1.

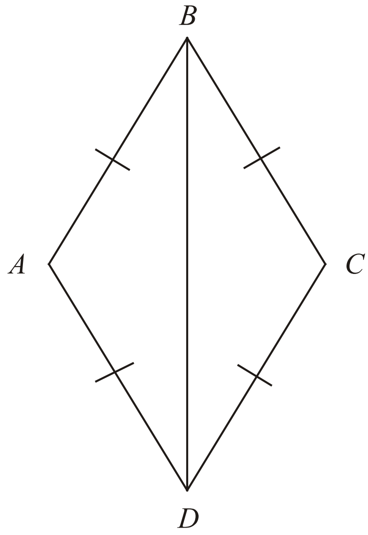

Diagram **NOT** accurately drawn

In the diagram, $AB = BC = CD = DA$.

Prove that triangle ADB is congruent to triangle CDB.

(Total 3 marks)

2.

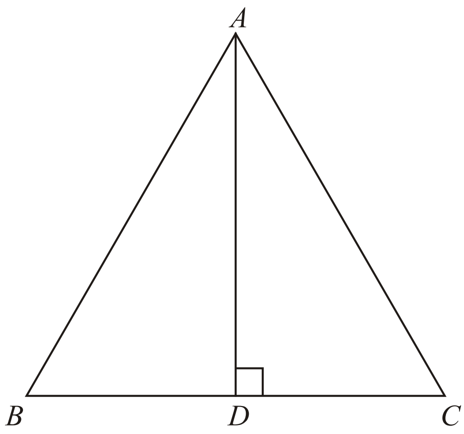

Diagram **NOT** accurately drawn

ABC is an equilateral triangle.
D lies on *BC*.
AD is perpendicular to *BC*.

(a) Prove that triangle *ADC* is congruent to triangle *ADB*.

(3)

(b) Hence, prove that $BD = \frac{1}{2}AB$.

(2)
(Total 5 marks)

3.

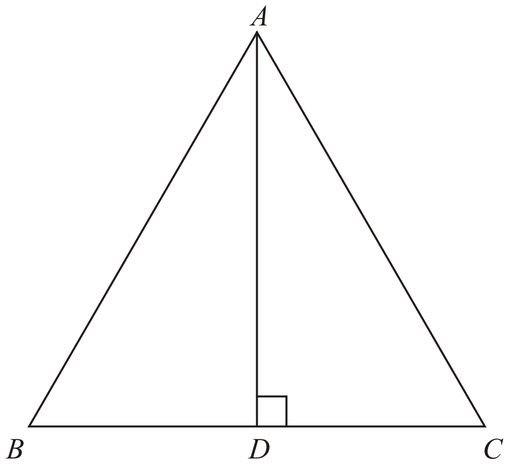

Diagram **NOT** accurately drawn

ABC is an equilateral triangle.
D lies on *BC*.
AD is perpendicular to *BC*.

Prove that triangle *ADC* is congruent to triangle *ADB*.

(Total 3 marks)

1. *AD* = *CD* equal sides
AB = *CB* equal sides
BD is common
ADB is congruent to *CDB* (SSS) 3

B2 for two of AD = CD, AB = CB, BD is common
OR for BD common and all other sides equal in length (it must be clear that the 'other sides' relate to the two triangles)
(B1 for one of these. Note: All sides are of the same length alone is ambiguous and gains B0)
B1 for proof of congruence (SSS or SAS or ASA) dependent upon THREE identities (with reasons)

[3]

2. (a) $AB = AC$ (equilateral triangle)
AD is common
$ADC = ADB$ (= 90° given)
$\Delta ADC \equiv \Delta ADB$ (RHS)

OR

$DAC = DAB$ (since $ACD = ABD$ and $ADC = ADB$)
$AB = AC$ (equilateral triangle)
AD is common
$\Delta ADC \equiv \Delta ADB$ (SAS)

OR

$DAC = DAB$ (since $ACD = ABD$ and $ADC = ADB$)
AD is common
$ACD = ABD$ (equilateral triangle)
$\Delta ADC \equiv \Delta ADB$ (AAS)

Proof 3

M1 for any three correct statements (which do not have to be justified) that together lead to a congruence proof (ignore irrelevant statements)
A1 for a full justification of these statements
A1 for RHS, SAS, AAS, ASA or SSS as appropriate

NB The two A marks are \independent

(b) $BD = DC$ (congruent Δs)
$BC = AB$ (equilateral Δs)

Hence $BD = \frac{1}{2}AB$

Proof 2

B1 for BD = DC and BC = AB
B1 for justification of these statements and completion of proof

[5]

3. $AB = AC$ (equilateral triangle)
AD is common
$ADC = ADB$ (= 90° given)
$\Delta ADC \equiv \Delta ADB$ (RHS)

OR
$DAC = DAB$ (since $ACD = ABD$ and $ADC = ADB$)
$AB = AC$ (equilateral triangle)
AD is common
$\Delta ADC \equiv \Delta ADB$ (SAS)

OR

$DAC = DAB$ (since $ACD = ABD$ and $ADC = ADB$)
AD is common
$ACD = ABD$ (equilateral triangle)
$\Delta ADC \equiv \Delta ADB$ (AAS)

Proof 3

M1 for any three correct statements (which do not have to be justified) that together lead to a congruence proof (ignore irrelevant statements)
A1 for a full justification of these statements
A1 for RHS, SAS, AAS, ASA or SSS as appropriate

NB The two A marks are independent

[3]

1. Candidates understanding of congruency was very good, however it is clear that formal congruency proofs have not been covered by very many centres. Very few candidates were able to quote the requirements for two triangles to be congruent and therefore acceptable proofs were rare. The pairing of corresponding sides was weak and many attempts would just quote vague facts such as ‘all the sides are equal’.
Some candidates tried to use equal angles but rarely were any reasons ever given for their two angles being equal in size.
Many candidates assumed that the symbols on each of the sides implied parallel lines.

2. Part (a) was very poorly answered. It was good to see some responses in which statements and justifications were laid out correctly but the majority of candidates had little idea of how to set out a formal proof of congruency. Statements were often vague and general, e.g. ‘all sides are the same’. Even when candidates were able to give three correct statements it was not uncommon for the incorrect reason for congruency to be given – most frequently SAS when it should have been RHS. Full justification was rare. $BD = DC$ was stated in numerous responses with candidates failing to realise that this was a consequence of congruency. The most common errors were not justifying the statements made and not providing the reason for congruency. Some candidates thought that AAA and ASS were sufficient for congruency. Very often the working was difficult to follow. More candidates were able to gain one mark in part (b) but very few realised they needed to use congruency to justify $BD = DC$.

3. This proved to be difficult for most candidates. Few had a clear idea of what a congruence proof entails and were content to appeal to symmetry. Better candidates were able to marshal some ideas although many made the assumption (they are not told it in the question) that the perpendicular to the base of an equilateral triangle bisects the base. This fact would of course be a consequence of the proof and as such cannot be part of the proof. Other candidates assumed that proving that the triangles were equiangular would do, or quoted SAS when A was not the included angle.