11	**(a)**		$4g\left(\frac{3}{2}\cos 60\right)+g\left(3\cos 60\right)=xT$	**M1**	**3.1b**	Taking moments about A – correct number of terms, allow sin/cos confusion and sign errors – may take moments about another point (and resolve) but must end up after elimination with an equation in T and x only	Dimensionally correct. Must be xT and not $xT\cos(...)$ or $xT\sin(...)$
				A1	**1.1**	Correct equation in g, x and T only – condone g replaced by 9.8	T is the tension in the string
			$T=\frac{9g}{2x}$ (N)	**A1**	**2.2a**	An answer of $\frac{44.1}{x}$ (or with trigonometric terms) is **A0** unless correct answer in terms of g seen	oe exact answers in terms of g and x (condone correct triple decker fractions)
				[3]			

For reference for parts **(a)** and **(b)**:

Moments about C: $R_A(x\cos 60)+g(3-x)\cos 60=4g(x-1.5)\cos 60+F_A(x\sin 60)$

Moments about B: $T(3-x)+R_A(3\cos 60)=4g(1.5\cos 60)+F_A(3\sin 60)$

Moments about midpoint of AB: $R_A(1.5\cos 60)+g(1.5\cos 60)=T(x-1.5)+F_A(1.5\sin 60)$

Resolving perpendicular to AB: $T+R_A\cos 60=4g\cos 60+g\cos 60+F_A\sin 60$

Resolving parallel to AB: $R_A\sin 60+F_A\cos 60=4g\sin 60+g\sin 60$

11	**(b)**		$T\cos 60 + R_A = 4g + g \quad \left(\Rightarrow R_A = 5g - \frac{9g}{4x}\right)$	**M1**	**3.3**	Resolve vertically or horizontally – correct number of terms with the tension at C in terms of cos/sin, condone sign errors, allow sin/cos confusion but forces that require resolving must be (and correspondingly those that don't require resolving e.g. the weights if resolving vertically, should not be resolved)	Or obtain an equation in F_A and/or R_A in terms of T (or their T) only (see list of equations below)
			$F_A = T\sin 60 \left(\Rightarrow F_A = \frac{9\sqrt{3}g}{4x}\right)$	**A1**	**1.1**	Both correct (unsimplified) – allow with T or their (possibly incorrect) T (oe eg two valid equations in R_A and F_A)	R_A is the normal contact force at A F_A is the frictional contact force at A
			$\frac{9\sqrt{3}g}{4x} = \frac{9\sqrt{3}}{35}\left(5g - \frac{9g}{4x}\right)$	**M1dep***	**3.4**	Use of $F = \mu R$ with correct μ to form an equation in x only – no forces missing from their R_A and F_A and all required forces resolved accordingly or not e.g. if resolving vertically the two weights should not contain sin/cos	
			$x = 2.2$	**A1**	**2.2a**	awrt 2.2	www
				[4]			

For reference for parts **(a)** and **(b)**:

Moments about C: $R_A(x\cos 60) + g(3 - x)\cos 60 = 4g(x - 1.5)\cos 60 + F_A(x\sin 60)$

Moments about B: $T(3 - x) + R_A(3\cos 60) = 4g(1.5\cos 60) + F_A(3\sin 60)$

Moments about midpoint of AB: $R_A(1.5\cos 60) + g(1.5\cos 60) = T(x - 1.5) + F_A(1.5\sin 60)$

Resolving perpendicular to AB: $T + R_A\cos 60 = 4g\cos 60 + g\cos 60 + F_A\sin 60$

Resolving parallel to AB: $R_A\sin 60 + F_A\cos 60 = 4g\sin 60 + g\sin 60$