August 2017 Answer Key

(1) 4	(9) 4	(17) . . . . . 1 . . . . .
(2) 2	(10) 1	(18) . . . . . 2 . . . . .
(3) 3	(11) 1	(19) . . . . . 3 . . . . .
(4) 3	(12) 2	(20) . . . . . 3 . . . . .
(5) 2	(13) 2	(21) . . . . . 3 . . . . .
(6) 1	(14) 2	(22) . . . . . 1 . . . . .
(7) 1	(15) 3	(23) . . . . . 4 . . . . .
(8) 2	(16) 2	(24) . . . . . 4 . . . . .

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:

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

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

$\sqrt{20} + 2.5 = 6.972135955$

$\sqrt{20}$: irrational

2.5: rational

6.972135955:
- irrational
- nonterminating & non repeating

$2.5 + \sqrt{225} = 17.5$

17.5:
- rational
- terminating decimal

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

yes repeatedly multiplying by 3

1	$1 \cdot 3^0$
$1 \cdot 3$	$1 \cdot 3^1$
$1 \cdot 3 \cdot 3$	$1 \cdot 3^2$
$1 \cdot 3 \cdot 3 \cdot 3$	$1 \cdot 3^3$

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

$V = \frac{1}{3}\pi r^2 h$ ← From Reference Sheet

$3 \cdot V = 3 \cdot \frac{1}{3}\pi r^2 h$

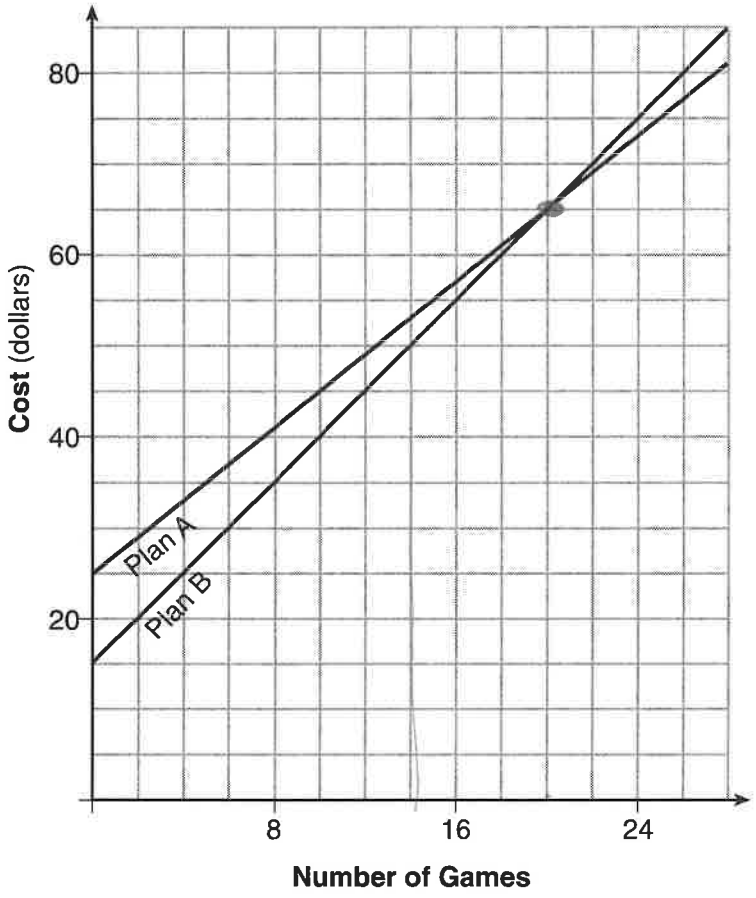
$\frac{3V}{\pi h} = \frac{\pi r^2 h}{\pi h}$

