

SCIENCE 1206
Unit 3: Motion
Worksheet 11: Vector and Scalars



Scalar quantity is one, which is fully defined by magnitude alone.
Important scalars: distance, speed, mass, time, work, energy, power, etc.

Vector quantity is fully defined by magnitude and direction.

Important vectors: displacement, velocity, acceleration, force, impulse, momentum,

Geography	Space	Vector	Sign (+ / -)
North	Up	↑	+
South	Down	↓	-
West	Left	←	-
East	Right	→	+

Distance moved is the actual length of the path along which an object travelled. It is a scalar.

Displacement is the straight line distance from the beginning to the end of the path along which an object moved. It is a vector and has nothing to do with how the object got there.

(Remember if a body returns to its original starting point its displacement is zero and its velocity is therefore zero since $\text{velocity} = \text{displacement} \div \text{time}$. But its $\text{speed} = \text{total distance travelled} \div \text{time taken}$)

Speed = total distance travelled \div time taken

Velocity = displacement \div time

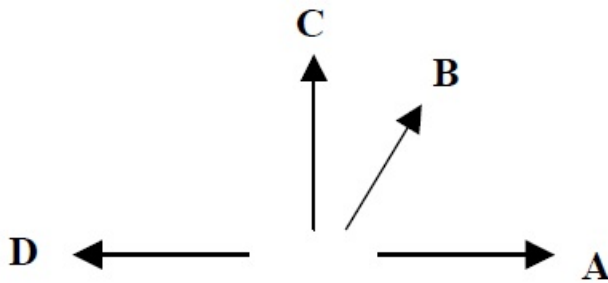
1. Which of the following is true for vectors and scalars?

	Scalar	Vector
(A)	Magnitude only	Magnitude only
(B)	Magnitude only	Magnitude and Direction
(C)	Magnitude and Direction	Magnitude only
(D)	Magnitude and Direction	Magnitude and Direction

2. Which of the following pairs are both scalar quantities?

- (A) Speed and displacement
- (B) Speed and mass
- (C) velocity and temperature
- (D) velocity and displacement

3. The wind blows an airplane towards east. Which vector indicates the direction of the airplane?



- (A) A
- (B) B
- (C) C
- (D) D

4. Which of the following is a physical quantity that has a magnitude but no direction?

- (A) displacement
- (B) resultant
- (C) scalar
- (D) vector

5. The speedometer in a car indicates
- (A) an average speed during a trip.
 - (B) a vector quantity.
 - (C) a scalar quantity.
 - (D) the distance the car travels
6. Which of the following is a vector quantity?
- (A) 5.5 kg
 - (B) 23 m
 - (C) 35 m/s
 - (D) 65 m/s [E]
7. John walks 4.0 km [East] and then turns and runs 3.0 km [South]. What is John's total distance?
- (A) 0 km
 - (B) 7.0 km
 - (C) 9.0 km
 - (D) 25 km
8. A girl runs once around a circular track with a radius of 65m at a speed of 2.0 m/s. What distance did she cover?
- (A) 0
 - (B) 410m west
 - (C) 410m east
 - (D) 410m
9. A car moves to the right 100 m then goes to the left for 150 m. What is the displacement (assuming motion to the right is positive)?
- (A) 250 m
 - (B) 50 m
 - (C) -50 m
 - (D) 100 m
10. A student walks 30m [E], 15m [W], and then 40m [E]. What is the student's total displacement?
- (A) 55 m [E]
 - (B) 55 m
 - (C) 85 m
 - (D) 85 m [W]

11. A ball is thrown vertically up and is caught at the starting point; what is the displacement of the ball?
- (A) 0
 - (B) double the height
 - (C) half of the height
 - (D) the height squared
12. What is the distance for the same ball in question #10?
- (A) 0
 - (B) double the height
 - (C) half of the height
 - (D) the height squared
13. A boy runs once around a circular track with a radius of 45m at a speed of 2.5 m/s. What is the boy's displacement?
- (A) 0
 - (B) 410m west
 - (C) 410m east
 - (D) 410m
14. A car travels 10 km [North] then turns and goes 8 km [South]. Which statement is correct?
- (A) the distance is 18 km and the displacement is 2 km.
 - (B) the distance is 2 km and the displacement is 18 km.
 - (C) both the distance and the displacement are 18 km.
 - (D) both the distance and the displacement are 2 km.
15. Which statement is true?
- (A) Displacement can never be equal to distance.
 - (B) Displacement can never be greater than distance.
 - (C) Displacement can never be less than distance.
 - (D) Displacement is always equal to distance.
16. A cyclist rides a bicycle 4.0 km West, then 3.0 km North. What was the total displacement travelled?
- (A) 7.0 km [NW]
 - (B) 5.0 km [N W]
 - (C) 7.0 km
 - (D) 5.0 km

17. Tom throws a baseball with an average speed of 150km/h. Calculate the time in hours for the ball to travel over a distance of 20m.
- (A) 7.5h
 - (B) 300h
 - (C) 150h
 - (D) 0.00013h
18. A car travels [North] at 100 km/h for 1.0 hour then turns and travels [South] at 70 km/h for 2.0 h. What is the average speed for the trip?
- (A) -13.3 km/h
 - (B) 15.0 km/h
 - (C) 80.0 km/h
 - (D) 85.0 km/h
19. What is the average velocity of a car that moved 40 km East and 80 km West in 2 hours?
- (A) 60 km/h [East]
 - (B) 20 km/h [West]
 - (C) 20 km/h [East]
 - (D) 20 km/h [West]
20. A boat goes 15 km [North] then turns and goes 10 km [South]. The trip takes 5 hours. What is the average velocity?
- (A) 1.0 km/h
 - (B) 3.0 km/h
 - (C) 5.0 km/h
 - (D) 25 km/h

21. Susann is training to be apart of the cross country team at Crescent Collegiate. As a part of her training she runs 22 km [N] and then 32 km [S]. Assuming the trip takes 4.2 hours.

(A) What is the total distance traveled? [1]

(B) What is the total displacement for the trip? [1]

(C) What is the average speed? (in m/s) [1]

D) What is the average velocity for the trip? (In m/s) [2]