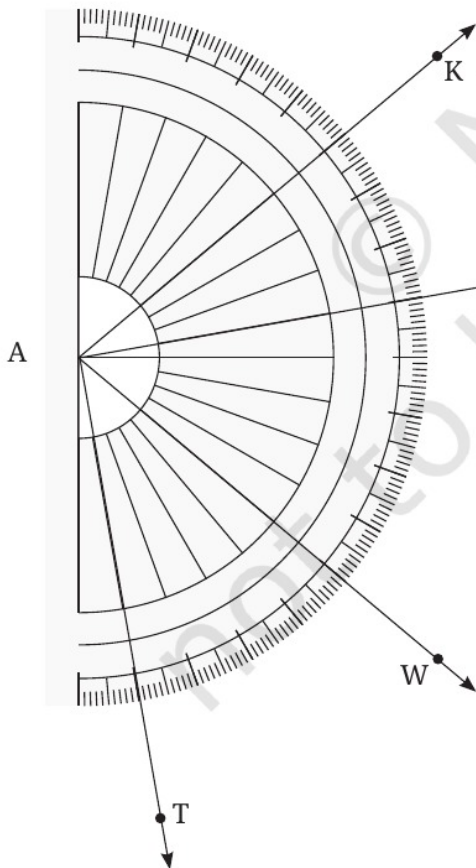
- Page 35 set: questions on pages 35-36
- Page 40 set: Questions 1-9 on pages 40-43
- Page 45 set: Questions 1-5 on pages 45-46

The question images below are reproduced from the supplied book pages so the wording and diagrams stay exactly as in the book. Solutions use the answer section at the end of the supplied book as the primary reference. For activity-based questions not answered there, a clearly marked explanatory/sample solution is provided.

Figure it Out Set Starting on Page 35

Question - Book page 35

Figure it out



1. Write the measures of the following angles:

a. $\angle KAL$

Notice that the vertex of this angle coincides with the centre of the protractor. So the number of units of 1 degree angle between KA and AL gives the measure of $\angle KAL$. By counting, we get —

$$\angle KAL = 30^\circ$$

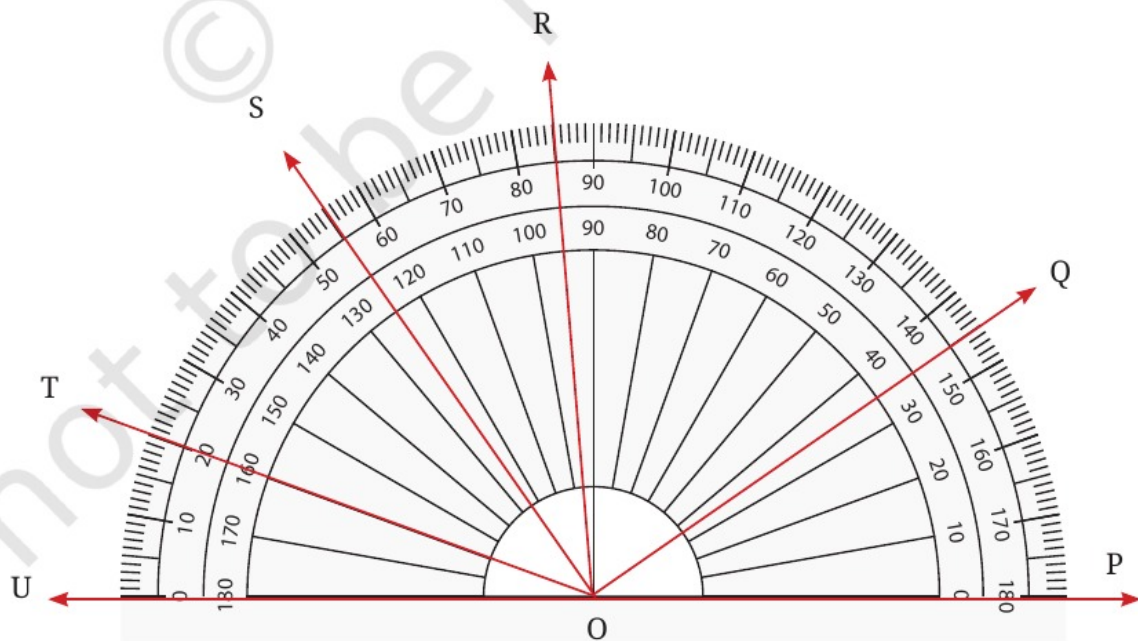
Making use of the medium sized and large sized marks, is it possible to count the number of units in 5s or 10s?

