Newton's Laws Application: Exam Revision Tracker

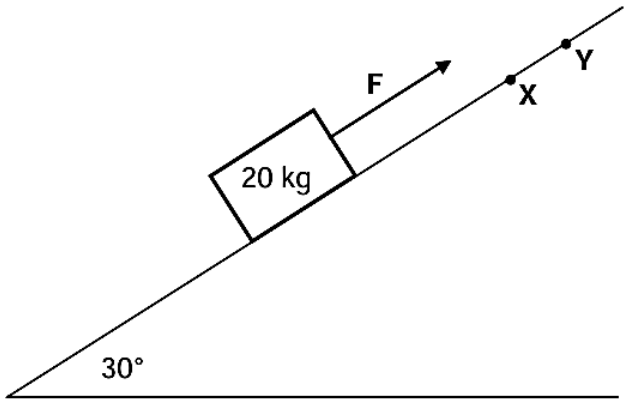
Attempt #1		Attempt #2		Attempt #3		Attempt #4		Attempt #5	
Total	Score	Total	Score	Total	Score	Total	Score	Total	Score
16		17		19		16		21	
Percentage =		Percentage =		Percentage =		Percentage =		Percentage =	

Newton's Laws Application: Attempt #1

Total = 16 Marks

A 20 kg block is placed on a rough surface inclined at 30° to the horizontal. A constant force **F**, acting parallel to the surface, is applied on the block so that the block moves up the incline at a CONSTANT VELOCITY of 2 $m \cdot s^{-1}$. Refer to the diagram below.

A constant kinetic frictional force of 18 N acts on the block.



1. State *Newton's First Law* in words. (2)

2. Draw a labelled free-body diagram for the block. (4)

3. Calculate the magnitude of force **F**. (4)

Force **F** is removed when the block reaches point **X** on the surface. The block continues to move up the surface and comes to rest momentarily at point **Y**.

Assume that the kinetic frictional force acting on the block remains at 18 N as it moves from point **X** to point **Y**.

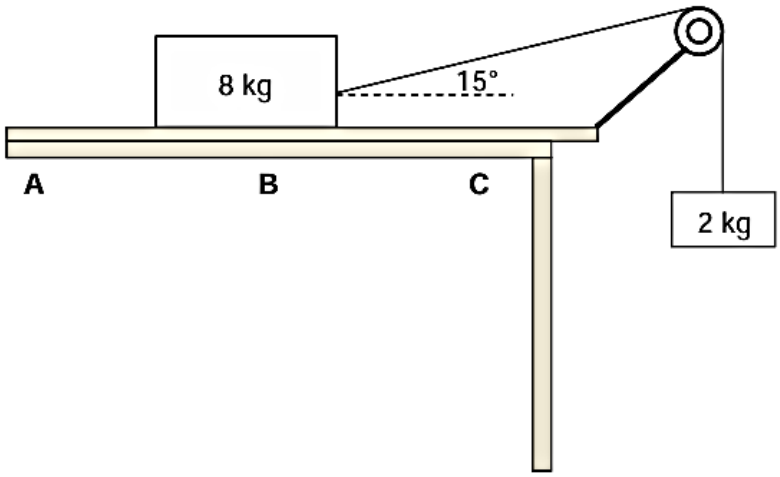
4. Write down the net force acting on the block as it moves from **X** to **Y**. (2)

5. Calculate the distance between points **X** and **Y**. (4)

Newton's Laws Application: Attempt #2

Total = 17 Marks

A block, of mass 8 kg, is placed on a rough horizontal surface. The 8 kg block, which is connected to a 2 kg block by means of a light inextensible string passing over a light frictionless pulley, starts sliding from point **A**, as shown below.



1. State Newton's Second Law in words. (2)

2. Draw a labelled free-body diagram for the 8 kg block. (4)

3. When the 8 kg block reaches point **B**, the angle between the string and the horizontal is 15° and the acceleration of the system is 1,32 $m \cdot s^{-2}$.

3.1 Give a reason why the system is NOT in equilibrium. (1)

3.2 Use the 2 kg mass to calculate the tension in the string. (3)

3.3 Calculate the kinetic frictional force between the 8 kg block and the horizontal surface. (4)

4. As the 8 kg block moves from **B** to **C**, the kinetic frictional force between the 8 kg block and the horizontal surface is not constant.

Give a reason for this statement. (1)

The horizontal surface on which the 8 kg block is moving, is replaced by another horizontal surface made from a different material.

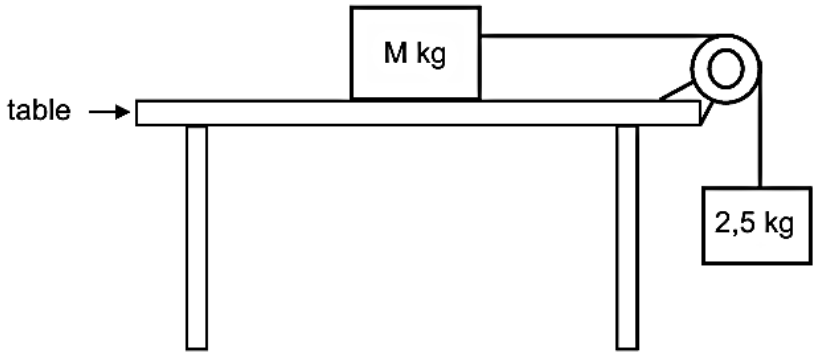
5. Will the kinetic frictional force, calculated in QUESTION 2.3.3 above, change? Choose from: YES or NO. Give a reason for the answer. (2)

Newton's Laws Application: Attempt #3

Total = 19 Marks

1. Two blocks of mass M kg and 2,5 kg respectively are connected by a light, inextensible string. The string runs over a light, frictionless pulley, as shown in the diagram below.

