

Use this space for
computations.

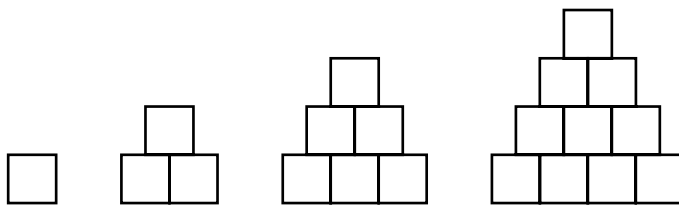
13 Which value of x satisfies the equation $\frac{5}{6}\left(\frac{3}{8} - x\right) = 16$?

- (1) -19.575 (3) -16.3125
(2) -18.825 (4) -15.6875

14 If a population of 100 cells triples every hour, which function represents $p(t)$, the population after t hours?

- (1) $p(t) = 3(100)^t$ (3) $p(t) = 3t + 100$
(2) $p(t) = 100(3)^t$ (4) $p(t) = 100t + 3$

15 A sequence of blocks is shown in the diagram below.



This sequence can be defined by the recursive function $a_1 = 1$ and $a_n = a_{n-1} + n$. Assuming the pattern continues, how many blocks will there be when $n = 7$?

- (1) 13 (3) 28
(2) 21 (4) 36

16 Mario's \$15,000 car depreciates in value at a rate of 19% per year. The value, V , after t years can be modeled by the function $V = 15,000(0.81)^t$. Which function is equivalent to the original function?

- (1) $V = 15,000(0.9)^{9t}$ (3) $V = 15,000(0.9)^{\frac{t}{9}}$
(2) $V = 15,000(0.9)^{2t}$ (4) $V = 15,000(0.9)^{\frac{t}{2}}$

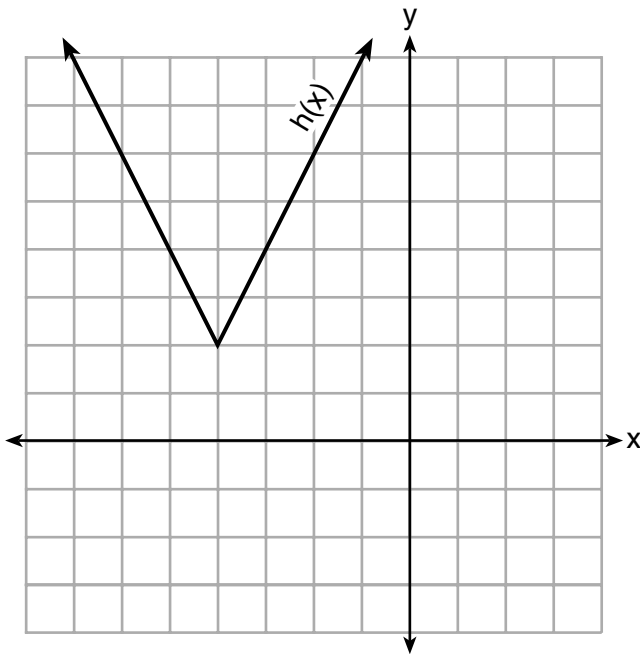
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17 The highest possible grade for a book report is 100. The teacher deducts 10 points for each day the report is late.

Which kind of function describes this situation?

- (1) linear (3) exponential growth
(2) quadratic (4) exponential decay

18 The function $h(x)$, which is graphed below, and the function $g(x) = 2|x + 4| - 3$ are given.



Which statements about these functions are true?

- I. $g(x)$ has a lower minimum value than $h(x)$.
II. For all values of x , $h(x) < g(x)$.
III. For any value of x , $g(x) \neq h(x)$.

