### Topic
Newton’s third law.

### Level
GCSE (or any course for students aged 11-16)

### Outcomes
1. To draw force diagrams to explain Newton’s third law.

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**Instructions for teachers:** the purpose of this task is to help students understand Newton’s third law. It is quite common for students to think that if interacting forces act in pairs, then a force in one direction will be cancelled out by an equal force acting in the opposite direction. Of course the interacting forces act on different objects and so both objects will experience the force. It’s also important that students understand that there is no pushing force acting on an object once it has been thrown – only weight and air resistance will be acting.
Alfie and Otis are having a snowball fight.

1. Draw a snowball and label the forces acting on it at t=2s.
2. The snowball hits Otis in the face with a Force of 5 Newtons. Ouch! Why does the snowball break apart? Draw a force diagram to explain your answer at t=3s.
3. Alfie tells Otis that the snow ball won’t hurt when it hits him in the face because every force has an equal and opposite reaction. 5N– 5N = 0N. Explain why Alfie is wrong.
4. Now imagine the snow ball fight happened on the moon. Would your answers to Q1 be different? Explain your thinking.
1. Draw a snowball and label the forces acting on it at t=2s. See diagram
2. The snowball hits Otis in the face with a Force of 5 Newtons. Ouch! Why does the snowball break apart? Draw a force diagram to explain your answer at t=3s. See diagram
3. Alfie tells Otis that the snowball won’t hurt when it hits him in the face because every force has an equal and opposite reaction. 5N− 5N = 0N. Explain why Alfie is wrong. Forces are acting on different objects – not the same object. Both face and snowball experience 5N. Ouch!
4. Now imagine the snowball fight happened on the moon. Would your answer to Q1 be different? Explain your thinking. Q1 – less weight so shorter force arrow, no air resistance.