HIGHER

7.14 Congruent Triangles: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Two right-angled triangles have equal hypotenuses and one pair of equal legs. Which congruence test proves they are congruent?

(Total for Question 1 is 1 mark)

2 Triangles XYZ and LMN have angle X = angle L, angle Z = angle N and the side XZ = LN between those angles. Which congruence test applies?

(Total for Question 2 is 1 mark)

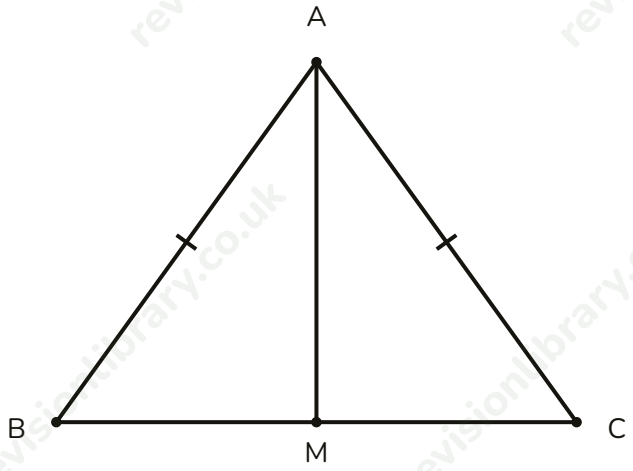
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3 Write down the four standard conditions that can be used to prove that two triangles are congruent, stating briefly what each one means.

(Total for Question 3 is 4 marks)

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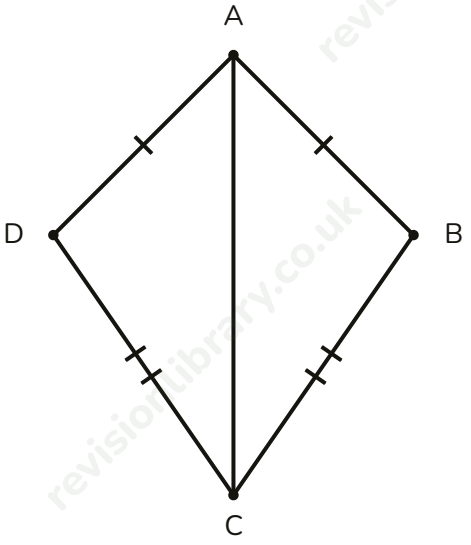
4 Triangle ABC is isosceles, with AB = AC. M is the midpoint of BC, and the line AM is drawn. Prove that triangle ABM is congruent to triangle ACM, and hence show that angle ABC = angle ACB.



(Total for Question 4 is 4 marks)

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5 ABCD is a kite, with AB = AD and CB = CD. The diagonal AC is drawn. Prove that triangle ABC is congruent to triangle ADC, and hence show that AC bisects both angle BAD and angle BCD.

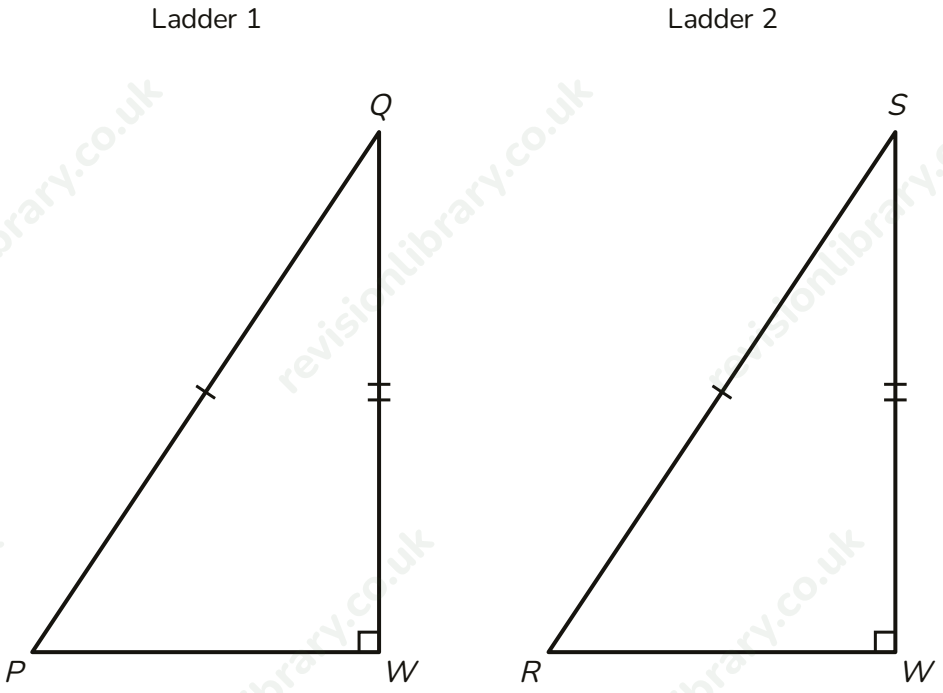


(Total for Question 5 is 4 marks)

