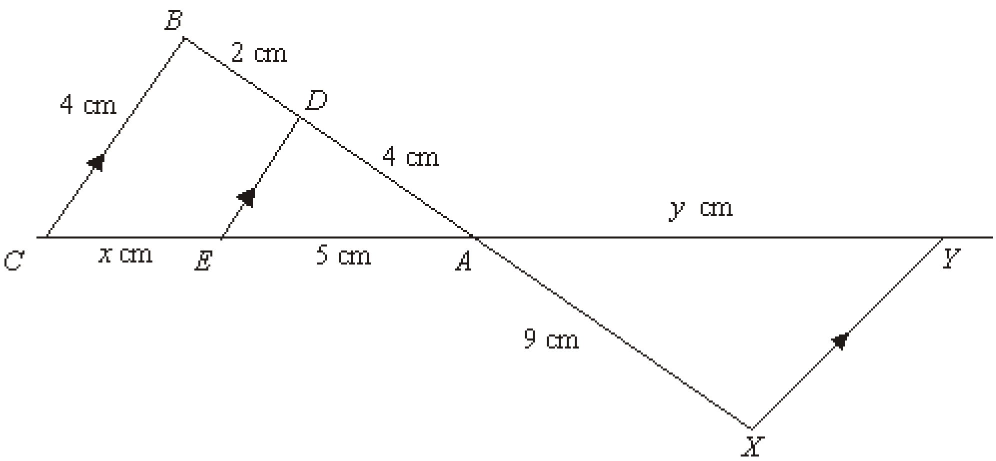
Q1.

Diagram **NOT** accurately drawn



$CEAY$ and $BDAX$ are straight lines.
XY, ED and CB are parallel.
AE = 5 cm.
AX = 9 cm.
AD = 4 cm.
BC = 4 cm.
BD = 2 cm.

CE = x cm.
XY = y cm.

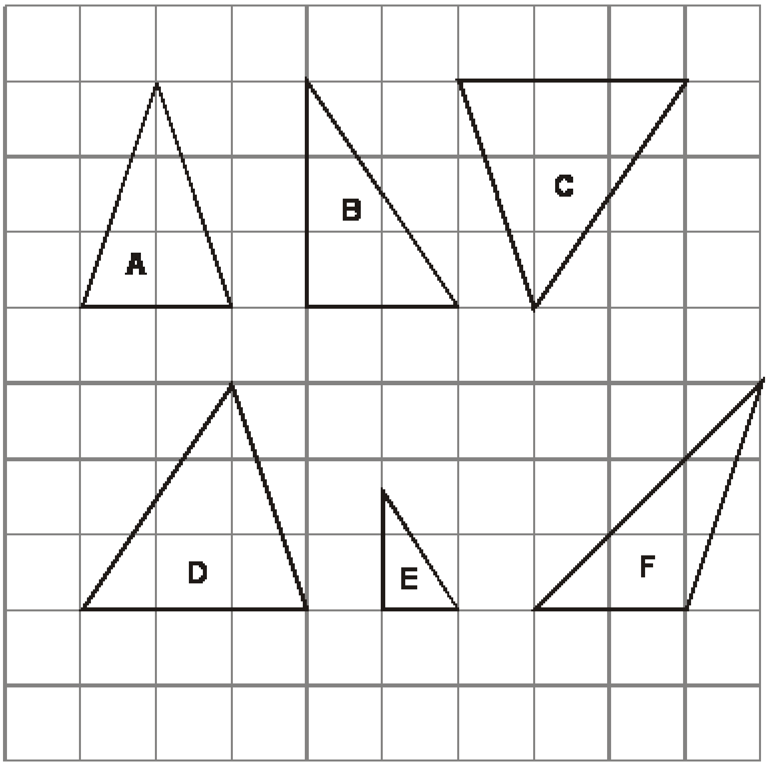
Find the value of x and the value of y.

x = ...

y = ...

(Total 4 marks)

Q2. These triangles have been drawn on a centimetre grid.



(a) Write down the letters of the **two** triangles that are congruent.