$\sqrt{\frac{3V}{\pi h}} = \sqrt{r^2}$

$\sqrt{\frac{3V}{\pi h}} = r$

$r = \sqrt{\frac{3V}{\pi h}}$

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



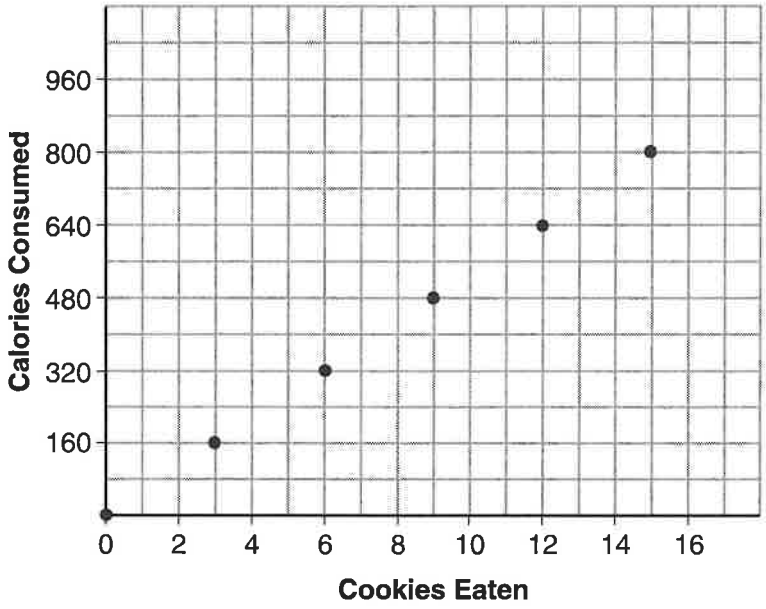
Explain why Plan *B* is the better choice for Dylan if he only has \$50 to spend on video games, including a membership fee.

He will get 14 games with Plan B + Less than 14 games with Plan A

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

Does not matter. Either plan will get him 20 games.

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.

She can eat any number, or piece, of a cookie. She does not have to eat cookies in multiples of 3.

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.

$\frac{\text{Body length}}{\text{jump length}} \quad \frac{2\text{ in}}{40\text{ in}} = \frac{5\text{ft }9\text{in}}{x} \quad 5\text{ft }9\text{in} = 69\text{in}$

$\frac{2\text{ in}}{40\text{in}} = \frac{69\text{ in}}{x}$

$2760 = 2x$

$1380 = x$

$\frac{1380\text{ in}}{1\text{ jump}} \cdot \frac{1\text{ mile}}{5280\text{ ft}} \cdot \frac{1\text{ft}}{12\text{in}} = \frac{1380\text{ miles}}{63360\text{ jump}}$

$\frac{1380\text{ miles}}{63360\text{ jumps}} = \frac{1\text{ mile}}{x\text{ jumps}}$

$x = 45.913$

46 jumps

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

$5x + 8x^3 + 28x^2 - 6x^2 - 9x$

$8x^3 + 22x^2 - 4x$

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

$-15 \quad -15$

$x^2 - 6x - 15 = 0$

$x^2 - 6x + \boxed{9} - 15 - \boxed{9} = 0$

$(x-3)^2 - 24 = 0$

$\sqrt{(x-3)^2} = \sqrt{24}$

$x - 3 = \pm\sqrt{24}$

$x = 3 \pm \sqrt{24}$

Part III

Answer all 4 questions in this part. Each correct answer will receive 4 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]

33 Loretta and her family are going on vacation. Their destination is 610 miles from their home. Loretta is going to share some of the driving with her dad. Her average speed while driving is 55 mph and her dad's average speed while driving is 65 mph.

The plan is for Loretta to drive for the first 4 hours of the trip and her dad to drive for the remainder of the trip. Determine the number of hours it will take her family to reach their destination.

$55 \cdot 4 = 220$

$610 - 220 = 390$

$\frac{390}{65} = 6$

$4 + 6 = 10$ hours

After Loretta has been driving for 2 hours, she gets tired and asks her dad to take over. Determine, to the *nearest tenth of an hour*, how much time the family will save by having Loretta's dad drive for the remainder of the trip.

$55 \cdot 2 = 110$

$610 - 110 = 500$

$\frac{500}{65} = 7.6923$

.3 hours

$2 + 7.6923 = 9.6923$

$10 - 9.6923 = .3076$

34 The heights, in feet, of former New York Knicks basketball players are listed below.

6.4	6.9	6.3	6.2	6.3	6.0	6.1	6.3	6.8	6.2
6.5	7.1	6.4	6.3	6.5	6.5	6.4	7.0	6.4	6.3
6.2	6.3	7.0	6.4	6.5	6.5	6.5	6.0	6.2	

Using the heights given, complete the frequency table below.

Interval	Frequency
6.0 – 6.1	11
6.2 – 6.3	𝍸 𝍸
6.4 – 6.5	𝍸 𝍸 1
6.6 – 6.7	
6.8 – 6.9	11
7.0 – 7.1	111

Question 34 is continued on the next page.

Question 34 continued.

Based on the frequency table created, draw and label a frequency histogram on the grid below.

Determine and state which interval contains the upper quartile. Justify your response.