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6 Two ladders are placed against the same vertical wall, standing on horizontal ground. Ladder 1 has its foot at point P and its top at point Q on the wall. Ladder 2 has its foot at point R and its top at point S on the wall (on the same side as Ladder 1). Let W be the point where the wall meets the ground. The two ladders are the same length (PQ = RS) and reach the same height up the wall (QW = SW).

Diagram NOT accurately drawn



(a) Prove that triangle PWQ is congruent to triangle RWS. **(3)**

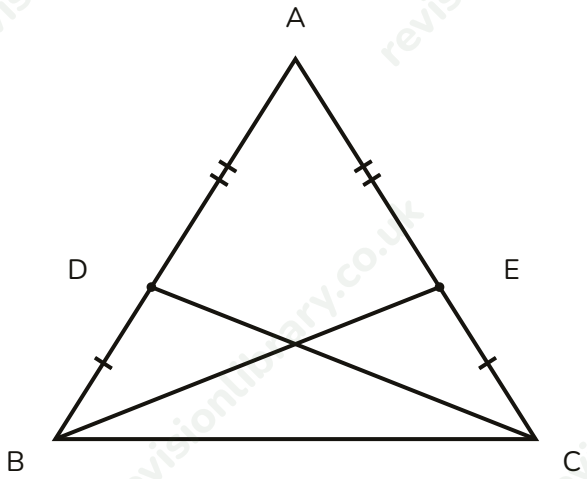
(b) The ladders are each 4.5 m long, and each reaches a height of 4.2 m up the wall. Calculate the distance of each ladder's foot from the wall, giving your answer to 1 decimal place. **(2)**

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(Total for Question 6 is 5 marks)

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7 Triangle ABC is isosceles, with AB = AC. D is a point on AB and E is a point on AC such that AD = AE. The lines DC and BE are drawn. Prove that triangle ADC is congruent to triangle AEB, and hence show that DC = EB.

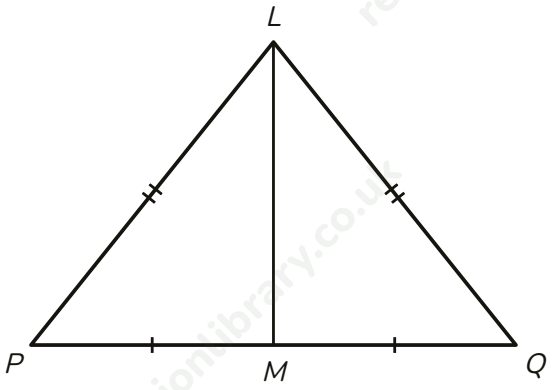


(Total for Question 7 is 4 marks)

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8 L is a point that is the same distance from two rescue boats, P and Q (that is, LP = LQ). M is the midpoint of PQ, and LM is drawn. Prove that triangle LPM is congruent to triangle LQM, and hence prove that LM is perpendicular to PQ.

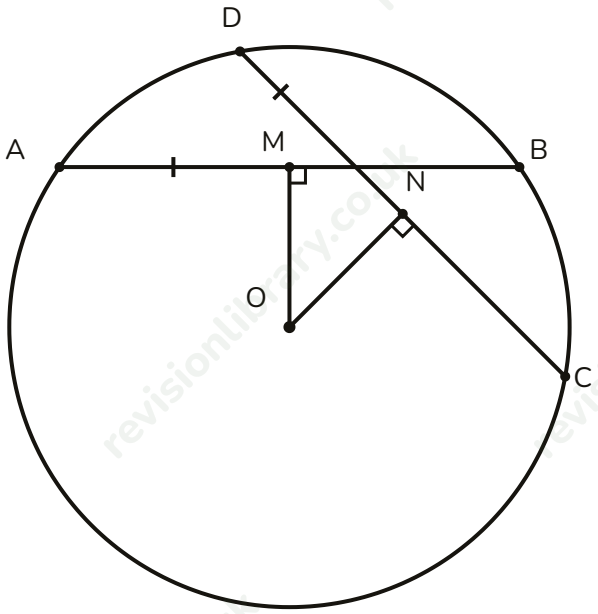
Diagram NOT accurately drawn



(Total for Question 8 is 5 marks)

