Problem of the Week
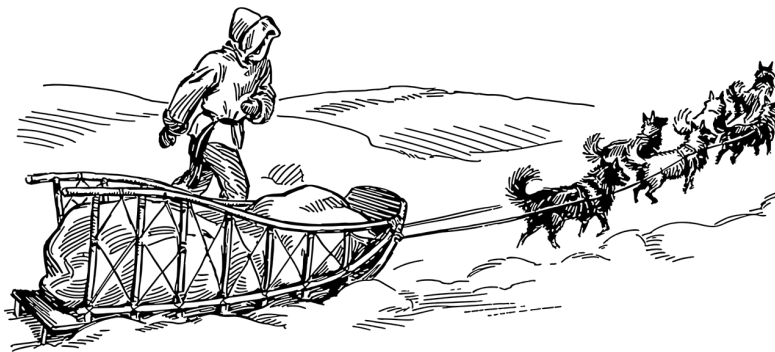## Problem B and Solution
Yukon Do It!

Problem

The Yukon Quest is one of the most famous endurance sled dog races in the world. The total distance the race covers is 1635 km.

(a) If the average distance travelled per day for each team is 145 km, how many days will it take, on average, for a team to complete the Yukon Quest?

(b) A team of Alaskan huskies travels at 15 km per hour, with an 18 minute rest after every three hours. A team of Siberian huskies runs more quickly at 20 km per hour, but requires a 30 minute rest after every two hours.

On a certain day both teams travel 145 km. Create a broken-line graph of distance versus time for each team for that day.

SUGGESTION: You may find it helpful to first construct a table for each team, matching the total distance travelled with the elapsed time for each interval of travel and rest.
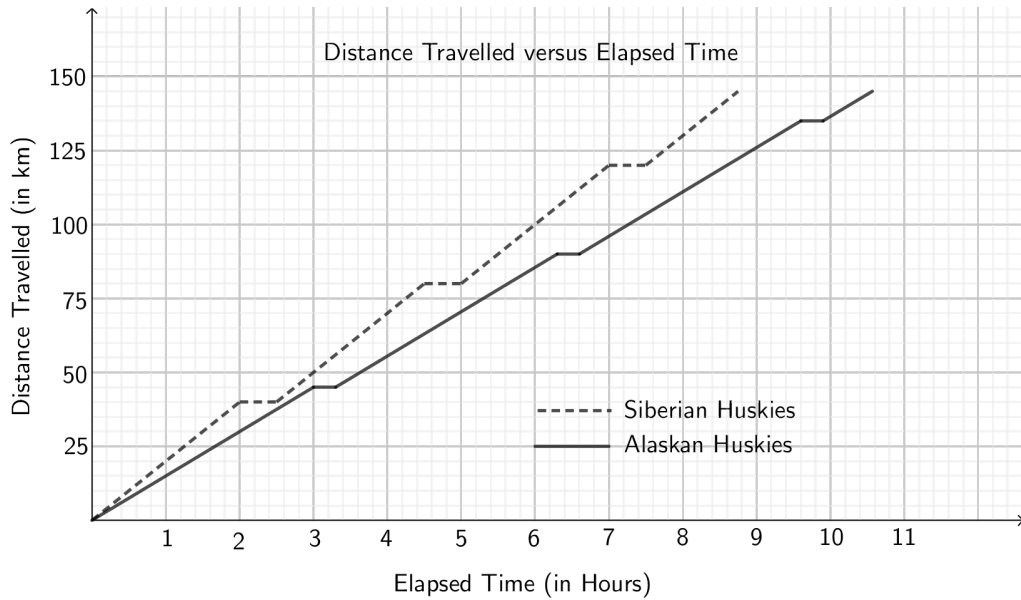
(c) Suppose that the weight of some additional equipment slows the average speed of the Siberian huskies by 5 km per hour. If the team still travels 145 km in a day, by how many minutes will this increase their travel time for the day?

Solution

(a) Since the average (mean) distance traveled each day is $145\,\text{km}$, and the total distance is $1635\,\text{km}$, the number of days to complete the race is $1635 \div 145 \approx 11.276$ days. Thus, on average, the teams would finish on the 12th day.

(b) A broken-line graph of distance versus time for each team is shown below.

Here is the table for the Alaskan husky team.

Interval Type	Start Time	End Time	Interval Distance Travelled (km)	Total Distance Travelled (km)
Travel	0	3 hrs	45	45
Rest	3 hrs	3 hrs 18 min	0	45
Travel	3 hrs 18 min	6 hrs 18 min	45	90
Rest	6 hrs 18 min	6 hrs 36 min	0	90
Travel	6 hrs 36 min	9 hrs 36 min	45	135
Rest	9 hrs 36 min	9 hrs 54 min	0	135
Travel	9 hrs 54 min	10 hrs 34 min	10	145

Here is the table for the Siberian husky team.

Interval Type	Start Time	End Time	Interval Distance Travelled (km)	Total Distance Travelled (km)
Travel	0	2 hrs	40	40
Rest	2 hrs	2 hrs 30 min	0	40
Travel	2 hrs 30 min	4 hrs 30 min	40	80
Rest	4 hrs 30 min	5 hrs	0	80
Travel	5 hrs	7 hrs	40	120
Rest	7 hrs	7 hrs 30 min	0	120
Travel	7 hrs 30 min	8 hrs 45 min	25	145

Note that the Alaskan huskies travel 135 km in three segments of 3 hours and 18 minutes each, plus 10 km in a final segment of 40 minutes. This gives a total time of 10 hours and 34 minutes. The Siberian huskies travel 120 km in three segments of 2 hours and 30 minutes each, plus 25 km in a final segment of 1 hour and 15 minutes. This gives a total time of 8 hours and 45 minutes.

(c) Since the average speed of the Siberian huskies is now only 15 km per hour, they will travel only 30 km in each 2 hour segment. Thus, they will now travel 120 km in four segments of 2 hours and 30 minutes each. That is, they will travel 120 km in 10 hours. They will travel the last 25 km in a final segment of 100 min, or 1 hour and 40 minutes. This gives a total time of 11 hours and 40 minutes. Thus, their time for the day has increased by 2 hours and 55 minutes, or 175 minutes.