- (1) I and II, only (3) II and III, only
(2) I and III, only (4) I, II, and III

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19 The zeros of the function $f(x) = 2x^3 + 12x - 10x^2$ are

(1) $\{2, 3\}$

(3) $\{0, 2, 3\}$

(2) $\{-1, 6\}$

(4) $\{0, -1, 6\}$

20 How many of the equations listed below represent the line passing through the points $(2,3)$ and $(4,-7)$?

$$5x + y = 13$$

$$y + 7 = -5(x - 4)$$

$$y = -5x + 13$$

$$y - 7 = 5(x - 4)$$

(1) 1

(3) 3

(2) 2

(4) 4

21 The Ebola virus has an infection rate of 11% per day as compared to the SARS virus, which has a rate of 4% per day.

If there were one case of Ebola and 30 cases of SARS initially reported to authorities and cases are reported each day, which statement is true?

(1) At day 10 and day 53 there are more Ebola cases.

(2) At day 10 and day 53 there are more SARS cases.

(3) At day 10 there are more SARS cases, but at day 53 there are more Ebola cases.

(4) At day 10 there are more Ebola cases, but at day 53 there are more SARS cases.

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22 The results of a linear regression are shown below.

$$y = ax + b$$

$$a = -1.15785$$

$$b = 139.3171772$$

$$r = -0.896557832$$

$$r^2 = 0.8038159461$$

Which phrase best describes the relationship between x and y ?

- (1) strong negative correlation
- (2) strong positive correlation
- (3) weak negative correlation
- (4) weak positive correlation

23 Abigail's and Gina's ages are consecutive integers. Abigail is younger than Gina and Gina's age is represented by x . If the difference of the square of Gina's age and eight times Abigail's age is 17, which equation could be used to find Gina's age?

- (1) $(x + 1)^2 - 8x = 17$
- (2) $(x - 1)^2 - 8x = 17$
- (3) $x^2 - 8(x + 1) = 17$
- (4) $x^2 - 8(x - 1) = 17$

24 Which system of equations does *not* have the same solution as the system below?

$$\begin{aligned} 4x + 3y &= 10 \\ -6x - 5y &= -16 \end{aligned}$$

- (1) $\begin{aligned} -12x - 9y &= -30 \\ 12x + 10y &= 32 \end{aligned}$
 - (2) $\begin{aligned} 20x + 15y &= 50 \\ -18x - 15y &= -48 \end{aligned}$
 - (3) $\begin{aligned} 24x + 18y &= 60 \\ -24x - 20y &= -64 \end{aligned}$
 - (4) $\begin{aligned} 40x + 30y &= 100 \\ 36x + 30y &= -96 \end{aligned}$
-

Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

25 A teacher wrote the following set of numbers on the board:

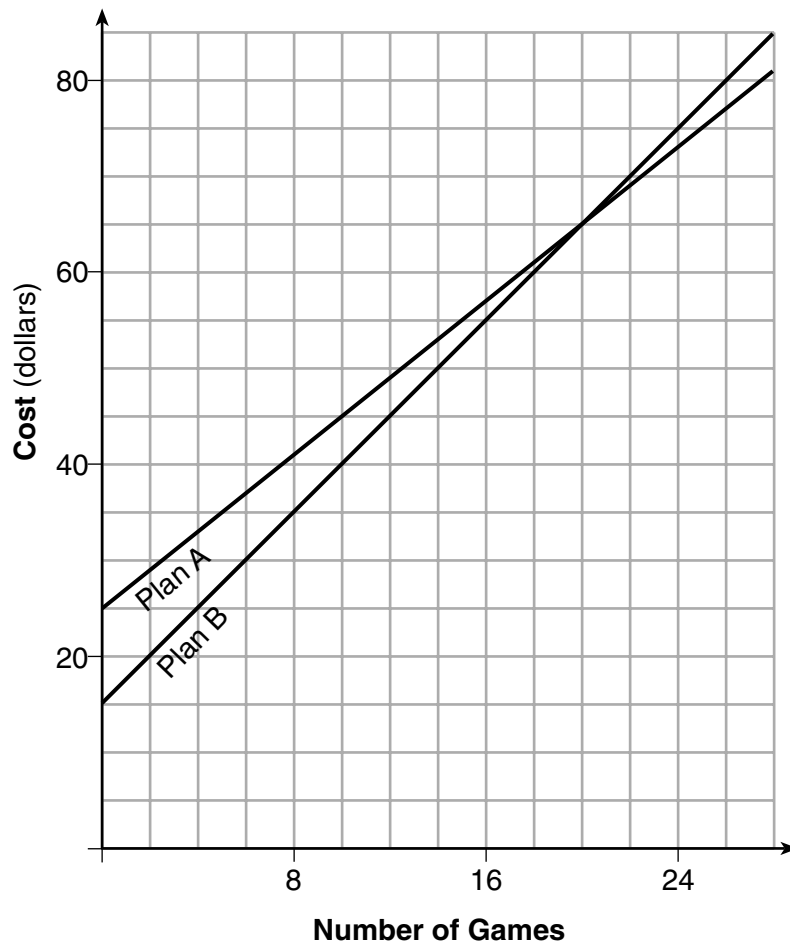
$$a = \sqrt{20} \quad b = 2.5 \quad c = \sqrt{225}$$

