Average Speed vs Average Velocity

Walk 4 km to school and back in an hour: average speed 4 km/h, average velocity zero. One uses total distance, the other displacement.

Name: Date: Score: ____ / 19

A. Fill in the blanks

1. Average speed = total distance ÷ total ____.

2. Average velocity = total ____ ÷ total time.

3. For a round trip, average velocity is ____.

4. |Average velocity| is always ____ than or equal to average speed.

B. True or False

5. For a round trip, average speed is zero. True / False

6. Average speed for two equal distances at 4 km/h and 12 km/h is 8 km/h. True / False

7. Average velocity can be zero while the object moved. True / False

8. Average speed is a scalar. True / False

C. Assertion and reason

9. Assertion (A): For a round trip, average velocity is zero.
Reason (R): Average velocity = total displacement ÷ total time.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

10. Assertion (A): Average speed of 30 km/h and 60 km/h over equal distances is 45 km/h.
Reason (R): Average speed = total distance ÷ total time.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

D. Choose the correct option

11. A cyclist goes 10 km in 1 h and returns in 1 h. Average speed:

(a) 0
(b) 5 km/h
(c) 10 km/h
(d) 20 km/h

Answer: _____

12. In the same trip, average velocity is:

(a) 0
(b) 5 km/h
(c) 10 km/h
(d) 20 km/h

Answer: _____

13. Equal distances at 4 km/h and 12 km/h. Average speed:

(a) 8 km/h

(b) 6 km/h

(c) 16 km/h

(d) 3 km/h

Answer: _____

14. Which can never be negative?

(a) velocity

(b) displacement

(c) average speed

(d) average velocity

Answer: _____

E. Numerical problems

15. A car goes 60 km at 30 km/h and returns 60 km at 60 km/h. Find average speed and average velocity.

16. A student walks 600 m to school in 10 min and returns in 15 min. Find the average speed for the round trip in m/s.

F. Short answer questions

17. Why can't we just average two speeds?

18. A bus goes 60 km at 30 km/h and returns at 60 km/h. Find average speed and average velocity.

G. Match the columns

19. Match each item in Column A with the correct item in Column B.

Column A	Column B	Your answer
1. Total distance ÷ total time	(a) Average velocity	1 → ____
2. Displacement ÷ total time	(b) Zero	2 → ____
3. Average velocity of a round trip	(c) 6 km/h	3 → ____
4. Two equal distances at 4 and 12 km/h	(d) Average speed	4 → ____

Detailed solutions

1. time

2. displacement

3. zero

4. less

5. False. Distance is non-zero, so average speed is non-zero.

6. False. Total time matters: it is 6 km/h.

7. True. If it returns to the start.

8. True. It uses distance, which has no direction.

9. (a) Displacement is zero, so R explains A.

10. (d) A is false (it is 40 km/h); R is the correct rule.

11. (c) 10 km/h. 20 km ÷ 2 h.

12. (a) 0. Displacement is zero.

13. (b) 6 km/h. For d each: $2d \div (d/4 + d/12) = 6$.

14. (c) average speed. Speed has no direction.

15. Time going = 60 ÷ 30 = 2 h; Time returning = 60 ÷ 60 = 1 h; Average speed = 120 ÷ 3 = 40 km/h; Displacement = 0, so average velocity = 0. **Answer: 40 km/h; 0**

16. Total distance = 1200 m; Total time = 25 min = 1500 s; Average speed = 1200 ÷ 1500 = 0.8 m/s. **Answer: 0.8 m/s**

17. Average speed is total distance ÷ total time. At the lower speed you spend more time, so it counts more; a simple average ignores this.

18. Time = 2 h + 1 h = 3 h; distance 120 km; average speed 40 km/h. Displacement 0, so average velocity 0.

19. 1 → (d), 2 → (a), 3 → (b), 4 → (c). Averages are always totals divided by total time.