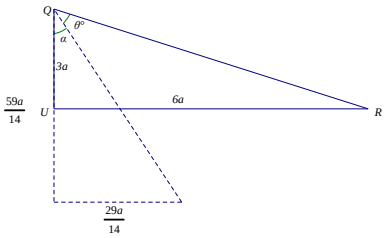
<table>
<tr><td>7a</td><td>
<table>
<tr><td></td><td>PQUV</td><td>URST</td><td>QRU</td><td>total</td></tr>
<tr><td>Mass ratio</td><td>$9a^2$</td><td>$36a^2$</td><td>$18a^2$</td><td>$63a^2$</td></tr>
<tr><td>Displacement From QT</td><td>$-\frac{3a}{2}$</td><td>$3a$</td><td>$2a$</td><td>d</td></tr>
</table>
</td><td>B1

B1</td><td>Correct mass ratios (1:4:2:7)

Correct displacements from QT or a parallel axis seen or implied. Signs consistent</td></tr>
<tr><td></td><td>Equation for moments about QT</td><td>M1</td><td>(or a parallel axis)
Dimensionally correct.
Condone sign errors</td></tr>
<tr><td></td><td>$18\times 2a+36\times 3a-9\times\frac{3a}{2}=63d$
$\left(4a+12a-\frac{3a}{2}=7d\right)$</td><td>A1</td><td>Or equivalent
Correct unsimplified equation
Check consistent in a.</td></tr>
<tr><td></td><td>$d=\frac{29a}{2}\Big/7\left(=\frac{261a}{2}\Big/63\right)=\frac{29a}{14}$ *</td><td>A1*</td><td>Obtain given answer from correct working. Need to see at least one interim step with all the a terms collected.
Check a is in final answer.</td></tr>
<tr><td></td><td></td><td>[5]</td><td></td></tr>
<tr><td>7b</td><td colspan="3">Condone if “a” is missing throughout the working in part (b) because they have not been asked for the distance here.</td></tr>
<tr><td></td><td>Vertical distances from Q:
$\frac{3a}{2}, 6a\left(=3a+3a\right), 2a, \left(v\right)$
From T: $7.5a, 3a, 7a$</td><td>B1</td><td>Seen or implied</td></tr>
<tr><td></td><td>Equation for moments about PQ</td><td>M1</td><td>(Or a parallel axis)
Dimensionally correct.
Condone sign errors</td></tr>
<tr><td></td><td>$9\times\frac{3a}{2}+18\times 2a+36\times 6a=63v$
$\left(\frac{3a}{2}+2\times 2a+4\times 6a=7v\right)$</td><td>A1</td><td>Correct unsimplified equation</td></tr>
<tr><td></td><td>$v=\frac{59a}{14}$ $\left(\frac{67}{14}a \text{ above } T, \frac{17}{14}a \text{ below } U\right)$</td><td>A1</td><td>4.2a or better (4.214…)</td></tr>
<tr><td></td><td colspan="3">The working for (a) and (b) might be combined in a vector equation. The marks for (b) are scored if the work is used in (b).</td></tr>
<tr><td></td><td>
</td><td></td><td></td></tr>
<tr><td></td><td>$\tan\alpha=\frac{29}{59}$ $\left(=26.175...°\right)$</td><td>M1</td><td>Use trig and their v to find a relevant angle
Allow for $90°-26.17...°$</td></tr>
</table>