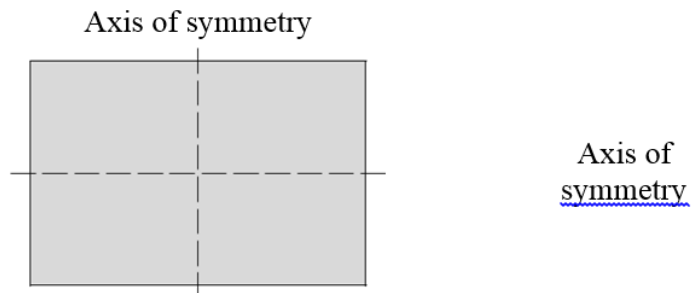


# WEIGHT MASS AND GRAVITY AND RESULTANT FORCES

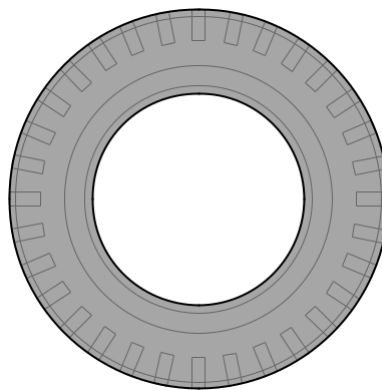
1 (a) The diagram shows a rectangle made out of a sheet of cardboard.



Draw an X on the diagram so that the centre of the X is at the centre of mass of the rectangle.

(1 mark)

(b) The drawing shows a car tyre.



(i) Where is the centre of mass of the tyre?

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(1 mark)

(ii) Explain your answer to (b)(i).

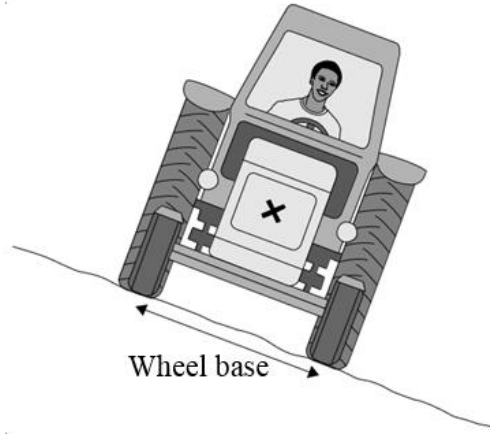
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(1 mark)

**Q3.** Tractors are often used on sloping fields, so stability is important in their design.

On the diagram, the centre of the X marks the centre of mass of the tractor.



(a) Explain why the tractor has not toppled over. You may add to the diagram to help you to explain.

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(3 marks)

(b) Give **two** features of the tractor which affect its stability and state how each feature could be changed to increase the tractor's stability.

Feature 1 \_\_\_\_\_

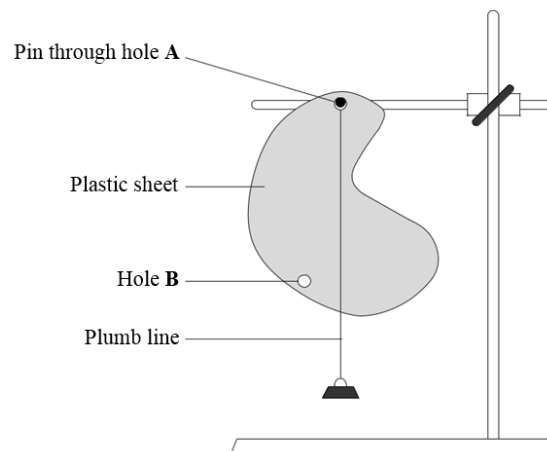
(2 marks)

**Q4.** The diagram shows how a student can find the centre of mass of a thin flat sheet of plastic.

Part of his equipment is a plumb line. This is a weight fastened to one end of a piece of string.

