

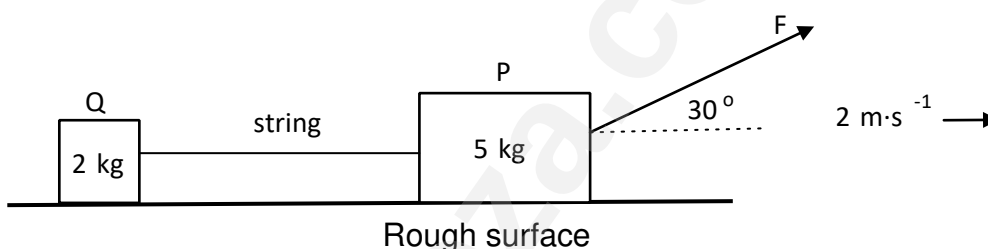


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Test Term 1**Physical sciences****Question 1**

Two boxes, **P** and **Q**, resting on a rough horizontal surface, are connected by a light inextensible string. The boxes have masses 5 kg and 2 kg respectively. A constant force **F**, acting at an angle of 30° to the horizontal, is applied to the 5 kg box, as shown below.

The two boxes now move to the right at a **constant speed** of $2 \text{ m}\cdot\text{s}^{-1}$.



1.1 State Newton's First Law of Motion in words. (2)

1.2 Draw a labelled free-body diagram for box **Q**. (4)

Box **P** experiences a constant frictional force of 5 N and box **Q** a constant frictional force of 3 N.

1.3 Calculate the magnitude of force **F**. (6)

Question 2

The string connecting **P** and **Q** suddenly breaks after 3 s while force **F** is still being applied.

Learners draw the velocity-time graph for the motion of **P** and **Q** before and after the string breaks, as shown below.

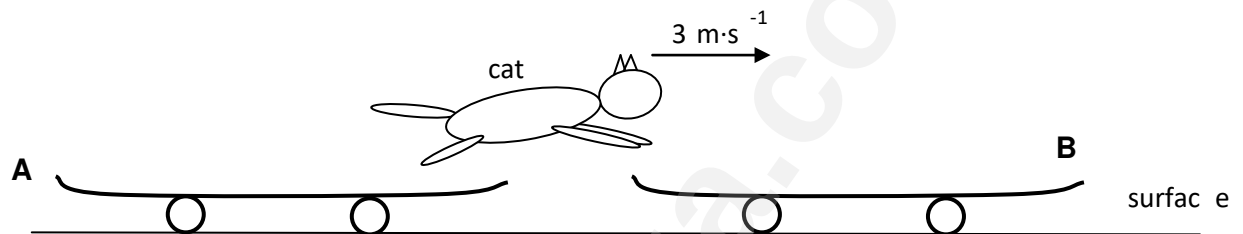
The diagram below shows two skateboards, **A** and **B**, initially at rest, with a cat standing on skateboard **A**. The skateboards are in a straight line, one in front of the other and a short distance apart. The surface is flat, frictionless and horizontal.



- 2.1 State the *principle of conservation of linear momentum* in words. (2)

EACH skateboard has a mass of 3,5 kg. The cat, of mass 2,6 kg, jumps from skateboard **A** with a horizontal velocity of $3 \text{ m}\cdot\text{s}^{-1}$ and lands on skateboard **B** with the same velocity of $3 \text{ m}\cdot\text{s}^{-1}$.

Refer to the diagram below.



- 2.2 Calculate the velocity of skateboard **A** just after the cat has jumped from it. (5)

Immediately after the cat has landed, the cat and skateboard **B** move horizontally to the right at $1,28 \text{ m}\cdot\text{s}^{-1}$.

- 2.3 Calculate the magnitude of the impulse on skateboard **B** as a result of the cat's landing. (3)
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