The blocks are **stationary**.



1.1 State Newton's THIRD law in words. (2)

1.2 Calculate the tension in the string. (3)

The coefficient of static friction (μ_s) between the unknown mass M and the surface of the table is 0,2.

1.3 Calculate the minimum value of M that will prevent the blocks from moving. (5)

The block of unknown mass M is now replaced with a block of mass 5 kg. The 2,5 kg block now accelerates downwards. The coefficient of kinetic friction (μ_k) between the 5 kg block and the surface of the table is 0,15.

1.4 Calculate the magnitude of the acceleration of the 5 kg block. (5)

2. A small hypothetical planet X has a mass of $6,5 \times 10^{20}$ kg and a radius of 550 km.

Calculate the gravitational force (weight) that planet X exerts on a 90 kg rock on this planet's surface. (4)

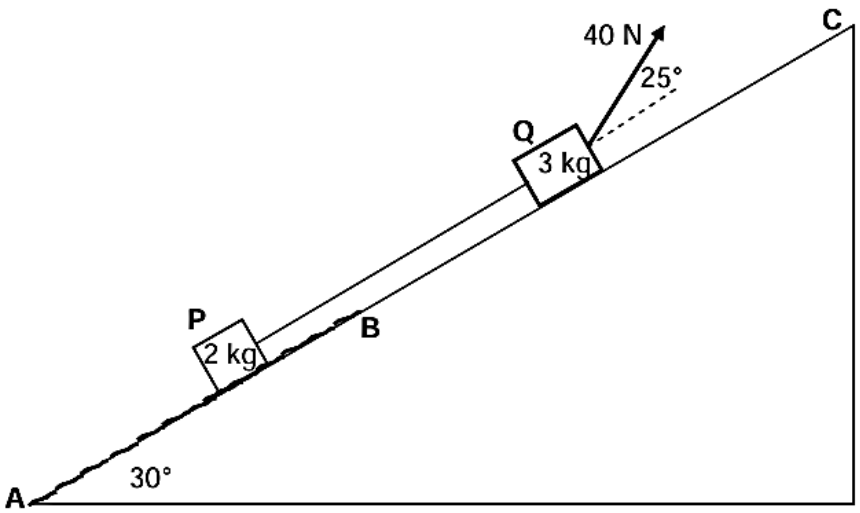
Newton's Laws Application: Attempt #4

Total = 16 Marks

Block **P**, of mass 2 kg, is connected to block **Q**, of mass 3 kg, by a light inextensible string. Both blocks are on a plane inclined at an angle of 30° to the horizontal.

Block **Q** is pulled by a constant force of 40 N at an angle of 25° to the incline.

Block **P** moves on a rough section, **AB**, of the incline, while block **Q** moves on a frictionless section, **BC**, of the incline. See diagram below.



An average constant frictional force of 2,5 N acts on block **P** as it moves from **A** to **B** up the incline.

1. State Newton's Second Law in words. (2)

2. Draw a labelled free-body diagram for block **P**. (4)

3. Calculate the magnitude of the acceleration of block **P** while block **P** is moving on section **AB**. (8)

4. If block **P** has now passed point **B**, how will its acceleration compare to that calculated in QUESTION 2.3? Choose from GREATER THAN, SMALLER THAN or EQUAL TO.

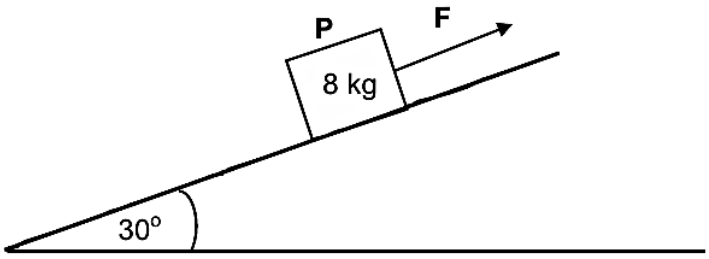
Give a reason for the answer. (2)

Newton's Laws Application: Attempt #5

Total = 21 Marks

1. An 8 kg block, **P**, is being pulled by constant force **F** up a rough inclined plane at an angle of 30° to the horizontal, at CONSTANT SPEED.

Force **F** is parallel to the inclined plane, as shown in the diagram below.



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

1.2 Draw a labelled free-body diagram for block **P**. (4)

The kinetic frictional force between the block and the surface of the inclined plane is 20,37 N.

1.3 Calculate the magnitude of force **F**. (5)

Force **F** is now removed and the block ACCELERATES down the plane. The kinetic frictional force remains 20,37 N.

1.4 Calculate the magnitude of the acceleration of the block. (4)

2. A 200 kg rock lies on the surface of a planet. The acceleration due to gravity on the surface of the planet is 6,0 $m \cdot s^{-2}$.

2.1 State Newton's Law of Universal Gravitation in words. (2)

2.2 Calculate the mass of the planet if its radius is 700 km. (4)