b. $\angle WAL$

c. $\angle TAK$

Continuation - Book page 36

☀ Name the different angles in the figure and write their measures.





Solutions - Set Starting on Page 35

1. Write the measures of the following angles:

Solution: a. $\angle KAL = 30^\circ$

b. $\angle WAL = 50^\circ$

c. $\angle TAK = 120^\circ$

Yes. The medium and long marks allow us to count conveniently in steps of 5° and 10° .

Name the different angles in the figure and write their measures.

Solution: Taking OP as 0° , the rays are at approximately $Q = 35^\circ$, $R = 95^\circ$, $S = 125^\circ$, $T = 160^\circ$ and $U = 180^\circ$. Therefore:

$\angle POQ = 35^\circ$; $\angle POR = 95^\circ$; $\angle POS = 125^\circ$; $\angle POT = 160^\circ$;
 $\angle QOR = 60^\circ$; $\angle QOS = 90^\circ$; $\angle QOT = 125^\circ$; $\angle QOU = 145^\circ$;
 $\angle ROS = 30^\circ$; $\angle ROT = 65^\circ$; $\angle ROU = 85^\circ$;
 $\angle SOT = 35^\circ$; $\angle SOU = 55^\circ$; $\angle TOU = 20^\circ$.

Additional observation: $\angle POU = 180^\circ$, a straight angle.

