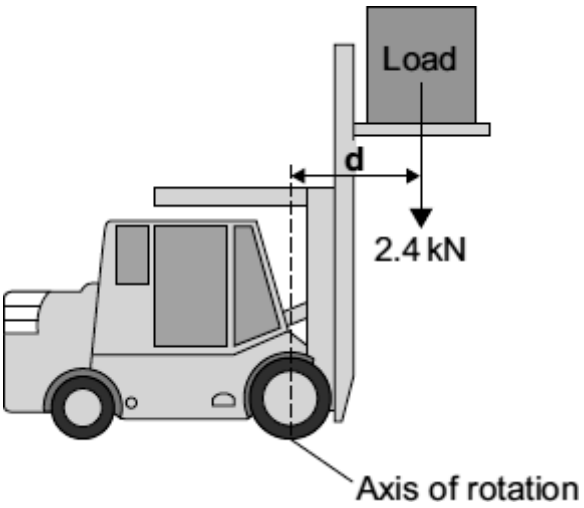
Q1. The diagram shows a fork-lift truck with a load of 2.4 kN. The clockwise moment caused by this load is 2880 Nm.



(a) Use the equation in the box to calculate the distance **d**.

moment	=	force	× perpendicular distance from the line of action of the force to the axis of rotation

Show clearly how you work out the answer and give the unit.

.....

.....

.....

Distance **d** = ...

(3)

(b) This warning notice is in the driver's cab.

Warning

Maximum load 10.0 kN

This load must not be exceeded

Explain in terms of moments why the maximum load must not be exceeded.

.....

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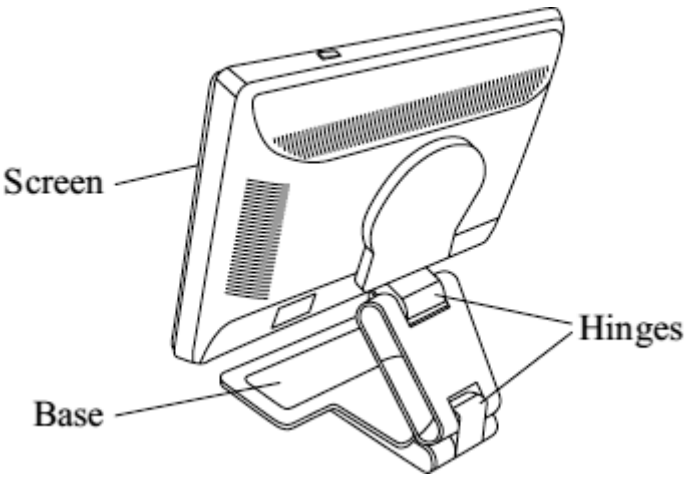
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(2)
(Total 5 marks)

Q2. The diagram shows a back view of a computer monitor.



(a) In normal use, the monitor is *stable.*

(i) Explain the meaning, in the above sentence, of the word *stable.*

.....

.....

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.....

(2)

(ii) State the relationship between the total clockwise moment and the total anticlockwise moment about any axis of the monitor when it is stable.

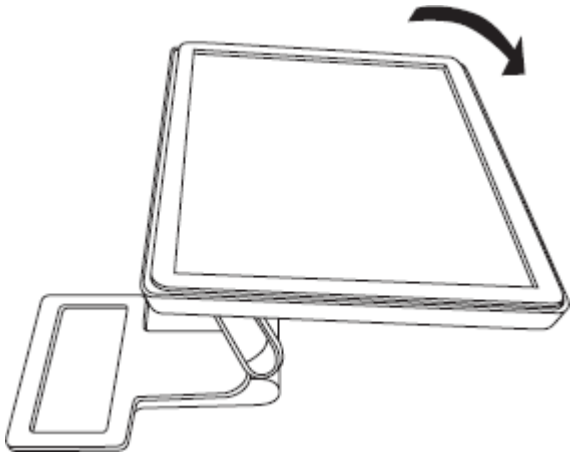
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(1)

(b) The instruction booklet explains that the screen can be tilted.
It also includes a warning.

Caution
The monitor can tip over if the screen is tilted too far back.



Explain why the monitor will tip over if the screen is tilted too far back.

Include the words *centre of mass, weight* and *moment* in your explanation.

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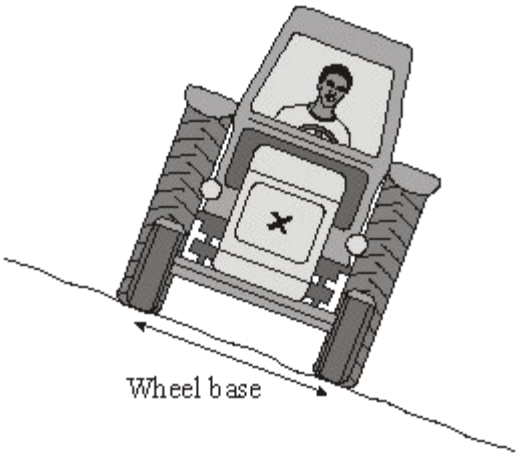
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(3)
(Total 6 marks)

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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.....

