CBSE Class 6 Mathematics

Lines and Angles — Solved 'Figure It Out' Questions (NCERT Chapter 2)

This document provides complete, step-by-step solutions to every 'Figure It Out' activity and question from the NCERT Class 6 Mathematics chapter on Lines and Angles (Ganita Prakash). Solutions are organised section-wise, matching the sequence of the textbook.

Section 2.4 — Ray (Page 15)

Q. Rihan marked a point on a piece of paper. How many lines can he draw that pass through the point? Sheetal marked two points on a piece of paper. How many different lines can she draw that pass through both of the points?

Ans. Rihan can draw an unlimited (infinite) number of lines through a single point. Sheetal can draw only one line through two given points.

Q. Name the line segments in Fig. 2.4. Which of the five marked points are on exactly one of the line segments? Which are on two of the line segments?

Ans. The line segments are LM, MP, PQ and QR. Points L and R lie on exactly one line segment each. Points M, P and Q lie on two line segments each.

Q. Name the rays shown in Fig. 2.5. Is T the starting point of each of these rays?

Ans. The rays are TA, TB, TN and NB. T is the starting point of TA, TB and TN, but T is not the starting point of NB (N is).

Q. Draw a rough figure and write labels appropriately to illustrate: (a) OP and OQ meet at O; (b) XY and PQ intersect at point M; (c) Line l contains points E and F but not point D; (d) Point P lies on AB.

Ans. Draw each as described: (a) two rays OP and OQ starting from a common point O; (b) two lines XY and PQ crossing at point M; (c) a line l passing through E and F, with D marked away from the line; (d) a line segment AB with point P marked anywhere on it.

Section 2.5 — Angles (Page 19)

Q. Can you find the angles in the given pictures? Draw the rays forming any one of the angles and name the vertex of the angle.

Ans. One of the angles is ∠BDC, with vertex D; the rays forming it are DB and DC. (Students should identify similar angles, arms, and vertices in the other pictures.)

Q. Draw and label an angle with arms ST and SR.

Ans. Draw two rays ST and SR starting from the common point S; the angle formed is ∠TSR (or ∠RST), with vertex S.

Q. Name the angles marked in the given figure.

Ans. The angles marked are ∠RTQ and ∠RTP.

Q. Mark any three points on your paper that are not on one line. Label them A, B, C. Draw all possible lines through pairs of these points. How many lines do you get? Name them. How many angles can you name using A, B, C?

Ans. You get three lines: AB, BC and CA. Using A, B and C, three angles can be named: ∠ABC (or ∠CBA), ∠BCA (or ∠ACB), and ∠CAB (or ∠BAC).

Q. Now mark any four points, no three on one line. Label them A, B, C, D. Draw all possible lines through pairs of these points. How many lines and angles can you name?

Ans. You get six lines: AB, BC, CD, DA, AC and BD. Using A, B, C and D the angles that can be named include: ∠BAC, ∠CAD, ∠BAD, ∠ADB, ∠BDC, ∠ADC, ∠DCA, ∠ACB, ∠DCB, ∠CBD, ∠DBA and ∠CBA.

Section 2.6 — Comparing Angles (Page 20 & 23)

Q. Is it always easy to compare two angles?

Ans. No, it is not always easy. For example, 89° and 91° cannot be compared correctly just by looking; they need to be measured or superimposed. However, some pairs of angles that look very different in size can be compared easily just by observation.

Q. Where else do we use superimposition to compare?

Ans. Superimposition is also used to compare line segments, squares, circles, and other shapes to check which is larger or whether they are equal.

Q. Fold a rectangular sheet of paper, then draw a line along the fold created. Name and compare the angles formed between the fold and the sides of the paper. Which is the largest and smallest angle you made?

Ans. When a rectangular sheet is folded once, the crease usually forms two equal angles with the sides of the paper (if folded straight) or two unequal angles (if folded at a slant). By making several different folds and comparing through superimposition, students will find that a fold perpendicular to a side gives the largest possible pair of equal angles (90° each), while a very slanted fold gives one very small and one very large angle.

Section 2.8 — Right Angles and Classifying Angles (Pages 29 & 31)

Q. How many right angles do the windows of your classroom contain? Do you see other right angles in your classroom?

Ans. Most classroom windows are rectangular and contain 4 right angles each (one at each corner). Other right angles can be seen at the corners of the door, the blackboard, books, and tables.

