

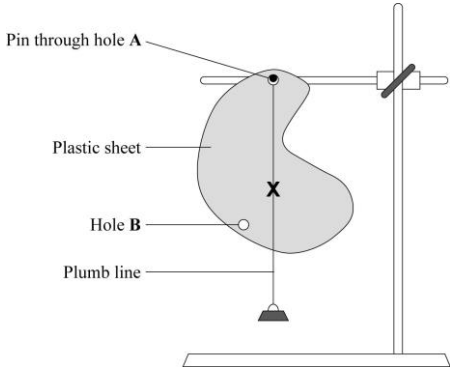
# WEIGHT MASS AND GRAVITY AND RESULTANT FORCES

## MARK SCHEMES

| Question 1   |   |   |   |
|--------------|---|---|---|
| question     | answers   | extra information   | mark  |
| (a)          | centre of X at the point where the axes cross   | to within 1 mm in any direction   | 1   |
| (b)(i)       | (at / in the) centre (of the tyre)  | <b>or</b> unambiguously shown on the diagram  | 1   |
| (ii)         | (this is) where axes of symmetry (of the tyre) cross / intersect / meet   | <b>or</b> point at which the mass of the tyre seems to be (concentrated)  | 1   |
| <b>total</b> |   |   | <b>3</b>  |
| Question 2   |   |   |   |
| (a)          | (line of action of) its weight<br><br>falls inside its wheel base<br><br><br><br><br><br><br><br><br><br>(so there is) no (resultant / clockwise) moment / turning effect | accept falls between the wheels<br><br><br>the first <b>two</b> points may be credited by adding a vertical line from the centre of the X on the diagram (1) and labelling it weight / force / with a downwards arrow (1) provided there is no contradiction between what is added to the diagram and anything which may be written | 1<br><br>1<br><br><br><br><br><br><br><br><br><br>1 |
| (b)          | centre of mass should be lower  |   | 1   |

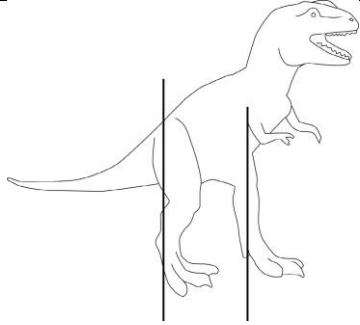
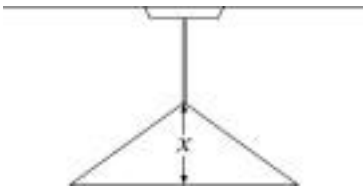
|              |                            |   |          |
|--------------|----------------------------|---|----------|
|              | wheel base should be wider | <p>accept centre of gravity accept weight / mass low down<br/><b>not</b> just lower the roof</p> <p>accept long axle(s) for wide wheel base<br/>allow bigger / larger wheel base<br/>do <b>not</b> credit <u>long</u> wheel base</p> <p>responses in either order</p> | 1        |
| <b>total</b> |                            |   | <b>5</b> |

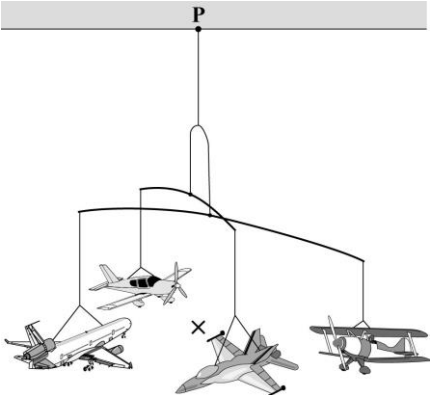
**Question 3**

|              |   |   |          |
|--------------|---|---|----------|
| (a)          | centre of <b>X</b> on the plumb line and between the level of the captions 'plastic sheet' and 'hole <b>B</b> ' | <p><b>example</b></p>  | 1        |
| (b)          | centre of mass  | accept any unambiguous indication   | 1        |
| (c)          | vertical  | accept any unambiguous indication   | 1        |
| <b>Total</b> |   |   | <b>3</b> |

**Question 4**

|        |   |  |   |
|--------|---|--|---|
| (a)(i) | centre of <b>X</b> above the feet and in the body | a vertical line from their <b>X</b> falls between two lines in diagram – judged by eye | 1 |
|--------|---|--|---|

|                   |   |   |          |
|-------------------|---|---|----------|
|                   |   |   |          |
| (a)(ii)           | where the mass seems to be concentrated   | accept it's above the <u>base</u> (area) accept because otherwise it would topple<br>accept line of action (of weight) passes through the <u>base</u> do <b>not</b> accept where the mass is concentrated | 1        |
| (b)               | any <b>two</b> from: <ul style="list-style-type: none"> <li>• make (the area of) feet / base bigger</li> <li>• make feet wider apart</li> <li>• makes legs shorter / heavier</li> <li>• make head smaller / lighter</li> <li>• make tail touch the ground / make the tail longer</li> </ul> | accept 'make centre of mass / gravity lower'  | 2        |
| Total             |   |   | <b>4</b> |
| <b>Question 5</b> |   |   |          |
| (a)               | centre of <b>X</b> should appear to be on the continued line of the flex and in the body of the lamp as judged by eye   | example<br>   | 1        |

|                   |   |  |   |
|-------------------|---|--|---|
|                   |   |  |   |
| (b)               | below   |  | 1 |
| (c)               | (D)→B→F→A→C→(E)   | all four correct for <b>3</b> marks <b>or</b><br>any two correct for <b>2</b> marks <b>or</b><br>just one correct for <b>1</b> mark  | 3 |
| total             |   |  | 5 |
| <b>Question 6</b> |   |  |   |
| 6(a)(i)           | centre of <b>X</b> directly below <b>P</b> <u>and</u><br>between the model aeroplanes | as judged by eye but between centre of<br>propeller of top aeroplane and<br>canopy of bottom aeroplane<br><br>example<br> | 1 |
| 6(a)(ii)          | the centre of mass is (vertically) below<br>the point of suspension / P               |  | 1 |
|                   | the centre of mass is in the middle of<br>the aeroplanes                              | accept the centre of mass is level<br>with the aeroplanes  | 1 |
| 6(b)              | <u>centre of mass</u> of the worker<br><u>and the ladder</u> (and device)             |  | 1 |
|                   | line of action of the weight is inside the<br>base                                    | accept the centre of mass is above /<br>within / inside the base<br>(of the ladder and device)   | 1 |
|                   | so there will not be a (resultant) moment<br><br><b>or</b>                            | accept so he / it / the ladder will not<br>topple even if he leans over  | 1 |

|              |   |   |          |
|--------------|---|---|----------|
|              | it will (only) topple over if the line of action of the weight / the centre of mass is outside the base | accept each point, either on the diagram or in the written explanation, but do <b>not</b> accept the point if there is any contradiction between them |          |
| <b>Total</b> |   |   | <b>6</b> |