

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