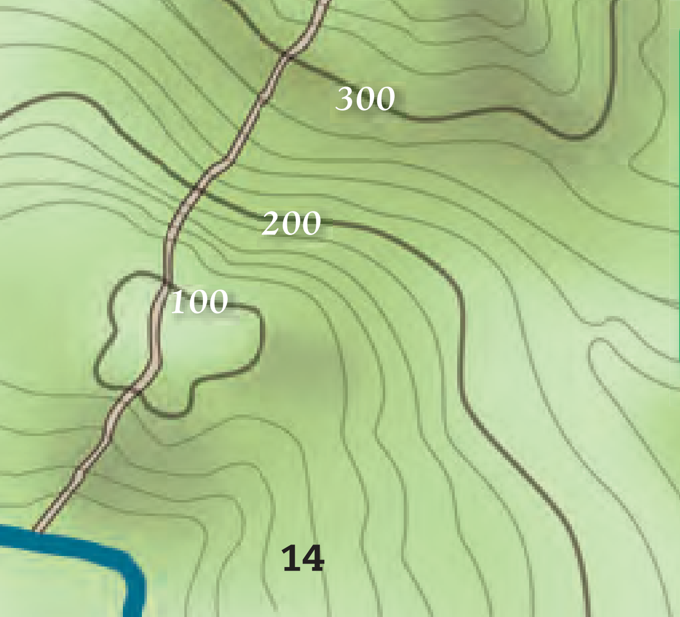
Tramping against Gravity

You need
- Henry's potential energy graph (see copymaster)
- a computer spreadsheet or calculator

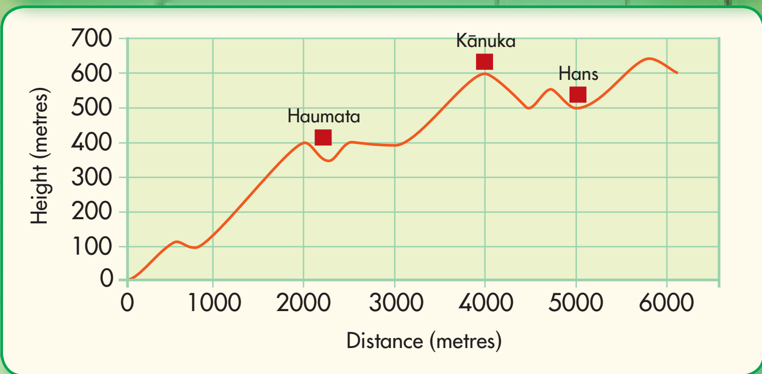
Activity

On Earth, the force of gravity is about 10 metres per second squared (10 m/s^2) times the mass of an object in kilograms (kg).

When you climb, you have to work against this force. This takes energy! To find out how much, multiply the force of gravity acting on you (10 times your mass in kilograms) by the height you gain (in metres). Remember that your mass includes your clothing and whatever you are carrying.



Elevation



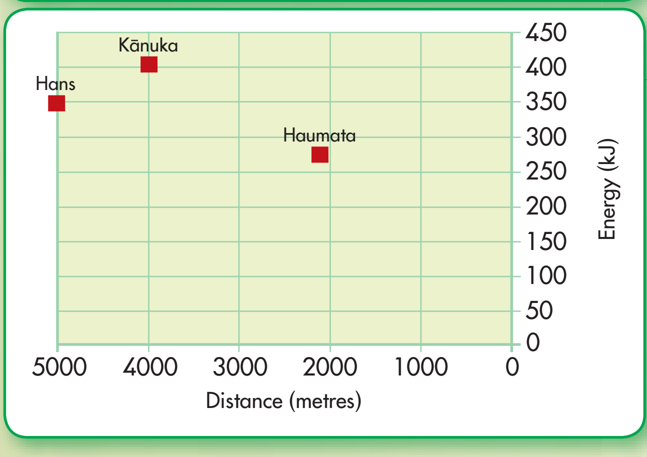
1. Henry and his friends, carrying their packs, have just climbed the track from the river to the ridge line.
   a. If they camp at Haumata Hut, to what height above sea level have they climbed?
   b. How many kilojoules (1 kJ = 1 000 J) of energy has Henry spent working against gravity?

Person	Body mass (including clothes and shoes)	Pack mass
Henry	51 kg	15 kg
Rua	65 kg	19 kg
Mukasa	57 kg	20 kg

   c. Who has burned the most energy fighting gravity?
2. The following day, Mukasa is tired from having carried his pack the day before. Rua puts 10 kg from Mukasa's pack into his own pack and carries it from Haumata Hut to Kānuka Lodge.
   a. How many kilojoules does Rua burn by working against gravity on this climb?
   b. How much potential energy has Rua's pack gained?
3. Henry, Mukasa, and Rua hike on to Hans Hut, leaving their packs behind at the lodge. How much potential energy do they lose?
4. On your copy of the graph below, sketch Henry's potential energy as he hikes back to the car park.

   Make sure your graph includes:
   - the potential energy change as he hikes back from Hans Hut to Kānuka Lodge
   - the potential energy change when he picks up his pack at the lodge.

Henry's Potential Energy (return trip)



5. a. Where on your graph does Henry have the most potential energy?
   b. Where is he getting the greatest boost to his kinetic energy?

Focus Evaluating potential energy and using equations