.... and ....
(1)

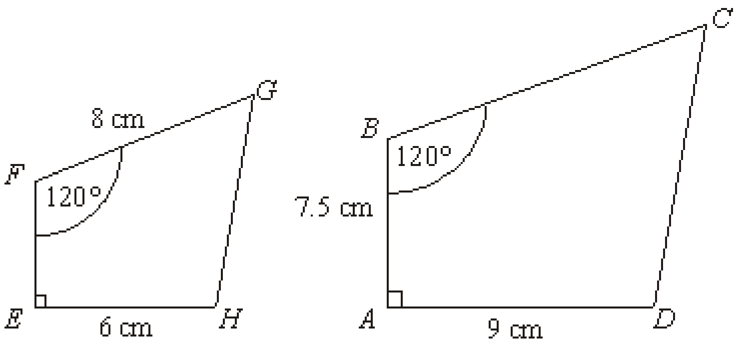
(b) Write down the letters of **two different** triangles that are similar.

.... and ....
(1)

(c) Find the area of triangle **D**.

....
(1)
(Total 3 marks)

Q3. Shapes $ABCD$ and $EFGH$ are mathematically similar.



Diagrams **NOT** accurately drawn

(a) Calculate the length of BC.

.... cm

(2)

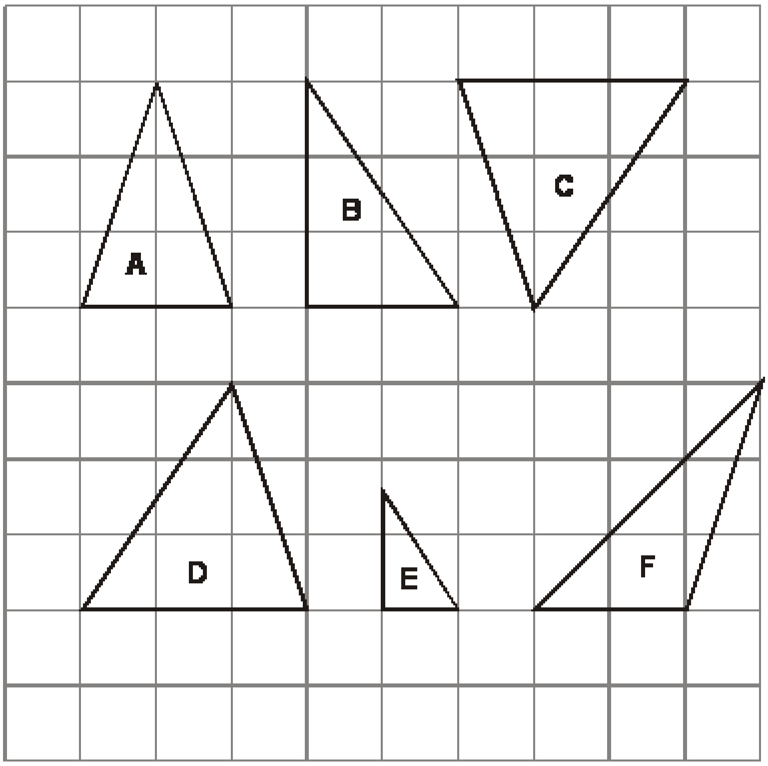
(b) Calculate the length of EF.

.... cm

(2)

(Total 4 marks)

Q4. These triangles have been drawn on a centimetre grid.



(a) Write down the letters of the **two** triangles that are congruent.

.... and ....

(1)

(b) Write down the letters of **two different** triangles that are similar.

.... and ....

(1)

(c) Find the area of triangle **D**.

....

(1)
(Total 3 marks)

Q5.

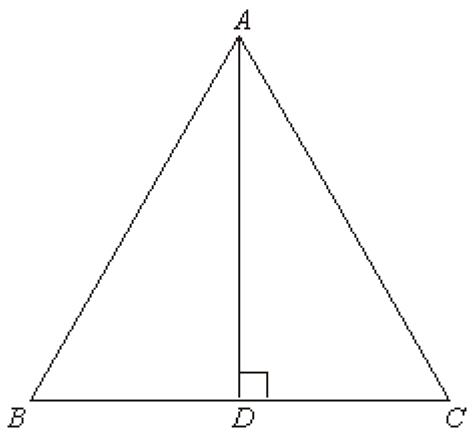


Diagram **NOT** accurately drawn

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)

Q6.

