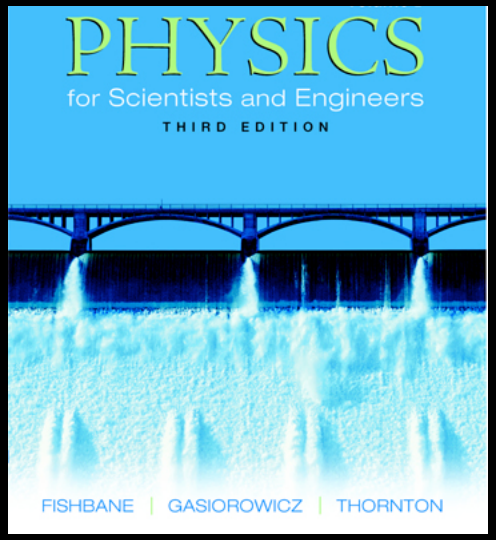


ConcepTest PowerPoints

Chapter 2

Physics for Scientists and Engineers, 3rd edition

Fishbane
Gasiorowicz
Thornton

ConcepTest 2.1 Walking the Dog

You and your dog go for a walk to the park. On the way, your dog takes many side trips to chase squirrels or examine fire hydrants. When you arrive at the park, do you and your dog have the same displacement?

1) yes
2) no

ConcepTest 2.1 Walking the Dog

You and your dog go for a walk to the park. On the way, your dog takes many side trips to chase squirrels or examine fire hydrants. When you arrive at the park, do you and your dog have the same displacement?

1) yes
2) no

Yes, you have the same displacement. Since you and your dog had the same initial position and the same final position, then you have (by definition) the same displacement.

Follow-up: Have you and your dog traveled the same distance?

ConcepTest 2.6b

Cruising Along II

You drive 4 miles at 30 mi/hr and then another 4 miles at 50 mi/hr. What is your average speed for the whole 8-mile trip?

1) more than 40 mi/hr
2) equal to 40 mi/hr
3) less than 40 mi/hr

ConcepTest 2.6b

Cruising Along II

You drive 4 miles at 30 mi/hr and then another 4 miles at 50 mi/hr. What is your average speed for the whole 8-mile trip?

1) more than 40 mi/hr
2) equal to 40 mi/hr
3) less than 40 mi/hr

It is not 40 mi/hr! Remember that the average speed is distance/time. Since it takes longer to cover 4 miles at the slower speed, you are actually moving at 30 mi/hr for a longer period of time! Therefore, your average speed is closer to 30 mi/hr than it is to 50 mi/hr.

Follow-up: How much further would you have to drive at 50 mi/hr in order to get back your average speed of 40 mi/hr?

ConcepTest 2.8a Acceleration I

If the velocity of a car is non-zero ($v \neq 0$), can the acceleration of the car be zero?

1) Yes
2) No
3) Depends on the velocity

ConcepTest 2.8a Acceleration I

If the velocity of a car is non-zero ($v \neq 0$), can the acceleration of the car be zero?

1) Yes
2) No
3) Depends on the velocity

Sure it can! An object moving with *constant* velocity has a non-zero velocity, but it has zero acceleration since the velocity is not changing.

ConcepTest 2.8b Acceleration II

When throwing a ball straight up, which of the following is true about its velocity *v* and its acceleration *a* at the highest point in its path?

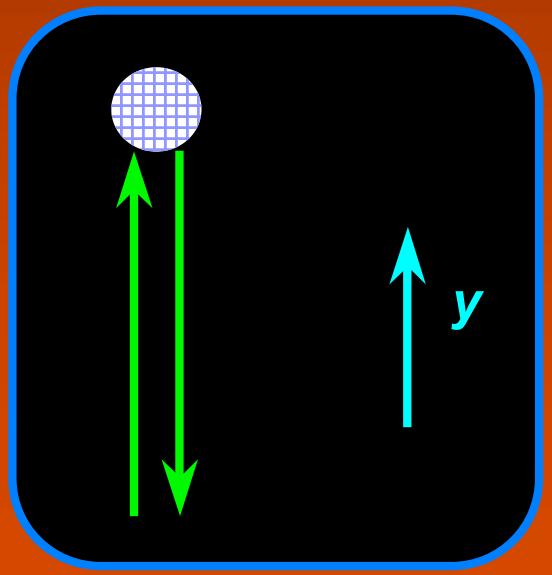
1) both $v = 0$ and $a = 0$
2) $v \neq 0$, but $a = 0$
3) $v = 0$, but $a \neq 0$
4) both $v \neq 0$ and $a \neq 0$
5) not really sure