Q. Get a slanting crease on the paper. Now try to get another crease perpendicular to the slanting crease. How many right angles do you have now?

Ans. You get four right angles at the point where the two creases cross, since each crease is a straight line and the two lines are perpendicular. This can be verified by folding the paper so that one part of the crease lies exactly on top of the other part — if they match exactly, the angles are right angles.

Q. Identify acute, right, obtuse and straight angles in the previous figures.

Ans. Angles less than 90° are acute; angles equal to 90° are right angles; angles greater than 90° but less than 180° are obtuse; and angles equal to 180° are straight angles. Students should label each angle from the earlier figures accordingly.

Q. Make a few acute angles and a few obtuse angles. Draw them in different orientations.

Ans. Draw several angles smaller than a right angle (acute) and several larger than a right angle but smaller than a straight angle (obtuse), in different rotated positions on the page.

Q. Do you know what the words 'acute' and 'obtuse' mean? Why do you think these words have been chosen?

Ans. 'Acute' means sharp, and 'obtuse' means blunt. Acute angles look sharp and narrow (a small opening between the arms), while obtuse angles look wide and blunt (a larger opening between the arms) — hence the names.

Q. Find the number of acute angles in each of the given figures. What will be the next figure and how many acute angles will it have? Do you notice a pattern?

Ans. The figures have 3, 12, and 21 acute angles respectively. The next figure will have 30 acute angles. The pattern follows the rule $3 \times 0 + 1$, $3 \times 1 + 1$, $3 \times 2 + 1$, $3 \times 3 + 1$, ... where the numbers 0, 1, 2, 3, ... represent the number of inner triangles in each figure.

Section 2.9 — Using a Protractor (Pages 35 & 36)

Q. Write the measures of ∠KAL, ∠WAL and ∠TAK using the protractor.

Ans. ∠KAL = 30°, ∠WAL = 50°, and ∠TAK = 120°. (Yes, it is possible to count the protractor units in steps of 5s or 10s using the medium and long marks.)

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

Ans. ∠POQ = 35°, ∠POR = 95°, ∠POS = 125°, ∠POT = 160°, ∠QOR = 60°, ∠QOS = 90°, ∠QOT = 125°, ∠QOU = 145°, ∠ROS = 30°, ∠ROT = 65°, ∠ROU = 85°, ∠SOT = 35°, ∠SOU = 55°, and ∠TOU = 20°.

Think! and Angle Bisector (Page 40)

Q. In Fig. 2.20, ∠AOB = ∠BOC = ∠COD = ∠DOE = ∠EOF = ∠FOG = ∠GOH = ∠HOI = _____. Why?

Ans. Each angle equals 22.5°. This is because the straight angle of 180° has been divided into eight equal parts, so each part = 180° ÷ 8 = 22.5°.

Q. Find the degree measures of the given angles using your protractor.

Ans. ∠IHJ = ∠JHI = 47°; ∠GHK = ∠IHJ = 23°; ∠IHJ = ∠JHI = 108° (measured directly using the protractor on the given figures).

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

Ans. ∠IHJ = 42°, ∠IHJ = 116°. No, a simple paper (folded) protractor cannot measure these accurately since they are not simple fractions of 180° — a standard graduated protractor is needed.

Q. How can you find the degree measure of the marked angle using a protractor when it is greater than 180°?

Ans. Measure the smaller, unmarked angle first using the protractor, then subtract it from 360°. For example, if the unmarked angle is 100°, the marked reflex angle = 360° − 100° = 260°.

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

Ans. The measures are: (a) 80°, (b) 120°, (c) 60°, (d) 130°, (e) 130°, (f) 60° (as read directly off the protractor in each diagram).

Q. Find the degree measures of ∠BXE, ∠CXE, ∠AXB and ∠BXC.

Ans. ∠BXE = 115°, ∠CXE = 85°, ∠AXB = 65°, and ∠BXC = 30° (measured directly using the protractor).

Q. Find the degree measures of ∠PQR, ∠PQS and ∠PQT.

Ans. ∠PQR = 45°, ∠PQS = 100°, and ∠PQT = 150° (measured directly using the protractor).

