Resultant Forces

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

A box has three horizontal forces on it: 8 N to the right, 3 N to the left and 2 N to the left. Calculate the resultant force. (2 marks)

Step 1 · Add forces in the same direction

Left: 3 + 2 = 5 N

Step 2 · Subtract opposite directions

8 – 5 = 3 N, in the direction of the bigger force

Answer: 3 N to the right

Check: Always give the direction size.

2. Now try one with the steps

A car's engine provides a driving force of 3000 N. Air resistance is 1500 N and friction is 700 N. Calculate the resultant force and describe the motion. (3 marks)

Step 1 · Resistive forces

Step 2 · Resultant

Step 3 · Motion

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Define the resultant force on an object. [1]

2. Two forces act on an object: 10 N to the right and 4 N to the left. State the resultant force. [2]

3. Forces of 8 N right, 3 N left and 2 N left act on a box. State the resultant force. [2]

4. The forces on a moving object are balanced. Describe its motion. [1]

5. Describe the forces on a book resting on a table, on a free-body diagram. [2]

6. A car has a driving force of 3000 N and total resistive forces of 2200 N. Calculate the resultant force. [2]

7. A lift cable pulls up with 9000 N. The lift and passengers weigh 8000 N. State the size and direction of the resultant force. [2]

8. Describe the motion of a skydiver when the air resistance equals their weight. [1]

9. Forces of 6 N east and 8 N north act on an object. Calculate the size of the resultant force. [3]

10. For question 9, calculate the angle of the resultant measured from east, to the nearest degree. [2]

11. A 20 N force acts at 30° above the horizontal. Calculate its horizontal component. [3]

12. For question 11, calculate the vertical component. [1]

13. A boat is pulled by two ropes at right angles to each other, each with a force of 300 N. Calculate the size of the resultant force to 3 significant figures. [3]

14. Three forces act on an object in equilibrium. Describe the vector diagram you would get by drawing them tip to tail. [1]

4. Before you hand it in

Adding all the forces, whatever their direction
Forces in the same direction add; opposite forces subtract. Give the direction of the resultant.

"Balanced forces mean the object is not moving."
Balanced forces mean no change in motion: stationary objects stay still, moving objects keep a constant velocity.

Adding perpendicular forces: 6 N + 8 N = 14 N
Use Pythagoras (or a scale drawing): $\sqrt{(6^2 + 8^2)} = 10$ N.

Using sin for the horizontal component of a force at an angle to the horizontal
The component next to the angle (adjacent) uses cos: F cos θ. The other uses sin.