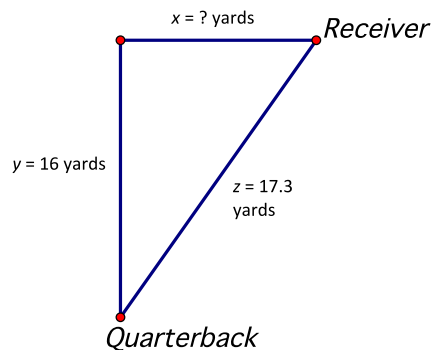# First Rate

Level E

The quarterback calls his favorite play during a football game: the receiver runs straight ahead, turns right, and runs toward the sideline.

When the play starts, the receiver runs straight ahead for ten yards, makes a right turn, and runs toward the sideline. The quarterback moves to his right and stops 6 yards behind where the receiver began. The quarterback does not make the pass until after the receiver turns right toward the sideline. The receiver is running toward the sideline at a speed of 8 yards/sec.

The quarterback tracks the receiver, deciding when to throw the ball. If the receiver makes the catch 12 yards after turning right, what is the distance between the quarterback and the receiver when he catches the ball, and at what rate is the distance between the receiver and quarterback changing at that moment?
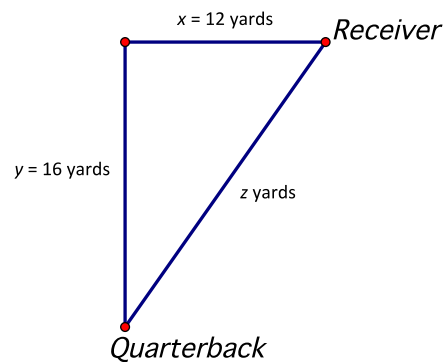
Suppose the quarterback threw the ball sooner, and the receiver is running toward the sideline at the same speed (8 yards/second). The distance between the quarterback and the receiver when he caught the ball was 17.3 yards. How many yards had the receiver run after turning right when he caught the ball, and at what rate was the distance between the receiver and quarterback changing at that time?

Given the constant speed of the receiver, consider several locations where the receiver could catch the ball. Explain the relationship between the location of the receiver when he catches the ball, the distance between the quarterback and receiver when he catches the ball, and the rate that the distance between the receiver and quarterback was changing at that time.