Explain why $a + b$ is irrational, but $b + c$ is rational.

26 Determine and state whether the sequence 1, 3, 9, 27,... displays exponential behavior. Explain how you arrived at your decision.

27 Using the formula for the volume of a cone, express r in terms of V , h , and π .

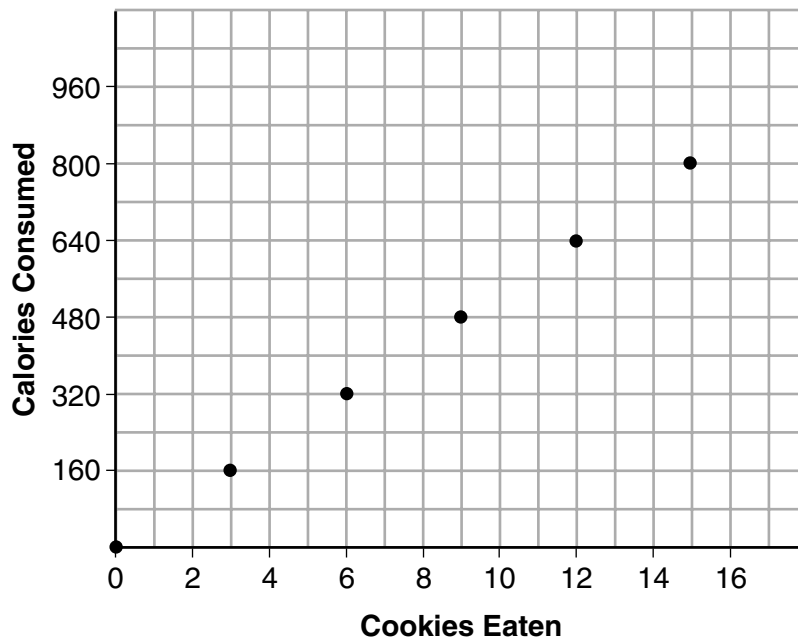
28 The graph below models the cost of renting video games with a membership in Plan A and Plan B.



Explain why Plan B is the better choice for Dylan if he only has \$50 to spend on video games, including a membership fee.

Bobby wants to spend \$65 on video games, including a membership fee. Which plan should he choose? Explain your answer.

- 29 Samantha purchases a package of sugar cookies. The nutrition label states that each serving size of 3 cookies contains 160 Calories. Samantha creates the graph below showing the number of cookies eaten and the number of Calories consumed.



Explain why it is appropriate for Samantha to draw a line through the points on the graph.

30 A two-inch-long grasshopper can jump a horizontal distance of 40 inches. An athlete, who is five feet nine, wants to cover a distance of one mile by jumping. If this person could jump at the same ratio of body-length to jump-length as the grasshopper, determine, to the *nearest jump*, how many jumps it would take this athlete to jump one mile.

31 Write the expression $5x + 4x^2(2x + 7) - 6x^2 - 9x$ as a polynomial in standard form.

32 Solve the equation $x^2 - 6x = 15$ by completing the square.