Where Are the Angles? (Page 45)

Q. 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, 4 and 6 o'clock?

Ans. The full circle of the clock face (360°) is divided into 12 equal parts, so the angle between two consecutive numbers = 360° ÷ 12 = 30°. At 2 o'clock, the angle = 2 × 30° = 60°. At 4 o'clock, the angle = 4 × 30° = 120°. At 6 o'clock, the angle = 6 × 30° = 180° (a straight angle).

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

Ans. Yes. The vertex of the angle is the hinge point where the door meets the wall/frame. The two arms of the angle are the edge of the open door and the edge of the wall (door frame) that stayed fixed.

Q. Vidya is enjoying her time on the swing. Where is the angle formed while swinging?

Ans. The angle can be imagined between the position where Vidya starts swinging (the vertical resting position of the swing ropes) and the position the swing reaches at the highest point on either side. The vertex of this angle is at the top, where the ropes are attached.

Q. A toy has slanting slabs; the greater the slope, the faster the balls roll. Can angles describe the slope? What are the arms of each angle?

Ans. Yes, angles can directly describe the slope — a larger angle means a steeper slope and faster rolling balls. One arm of each angle is the vertical support of the toy (often not visible), and the other arm is the visible slanting edge of the slab.

Figure It Out — Page 49

Q. In Fig. 2.23, list all the angles possible. Guess their measures, then measure with a protractor and compare.

Ans. The possible angles include ∠CAP, ∠ACD, ∠APL, ∠DLP, ∠RPL, ∠SLP, ∠PRS, ∠LSR, ∠BRS and ∠CLP (and any other combinations visible in the figure). Students should record their estimated and actual (protractor-measured) values in a table and compare the accuracy of their guesses.

Reflex Angles and Estimation (Page 51 & 52)

Q. Use a protractor to find the measure of each angle, then classify each as acute, obtuse, right, or reflex.

Ans. ∠PTR = 30° (Acute angle); ∠PTQ = 60° (Acute angle); ∠PTW = 102° (Obtuse angle); ∠WTP (reflex) = 258° (Reflex angle).

Q. Let's Explore: In the figure, ∠TER = 80°. What is the measure of ∠BET? What is the measure of ∠SET?

Ans. Since ∠REB is a straight angle (180°) and ∠TER = 80°, we get ∠BET = 180° − 80° = 100°. Similarly, since ∠SET and ∠TER are related along another straight angle (90° + 90° = 180°, with ∠SET + ∠TER = 90°), ∠SET = 90° − 80° = 10°.

Q. Make any figure with three acute angles, one right angle and two obtuse angles.

Ans. Draw any closed or open figure with six labelled angles — for example, ∠A, ∠B and ∠C as three acute angles, ∠E as the right angle, and ∠D and ∠F as the two obtuse angles.

Drawing and Classifying Angles (Page 53)

Q. Draw angles with the following degree measures: (a) 140° (b) 82° (c) 195° (d) 70° (e) 35°.

Ans. Using a protractor, mark each of the given degree measures from a base ray and join the vertex to the marked point to draw each angle accurately: 140° (obtuse), 82° (acute), 195° (reflex), 70° (acute), 35° (acute).

Q. Estimate the size of each angle and then measure it with a protractor. Classify these angles as acute, right, obtuse or reflex.

Ans. First estimate each angle by eye, then verify using a protractor. Classify each result based on its measure: less than 90° is acute, exactly 90° is right, between 90° and 180° is obtuse, and between 180° and 360° is reflex.

Q. Make any figure with three acute angles, one right angle and two obtuse angles.

Ans. Same as above — construct a figure with six angles matching each required type (three acute, one right, two obtuse) and label them clearly.

Q. Draw the letter 'M' such that the angles on the sides are 40° each and the angle in the middle is 60°.

Ans. Draw the letter M using three angles: two outer angles of 40° each (formed by the slanting outer strokes) and one middle angle of 60° (formed by the inner V of the M), using a protractor to ensure accuracy.

Q. Draw the letter 'Y' such that the three angles formed are 150°, 60° and 150°.

Ans. Draw the letter Y with the two upper arms meeting the stem such that the angles on either side measure 150° each, and the angle directly between the two upper arms (at the fork) measures 60°.