

GCSE Combined Science: Trilogy

Worksheet: Resultant forces

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Resultant forces

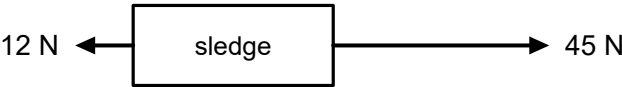
NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Figure 1 shows the horizontal forces acting on a sledge as a child pulls it across snow.

Figure 1



0 1 . 1

Calculate the resultant force on the sledge.

.....

.....

.....

.....

Resultant force = N

[2 marks]

0 1 . 2

Give the direction of the resultant force.

.....

.....

[1 mark]

0 1 . 3

A second child pushes the back of the sledge with a force of 20 N in the same direction as the 45 N force.

Calculate the new resultant force on the sledge.

.....

.....

.....

Resultant force = N

[1 mark]

0 1 . 4

What is meant by the resultant force on an object?

.....

.....

[1 mark]

0 2

0 2 . 1

Which of these is the correct definition of the resultant force on an object?

Tick (✓) **one** box.

The largest of the forces acting on the object

☐

The single force that has the same effect as all the forces acting on the object together

☐

The force needed to keep the object still

☐

The force that always acts against the object's motion

☐

[1 mark]

0 2 . 2

State what it means for an object when the resultant force acting on it is zero.

.....

.....

[1 mark]

0 2 . 3

A stationary crate is pushed with a force of 90 N to the right. Friction of 90 N acts to the left.
Calculate the resultant force on the crate.

.....

.....

.....

.....

Resultant force = N

[2 marks]

0 3

A tractor pulls a trailer using a chain, which exerts a forward force of 2400 N on the trailer. Resistive forces (friction and air resistance) on the trailer total 2400 N. The trailer is already moving forward.

0 3 . 1

Calculate the resultant force on the trailer.

.....

.....

.....

.....

Resultant force = N

[2 marks]

0 3 . 2

Describe the motion of the trailer as a result.

.....

.....

[1 mark]

0 4

Two horizontal forces act on a loaded sledge: 75 N to the right and 80 N to the left.

0 4 . 1

Calculate the resultant force on the sledge.

.....

.....

.....

.....

Resultant force = N

[2 marks]

0 4 . 2

Give the direction of the resultant force.

.....

.....

[1 mark]

0 5

A crane lifts a crate using a vertical steel cable. The weight of the crate is 3600 N. Ignore air resistance.

0 5 . 1

The crate hangs at rest just above the ground.

What is the tension in the cable?

.....

.....

.....

Tension = N

[1 mark]

0 5 . 2

The tension in the cable is increased to 3900 N.
Calculate the resultant force on the crate and give its direction.

.....

.....

.....

.....

Resultant force = N

[2 marks]

0 5 . 3

Describe the motion of the crate while the tension is 3900 N.

.....

.....

[1 mark]

0 5 . 4

Later, the crate moves upwards at a constant speed.
Give the tension in the cable. Explain your answer.

.....

.....

.....

.....

[2 marks]

.....

0 6

Four horizontal forces act on a shopping trolley: 20 N to the right, 35 N to the right, 45 N to the left and 50 N to the left.

0 6 . 1

Calculate the resultant force on the trolley.

.....

.....

.....

.....

Resultant force = N

[2 marks]

0 6 . 2

Give the direction of the resultant force.

.....

.....

[1 mark]

0 6 . 3

One extra horizontal force is added, so that the resultant force on the trolley becomes zero.

Give the size and direction of this extra force.

.....

.....

.....

.....

[2 marks]

0 7

Four horizontal forces act on a small metal ring, which stays at rest: 8.0 N to the north, 5.0 N to the east, 5.0 N to the west and a force P to the south.

0 7 . 1

What word describes an object when the resultant force acting on it is zero?

.....

.....

.....

.....

[1 mark]

0 7 . 2

Determine the size of force P.
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 7 . 3

The 5.0 N force to the west is removed.
Give the size and direction of the resultant force on the ring now.

.....

.....

.....

.....

[2 marks]

0 7 . 4

Describe how the ring moves after the 5.0 N force to the west is removed.

.....

.....

[1 mark]

END OF QUESTIONS

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Resultant forces · 32 marks

Question 1 (5 marks)

01.1 [2 marks]

Answer: 33 N

- 45 – 12 (1)
 - 33 (N) (1)
-

01.2 [1 mark]

Answer: To the right.

- to the right / in the direction of the 45 N force (1)
-

01.3 [1 mark]

Answer: 53 N

- 53 (N) (1)
-

01.4 [1 mark]

Answer: The single force that has the same effect as all the original forces acting together.

- the single force that has the same effect as all the forces acting on the object (acting together) (1)
-

Question 2 (4 marks)

02.1 [1 mark]

Correct: The single force that has the same effect as all the forces acting on the object together

02.2 [1 mark]

Answer: It stays at rest or moves at constant velocity (it is in equilibrium).

- the object stays at rest, or continues to move at a constant velocity (it is in equilibrium) (1)
-

02.3 [2 marks]

Answer: 0 N

- 90 – 90 (1)
 - 0 (N) (1)
-

Question 3 (3 marks)

03.1 [2 marks]

Answer: 0 N

- 2400 – 2400 (1)
 - 0 (N) (1)
-

03.2 [1 mark]

Answer: It continues at a constant velocity.

- it continues to move at a constant velocity (a steady speed in a straight line) (1)
-

Question 4 (3 marks)

04.1 [2 marks]

Answer: 5 N

- 80 – 75 (1)
 - 5 (N) (1)
-

04.2 [1 mark]

Answer: To the left.

- to the left (1)
-

Question 5 (6 marks)

05.1 [1 mark]

Answer: 3600 N

- 3600 (N) (1)

05.2 [2 marks]

Answer: 300 N upwards

- 300 (N) (1)
- upwards (1)

05.3 [1 mark]

Answer: It accelerates upwards.

- accelerates upwards / speeds up (moving upwards) (1)

05.4 [2 marks]

Answer: 3600 N, because the resultant force is zero at constant speed.

- 3600 (N) (1)
- (constant speed so) the resultant force is zero / the forces are balanced, so the tension equals the weight (1)

Question 6 (5 marks)

06.1 [2 marks]

Answer: 40 N

- total to the right = 55 (N) and total to the left = 95 (N) (1)
- resultant = $95 - 55 = 40$ (N) (1)

06.2 [1 mark]

Answer: To the left.

- to the left (1)

06.3 [2 marks]

Answer: 40 N to the right.

- 40 N (allow ECF) (1)
 - to the right (1)
-

Question 7 (6 marks)

07.1 [1 mark]

Answer: Equilibrium.

- (in) equilibrium (1)

Notes: Allow balanced.

07.2 [2 marks]

Answer: 8.0 N: the resultant force is zero, so P balances the 8.0 N force to the north.

- 8.0 (N) (1)
 - the ring is at rest, so the resultant force on it is zero: P must balance the 8.0 N force to the north (the east and west forces already cancel) (1)
-

07.3 [2 marks]

Answer: 5.0 N to the east.

- 5.0 (N) (1)
 - to the east (1)
-

07.4 [1 mark]

Answer: It accelerates towards the east.

- it accelerates (starts to move) towards the east (1)
-