CLASS 7 MATHS NCERT SOLUTIONS

NCERT Solutions for Class 7 Maths Chapter 9: Geometric Twins – Ganita Prakash Part 2

Complete NCERT Solutions for Class 7 Maths Chapter 9 "Geometric Twins" (Ganita Prakash Part 2, Chapter 1), covering congruence of figures and triangles.

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9.1 Geometric Twins

Q1.

Check if the two given figures are congruent. (Diagram-dependent question — based on measuring angles with a protractor in the textbook figure.)

Answer: Measuring the marked angles in each figure with a protractor, the corresponding angle (∠ABC vs ∠DEF) does not match between the two figures. Since the angles do not coincide, the two figures are **not congruent**. (In general: to check congruence, measure and compare all corresponding sides and angles — if even one pair fails to match, the figures are not congruent.)

Q2.

Circle the pairs of figures that appear congruent among the given set. (Diagram-dependent.)

Answer: Per the textbook figure, the pair labelled (a) and (d) are congruent, since they can be superimposed exactly on each other. The other pairs differ in size or shape and are not congruent.

Q3.

What measurements would you take to create a figure congruent to a given (a) circle, (b) rectangle? Using this, state how you would check if two circles / two rectangles are congruent.

Answer: (a) Measure the **radius (or diameter)** of the given circle. To check if two circles are congruent, place one circle over the other — if they superimpose exactly, they are congruent; this happens exactly when both circles have the same radius.
(b) Measure the **length and breadth** of the given rectangle. To check if two rectangles are congruent, place one over the other — if they superimpose exactly, they are congruent; this happens exactly when both have the same length and the same breadth.

Q4.

How would we check if two figures made of two line segments meeting at a point are congruent? Use this to identify whether each given pair is congruent. (Diagram-dependent for the specific pairs.)

Answer: Measure the lengths of the two corresponding line segments and the angle between them in each figure; if both segment-lengths and the included angle match, the figures are congruent. For the pairs shown in the textbook figure: each pair is congruent — the horizontal segment measures 3.3 cm, the vertical segment measures 2.3 cm, and the angle between them is 82° in every case.

9.2 Congruence of Triangles

Q1.

Suppose ΔHEN is congruent to ΔBIG. List all the other correct ways of expressing this congruence.

Answer: Since ΔHEN ≅ ΔBIG means vertex H corresponds to B, E to I, and N to G, there are six correct ways to write this congruence in total (the given one plus five more, keeping the vertex correspondence H↔B, E↔I, N↔G intact under any cyclic/reverse relabelling of the same triangle):

ΔHEN ≅ ΔBIG (as given)

ΔHNE ≅ ΔBGI

ΔEHN ≅ ΔIBG

ΔENH ≅ ΔIGB

ΔNHE ≅ ΔGBI

ΔNEH ≅ ΔGIB

Q2.

Determine whether ΔRED and ΔJAM are congruent, given RE = 3.5 cm, ED = 5 cm, RD = 6 cm and JA = 3.5 cm, AM = 5 cm, JM = 6 cm.

Answer: RE = JA = 3.5 cm, ED = AM = 5 cm, RD = JM = 6 cm — all three corresponding sides are equal, so by the **SSS (side-side-side) criterion**, ΔRED ≅ ΔJAM.

Q3.

Given AB = AD and CB = CD in a figure, identify any pair of congruent triangles and explain why. Does AC divide ∠BAD and ∠BCD into two equal parts?

Answer: In ΔABC and ΔADC: AB = AD (given), CB = CD (given), AC = AC (common side). By the **SSS criterion**, ΔABC ≅ ΔADC. Since corresponding parts of congruent triangles are equal (CPCT), ∠BAC = ∠DAC and ∠BCA = ∠DCA. So **yes**, AC bisects both ∠BAD and ∠BCD.

Q4.

Given DF = DG and FE = GE, are ΔDFE and ΔGED congruent to each other?

Answer: In ΔDFE and ΔDGE: DF = DG (given), FE = GE (given), DE = DE (common side). By **SSS**, ΔDFE ≅ ΔDGE. However, the specific correspondence asked about, ΔDFE ≅ ΔGED, does **not** hold — the vertex order matters for a congruence statement, and DF corresponds to DG (not to GE), FE corresponds to EG (not to ED), so the given information supports ΔDFE ≅ ΔDGE, not ΔDFE ≅ ΔGED.

Q5.

Identify whether two triangles with BC = ZY = 5 cm, BA = ZX = 7 cm, and ∠ABC = ∠XZY = 47° are congruent. What condition did you use?

Answer: Two sides and the *included* angle of ΔABC (BC, BA, and ∠ABC between them) equal the corresponding two sides and included angle of ΔXZY. By the **SAS (side-angle-side) criterion**, ΔABC ≅ ΔXZY.

Q6.

Given that CD and AB are parallel and AB = CD, what other parts of the figure are equal? Are the two resulting triangles congruent?

Answer: Since DC ∥ AB with AB = CD, and using alternate angles formed by transversals: ∠OCD = ∠OAB and ∠OBA = ∠ODC (alternate angles), and ∠DOC = ∠BOA (vertically opposite angles). By **ASA** (using AB = CD and the two pairs of equal angles), ΔAOB ≅ ΔCOD. By CPCT, OA = OC and OB = OD.