6.4 - 6.5

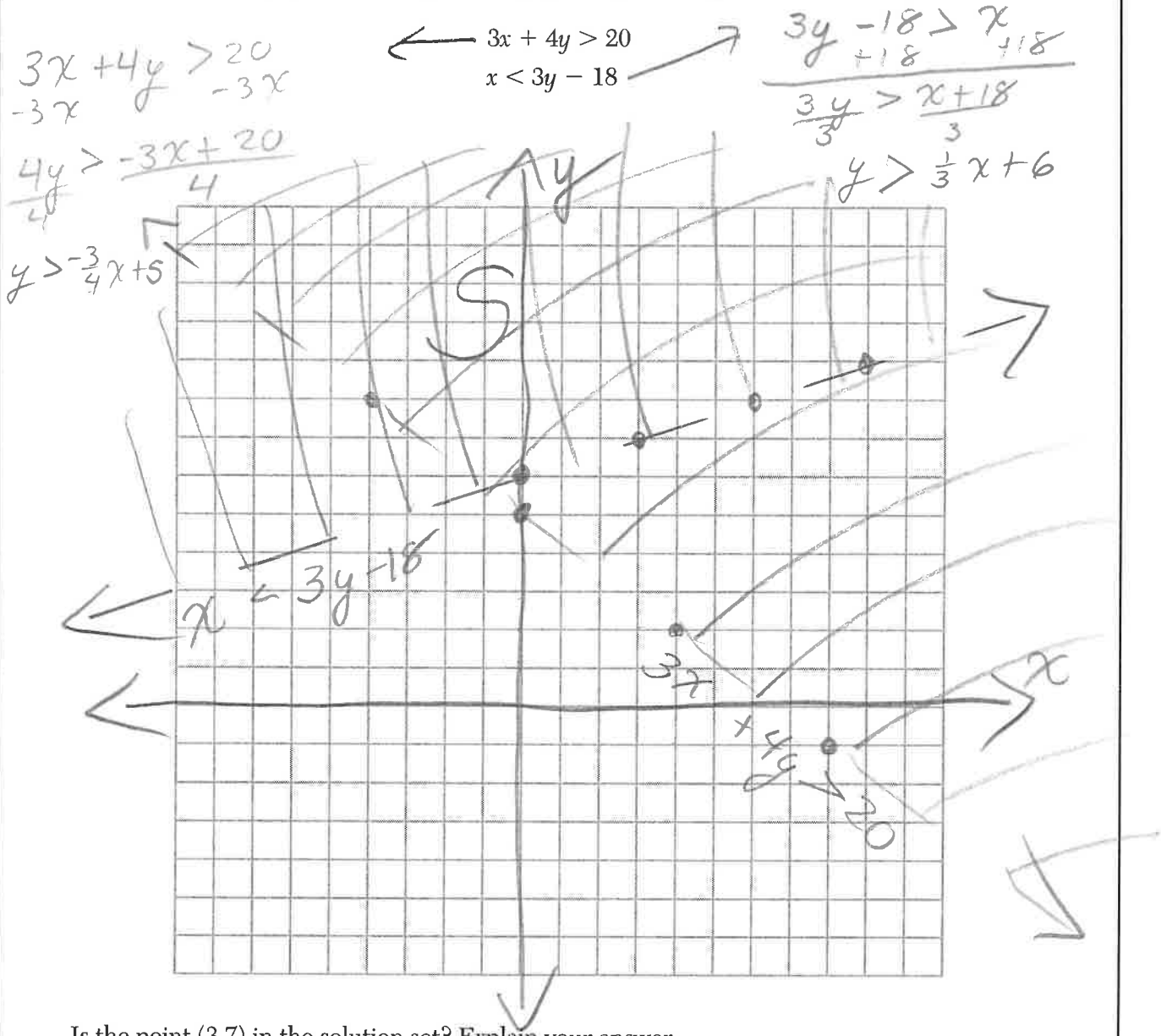
Median is the 15th # in the list

Upper Quartile is the middle of the top 14 #s, or between the 22nd & 23rd #s in the list.

35 Solve the following system of inequalities graphically on the grid below and label the solution S.

$3x + 4y > 20$

$x < 3y - 18$



Is the point (3,7) in the solution set? Explain your answer.

No.
It is on a dashed line, which is not part of the solution set.

36 An Air Force pilot is flying at a cruising altitude of 9000 feet and is forced to eject from her aircraft. The function $h(t) = -16t^2 + 128t + 9000$ models the height, in feet, of the pilot above the ground, where t is the time, in seconds, after she is ejected from the aircraft.

Determine and state the vertex of $h(t)$. Explain what the second coordinate of the vertex represents in the context of the problem.

From Calculator

x	y
0	9000
1	9112
2	9192
3	9240
4	9256
5	9240
6	9192

(4, 9256)

The pilot reaches 9,256 ft in the air.