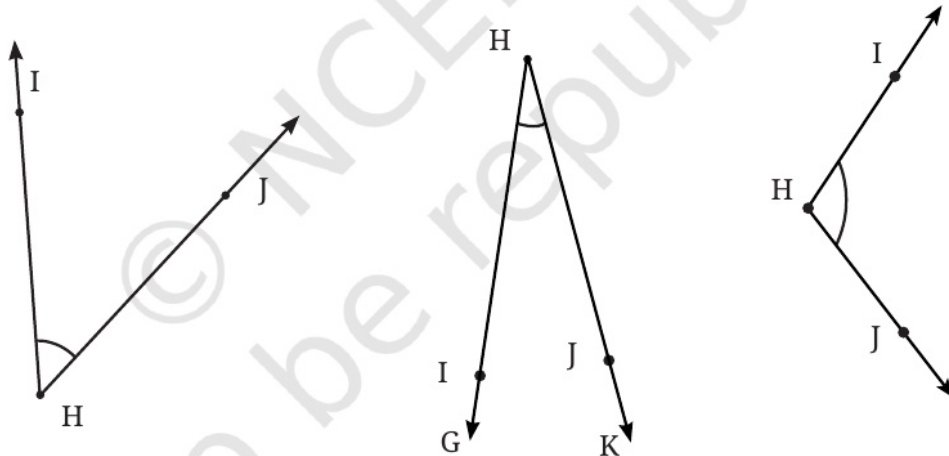
Figure it Out Set Starting on Page 40

Questions 1-2 - Book page 40



Figure it Out

1. Find the degree measures of the following angles using your protractor.



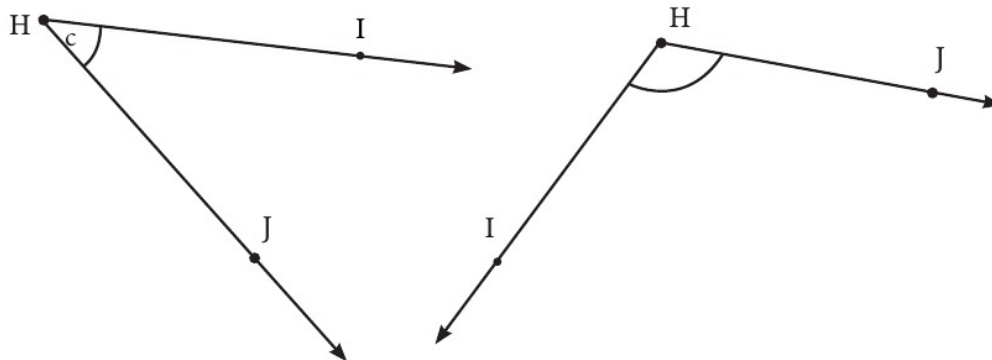
2. Find the degree measures of different angles in your classroom using your protractor.

Teacher's Note

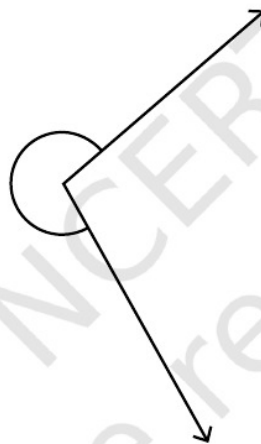
It is important that students make their own protractor and use it to measure different angles before using the standard protractor so that they know the concept behind the marking of the standard protractor.

Questions 3-5 (part) - Book page 41

3. Find the degree measures for the angles given below. Check if your paper protractor can be used here!

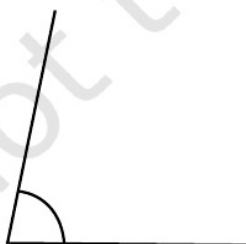


4. How can you find the degree measure of the angle given below using a protractor?

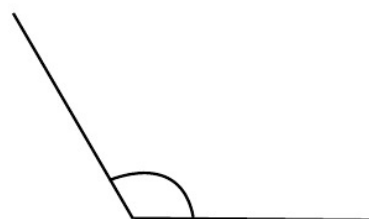


5. Measure and write the degree measures for each of the following angles:

a.

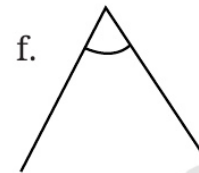
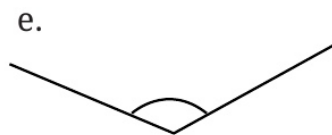
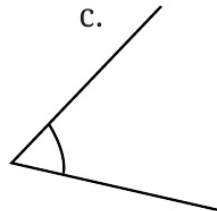


b.

