Firrhill High School	N4 N5	Dynamics		**7.** Unbalanced Forces

Section A&B (2 marks for all correct)

1. What is Newton's 1st Law?

2. What is Newton's 2nd Law?

3. What is Newton's 3rd Law?

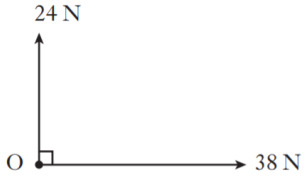
Section C

1. The diagram shows the horizontal forces acting on a box.

The box accelerates at 1·6 ms^{-2}.
The mass of the box is

A. 0·10 kg
B. 10·0 kg
C. 15·0 kg
D. 25·6 kg
E. 38·4 kg

2. Two forces act on an object O in the directions shown.



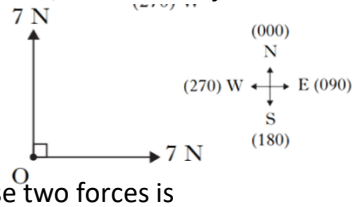
The size of the resultant force is

A. 14 N
B. 24 N
C. 38 N
D. 45 N
E. 62 N

3. A rocket accelerates vertically upwards from the surface of the Earth.
An identical rocket accelerates vertically upwards from the surface of Mars. The engine thrust from each rocket is the same.
Which row in the table shows how the weight of the rocket and the unbalanced force acting on the rocket compares on Mars and Earth?

	Weight on Mars compared to weight on Earth	Unbalanced force on Mars compared to unbalanced force on Earth
A.	greater	greater
B.	same	same
C.	same	less
D.	less	greater
E.	less	less

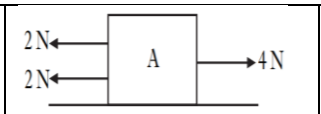
4. Two forces, each of 7 N, act on an object O.
The forces act as shown.

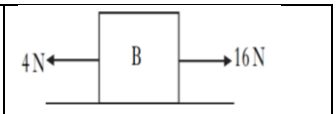


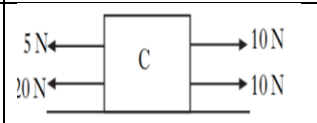
The resultant of these two forces is

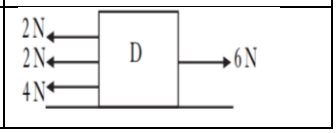
A. 7 N at a bearing of 135
B. 9·9 N at a bearing of 045
C. 9·9 N at a bearing of 135
D. 14 N at a bearing of 045
E. 14 N at a bearing of 135

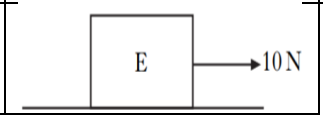
5. Which block has the largest resultant force acting on it?

A. 

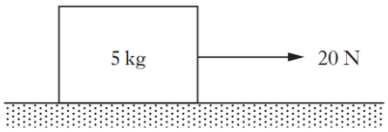
B. 

C. 

D. 

E. 

6. A block is pulled across a horizontal surface as shown.



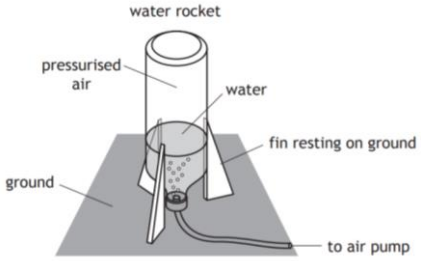
The mass of the block is 5 kg. The block is travelling at a constant speed. The force of friction acting on the block is

A. 0 N
B. 4 N
C. 15 N
D. 20 N
E. 25 N

Section D

1. A student is investigating the motion of water rockets. The water rocket is made from an upturned plastic bottle containing some water. Air is pumped into the bottle.
   When the pressure of the air is great enough the plastic bottle is launched upwards.

   The mass of the rocket before launch is 0·94 kg.



   a) Calculate the weight of the water rocket. **3**

   b) Use Newton's Third Law to explain how the rocket launches. **1**

   c) At launch, the initial upward thrust on the rocket is 370 N. **3**
   Calculate the initial acceleration of the rocket.