

Exponential Word Problems

- 1) When Hector found a rare coin a few years ago, it was worth \$190. Since then, it has been increasing in value by the same percentage each year. One year after Hector found the coin, it was worth \$209.

If  $c(n)$  represents the value in dollars of the coin  $n$  years after Hector found it, which expression is equal to  $c(n)$ ?

- ~~A)  $190 \cdot 1.01^n$~~       B)  $190 \cdot 1.1^n$   
 C)  $190 \cdot 0.01^n$       D)  $190 \cdot 0.1^n$

$$\frac{209}{190} = 1.1$$

- 3) Which ordered pairs are on the graph  $y = 4 \cdot 3^x$ ? Select all that apply.

$$y = 4 \cdot 3^1 = 12$$

- I.  $(-1, \frac{4}{3})$       III.  $(1, 12)$       V.  $(4, 324)$

- ~~II.  $(\frac{1}{2}, 6)$~~       ~~IV.  $(2, 144)$~~

$$y = 4 \cdot 3^2 = 36$$

$$y = 4 \cdot 3^4 = 324$$

$$y = 4 \cdot 3^{-1} = \frac{4}{3}$$

$$y = 4 \cdot 3^{\frac{1}{2}} = 6.93$$

- 5) Identify whether the situation is exponential growth, decay, or neither.

To take a taxi, it will cost Connor \$2.00 for the first mile. After 5 miles, it will cost him a total of \$6.50.

- A) neither  
 B) exponential decay  
 C) exponential growth

y =

- 2) Sam has 3,250 followers on social media. His number of followers is decreasing at a rate of 3% per week. Which function represents his number of followers after  $w$  weeks?

- A)  $f(w) = 3250 \cdot 0.97^w$   
~~B)  $f(w) = 3250 \cdot 1.03^{w-1}$~~   
 C)  $f(w) = 3250 \cdot 0.97^{w-1}$   
~~D)  $f(w) = 3250 \cdot 1.03^w$~~

$$3250(1-3\%)^n$$

- 4) Identify whether the situation is exponential growth, decay, or neither.

Membership at a fitness center decline at a rate of 5% each year. There were 135 members at the end of the first year.

- A) neither  
 B) exponential growth  
 C) exponential decay

- 6) Identify whether the situation is exponential growth, decay, or neither.

Sheila bought a car for 18,000\$. She expects the car to lose value at a rate of 14% each year.

- A) neither  
 B) exponential growth  
 C) exponential decay



- 7) Identify whether the situation is exponential growth, decay, or neither.

Ella starts a track program by walking 2 miles. She increases her distance by 3% each week.

- A) neither  
 B) exponential growth  
 C) exponential decay

- 8) Identify whether the situation is exponential growth, decay, or neither.

An initial population of 15 hamsters doubles each year for 6 years.

- A) neither  
 B) exponential growth  
 C) exponential decay

- 9) A particular type of cell doubles in number every hour. Which function can be used to find the number of cells present at the end of  $h$  hours if there are initially 4 of these cells?

- A)  $n = 4 + 2^h$   
 B)  $n = 4 \cdot 2^h$   
 C)  $n = 4 \cdot \left(\frac{1}{2}\right)^h$   
 D)  $n = 4 + \left(\frac{1}{2}\right)^h$

- 10) Which statement about the graph of

$$y = \frac{1}{3} \cdot \left(\frac{2}{3}\right)^x$$

- A) The graph decreases from left to right.  
 B) The graph has a vertical asymptote.  
 C) The graph has an asymptote at  $y = \frac{1}{3}$   
 D) The graph crosses the  $y$  axis at  $\left(0, \frac{2}{9}\right)$ .

- Omit*  
 11) Which statement about the graph of  $y = 0 \cdot 0.25^x$  is true?

- A) The equation of the asymptote is  $x = 0$   
 B) The coordinates of the  $x$ -intercept are  $(0.25, 0)$   
 C) The coordinates of the  $y$ -intercept are  $(0, 8)$   
 D) The graph includes the point  $(2, 1)$

- 12) There are 1024 players in a tennis tournament. In each round, half the players are eliminated. Which function can be used to find the number of players remaining in the tournament at the end of  $x$  rounds?

