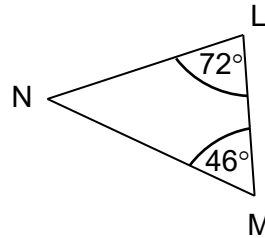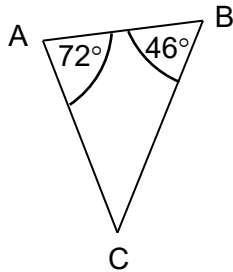## Higher Check In - 9.02 Congruence
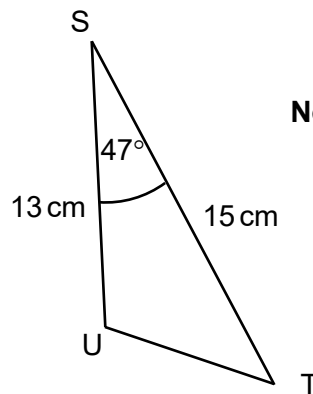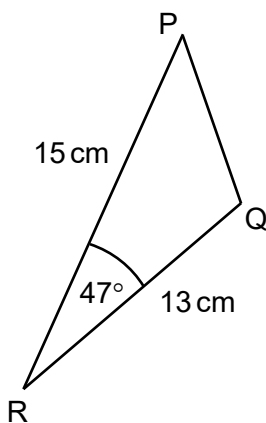
1. Write down the sides of each triangle that must be equal for the triangles to be congruent.

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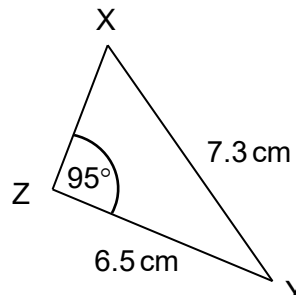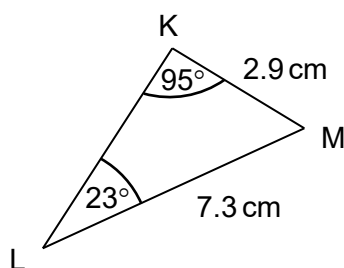
2. Which of the following methods will prove that triangle PQR is congruent to triangle STU?

   A RHS   **B** SAS   **C** ASA   **D** SSS
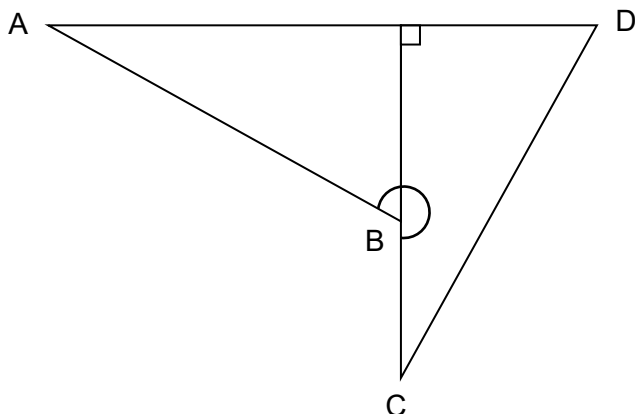

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For questions 3 and 4 use the following congruent triangles.

