Distance vs. Displacement

(Go to the following website for more help on distance and displacement)

http://www.physicsclassroom.com/class/1dkin/u1l1c.cfm

Distance - is the total distance that an object has moved, no matter what direction the object travelled in

Displacement - is the distance that an object moves from its starting point, and includes direction.

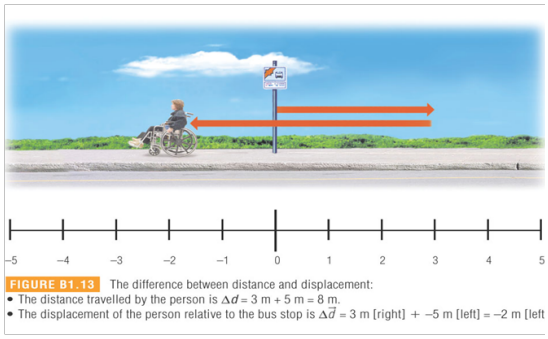


FIGURE B1.13 The difference between distance and displacement:
- The distance travelled by the person is $\Delta d = 3\text{ m} + 5\text{ m} = 8\text{ m}$.
- The displacement of the person relative to the bus stop is $\Delta \vec{d} = 3\text{ m [right]} + -5\text{ m [left]} = -2\text{ m [left}$

Example: Adam rides his bike 14 km North and then turns around and bikes 20 km South.

What distance did Adam travel? 34 km

What is Adam's displacement? 6 km [S] South

Scalar vs. Vector Quantities

(Go to the following website for more help with scalars and vectors)

http://www.physicsclassroom.com/class/1dkin/u1l1b.cfm

Scalar - a quantity that does not have a direction associated with it.

Examples: Time, mass, distance, speed

Distance travelled by and object does not include the direction travelled.

Speed of an object does not include the direction travelled.

Vector - a quantity that does have a direction associated with it.

Examples: displacement, velocity, acceleration

Displacement is the distance and direction an object is away from a starting point.

Velocity of an object includes the direction that an object travels.

Practice Sheet 1

1. Identify the following as vector or scalar quantities.

Measured Quantity	Scalar or Vector
2.5m/s	S
55m/s 35° west of north	V
350N downward	V
50.0g	S
30gigajoules per hour	S
35km 40° east of north	V

2. A physics teacher walks 4 meters East, 2 meters South, 4 meters West, and finally 2 meters North.

North ↑

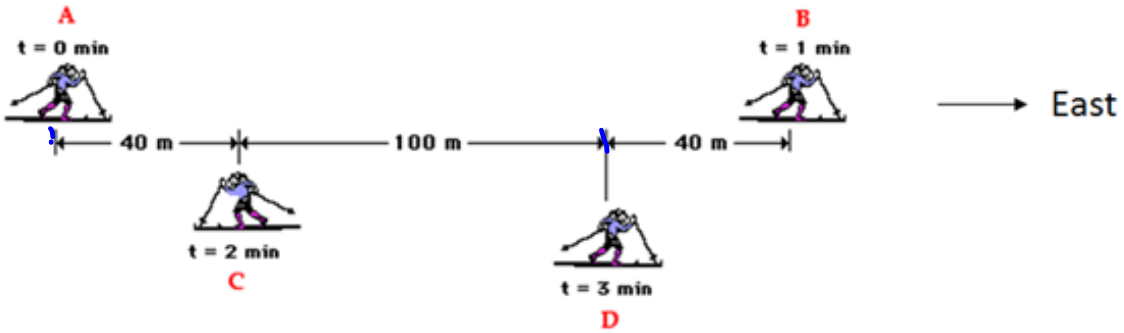
What is the distance travelled by the teacher? 12m

What is the displacement of the teacher? 0m

3. Use the diagram below of a cross country skiers motion to answer the following questions.

What is the distance travelled by the skier? 420m

What is the displacement of the skier? 140m [E]



4. Consider a football coach pacing back and forth along the sidelines. The diagram below shows several of coach's positions at various times. At each marked position, the coach makes a "U-turn" and moves in the opposite direction. In other words, the coach moves from position A to B to C to D.

What is the distance travelled by the coach?

35yd + 20yd + 40yd = 95yd

What is the displacement of the coach?

55yd left