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.....

(3)

(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 .....

.....

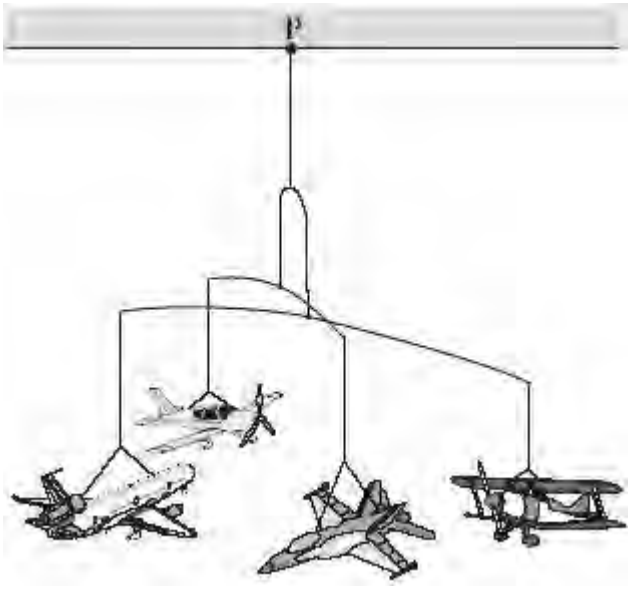
Feature 2 .....

.....

(2)
(Total 5 marks)

Q4. **(a)** **The diagram shows a child's mobile. The mobile hangs from point P on the ceiling of the child's bedroom.**

(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)

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

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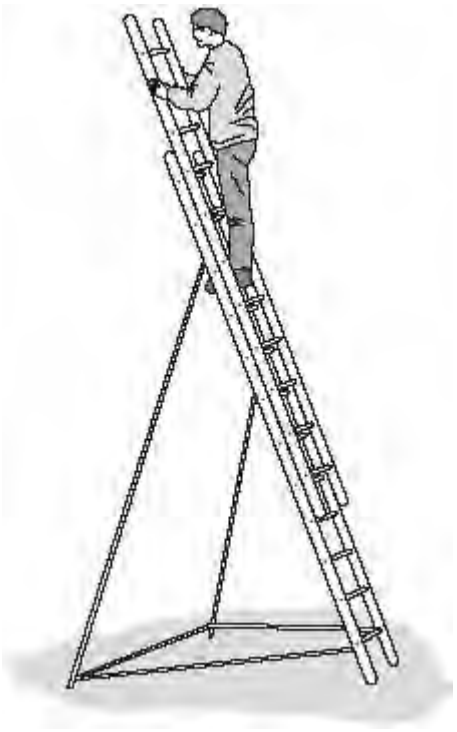
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(2)

(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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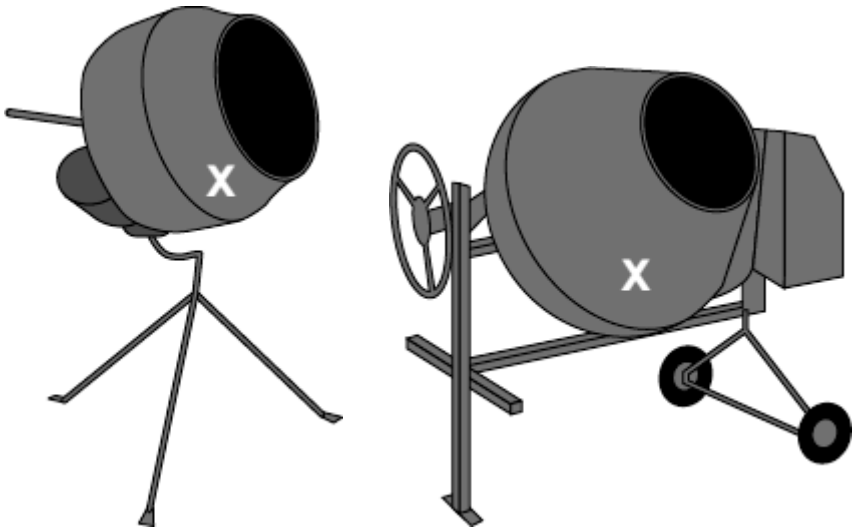
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(3)
(Total 6 marks)

Q5. The diagrams show two concrete mixers.



Concrete mixer A **Concrete mixer B**

On each diagram, the centre of the white X marks the centre of mass of the concrete mixer and its contents.

(a) Complete the sentence to explain what the term *centre of mass* means.

The centre of mass of a concrete mixer and its contents is .....

.....

.....

(1)

(b) Both diagrams are drawn to the same scale.

Concrete mixer B is more stable than concrete mixer A.

The two features which make concrete mixer B more stable are:

1 .....

.....

2 .....

.....

(2)

(c) Use the terms 'line of action of the weight' and 'resultant moment' to explain why a stable concrete mixer does not fall over when it is given a small push.

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(2)
(Total 5 marks)