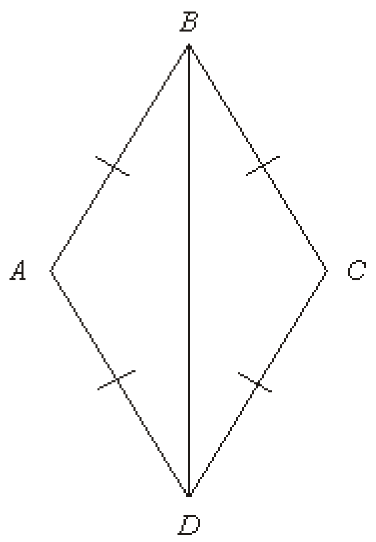


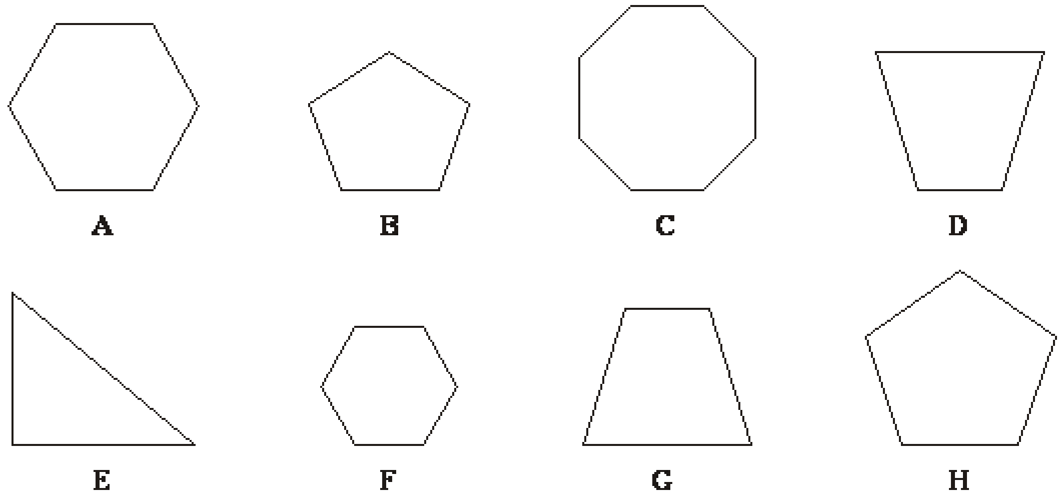
Diagram **NOT** accurately drawn

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

Prove that triangle ADB is congruent to triangle CDB.

(Total 3 marks)

Q7. Here are 8 polygons.



(a) Write down the mathematical name for shape **A**.

....

(1)

(b) Write down the letter of the shape that is an octagon.

....

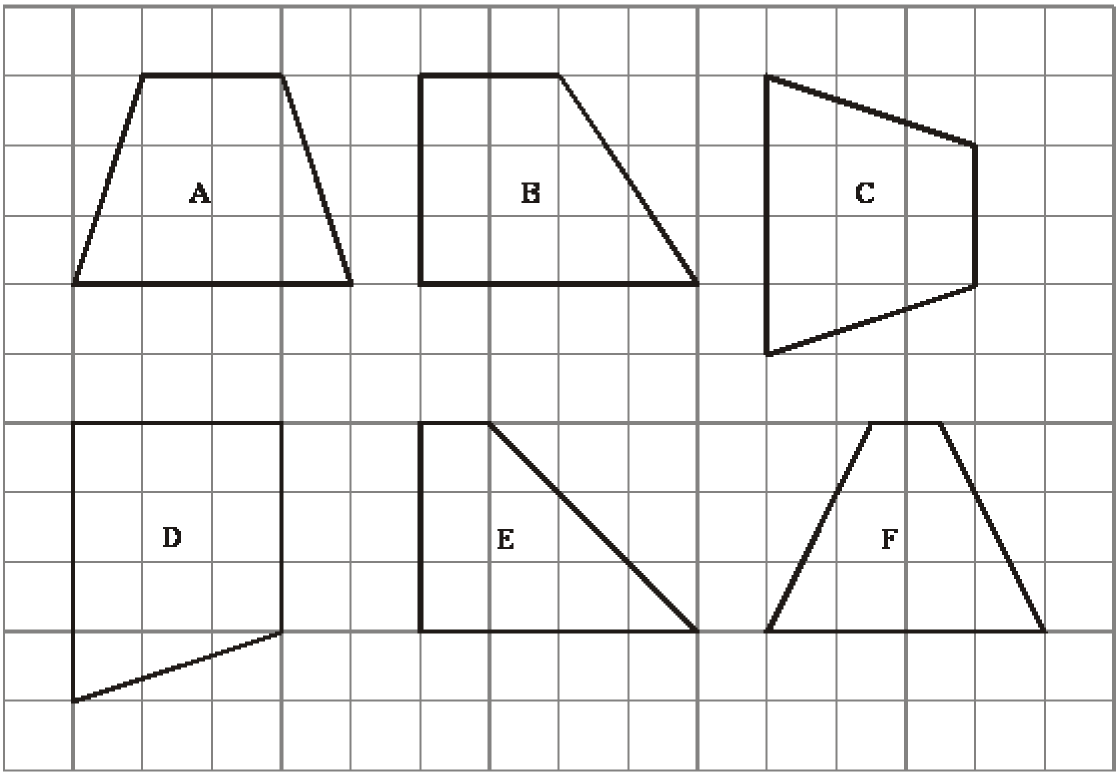
(1)

