## Lessons 7.5–7.7
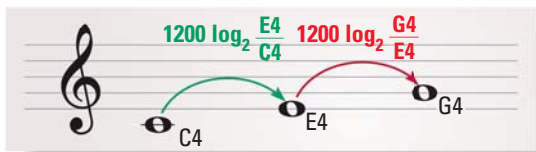
**MULTIPLE CHOICE**

1. **MUSIC** In music, a *cent* is a unit that is used to express a small step up or down in pitch. The number $c$ of cents by which two notes differ in pitch is given by

$$c = 1200 \log_2 \frac{a}{b}$$

where $a$ and $b$ are the frequencies of the notes $a$ and $b$.



Three notes on the standard scale are C4, E4, and G4. You can compare the difference in the number of cents from C4 to E4 with the difference in the number of cents from E4 to G4 by evaluating this expression:

$$1200 \log_2 \frac{E4}{C4} - 1200 \log_2 \frac{G4}{E4}$$

Which of the following is the expression written as a single logarithm? *TEKS 2A.11.F*

A  $1200 \log_2 \frac{C4}{G4}$

B  $1200 \log_2 \frac{G4}{C4}$

C  $1200 \log_2 \frac{E4}{C4 \cdot G4}$

D  $1200 \log_2 \frac{(E4)^2}{C4 \cdot G4}$

2. **EXPONENTIAL FUNCTIONS** Which exponential function of the form $y = ab^x$ has a graph that passes through the points (2, 7) and (5, 56)? *TEKS 2A.11.F*

F  $y = 0.28(5)^x$

G  $y = 1.75(2)^x$

H  $y = 2(1.75)^x$

J  $y = 18.35(1.25)^x$

3. **INTEREST RATES** The *effective interest rate* is a rate associated with the formula for continuously compounded interest. The effective interest rate takes into account the effects of compounding on the *nominal interest rate* (the interest rate in the formula for continuous compounding). The relationship between the effective interest rate $E$ and the nominal interest rate $N$ is given by the equation $N = \ln (E + 1)$ where $E$ and $N$ are expressed as decimals. Which of the following is the approximate effective interest rate for an account that has a nominal interest rate of 10%? *TEKS 2A.11.D*

A  1.0%      B  9.5%

C  10.5%     D  11.5%

4. **TRANSPORTATION** The table below shows the total number of miles traveled in the United States each year during 1997–2001. Which power function best models the data pairs $(x, y)$? *TEKS 2A.11.F*

| Years since 1990, $x$ | Miles (billions), $y$ |
|---|---|
| 7 | 2562 |
| 8 | 2632 |
| 9 | 2691 |
| 10 | 2747 |
| 11 | 2782 |

F  $y = x^{0.185}$      G  $y = x^{1.791}$

H  $y = 0.185x^{1.791}$      J  $y = 1791x^{0.185}$

**GRIDDED ANSWER** ⊙ ① ● ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

5. **SCHOOL EXPENDITURES** The total expenditures $y$ (in billions of dollars) for U.S. elementary and secondary schools can be modeled by $y = 385(1.04)^x$ where $x$ is the number of years since 1996. During which year did the total expenditures reach $550 billion? *TEKS 2A.11.D*

6. **INVESTMENT** You invest $4000 in an account that pays 2% annual interest compounded continuously. To the nearest year, how long will it take to earn $1000 in interest? *TEKS 2A.11.D*