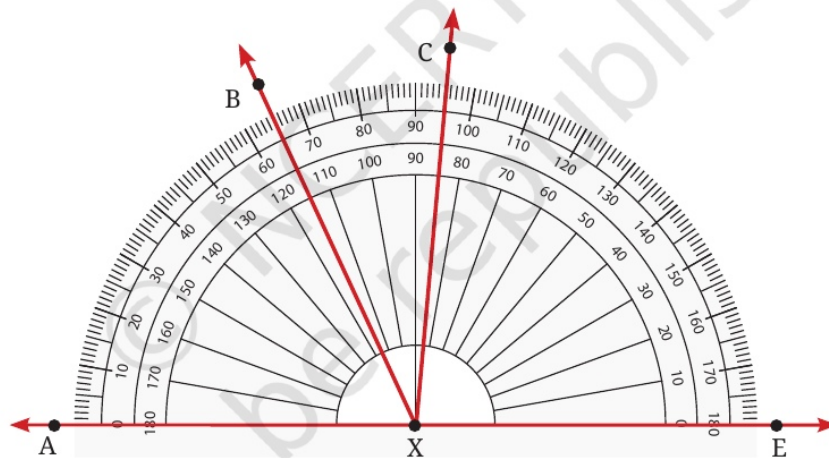


Question 5 (continued), Questions 6-7 - Book page 42

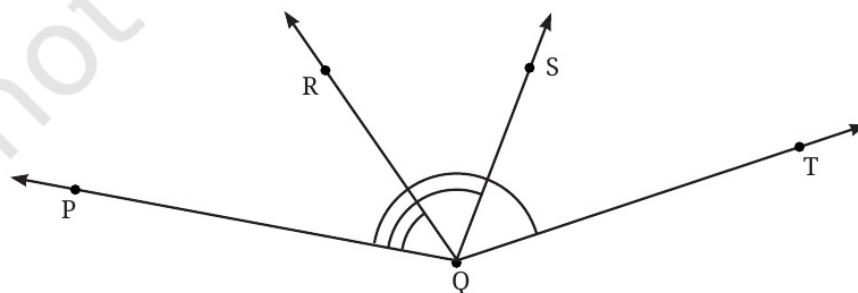
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6. Find the degree measures of $\angle BXE$, $\angle CXE$, $\angle AXB$ and $\angle BXC$.

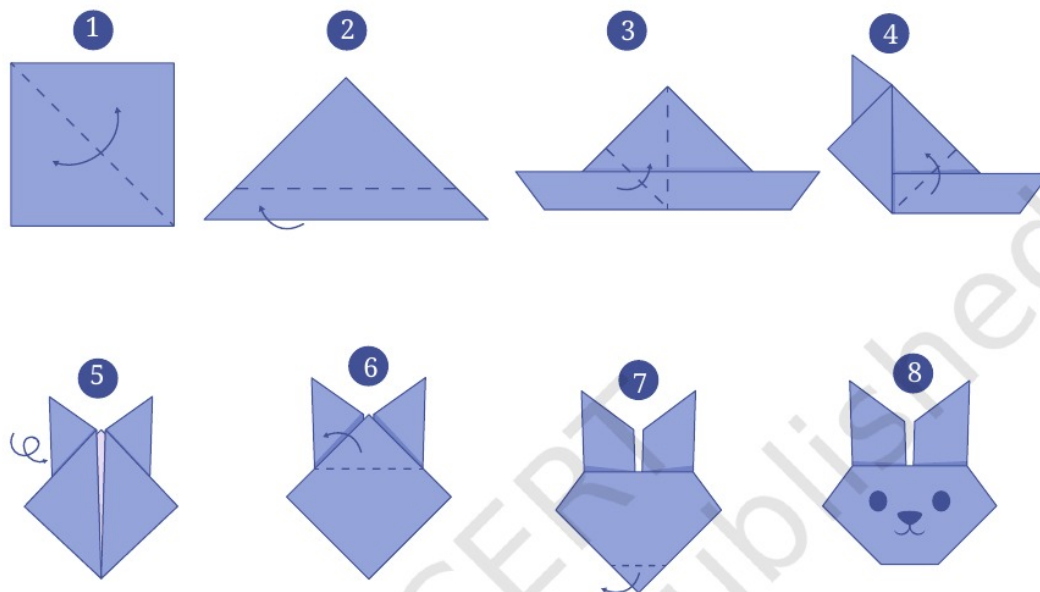


7. Find the degree measures of $\angle PQR$, $\angle PQS$ and $\angle PQT$.

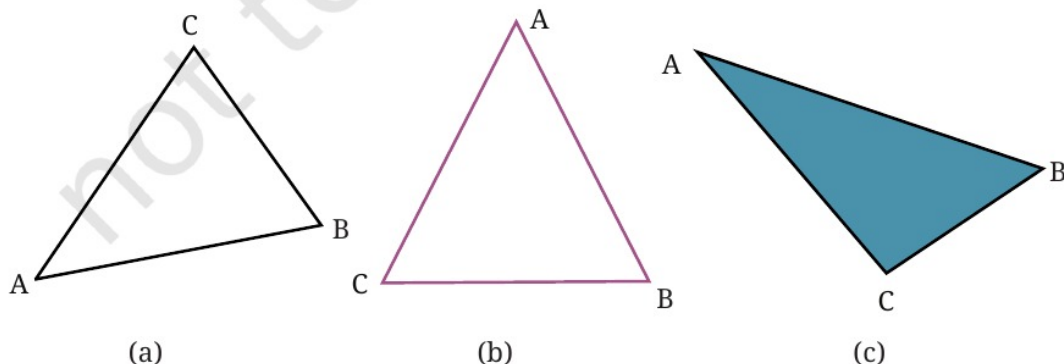


Questions 8-9 - Book page 43

8. Make the paper craft as per the given instructions. Then, unfold and open the paper fully. Draw lines on the creases made and measure the angles formed.