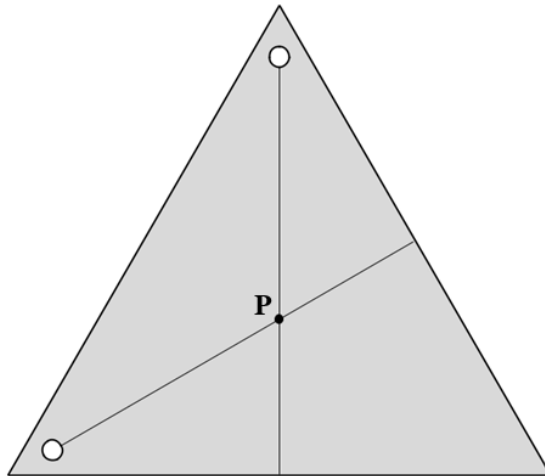
He hangs the sheet and the plumb line from a pin through hole A.

**(a)** Mark an X on the diagram so that the centre of the X marks the likely position of the centre of mass of the plastic sheet.



**(b)** The dashed lines on the diagram below show the position of the plumb line from each hole when the student uses a different plastic sheet.

Point P is on both the dashed lines.



Complete the following sentence by drawing a ring around the correct line in the box.

**Point P** shows the

- |  |
|--|
| axis<br>centre of mass<br>moment<br>symmetry |
|--|

of the plastic sheet.

(1 mark)

(c) Complete the following sentence by drawing a ring around the correct word in the box.

A plumb line always hangs so that it is

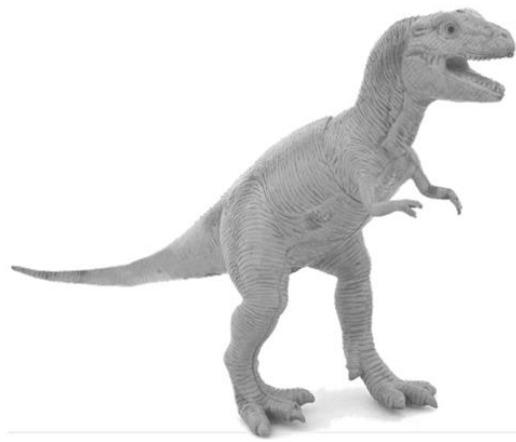
- |  |
|--|
| curved<br>horizontal<br>parallel<br>vertical |
|--|

of the plastic sheet.

(1 mark)

**Q5.** The drawing shows a plastic toy which can stand on its feet.

**(a) (i)** Draw an X on the diagram so that the centre of the X marks the likely position of the centre of mass of the toy.



(a) (ii) Explain the reason for your choice in part (a)(i).

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(1 mark)

(b) Suggest two ways in which the design of the toy could be altered to make the toy more stable.

1 \_\_\_\_\_

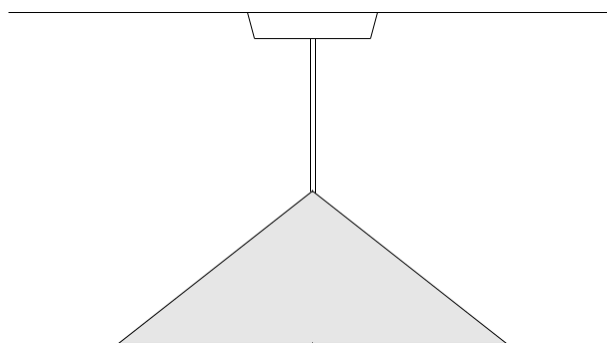
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2 \_\_\_\_\_

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(2 marks)

**Q5. (a)** The diagram shows a lampshade hanging from the ceiling. Draw an X on the diagram so that the centre of the X marks the centre of the mass of the lampshade.