- A)  $f(x) = 1024 \cdot 0.05^x$   
 B)  $f(x) = 1024 \cdot 1.5^x$   
 C)  $f(x) = 1024 \cdot 1.05^x$   
 D)  $f(x) = 1024 \cdot 0.5^x$

- 13) In the year 1900, the total number of metric tons of copper produced in the world was 495,000. Each year since 1900, the total number of metric tons of copper produced has increased on average by about 3.25% over the amount produced the previous year.

Which function models the total number of metric tons of copper produced in the year that is  $x$  years since 1900?

- A)  $c(x) = 495000 \cdot 0.9675^x$   
 B)  $c(x) = 495000 \cdot 1.0325^x$   
 C)  $c(x) = 495000x^{1.0325}$   
 D)  $c(x) = 495000x^{0.9675}$



- 14) Scientists are studying a bacteria sample.

The function  $f(x) = 245 \cdot 1.12^x$  gives the number of bacteria in the sample at the end of  $x$  days.

Which statement is the best interpretation of one of the values in this function?

- ~~A) The initial number of bacteria decreases at a rate of 88% each day.~~  
B) The number of bacteria increases at a rate of 12% each day.  
C) The number of bacteria at the end of one day is 245.  
~~D) The initial number of bacteria is 12.~~

- 15) The amount of fertilizer in a landscaping company's warehouse decreases at a rate of 3% per week. The amount of fertilizer in the warehouse was originally 78,000 cubic yards.

$$(1 - 3\%) = 0.97$$

Which function models the amount of fertilizer in cubic yards left after  $w$  weeks?

- A)  $f(w) = 1.03 \cdot 78000^w$   
B)  $f(w) = 0.97 \cdot 78000^w$   
C)  $f(w) = 78000 \cdot 0.97^w$   
D)  $f(w) = 78000 \cdot 1.03^w$

- 16) A student used  $f(x) = 5 \cdot 1.012^x$  to show how balance in a savings account will increase over time. What does the 5 represent?

- A) The starting balance of the savings account.  
B) The annual interest rate of the savings account  
C) The number of years the savings account has earned interest  
D) The interest the savings account earned for the first year



- 17) The table contains some points on the graph of an exponential function.

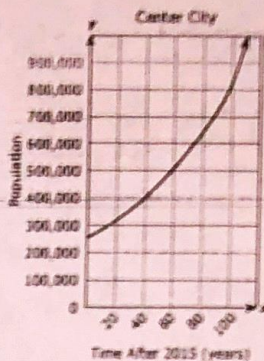
$x$	$y$
0	0.0625
1	0.25
2	1
3	4

Based on the table, which function represents the same relationship?

- A)  $q(x) = 0.25^x$
- B)  $q(x) = 0.0625 \cdot 4^x$
- C)  $q(x) = 256 \cdot 0.25^x$
- D)  $q(x) = 0.5 \cdot 4^x$

$$r = 4$$

- 18) The population of Center City is modeled by exponential function  $f$ , where  $x$  is the number of years after 2015. The graph of  $f$  is shown on the grid.

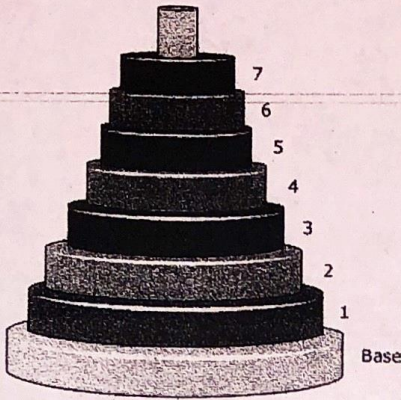


Which inequality best represents the range of  $f$  in this situation?

- A)  $x \geq 0$
- B)  $250000 \leq y \leq 1000000$
- C)  $0 \leq x \leq 110$
- D)  $y \geq 250000$



- DMT
- 19) A toy is made up of cylindrical rings stacked on a base, as shown in the diagram. The diagram of Ring 1 is 87% of the diameter of the base. For Ring 2 through Ring 7, the diameter of each ring is 87% of the diameter of the ring directly below it.