Q7.

Given ∠ABC = ∠DBC and ∠ACB = ∠DCB, show that ∠BAC = ∠BDC. Are the two triangles congruent?

Answer: In ΔABC and ΔDBC: ∠ABC = ∠DBC (given), ∠ACB = ∠DCB (given), BC = BC (common side). By the **ASA criterion**, ΔABC ≅ ΔDBC. By CPCT, ∠BAC = ∠BDC.

Q8.

Given ∠ABD = ∠DCA and ∠ACB = ∠DBC, identify the equal parts in the figure.

Answer: ∠AOB = ∠DOC (vertically opposite angles, where O is the intersection point). By **ASA** (using the two given angle pairs and a common/vertical angle), ΔCOD ≅ ΔBOA. By CPCT, AO = DO and CO = BO.

9.3 Angles of Isosceles and Equilateral Triangles

Q9.

ΔAIR ≅ ΔFLY. Identify the corresponding vertices, sides, and angles.

Answer: Corresponding vertices: A↔F, I↔L, R↔Y. Corresponding sides: AI↔FL, IR↔LY, AR↔FY. Corresponding angles: ∠A↔∠F, ∠I↔∠L, ∠R↔∠Y.

Q10.

For each case below, identify whether the two triangles are congruent, with reason:
(a) AB=DE, BC=EF, CA=DF
(b) AB=EF, ∠A=∠E, AC=ED
(c) AB=DF, ∠B=∠D=90°, AC=FE
(d) ∠A=∠D, ∠B=∠E, AC=DF
(e) AB=DF, ∠B=∠F, AC=DE

Answer:
(a) All three corresponding sides equal ⇒ **SSS** ⇒ ΔABC ≅ ΔDEF.
(b) Two sides and the included angle (at A and at E) equal ⇒ **SAS** ⇒ ΔABC ≅ ΔEFD.
(c) Right angle, hypotenuse (AC, FE), and one side equal ⇒ **RHS** ⇒ ΔABC ≅ ΔFDE.
(d) Two angles and the included side equal ⇒ **AAS** ⇒ ΔABC ≅ ΔDEF.
(e) Two sides and a *non-included* angle (angle B is not between AB and AC) ⇒ this is the **SSA case, which is not a valid congruence rule** ⇒ ΔABC need **not** be congruent to ΔDFE.

Q11.

Given OB = OC and OA = OD, show that AB is parallel to CD.

Answer: Since OB = OC, OA = OD, and ∠AOB = ∠COD (vertically opposite angles), by **SAS**, ΔAOB ≅ ΔCOD. By CPCT, ∠A = ∠D and ∠B = ∠C. Since AD is a transversal to lines AB and CD and these are pairs of equal alternate angles, **AB ∥ CD**.

Q12.

ABCD is a square. Show that ΔABC ≅ ΔADC. Is ΔABC also congruent to ΔCDA? Give another example of two triangles congruent in six different ways.

Answer: Since ABCD is a square: AD = AB, CD = CB, and AC = AC (common side). By **SSS**, ΔABC ≅ ΔADC. Since ABCD is a square, AB = CD, BC = DA, and AC = CA, so by **SSS** again, ΔABC ≅ ΔCDA as well. As with ΔHEN ≅ ΔBIG earlier (Q1), any pair of congruent triangles can be written in six correct ways by consistently relabelling the vertex correspondence.

Q13.

Find ∠B and ∠C, if A is the centre of the circle and the angle at A (∠BAC) is 120°.

Answer: AB = AC (both are radii of the circle), so ΔBAC is isosceles and ∠ABC = ∠ACB = x (angles opposite equal sides are equal). By the angle sum property: x + x + 120° = 180° ⇒ 2x = 60° ⇒ x = 30°. So **∠B = ∠C = 30°**.

Q14.

Find the missing angles in a compound figure made of several isosceles/equilateral triangles sharing vertices, where equal line segments are marked with matching tick marks. (Diagram-dependent — specific angle values below come from the textbook figure.)

Answer (method + figure-specific working): In each small isosceles triangle, the two base angles are equal (angles opposite equal marked sides), so each unknown pair of base angles x satisfies 2x + (known apex angle) = 180°, solved by working outward from triangles where one angle is already known, then using linear-pair (angles on a straight line = 180°) and vertically-opposite-angle facts to feed each newly found angle into the next triangle. Applying this method to the figure: in one isosceles triangle with a 90° angle, the equal base angles are 45° each; in an adjoining isosceles triangle with a 68° angle, the equal base angles are 56° each; continuing around the figure using the linear pair and angle-sum property in this way, the equilateral triangle in the figure has all three 60° angles, and the remaining unknown angles work out to 34°, 30°, 48°, 102° and 60° at the various labelled points, finishing with the last triangle confirming its own base angles are equal by the SAS congruence of two of the figure's triangles. (The exact labelled answer for each named point depends on the specific figure in the textbook; the method above — angle sum in each triangle + linear pairs + vertical angles, applied outward from the known angles — is what to use to solve it from the printed figure.)

Practice more: Extra Questions for Class 7 Maths Chapter 9

Quick revision: Revision Notes for Class 7 Maths Chapter 9