Not to scale

3. Find the length KL.

4. Find angle ZXY.

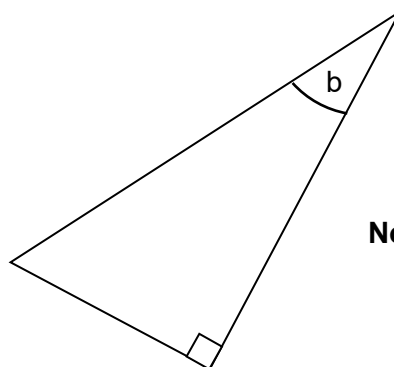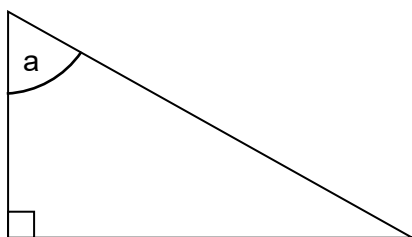5. The diagram shows two congruent triangles, joined as shown. Find the size of the reflex angle ABC.
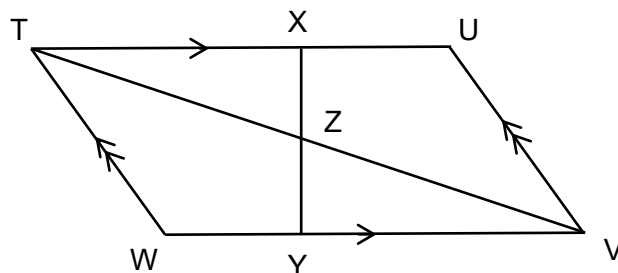

Not to scale

6. For these two triangles, explain why you cannot be certain that the triangles are congruent.

$\sin a = \dfrac{4}{5}$, $\cos a = \dfrac{3}{5}$, $\tan b = \dfrac{3}{4}$

Not to scale

7. In parallelogram TUVW, WY = UX. Prove that triangle TXZ is congruent to triangle VYZ.

Not to scale

8. The diagram shows a cyclic quadrilateral ABCD where AC and BD are diameters and AB is parallel to DC. Prove that AOD is congruent to BOC.
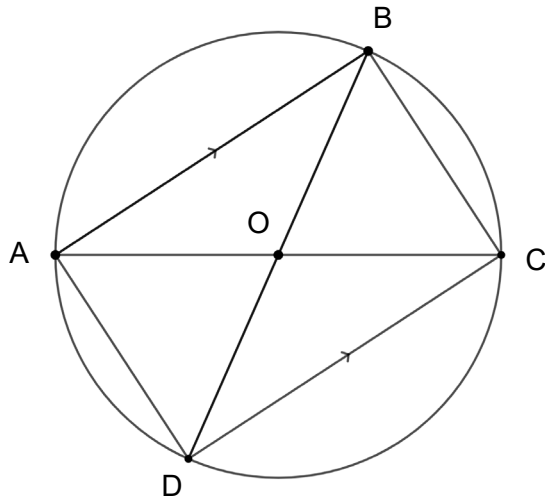
Not to scale

9. Work out whether these triangles are congruent or not.

17 cm

8 cm

A

15 cm

B

28.1°
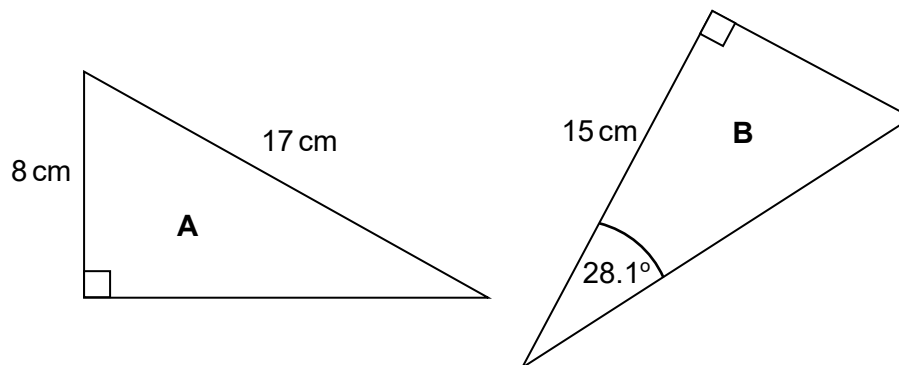
Not to scale

10. The diagram shows a circle, centre O, and two equal length tangents to the circle at Q and R from the point P. The line OP cuts the circle at S. Find the size of angle a, giving a mathematical reason for each stage of your working.