The diameter of the base is 5 inches. Which function can be used to find the diameter in inches of Ring  $r$ , where

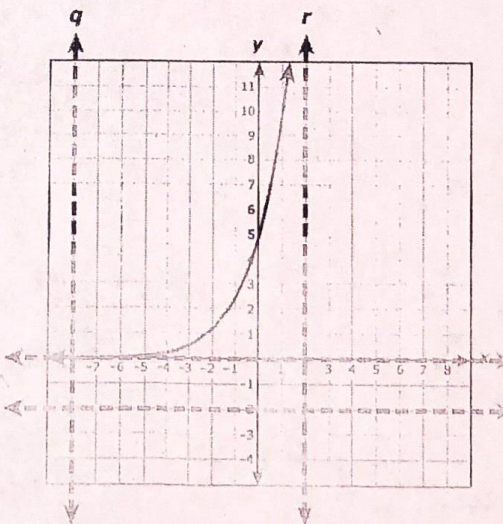
$$1 \leq r \leq 7$$

- A)  $d(r) = 0.87(r - 5)$   
 B)  $d(r) = 0.87 \cdot 5^r$   
 C)  $d(r) = 5 \cdot 0.87^r$   
 D)  $d(r) = 5(r - 0.87)$

- 21) The graph of an exponential function is shown on the grid.

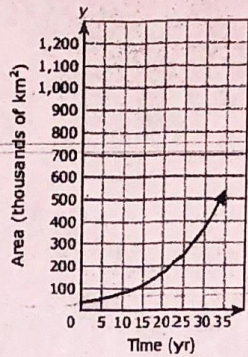
Which dashed line is an asymptote for the function on the grid?

- A) Line  $t$       B) Line  $q$   
 C) Line  $r$       D) Line  $s$



- DMT
- 20) The exponential function modeled below represents the number of square kilometers of land occupied by cane toads  $x$  years after this animal was first introduced into Australia.

Area Occupied by Cane Toads



Time (yr)	Area (km <sup>2</sup> )
0	36,500
5	53,600
10	78,800
15	115,780
20	170,120
25	250,000
30	367,300
35	539,700

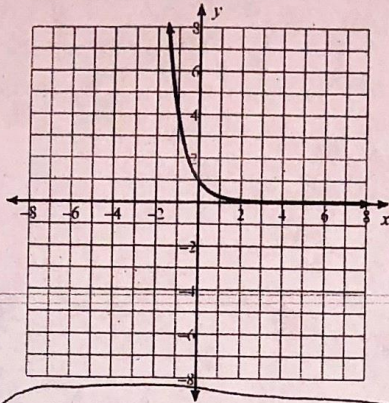
Based on the data, which measurement is closest to the number of square kilometers of land that will be occupied by cane toads 40 years after this animal was first introduced into Australia?

- A) 600,000 km<sup>2</sup>      B) 800,000 km<sup>2</sup>  
 C) 1,250,000 km<sup>2</sup>      D) 550,000 km<sup>2</sup>

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- 22) Based on the graph, which statement about the function is true?



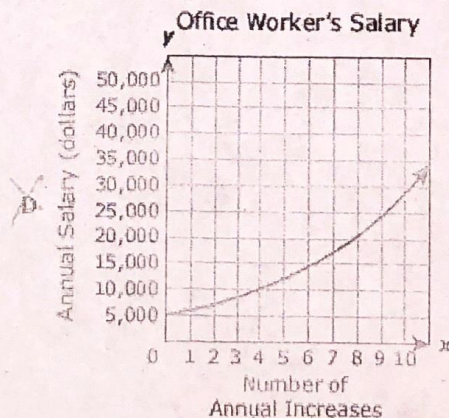
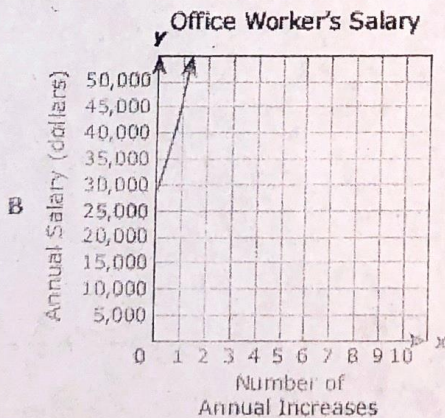
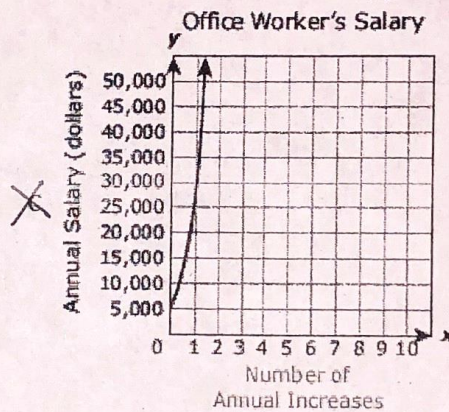
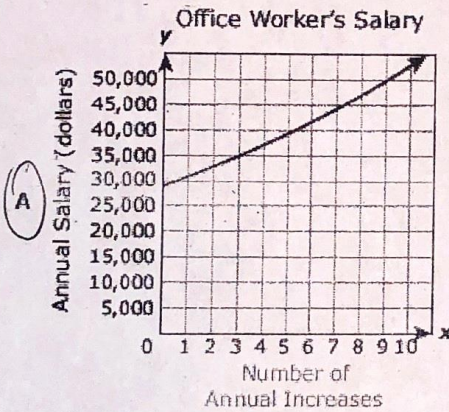
$$y > 0$$

