

RESPONSE TIME

Teaching Guidelines

Subject: Mathematics

Topics: Algebra—Expressions and Equations

Grades: 8 - 12

Knowledge and Skills:

- Can evaluate expressions by substituting values for variables
- Can simplify expressions using correct order of operations
- Can do basic operations on both sides of an equation in such a way as to preserve the equality

Answers

1.

| L | $t_{processing}$ | $t_{response}$ |
|-------------------|------------------|----------------|
| 500,000 meters | 0.013 seconds | 0.018 |
| 8,000,000 meters | 0.005 seconds | 0.085 |
| 2,000 meters | 0.002 seconds | 0.00202 |
| 20,000,000 meters | 0.04 seconds | 0.24 |

2.

| L | $t_{processing}$ | $t_{response}$ |
|------------|------------------|----------------|
| 750,000 | 0.025 | 0.0325 |
| 95,000 | 0.001 | 0.00195 |
| 100,000 | 0.015 | 0.016 |
| 50,000,000 | 0.003 | 0.503 |

Response Time

If you send a signal over a fiber optic cable to another computer and get a response, the response time, $t_{response}$, depends on three things:

- the distance between you and the computer, L
- the velocity of light traveling through the cable, v
- the amount of time it takes the other computer to process your signal, $t_{processing}$

The equation you would use to find the response time is this:

$$t_{response} = t_{processing} + \frac{2L}{v}$$

Note that the velocity of light in fiber optic cable, v , is about 2/3 of the velocity of light in a vacuum, which makes it approximately equal to 200,000,000 meters/second.

1. Calculate $t_{response}$ for the given values of L and $t_{processing}$:

| L | $t_{processing}$ | $t_{response}$ |
|-------------------|------------------|----------------|
| 500,000 meters | 0.013 seconds | |
| 8,000,000 meters | 0.005 seconds | |
| 2,000 meters | 0.002 seconds | |
| 20,000,000 meters | 0.04 seconds | |

2. Solve the equation to find the unknown value:

| L | $t_{processing}$ | $t_{response}$ |
|------------|------------------|----------------|
| 750,000 | ? | 0.0325 |
| ? | 0.001 | 0.00195 |
| ? | 0.015 | 0.016 |
| 50,000,000 | ? | 0.503 |