After the pilot was ejected, what is the maximum number of feet she was above the aircraft's cruising altitude? Justify your answer.

9256 - 9000 = 256

256 ft.

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. 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. [6]

37 Zeke and six of his friends are going to a baseball game. Their combined money totals \$28.50. At the game, hot dogs cost \$1.25 each, hamburgers cost \$2.50 each, and sodas cost \$0.50 each. Each person buys one soda. They spend all \$28.50 on food and soda.

Write an equation that can determine the number of hot dogs, x, and hamburgers, y, Zeke and his friends can buy.

$1.25x + 2.5y + 7(.50) = 28.50$

For Graphing ↓

$1.25x + 2.5y + 3.50 = 28.50$

$-1.25x \qquad -3.50 \qquad -1.25x - 3.50$

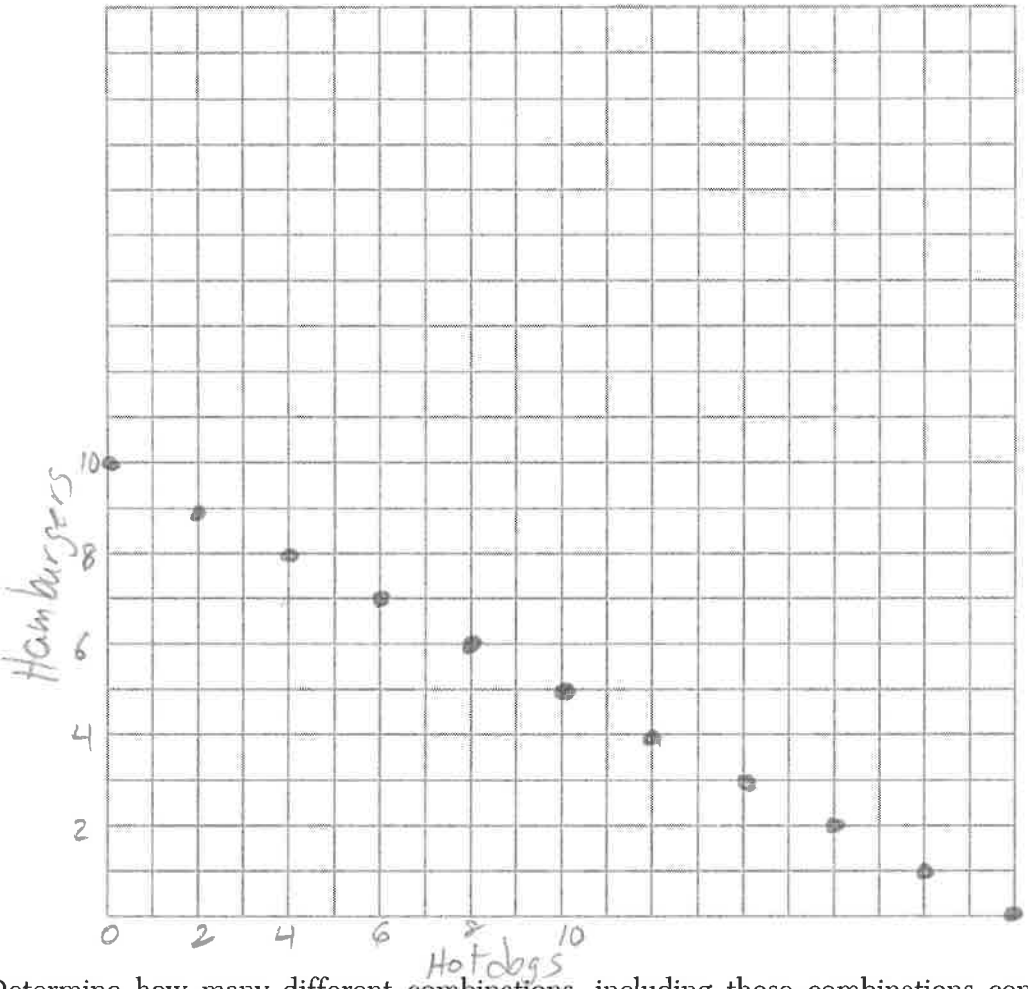
$\frac{2.5y}{2.5} = \frac{-1.25x}{2.5} + \frac{25}{2.5}$

$y = -\frac{1}{2}x + 10$

Question 37 is continued on the next page.

Question 37 continued.

Graph your equation on the grid below.



Determine how many different combinations, including those combinations containing zero, of hot dogs and hamburgers Zeke and his friends can buy, spending all $28.50. Explain your answer.

11 combinations
The points shown on my graph are the only possibities because you cannot buy part of a hotdog or hamburger.