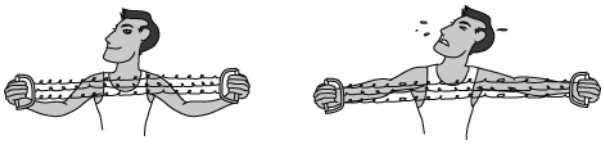
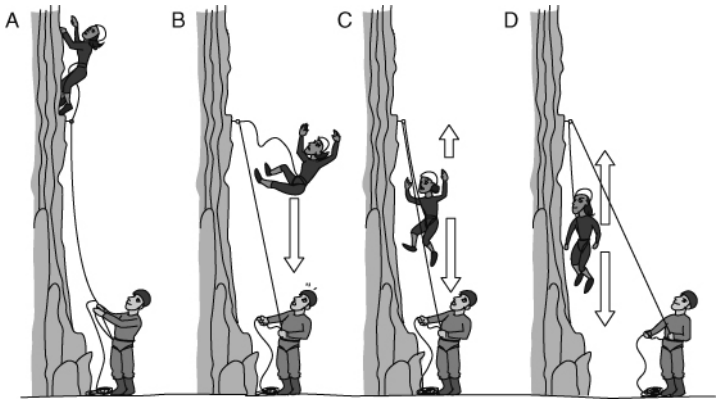
Climbing ropes

Rock climbers and mountaineers use ropes to stop them getting hurt if they fall, but did you know that climbing ropes are stretchy?

Think about a spring like this chest expander. It is quite easy to stretch it a little way, but it takes a much bigger force to stretch it a long way. The amount of force from the spring depends on how far it has been stretched.



The same thing happens with climbing ropes.



1 What force or forces are acting on the falling climber in picture B?

2 **a** What forces are acting on the climber in C?

b Are the forces balanced or unbalanced?

c What will happen to the falling speed of the climber?

3 Are the forces balanced or unbalanced in D?

4 **a** Will the climber fall further than the point she has already reached in D? Explain your answer.

b What will happen to the force from the rope if she falls further?

c What effect will this have on her speed?

5 **a** If she had a more stretchy rope than the one shown, would she fall further or less far?

b What would happen if the rope was too stretchy?

6 In the example above, the force on the climber from the rope increases gradually.

a What would happen if the rope was not stretchy?

b What would it feel like if a non-stretchy rope stopped her fall?

I can…

- explain the effects of balanced and unbalanced forces in unfamiliar situations.