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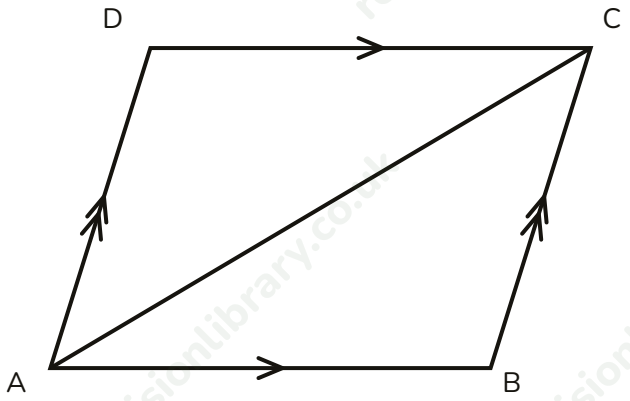
9 O is the centre of a circle. AB and CD are chords of the circle with AB = CD. M and N are the feet of the perpendiculars from O to AB and CD respectively (OM perpendicular to AB, ON perpendicular to CD). You may assume that a perpendicular from the centre of a circle to a chord bisects that chord. Prove that OM = ON.



(Total for Question 9 is 5 marks)

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10 ABCD is a parallelogram, so AB is parallel to DC and AD is parallel to BC. The diagonal AC is drawn.



(a) Prove that triangle ABC is congruent to triangle CDA. **(4)**

(b) Hence state two facts about the sides or angles of parallelogram ABCD that follow from this congruence. **(2)**

(Total for Question 10 is 6 marks)

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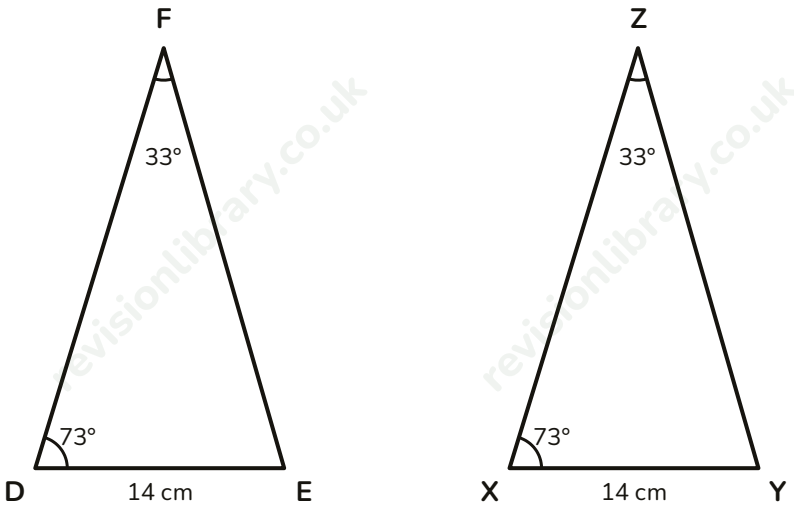
11 Triangle ABC is congruent to triangle PQR, with angle ABC corresponding to angle PQR. Angle ABC = (2y - 16) degrees and angle PQR = (y + 2) degrees. Work out the value of y and the size of angle ABC.

(Total for Question 11 is 4 marks)

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12 Triangle DEF and triangle XYZ are such that angle DFE = angle XZY = 33 degrees; angle EDF = angle YXZ = 73 degrees; DE = XY = 14 cm. Can you be sure that the two triangles are congruent? Give a reason for your answer.

