Blackline Master 9.5d

# *Average Speed: Exercise 2*

Sonia and Kyle have each won a scholarship to attend a Summer Science Camp in Kingston. The scholarship includes the cost of a round trip ticket by bus, train, or airplane from their homes to Kingston. Their hometowns are Toronto and Windsor.

1. The following table gives the distance from their hometowns to Kingston and the time it would take them to get there by bus.

| Student | Hometown | Distance Travelled (km) | Time Taken (including stops) (h) |
|---|---|---|---|
| Sonia | Toronto | 255 | 3.08 |
| Kyle | Windsor | 625 | 8.83 |

Calculate the average speed of each bus trip. $V = \frac{D}{T}$

2. Because trains and buses travel different routes between one city and another, the distances they travel are not the same. The table below gives the average speed of each train trip and the distance travelled between the hometown and Kingston. $T = \frac{D}{V}$

| Student | Hometown | Distance Travelled (km) | Average Speed (km/h) |
|---|---|---|---|
| Sonia | Toronto | 240 | 95 |
| Kyle | Windsor | 615 | 90 |

Calculate the time it would take each student to get to Kingston by train.

3. As with trains and buses, the average speed of airplanes is reduced if there are stops along the way. The table gives the average speed of the airplane journeys and the time taken for each trip.

| Student | Hometown | Average Speed (km/h) | Time Taken (including stops) (h) |
|---|---|---|---|
| Sonia | Toronto | 310 | 0.80 |
| Kyle | Windsor | 235 | 2.67 |

Calculate the distance travelled by each student. $D = T \cdot V$

4. Which student would save the most time by choosing air travel over ground transportation?

Blackline Master 9.5b

# *Average Speed: Exercise 1*

The Canadian records for running, as of December 1, 1999, are listed in the table below. They are taken from the official web site of Athletics Canada: http://cgi.canoe.ca/AthcanRecordbook/seniorrec2.html

| Men's Event | Time | Name | Location | Date |
|---|---|---|---|---|
| 100 m | 9.84 s | Donovan Bailey | Atlanta, USA | 1996 07 27 |
| 100 m | 9.84 s | Bruny Surin | Seville, ESP | 1999 08 22 |
| 200 m | 20.17 s | Atlee Mahorn | Tokyo, JPN | 1991 08 26 |
| 1000 m | 2 min,16.88 s | Graham Hood | Montréal, CAN | 1996 06 10 |
| **Women's Event** | **Time** | **Name** | **Location** | **Date** |
| 100 m | 10.98 s | Angela Bailey | Budapest, HUN | 1987 07 06 |
| 200 m | 22.62 s | Marita Payne | Edmonton, CAN | 1983 07 10 |
| 1000 m | 2 min, 34.99 s | Angela Chalmers | Victoria, CAN | 1994 08 19 |

7.306

8.84

6.452

1. Calculate the average speed for the men and the average speed for the women when they each set the Canadian records for the following races. State each answer with the correct certainty and units.

| | MEN | WOMEN |
|---|---|---|
| (a) 100 m | | |
| (b) 200 m | | |
| (c) 1000 m | | |

2. According to the calculations in question 1, who is the fastest person in Canada? Convert the record setting speed to the value in kilometres per hour.

3. Why is the average speed for the 1000-m race reported with greater certainty (more significant digits) than the average speeds for the shorter races?

Blackline 9.5b — Ave Speed

a) 100m (DB) $V = \frac{d}{t} = \frac{100m}{9.84s} = 10.2 \frac{m}{s}$

(BS) $V = \frac{100m}{9.84s} = 10.2 m/s$

MEN AVG = 10.2

(AB) $V = \frac{100m}{10.98s} = 9.12 m/s$ WOMAN

b) 200m (AM) $V = \frac{200m}{20.17s} = 9.92 m/s$ M

(MP) $V = \frac{200m}{22.62s} = 8.84 m/s$ W

c) 1000m (GH) $V = \frac{1000m}{2m\ 16.88s} = \frac{1000m}{136.88s} = 7.306 m/s$ M

(AC) $V = \frac{1000m}{2m\ 34.99s} = \frac{1000m}{154.99s} = 6.452 m/s$ W

2. FASTEST CANADIAN MP $= 8.84 \frac{m}{s} \times 3.6 = 31.8 \frac{km}{h}$

3. 1000 m has 4 SIG DIGS

100 m has 3 SIG DIGS

MEN

$\frac{10.2 + 10.2 + 9.12 + 7.306}{4}$

9.4 m/s

WOMEN $\frac{9.12 + 8.84 + 6.452}{3}$

8.1 m/s

Blackline Master 9.5e

# *Average Speed: Exercise 2 Solutions*

1. Bus trip from Toronto

$\Delta d = 255$ km
$\Delta t = 3.08$ h

$$v_{av} = \frac{\Delta d}{\Delta t}$$
$$= \frac{255 \text{ km}}{3.08 \text{ h}}$$
$$= 82.8 \frac{\text{km}}{\text{h}}$$

The average speed of the bus trip from Toronto is 82.8 km/h.