(c) Write down the letters of the pair of congruent shapes.

.... and ....

(1)
(Total 3 marks)

Q8. Here are 6 shapes drawn on a grid.



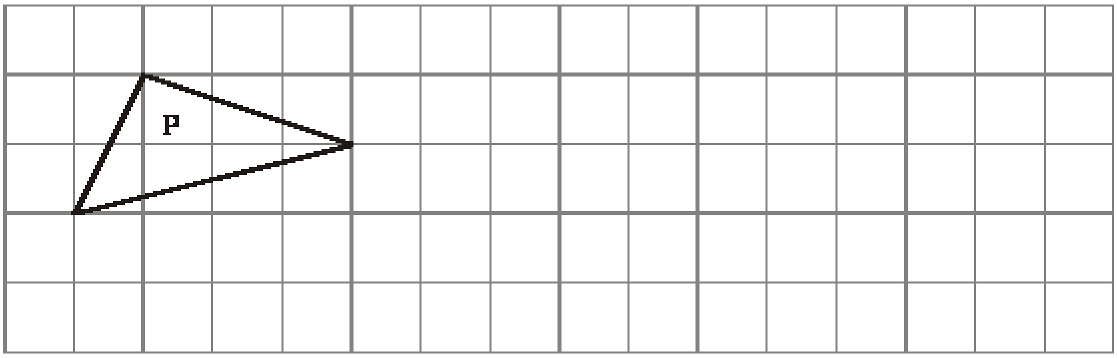
Two of these shapes are congruent.

(a) Write down the letters of these two shapes.

.... and ....

(1)

(b) On the grid below, draw a shape that is congruent to shape **P**.



(1)
(Total 2 marks)

Q9.

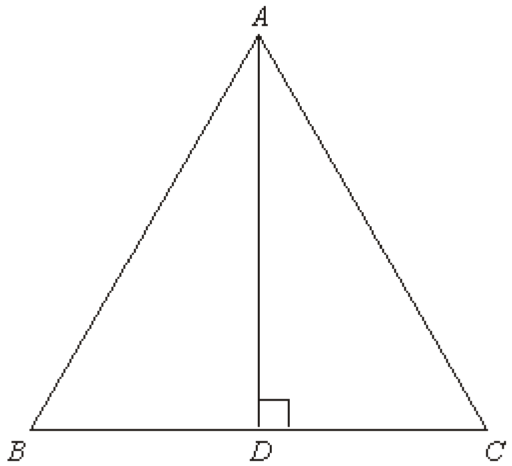


Diagram **NOT** accurately drawn

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)

M1.

Working	Answer	Mark	Additional Guidance
$\frac{x}{5} = \frac{2}{4}$ $\frac{y}{x+5} = \frac{9}{6}$ **or** $\frac{y}{9} = \frac{x+5}{6}$	$x = 2.05$ $y = 11.25$	4	**M1** a correct expression for x involving ratios of sides, e.g. $\frac{x}{5} = \frac{2}{4}$ oe **A1** cao

Total for Question: 4 marks

M2.