Diagram NOT accurately drawn



(Total for Question 12 is 2 marks)

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Mark scheme · 7.14 Congruent Triangles: 1-hour Pack

Question 1

RHS cao **B1**

Answer: RHS (right angle, hypotenuse, side)

Question 2

ASA cao **B1**

Answer: ASA (angle-side-angle)

Question 3

SSS - all three pairs of corresponding sides are equal **B1**

SAS - two pairs of corresponding sides and the included angle between them are equal **B1**

ASA (or AAS) - two pairs of corresponding angles and a corresponding side are equal **B1**

RHS - both triangles are right-angled, with equal hypotenuses and one further pair of equal sides **B1**

Answer: SSS, SAS, ASA (or AAS), RHS

Question 4

AB = AC (given) **B1**

BM = CM (M is the midpoint of BC) **B1**

AM = AM (common side); hence triangle ABM = triangle ACM (SSS) **B1**

angle ABM = angle ACM (corresponding angles in congruent triangles), so angle ABC = angle ACB (cso) **B1**

Answer: Triangle ABM = Triangle ACM (SSS); therefore angle ABC = angle ACB

Question 5

AB = AD (given) **B1**

CB = CD (given) **B1**

AC = AC (common side); hence triangle ABC = triangle ADC (SSS) **B1**

angle BAC = angle DAC and angle BCA = angle DCA (corresponding angles in congruent triangles), so AC bisects angle BAD and angle BCD (cso) **B1**

Answer: Triangle ABC = Triangle ADC (SSS); AC bisects angle BAD and angle BCD

Question 6

(a) angle PWQ = angle RWS = 90 degrees (wall is vertical, ground is horizontal) **B1**

(a) PQ = RS (given, hypotenuse) and QW = SW (given, one other side) **B1**

(a) hence RHS, triangle PWQ = triangle RWS (cso) **B1**

(a) Answer: Triangle PWQ = Triangle RWS (RHS)

(b) PW = $\sqrt{4.5^2 - 4.2^2}$ oe (correct use of Pythagoras) **M1**

(b) PW = RW = 1.6 m awrt **A1**

(b) Answer: 1.6 m

Question 7

AD = AE (given) **B1**

AC = AB (given, triangle ABC is isosceles) **B1**

angle DAC = angle EAB (the same angle, angle BAC, since D lies on AB and E lies on AC); hence SAS, triangle ADC = triangle AEB **B1**

hence DC = EB (corresponding sides in congruent triangles, cso) **B1**

Answer: Triangle ADC = Triangle AEB (SAS); DC = EB

Question 8

LP = LQ (given) **B1**

PM = QM (M is the midpoint of PQ) **B1**

LM = LM (common side); hence SSS, triangle LPM = triangle LQM **B1**

angle LMP = angle LMQ (corresponding angles in congruent triangles), and angle LMP + angle LMQ = 180 degrees (angles on a straight line PQ) **B1**

hence angle LMP = angle LMQ = 90 degrees, so LM is perpendicular to PQ (cso) **B1**

Answer: Triangle LPM = Triangle LQM (SSS); LM is perpendicular to PQ

Question 9

AM = (1/2) AB and CN = (1/2) CD (perpendicular from centre bisects the chord); since AB = CD, AM = CN **B1**

OA = OC (both radii of the circle) **B1**

angle OMA = angle ONC = 90 degrees (given) **B1**

hence RHS, triangle OAM = triangle OCN **B1**

hence OM = ON (corresponding sides in congruent triangles, cso) **B1**

Answer: Triangle OAM = Triangle OCN (RHS); OM = ON

Question 10

(a) angle BAC = angle DCA (alternate angles, AB parallel to DC) **B1**

(a) angle BCA = angle DAC (alternate angles, AD parallel to BC) **B1**

(a) AC = CA (common side) **B1**

(a) hence ASA, triangle ABC = triangle CDA (cso) **B1**

(a) Answer: Triangle ABC = Triangle CDA (ASA)

(b) One correct side or angle fact following from the congruence, e.g. AB = CD, BC = AD, angle ABC = angle ADC, angle BAD = angle BCD, angle BAC = angle DCA or angle BCA = angle DAC. Accept equivalent notation. **B1**

(b) A second distinct correct side or angle fact following from the congruence. Accept any two side facts, any two angle facts, or one of each; for example AB = CD and BC = AD earn both marks. Do not count a restatement of the same fact twice. **B1**

(b) Answer: AB = CD, BC = AD; angle ABC = angle ADC

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Question 11

2y - 16 = y + 2	**M1**
rearranges to make y the subject	**M1**
y = 18	**A1**
angle ABC = 20 degrees	**B1**

Answer: y = 18, angle ABC = 20 degrees

Question 12

Yes	**B1**
AAS given as the reason	**B1**

Answer: Yes, AAS

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