International GCSE Further Pure Mathematics – Paper 1 mark scheme

Paper 1		
Question number	Scheme	Marks
1	$\frac{2\sqrt{3}-4}{3\sqrt{3}+5}\times\frac{3\sqrt{3}-5}{3\sqrt{3}-5}$	M1
	$=\frac{18-10\sqrt{3}-12\sqrt{3}+20}{27-25}\left(=\frac{38-22\sqrt{3}}{2}\right)$ oe	dM1
	$=19-11\sqrt{3}$ correct working throughout only	A1 (3)
ALT	$2\sqrt{3}-4=\left(3\sqrt{3}+5\right)\left(a+b\sqrt{3}\right)$	M1
	$2\sqrt{3}-4=5a+9b+3\sqrt{3}a+5\sqrt{3}b\Rightarrow "5a+9b"=-4;\ "3a+5b"=2$	dM1
	$15a+27b=-12$ or $25a+45b=-20$	A1
	$15a+25b=10$ $27a+45b=18$	
	$2b=-22\ \Rightarrow b=-11$ $2a=38\ \Rightarrow a=19$	
	$15a-297=-12\Rightarrow a=19$ $57\ +\ 5b=2\ \Rightarrow b=-11$	
	$=19-11\sqrt{3}$ correct working throughout only	(3)
		Total 3 marks

Marks	**Notes**
M1	For multiplying by $\frac{3\sqrt{3}-5}{3\sqrt{3}-5}$ This may be seen as two separate calculations. Note, multiplying by $\frac{5-3\sqrt{3}}{5-3\sqrt{3}}$ is valid and will lead to all terms being the opposite and should be marked in the same way.
dM1	Dependent on M1 for attempting to multiply out the numerator and denominator. There may be up to 2 errors or omissions. $\frac{38-22\sqrt{3}}{2}$ is sufficient working
A1	For $19-11\sqrt{3}$ (Allow $a=19,\ b=-11$) As this result can be achieved with a calculator, there can be no incorrect working shown for this mark to be awarded.
ALT	
M1	For $\left(3\sqrt{3}+5\right)\left(a+b\sqrt{3}\right)$
dM1	For attempting to multiply out $\left(3\sqrt{3}+5\right)\left(a+b\sqrt{3}\right)$ to reach an expression that can be used to compare coefficients. There may be up to 2 errors or omissions.
A1	For forming 2 correct simultaneous equations and solving correctly to reach $19-11\sqrt{3}$ (Allow $a=19,\ b=-11$). Two common examples are shown in the scheme. As this result can be achieved with a calculator, there can be no incorrect working shown for this mark to be awarded.