ConcepTest 2.8b Acceleration II

When throwing a ball straight up, which of the following is true about its velocity *v* and its acceleration *a* at the highest point in its path?

1) both $v = 0$ and $a = 0$
2) $v \neq 0$, but $a = 0$
3) $v = 0$, but $a \neq 0$
4) both $v \neq 0$ and $a \neq 0$
5) not really sure

At the top, clearly $v = 0$ because the ball has momentarily stopped. But the velocity of the ball is changing, so its acceleration is definitely not zero! Otherwise it would remain at rest!!



Follow-up: …and the value of *a* is…?

ConcepTest 2.11 Two Balls in the Air

A ball is thrown straight upward with some initial speed. When it reaches the top of its flight (at a height *h*), a second ball is thrown straight upward with the same initial speed. Where will the balls cross paths?

1) at height h
2) above height h/2
3) at height h/2
4) below height h/2 but above 0
5) at height 0

ConcepTest 2.11 Two Balls in the Air

A ball is thrown straight upward with some initial speed. When it reaches the top of its flight (at a height *h*), a second ball is thrown straight upward with the same initial speed. Where will the balls cross paths?

1) at height h
2) above height h/2
3) at height h/2
4) below height h/2 but above 0
5) at height 0

The first ball starts at the top with no initial speed. The second ball starts at the bottom with a large initial speed. Since the balls travel the same time until they meet, the second ball will cover more distance in that time, which will carry it over the halfway point before the first ball can reach it.

Follow-up: How could you calculate where they meet?

ConcepTest 3.1b Vectors II

Given that **A** + **B** = **C**, and that $|A|^2 + |B|^2 = |C|^2$, how are vectors **A** and **B** oriented with respect to each other?

1) they are perpendicular to each other
2) they are parallel and in the same direction
3) they are parallel but in the opposite direction
4) they are at 45° to each other
5) they can be at any angle to each other

ConcepTest 3.1b Vectors II

Given that A + B = C, and that $|A|^2 + |B|^2 = |C|^2$, how are vectors A and B oriented with respect to each other?

1) they are perpendicular to each other
2) they are parallel and in the same direction
3) they are parallel but in the opposite direction
4) they are at 45° to each other
5) they can be at any angle to each other

Note that the magnitudes of the vectors satisfy the Pythagorean Theorem. This suggests that they form a right triangle, with vector C as the hypotenuse. Thus, A and B are the legs of the right triangle and are therefore perpendicular.

ConcepTest 3.1c Vectors III

Given that **A** + **B** = **C**, and that |**A**| + |**B**| = |**C**|, how are vectors **A** and **B** oriented with respect to each other?

1) they are perpendicular to each other
2) they are parallel and in the same direction
3) they are parallel but in the opposite direction
4) they are at 45° to each other
5) they can be at any angle to each other

ConcepTest 3.1c Vectors III

Given that **A** + **B** = **C**, and that |**A**| + |**B**| = |**C**|, how are vectors **A** and **B** oriented with respect to each other?

1) they are perpendicular to each other
2) they are parallel and in the same direction
3) they are parallel but in the opposite direction
4) they are at 45° to each other
5) they can be at any angle to each other

The only time vector magnitudes will simply add together is when the direction does not have to be taken into account (i.e., the direction is the same for both vectors). In that case, there is no angle between them to worry about, so vectors **A** and **B** must be pointing in the same direction.