	Working	Answer	Mark	Additional Guidance
(a)		C and D	1	**B1** cao
(b)		B and E	1	**B1** cao
(c)		4.5 cm^2	1	**B1** cao
Total for Question: 3 marks				

M3.

	Working	Answer	Mark	Additional Guidance
(a)	$\frac{3}{2} \times 8$	12	2	**M1** for $\frac{9}{6}$ or $\frac{6}{9}$ or $\frac{8}{6}$ or $\frac{6}{8}$ **A1** cao
(b)	$\frac{2}{3} \times 7.5$	5	2	**M1** for $\frac{9}{6}$ or $\frac{6}{9}$ or $\frac{9}{7.5}$ or $\frac{7.5}{9}$ or $\frac{"12"}{8}$ or $\frac{8}{"12"}$ or $\frac{"12"}{7.5}$ or $\frac{7.5}{"12"}$ **A1** cao
Total for Question: 4 marks				

M4.

	Working	Answer	Mark	Additional Guidance
(a)		C and D	1	**B1** cao
(b)		B and E	1	**B1** cao
(c)		4.5 cm^2	1	**B1** cao
				Total for Question: 3 marks

M5.

	Working	Answer	Mark	Additional Guidance
(a)	*AB* = *AC* (equilateral triangle) *AD* is common *ADC*=*ADB* (= 90° given) ∆*ADC* ≡ ∆*ADB* (RHS) **OR** *DAC* = *DAB* (since *ACD* = *ABD* and *ADC* = *ADB*) *AB* = *AC* (equilateral triangle) *AD* is common ∆*ADC* ≡ ∆*ADB* (SAS) **OR** *DAC* = *DAB* (since *ACD* = *ABD* and *ADC* = *ADB*) *AD* is common *ACD* = *ABD* (equilateral triangle)	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

	$\Delta ADC \equiv \Delta ADB$ (AAS)			
(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
				Total for Question: 5 marks

M6.

Working	Mark	Additional Guidance
$AD = CD$ 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)
		Total for Question: 3 marks

M7.

	Working	Answer	Mark	Additional Guidance
(a)		Regular hexagon	1	**B1** (accept hexagon)
(b)		D	1	**B1** cao

(c)		D and G	1	**B1** for both, in any order
				Total for Question: 3 marks

M8.

	Answer	Mark	Additional Guidance
(a)	A and C	1	**B1** c for A and C or C and A
(b)	Shape drawn	1	**B1** for correct shape, any orientation or reflection, ±2 mm
			Total for Question: 2 marks

M9.

Working	Answer	Mark	Additional Guidance
AB = *AC* (equilateral triangle) *AD* is common *ADC*=*ADB* (= 90° given) ∆*ADC* ≡ ∆*ADB* (RHS) **OR** *DAC* = *DAB* (since *ACD* = *ABD* and *ADC* = *ADB*) *AB* = *AC* (equilateral triangle) *AD* is common ∆*ADC* ≡ ∆*ADB* (SAS)	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

OR *DAC* = *DAB* (since *ACD* = *ABD* and *ADC* = *ADB*) *AD* is common *ACD* = *ABD* (equilateral triangle) $\Delta ADC \equiv \Delta ADB$ (AAS)			
			Total for Question: 3 marks

E3. Those candidates who worked with scale factors were usually successful. Errors were more common in part (b) where some candidates multiplied 7.5 by the scale factor rather than divide. A quick look at the diagram ought to have alerted these candidates to the fact that the length of *EF* could not possibly be 11.25 cm. Many candidates, though, did not work with scale factors but assumed that because *AD* was 3 cm longer than *EH* then each side in *ABCD* was 3cm longer than the corresponding side in *EFGH*. This resulted in 11 cm and 4.5 cm being very common incorrect answers in part (a) and part (b) respectively.

E5. 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.*

E6. 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.

E8. Writing down the correct letters of the two shapes that were congruent resulted in a 79% success rate for part (a). Use of tracing paper would have ensured accuracy.

In part (b) there appeared to be a fairly good understanding of the word ‘congruent’ with just over half the candidates drawing a shape that was identical to the given one. It would have been sufficient to merely draw the shape again a few squares to the right to earn full marks. However, for some reason, possibly because they did not understand what was required, many inverted the shape, rotated the shape or reflected the shape which resulted in the task being made much more demanding.

E9. 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.