Bus trip from Windsor

$\Delta d = 625$ km
$\Delta t = 8.83$ h

$$v_{av} = \frac{\Delta d}{\Delta t}$$
$$= \frac{625 \text{ km}}{8.83 \text{ h}}$$
$$= 70.8 \frac{\text{km}}{\text{h}}$$

The average speed of the bus trip from Windsor is 70.8 km/h.

2. Train trip from Toronto

$\Delta d = 240$ km
$v_{av} = 95$ km/h

$$v_{av} = \frac{\Delta d}{\Delta t} \quad \text{OR} \quad v_{av} = \frac{\Delta d}{\Delta t}$$
$$\Delta t = \frac{\Delta d}{v_{av}} \qquad 95 \frac{\text{km}}{\text{h}} = \frac{240 \text{ km}}{\Delta t}$$
$$\Delta t = \frac{240 \cancel{\text{km}}}{95 \frac{\cancel{\text{km}}}{\text{h}}} \qquad \Delta t = \frac{240 \cancel{\text{km}}}{95 \frac{\cancel{\text{km}}}{\text{h}}}$$
$$= 2.5 \text{ h} \qquad = 2.5 \text{ h}$$

The train trip from Toronto to Kingston takes 2.5 h.

Train trip from Windsor

$\Delta d = 615$ km
$v_{av} = 90$ km/h

$$v_{av} = \frac{\Delta d}{\Delta t} \quad \text{OR} \quad v_{av} = \frac{\Delta d}{\Delta t}$$
$$\Delta t = \frac{\Delta d}{v_{av}} \qquad 90 \frac{\text{km}}{\text{h}} = \frac{615 \text{ km}}{\Delta t}$$
$$\Delta t = \frac{615 \cancel{\text{km}}}{90 \frac{\cancel{\text{km}}}{\text{h}}} \qquad \Delta t = \frac{615 \cancel{\text{km}}}{90 \frac{\cancel{\text{km}}}{\text{h}}}$$
$$= 6.8 \text{ h} \qquad = 6.8 \text{ h}$$

The train trip from Windsor to Kingston takes 6.8 h.

3. Plane trip from Toronto

$v_{av} = 310$ km/h $\quad \Delta t = 0.80$ h

$$v_{av} = \frac{\Delta d}{\Delta t} \quad \text{OR} \quad v_{av} = \frac{\Delta d}{\Delta t}$$
$$\Delta d = v_{av} \Delta t \qquad 310 \text{ km/h} = \frac{\Delta d}{0.80 \text{ h}}$$
$$= 310 \frac{\text{km}}{\cancel{\text{h}}} \times 0.80 \cancel{\text{h}} \qquad \Delta d = 310 \frac{\text{km}}{\cancel{\text{h}}} \times 0.80 \cancel{\text{h}}$$
$$= 2.5 \times 10^2 \text{ km} \qquad = 2.5 \times 10^2 \text{ km}$$

The plane from Toronto travels $2.5 \times 10^2$ km.

Plane trip from Windsor

$v_{av} = 235$ km/h $\quad \Delta t = 2.67$ h

$$v_{av} = \frac{\Delta d}{\Delta t} \quad \text{OR} \quad v_{av} = \frac{\Delta d}{\Delta t}$$
$$\Delta d = v_{av} \Delta t \qquad 235 \text{ km/h} = \frac{\Delta d}{2.67 \text{ h}}$$
$$= 235 \frac{\text{km}}{\cancel{\text{h}}} \times 2.67 \cancel{\text{h}} \qquad \Delta d = 235 \frac{\text{km}}{\cancel{\text{h}}} \times 2.67 \cancel{\text{h}}$$
$$= 627 \text{ km} \qquad = 627 \text{ km}$$

The plane from Windsor travels 627 km.

4. Kyle would save the most time by choosing air travel.

Sonia 2.4 − 0.8 = 1.7 h

Kyle 2.67 − 0.8 = 1.87 h