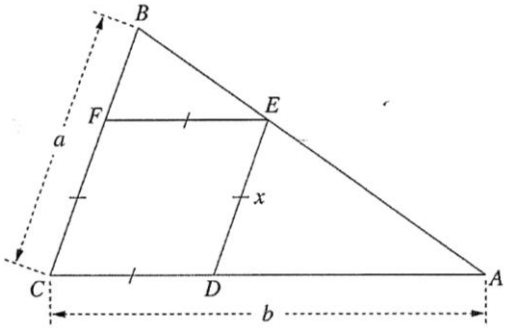
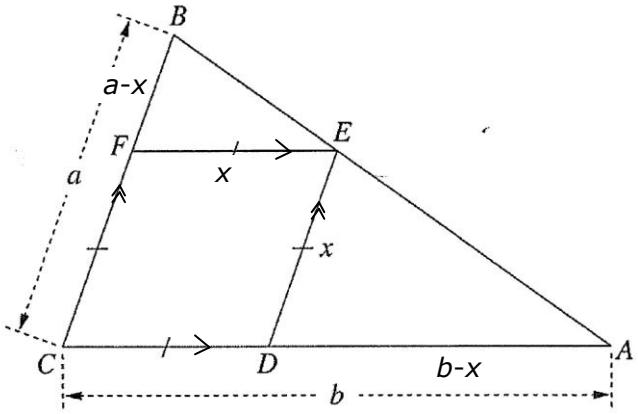
12	**16a**	The diagram shows a triangle *ABC* with sides *BC* = *a* and *AC* = b. The points *D*, *E* and *F* lie on the sides *AC*, *AB* and *BC*, respectively, so that *CDEF* is a rhombus with sides of length *x*. (i) Prove that ΔEBF is similar to ΔAED. (ii) Find an expression for *x* in terms of *a* and *b*.  	**2** **2**



(i) $\angle BFE = \angle FCD$ (corr $\angle$s, $FE||CD$)

$\angle FCD = \angle EDA$ (corr $\angle$s, $FC||ED$)

$\therefore \angle BFE = \angle EDA$

$\angle FBE = \angle DEA$ (corr $\angle$s, $BC||ED$)

$\therefore \Delta EBF$ is similar to ΔAED (equi-angular)

State Mean:
0.94/2
0.62/2

(ii) $\frac{FE}{AD} = \frac{BF}{ED}$ (matching sides of sim Δs in proportion)

$$\frac{x}{b-x} = \frac{a-x}{x}$$

$$x^2 = (a-x)(b-x)$$

$$x^2 = ab - ax - bx + x^2$$

$$ax + bx = ab$$

$$x(a+b) = ab$$

$$x = \frac{ab}{a+b}$$

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by the Board of Studies

Board of Studies: Notes from the Marking Centre

(i) In most responses, candidates displayed knowledge of the tests for similar triangles. However, many candidates did not present a logical argument using correct terminology. In many responses, candidates assumed parallel lines without explanation. Candidates needed to show that $\angle BFE = \angle EDA$ by linking it to an angle within the rhombus. Candidates also needed to state the properties of a rhombus, which are relevant to their proof, rather than merely claiming that those properties are given. Candidates are also reminded that if they are going to use additional constructions or name additional points in their proof, it is very important to redraw the diagram in their answer booklet with that information included.

(ii) In many responses, candidates made an incorrect ratio statement or did not solve the equation formed by a correct ratio statement. Candidates who drew the triangles in a similar orientation were, generally, more successful in establishing the correct ratio statement. In weaker responses, candidates failed to see the link between the similar triangles in part (i) and this part. As a result they did not use the ratios of corresponding sides to find x in terms of a and b but tried to use statements such as $a = x + (a - x)$ to try to obtain the result.

Source: http://www.boardofstudies.nsw.edu.au/hsc_exams/