

AP Physics 1

Name: _____ Score: _____

1. Which of these is a **vector** quantity?

- ☐ temperature
- ☐ velocity
- ☐ mass
- ☐ speed

2. A runner completes exactly one lap of a 400 m track. What is their **displacement**?

- ☐ 800 m
- ☐ 0 m
- ☐ 200 m
- ☐ 400 m

3. On a **position–time** graph, what does the slope of the line represent?

- ☐ displacement
- ☐ acceleration
- ☐ distance
- ☐ velocity

4. A passenger walks at $+2 \frac{\text{m}}{\text{s}}$ toward the front of a train moving at $+30 \frac{\text{m}}{\text{s}}$. What is the passenger's velocity relative to the ground, in $\frac{\text{m}}{\text{s}}$?

_____ m/s

5. A velocity of $10 \frac{\text{m}}{\text{s}}$ points 37° above the horizontal. Its horizontal component is $10 \cos 37^\circ$. With $\cos 37^\circ = 0.8$, what is v_x in $\frac{\text{m}}{\text{s}}$?

_____ m/s

6. A velocity of $-8 \frac{\text{m}}{\text{s}}$ is slower than a velocity of $+8 \frac{\text{m}}{\text{s}}$.

- ☐ True ☐ False

7. A cyclist has a displacement of 240 m in 30 s. What is the average velocity, in $\frac{\text{m}}{\text{s}}$?

_____ m/s

8. On a **velocity–time** graph, what does the area between the line and the time axis represent?

- ☐ velocity
- ☐ acceleration

☐ displacement

☐ force

9. The same passenger now walks toward the **back** at $2 \frac{\text{m}}{\text{s}}$. Velocity relative to the ground, in $\frac{\text{m}}{\text{s}}$?
_____ m/s

10. For the same velocity, the vertical component is $10 \sin 37^\circ$. With $\sin 37^\circ = 0.6$, what is v_y in $\frac{\text{m}}{\text{s}}$?
_____ m/s

AP Physics 1

1. **velocity**

Velocity has a size **and** a direction, so it is a vector. Mass, temperature and speed are scalars (size only).

2. **0 m**

Displacement is the change in position. The runner ends where they started, so $\Delta x = 0$. The **distance** travelled is 400 m.

3. **velocity**

Slope is rise over run $= \Delta x / \Delta t$, which is the **velocity**.

4. **32 m/s**

Same line, same direction: $30 + 2 = 32 \frac{\text{m}}{\text{s}}$.

5. **8 m/s**

$$v_x = A \cos \theta = 10 \times 0.8 = 8 \frac{\text{m}}{\text{s}}.$$

6. **False**

Both have the same **speed** ($8 \frac{\text{m}}{\text{s}}$). The minus sign is a direction, not a smaller size.

7. **8 m/s**

$$v_{\text{avg}} = \frac{\Delta x}{\Delta t} = \frac{240}{30} = 8 \frac{\text{m}}{\text{s}}.$$

8. **displacement**

Area = velocity $\times$ time $= \Delta x$, the **displacement**.

9. **28 m/s**

Now the walk is negative: $30 + (-2) = 28 \frac{\text{m}}{\text{s}}$.

10. **6 m/s**

$$v_y = A \sin \theta = 10 \times 0.6 = 6 \frac{\text{m}}{\text{s}}.$$