2. A light elastic string AB has natural length $3a$ and modulus of elasticity $\frac{20mg}{7}$

When the string is unstretched, two particles, each of mass m, are attached to the string, one at P, where $AP = a$ and the other at Q, where $AQ = 2a$.

The end A of the string is then attached to a point X on a horizontal ceiling and the end B is attached to another point Y on the ceiling, where $XY > 3a$.

The particles hang at rest in equilibrium and the two portions of the string, XP and YQ, both make an angle θ with the horizontal, as shown in Figure 1.

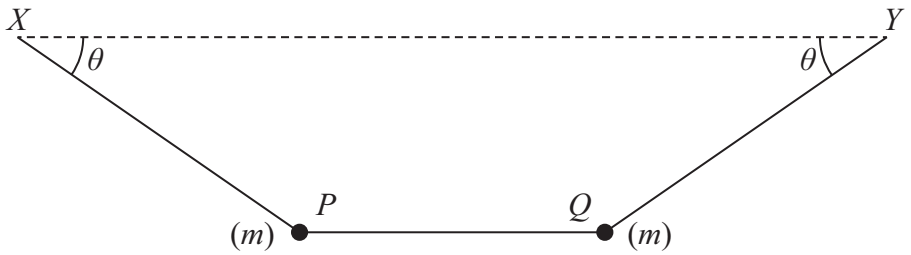


Figure 1

Given that $\tan\theta = \frac{3}{4}$, find XY in terms of a.

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Question 2 continued

(Total for Question 2 is 10 marks)