

SAT-Like Math Questions
Topic: Mathematical Models
Calculator NOT Permitted

Easy:

1.) The function below is best described as which of the following?

x	f(x)
6	150
8	151
10	152
12	153
14	154

- A. Increasing Linear
- B. Decreasing Linear
- C. Exponential Growth
- D. Exponential Decay

2.) The function below is best described as which of the following?

x	f(x)
-2	540
-1	270
0	135
1	67.5

- A. Increasing Linear
- B. Decreasing Linear
- C. Exponential Growth
- D. Exponential Decay

3.) The function below is best described as which of the following?

x	f(x)
200	3
300	6
400	12
500	24
600	48

- A. Increasing Linear
- B. Decreasing Linear
- C. Exponential Growth
- D. Exponential Decay

4.) The function below is best described as which of the following?

x	f(x)
-20	40
-18	37
-16	34
-14	31
-12	28

- A. Increasing Linear
- B. Decreasing Linear
- C. Exponential Growth
- D. Exponential Decay

5.) The density of an object can be found using the model $\rho = \frac{m}{v}$ where ρ is the density, m is the mass, and v is the volume. If an object has a density of 15 grams per cubic centimeter and a mass of 5 grams, what is its volume in cubic centimeters?

- A. 1/3
- B. 3
- C. 5
- D. 15

Medium:

6.) The trunk diameter, D , in inches of an oak tree that is t years old, can be modeled by the equation $D = \frac{t+8}{2}$. According to the model, for every increase in 1 year of age, by how many inches will the diameter of an oak tree increase?

- A. 0.5
- B. 1
- C. 2
- D. 8

7.) Priya is an editor for a weekly magazine. The amount of time it takes her to proofread an article can be modeled by the equation $T = 12p + 16.3$ where T is the time in minutes and p is the number of pages in the article. How much longer will it take Priya to proofread a 12 page article than to proofread a 10 page article?

- A. 12 minutes
- B. 16.3 minutes
- C. 24 minutes
- D. 28.3 minutes

8.) A model for the speed of sound in air is $v = 331 + 0.6T$ where v is the speed of sound in meters per second and T is the air temperature in $^{\circ}\text{C}$. Given this model, what does the number 0.6 represent?

- A. The speed of sound at an air temperature of 0°C .
- B. The speed of sound at an air temperature of 331°C .
- C. The increase in the speed of sound for each increase of 1°C in air temperature.
- D. The increase in the speed of sound for each increase of 0.6°C in air temperature.

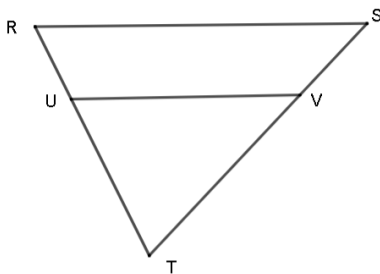
9.) Tarik has a newspaper route and can calculate the number of newspapers remaining to be delivered using the model $R = 336 - 48d$ where R is the number of newspapers he still needs to deliver in a given week and d is the number of days in the week he has already delivered papers. What is the best interpretation of the number 336 in this model?

- A. The number of newspapers he has to deliver at the beginning of each week.
- B. The number of newspapers he delivers each day.
- C. The number of newspapers he delivers in 48 days.
- D. The number of days he has been delivering newspapers.

10.) Eric is planting a new lawn in his backyard. He will need to purchase grass seed and rent a spreader and small bulldozer for the duration of the project. He calculates the total cost of the project, C , with the model $C = G + (S + B)d$ where G is the cost of the grass seed, S is the daily cost to rent a spreader, and B is the daily cost to rent a small bulldozer. What is the best interpretation for the variable, d ?

- A. The model of bulldozer that Eric rents
- B. The quality of grass seed that Eric purchases
- C. The number of days the project takes
- D. The size of Eric's lawn

Hard:



11.) In the figure above, $\overline{RS} \parallel \overline{UV}$. If $RU = 4$ and $UT = 7$, what is the ratio of the area of $\triangle RST$ to the area of $\triangle UVT$?

- A. $\frac{4}{7}$
- B. $\frac{7}{4}$
- C. $\frac{49}{16}$
- D. $\frac{121}{49}$

$$F = G \frac{m_1 m_2}{r^2}$$

12.) The gravitational force that two objects exert on each other can be calculated by the formula above, where G is the universal gravitational constant, m_1 and m_2 are the masses of the two objects, and r is the distance between them. An astronomer uses the formula to find the force of gravity between two celestial objects when they are different distances apart. What is the ratio of the gravitational force when the objects are 1.5×10^6 km apart to the gravitational force when they are 3×10^6 km apart?

- A. $\frac{1}{4}$
- B. $\frac{1}{2}$
- C. $\frac{3}{2}$
- D. $\frac{4}{1}$

$$I = \frac{P}{4\pi r^2}$$

13.) The intensity of a sound heard by an observer can be calculated by the model above, where I is the intensity (or loudness) of the sound to the observer, P is the power of the sound at its source, and r is the distance between the source and the observer. If Bryan is standing three times as far from the source of a sound as Renee, how many times louder will the noise sound to Renee as it does to Bryan?

- A. 3
- B. 4π
- C. 9
- D. 12π

14.) A robot used for a certain manufacturing application was originally purchased for \$350,000 and is depreciating at a rate of 15% per year. The manufacturing engineer uses the equation $V = 350000(r)^t$ to model the value of the robot after t years.

- a.) What value should the engineer use for r ?
- b.) In thousands of dollars, what does the manufacturing engineer believe the value of the robot will be after 6 years? (Round to the nearest thousand and disregard the \$ sign when gridding your answer. A calculator is permitted on this question.)

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Answer Key:

1.) A

2.) D

3.) C

4.) B

5.) A

6.) A

7.) C

8.) C

9.) A

10.) C

11.) D

12.) D

13.) C

14a.) .85

14b.) 132



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