9. Measure all three angles of the triangle shown in Fig. 2.21 (a), and write the measures down near the respective angles. Now add up the three measures. What do you get? Do the same for the triangles in Fig. 2.21 (b) and (c). Try it for other triangles as well, and then make a conjecture for what happens in general! We will come back to why this happens in a later year.





Solutions - Set Starting on Page 40

1. Find the degree measures of the following angles using your protractor.

Solution: From left to right:

- First figure: $\angle IHJ = 47^\circ$.
- Middle figure: $\angle GHK = \angle IHJ = 23^\circ$ (I lies on HG and J lies on HK, so both names refer to the same opening).
- Right figure: $\angle IHJ = 108^\circ$.

2. Find the degree measures of different angles in your classroom using your protractor.

Solution: Activity-based answer: measurements depend on the objects in your classroom. Example measurements could be: a notebook corner = 90° , two hands of a classroom clock at 2 o'clock = 60° , or a partly opened door 45° - 70° . Students should place the centre of the protractor at the vertex and align one arm with 0° before reading the other arm.

3. Find the degree measures for the angles given below. Check if your paper protractor can be used here!

Solution: Left figure = 42° .

Right figure = 116° .

The handmade paper protractor made earlier has only coarse markings (multiples of 22.5°), so it cannot measure 42° or 116° accurately. A standard protractor is needed.

4. How can you find the degree measure of the angle given below using a protractor?

Solution: First measure the smaller unmarked angle. It is about 100° . The marked angle is the reflex angle around the other side.

Marked angle = $360^\circ - 100^\circ = 260^\circ$.



Solutions - Set Starting on Page 40 (continued)

5. Measure and write the degree measures for each of the following angles:

Solution: a. 80°

b. 120°

c. 60°

d. 130°

e. 130°

f. 60°

6. Find the degree measures of $\angle BXE$, $\angle CXE$, $\angle AXB$ and $\angle BXC$.

Solution: $\angle BXE = 115^\circ$

$\angle CXE = 85^\circ$

$\angle AXB = 65^\circ$

$\angle BXC = 30^\circ$

7. Find the degree measures of $\angle PQR$, $\angle PQS$ and $\angle PQT$.

Solution: $\angle PQR = 45^\circ$

$\angle PQS = 100^\circ$

$\angle PQT = 150^\circ$

8. Make the paper craft as per the given instructions... measure the angles formed.

Solution: Activity-based answer: the exact readings depend on how accurately the folds are made. After opening the paper, draw straight lines on all creases, mark each intersection as a vertex, and measure each opening with a protractor. Accurate symmetric/half-folds will produce pairs of equal angles; common values may include 45° , 90° and 135° , depending on the crease.

9. Measure all three angles of the triangles in Fig. 2.21 and make a conjecture.

Solution: Measurements from the printed figures are approximately:

- Triangle (a): A 44° , B 65° , C 71° total 180° .
- Triangle (b): A 54° , B 63° , C 63° total 180° .
- Triangle (c): A 30° , B 52° , C 98° total 180° .

Conjecture: The sum of the three interior angles of every triangle is 180° . Small differences of 1° - 2° may occur when measuring a printed drawing with a protractor.