(1 mark)

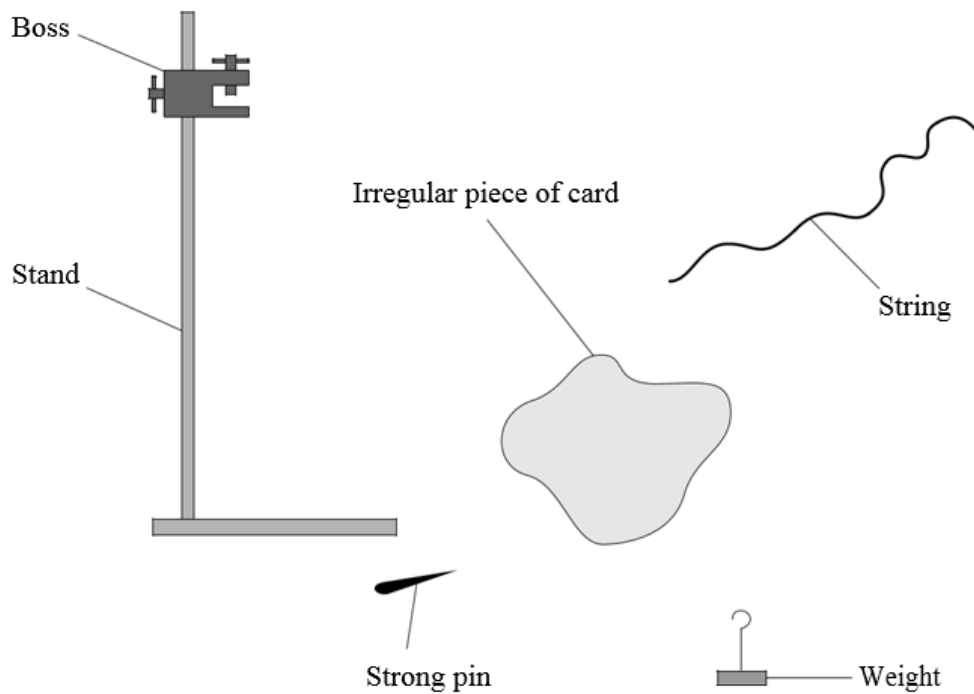
(b) Complete the sentence using the correct word or phrase from the box.

above	below	to the left of	to the right of
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A suspended object will come to rest with its centre of mass directly  
\_\_\_\_\_ the point of suspension

(1 mark)

(c) The diagrams show equipment that a student uses to find the centre of mass of a thin sheet of card



Arrange these sentences in the correct order to describe how the student can find the centre of mass of the card.

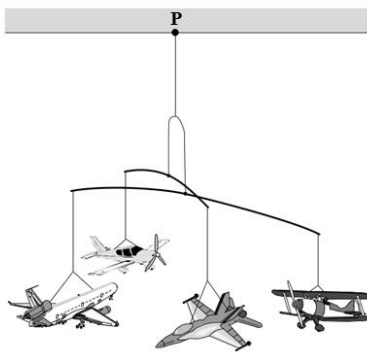
The sequence starts with sentence D finishes with sentence E.

<b>A.</b>	A line is drawn on the card marking the position of the string.
<b>B.</b>	The pin is put through one of the holes in the card and held in the boss.
<b>C.</b>	This is repeated using the other hole.
<b>D.</b>	Two holes are made in the card with each hole near to the edge of the card.
<b>E.</b>	The centre of mass is where the lines cross on the card.
<b>F.</b>	The weight is tied to the string and then the string is hung from the pin.

<b>D</b>					<b>E</b>
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**Q6 (a)** The diagram shows a child's mobile. The mobile hangs from point P on the ceiling of the child's bedroom.

(a) (i) Mark the position of the centre of mass of the mobile by drawing a letter X on the diagram. Do this so that the centre of the X marks the centre of mass of the mobile.



(1 mark)

(a)(ii) Explain why you have chosen this position for your letter X.

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(2 marks)



(b) The diagram shows a device which helps to prevent a ladder from falling over.



Use the term centre of mass to explain why the ladder, in the situation shown, is unlikely to topple over.

You may add to the diagram to illustrate your explanation.

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(3 marks)

**Total: 26 marks**

