EMPIRE STATE BUILDING RUN-UP

We recommend to use the Exercise 3 as a motivation for a discussion about the importance of accurate formulations and possible complications rising from giving incomplete information.

1. We expect students to check the result of the division: 1576 : 86 = 18.3 .

   Explanation: Not all floors have the same number of stairs. In the high- rises the ground floor (with shops, etc.) is higher than the rest of the floors, therefore the number of stairs from the ground floor to the first floor is bigger. The Empire State Building Run-up starts at the building lobby which has the heights of a few floors.

2. no

   Note
   - 11:33 (which is in the List of the results) means 11 minutes, 33 seconds,
   - 11.33 minutes (which was used by Kamila) means 11 minutes and 33 hundreths of a minute

   These two notations don't express the same time as $\frac{33}{100} \neq \frac{33}{60}$. Pupils in their explanation can show either the incorrectness of Kamila's notation only or they can also show the proper way of writing the time 11:33 as a decimal number: 33 seconds is equal to $\frac{33}{60} = 0{,}55$ minute and therefore 11:33 is 11.55 minutes.

3. Students should find out that the average velocity 1.455 km/h was calculated by the reporter as a quotient of the distance s = 320 meters and Susan's time t = 13:12 min.

   - 12 seconds = 0.2 minutes, therefore t = 13:12 min = 13.2 min = $\frac{13{,}2}{60} = 0{,}22$ hours
   - (another possibility is to express the time 13:12 in seconds first and then change them to hours: $t = 13:12 \text{ min.} = \frac{13 \cdot 60 + 12}{60 \cdot 60} = 0{,}22$ hours)
   - s = 320 meters = 0,32 km ,

   then $$v = \frac{s}{t} = \frac{0{,}32}{0{,}22} = 1{,}45454... \cong 1{,}455 \text{ (km/h).}$$

   (The pieces of information used by the reporter can be figured out either by guessing or by calculating them, e.g. : The reporter used Suzi's time t = 13:12 when calculating the average velocity. If the average velocity was $v \cong 1{,}455$ then the distance he used had to be $s = v \cdot t = 1{,}455 \cdot 0{,}22 \cong 0{,}3201$ km, so, approximately 320 m.)

   320 meters – this information in the text is not related to the distance the runners passed, but it is related to the vertical difference they passed during the run-up. Therefore the quotient the reporter calculated (the vertical difference divided by the time of the run) is not the average speed of the run (it would be calculated as a quotient of the distance and time) but it is the average speed of the ascent (it means the change of the altitude). The reporter's headline is misleading: a reader automatically assumes that the information is the average runner's speed.

   A topic for further work: try to find out how fast you would have to run up the stairs in your school to reach the speed 1.455 km/hour of your ascent.