- A) The range is the set of all real numbers greater than 0.  
 B) The range is the set of all real numbers less than 0.  
 C) The domain is the set of all real numbers greater than -4.  
 D) The domain is the set of all real numbers less than -4.

- 23) The starting annual salary for an office worker at a company is \$29,000. If the company awards an annual increase of 6.2%, which graph models the situation after the office worker receives  $x$  annual increases?

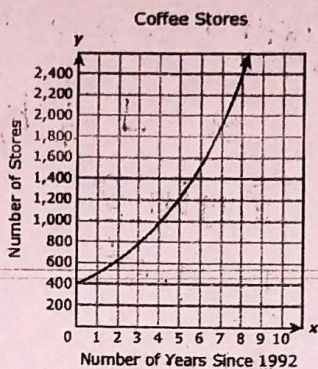
$$29000(1+6.2\%)^x$$

if  $x=3$ ; 34735.34





- 24) The number of stores opened by a coffee company can be modeled by the exponential function graphed on the grid, where  $x$  is the number of years since 1992.



Based on the graph, which statement does not appear to be true?

- A) The coffee company had opened 400 stores by the end of 1992. ✓
- B) The coffee company opened 100 stores in one year. ✓
- C) Since 1992, the coffee company has opened 250 stores each year.
- D) Every year, the number of stores the coffee company opened increased by 25%.

- 25) The amount of medicine in a patient's bloodstream is shown by the function  $A(h) = 600 \cdot 0.75^h$ , where  $h$  is the number of hours that have passed since the medicine was given.

What does 0.75 represent in this function?

- A) The amount of medicine in the bloodstream decreases by 25% each hour.
- B) The amount of medicine in the bloodstream decreases by 75% each hour.
- C) The amount of medicine in the bloodstream increases by 75% each hour.
- D) The amount of medicine in the bloodstream increases by 25% each hour.



26) Which graph best represents  $f(x) = 2 \cdot 5^x$ ?

stretch  
 $2 > 1$

$$K=0$$

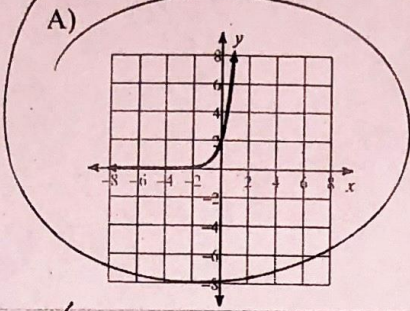
↓ growth b/c  $5 > 1$

so ↓ ; b/c no reflection

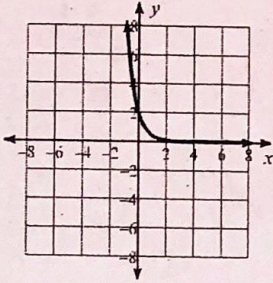
Plug in 0

$$y = 2 \cdot 5^0$$

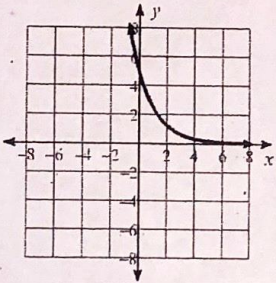
$$y = 2$$



~~B)~~



~~C)~~



D)

