

Problem

In 2008, Usain Bolt from Jamaica was the “fastest person in the world”. He ran 100 metres in a world record time of 9.69 seconds.

- a) If he could maintain that pace over 1000 metres, what would his time be?
- b) The current world record for the marathon is 2 hours, 3 minutes, 59 seconds. If Usain Bolt could maintain his pace (9.69 seconds for 100 metres) over 42.2 kilometres (the length of a marathon), what would his time be? Give your answer in hours and minutes.
- c) A cheetah is the fastest land mammal and can reach a speed of 120 kilometres per hour over short distances. If a cheetah could maintain this speed over 42.2 kilometres, what would be its time? Give your answer in minutes.



Extension :

1. Search the web for some recent data on the time taken by runners in 400 metre races. Then calculate their mean times for 100 metres, and compare them to Usain Bolt’s time for 100 metres. Would you expect them to be greater or less? Explain your answer.

Hints**Part a)**

Hint 1 - How many 100 metre races would make 1000 metres?

Part b)

Hint 1 - How many 100 metre races would make a marathon?

Hint 2 - How many seconds are there in one minute? In one hour?

Part c)

Hint 1 - How many minutes does it take the cheetah to run 1 kilometre?

Solution

- a) Since $1000 \text{ m} = 10 \times 100 \text{ m}$, if Usain Bolt could maintain his 100 m pace for 1000 m, his time would be $10 \times 9.69 = 96.9$ seconds.
- b) Since $42.2 \text{ km} = 42,200 \text{ m} = 422 \times 100 \text{ m}$, his time for the marathon would be $422 \times 9.69 = 4089.18 \text{ s}$; $4089.18 \text{ s} \div 60 \text{ s/min} = 68.153 \text{ min}$; $68.153 \text{ min} \div 60 \text{ min/hr} \approx 1.136 \text{ hr}$; $0.136 \text{ hr} \times 60 \text{ min/hr} \approx 8 \text{ min}$, so his time is about 1 hour and 8 minutes.
- c) The cheetah's time for the marathon would be $42.2 \div 120 \approx 0.35$ hours ≈ 21 minutes.

Extension : Since the runners are doing 400 metre races, we would expect them to run more slowly overall than someone running 100 metres. Thus we would expect their average times for 100 metres to be greater than Usain Bolt's time for 100 metres.