Figure it Out Set Starting on Page 45

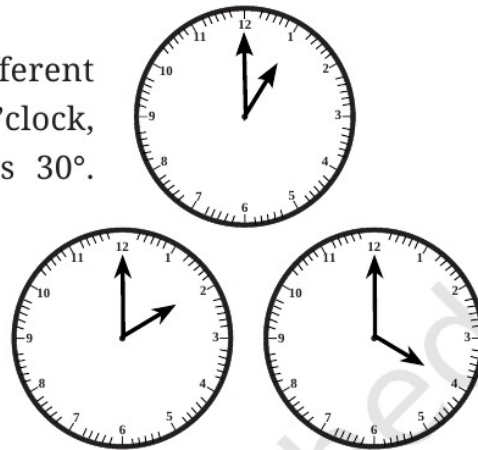
Questions 1-3 - Book page 45

Figure it Out

Where are the angles?

1. Angles in a clock:

- The hands of a clock make different angles at different times. At 1 o'clock, the angle between the hands is 30° . Why?
- What will be the angle at 2 o'clock? And at 4 o'clock? 6 o'clock?
- Explore other angles made by the hands of a clock.



2. The angle of a door:

Is it possible to express the amount by which a door is opened using an angle? What will be the vertex of the angle and what will be the arms of the angle?



- Vidya is enjoying her time on the swing. She notices that the greater the angle with which she starts the swinging, the greater is the speed she achieves on her swing. But where is the angle? Are you able to see any angle?



Questions 4-5 - Book page 46

4. Here is a toy with slanting slabs attached to its sides; the greater the angles or slopes of the slabs, the faster the balls roll. Can angles be used to describe the slopes of the slabs? What are the arms of each angle? Which arm is visible and which is not?
5. Observe the images below where there is an insect and its rotated version. Can angles be used to describe the amount of rotation? How? What will be the arms of the angle and the vertex?



Hint: Observe the horizontal line touching the insects.



Teacher's Note

It is important that students see the application of each mathematical concept in their daily lives. Teacher can organise some activities where students can appreciate the practical applications of angles in real-life situations, e.g., clocks, doors, swings, concepts of uphill and downhill.



Solutions - Set Starting on Page 45

1. Angles in a clock

Solution: a. A clock face is divided into 12 equal parts. Therefore, the angle between two successive hour numbers is $360^\circ \div 12 = 30^\circ$. Hence, at 1 o'clock the hands are 30° apart.

b. At 2 o'clock: $2 \times 30^\circ = 60^\circ$.

At 4 o'clock: $4 \times 30^\circ = 120^\circ$.

At 6 o'clock: $6 \times 30^\circ = 180^\circ$.

c. Other examples: 3 o'clock = 90° , 5 o'clock = 150° , 10 o'clock = 60° , 11 o'clock = 30° . At 9 o'clock, the smaller angle is 90° ; if we follow the larger/reflex turn, it is 270° .

2. The angle of a door

Solution: Yes. The amount by which a door is opened can be described by an angle. The vertex is at the hinge/pivot where the door turns. One arm is the reference position along the wall/door frame, and the other arm is the present position of the door. A larger opening angle means the door is opened farther.

3. Vidya on the swing

Solution: The angle is at the suspension point of the swing. The two arms can be thought of as the rope in two positions - a reference/vertical position and the displaced position of the rope when Vidya is pulled back or swings to one side. The greater this angular displacement, the higher the starting position.

4. Toy with slanting slabs

Solution: Yes. The slope of each slab can be described by the angle it makes with a reference horizontal line. The visible arm is the slanting edge of the slab. The other arm is an imaginary horizontal reference ray through the same point and may not be drawn in the picture. A larger angle with the horizontal means a steeper slope, so the ball tends to roll faster.

5. Insect and its rotated version

Solution: Yes. The amount of rotation can be described by an angle. Choose a fixed reference direction (the horizontal line shown in the hint) and compare it with the insect's direction after rotation. The vertex is the chosen pivot/reference point, and the arms are the original direction and the rotated direction. For example, changing from a horizontal orientation to a vertical orientation represents a 90° turn.



Solutions - Set Starting on Page 45 (continued)

Note: For measurement/activity questions, a student's measured values may vary slightly because of printing, scaling and folding accuracy. The mathematical conclusion and method are the important parts.

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