Not to scale

R

O

a

S

36°

P

Q
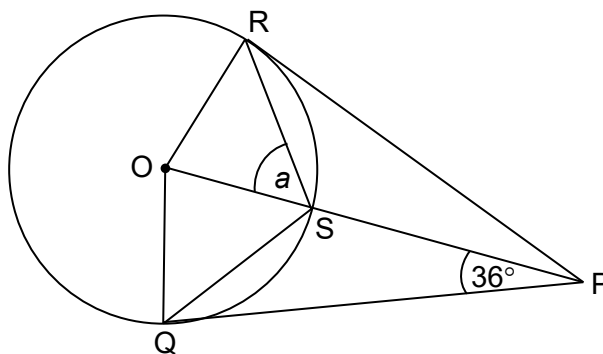
Extension

Triangle FGH and triangle KLM are congruent and each have an area of $63\,cm^2$.
Work out angle LKM.

Not to scale

Answers

1. AB and LM, AC and LN, BC and MN

2. **B** SAS

3. 6.5 cm

4. 62°

5. 242°

6. The sides of each triangle are in the ratio 3 : 4 : 5 but this could be 6 : 8 : 10 so the relationship is $3x : 4x : 5x$. The triangles are similar but not necessarily congruent.
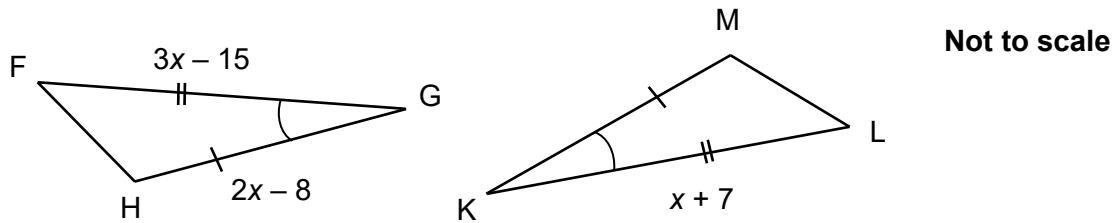
7. Angle XTZ = Angle YVZ (alternate angles)
   Angle TXZ = Angle VYZ (alternate angles)
   If WY = UX then VY = TX (equal opposite sides of a parallelogram) oe so ASA

8. Angle DAO = Angle CBO (angles in same segment)
   AO = BO (radii)
   Angle AOD = Angle BOC (vertically opposite angles) oe so ASA

9. Triangle **A**: $\sqrt{17^2 - 8^2} = 15$

   Triangle **B**: $\cos(28.1) = \dfrac{15}{H}$ cm, $H = \dfrac{15}{\cos(28.1)} = 17.0$

   So both triangles RHS: 90°, 17 cm and 15 cm.

10. OQ = OR (radii)
    PR = PQ (equal tangents)
    OP = OP (common side)
    $\triangle$OPQ is congruent to $\triangle$OPR (SSS)
    Angle POQ = Angle POR (congruent triangles)
    Angle OQP = Angle ORP = 90° (angle of tangent with radius)
    Angle POR = 54° (angles in a triangle = 180°)

    Angle a = $\dfrac{180 - 54}{2}$ = 63° (equal angles of isosceles triangle)

Extension

Solving $3x - 15 = x + 7$ gives $x = 11$.
Substituting $x = 11$ gives sides of 14 cm and 18 cm.
$\dfrac{1}{2} \times 14 \times 18 \times \sin K = 63$
Angle $LKM = \sin^{-1}(0.5) = 30°$

GCSE (9–1)
MATHEMATICS

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MATHEMATICS

Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Identify corresponding sides to show congruence			
AO1	2	Identify a method for proving congruency			
AO1	3	Find a length using congruence			
AO1	4	Find an angle using congruence			
AO1	5	Find an angle using congruence			
AO2	6	Understand the difference between similar and congruent			
AO2	7	Prove two triangles are congruent			
AO2	8	Prove two triangles are congruent			
AO3	9	Use Pythagoras' theorem and trigonometry to determine if two triangles are congruent			
AO3	10	Find an angle using congruence			

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