Part I

Answer all 30 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question. [60]

Use this space for computations.

1 Given:

Set $U = \{S, O, P, H, I, A\}$

Set $B = \{A, I, O\}$

If set B is a subset of set U, what is the complement of set B?

(1) $\{O, P, S\}$

(2) $\{I, P, S\}$

(3) $\{A, H, P\}$

(4) $\{H, P, S\}$

2 How many different sandwiches consisting of one type of cheese, one condiment, and one bread choice can be prepared from five types of cheese, two condiments, and three bread choices?

(1) 10

(2) 13

(3) 15

(4) 30

3 The sum of $4x^3 + 6x^2 + 2x - 3$ and $3x^3 + 3x^2 - 5x - 5$ is

(1) $7x^3 + 3x^2 - 3x - 8$

(2) $7x^3 + 3x^2 + 7x + 2$

(3) $7x^3 + 9x^2 - 3x - 8$

(4) $7x^6 + 9x^4 - 3x^2 - 8$

Use this space for computations.

4 What is the slope of the line that passes through the points (3,5) and (−2,2)?

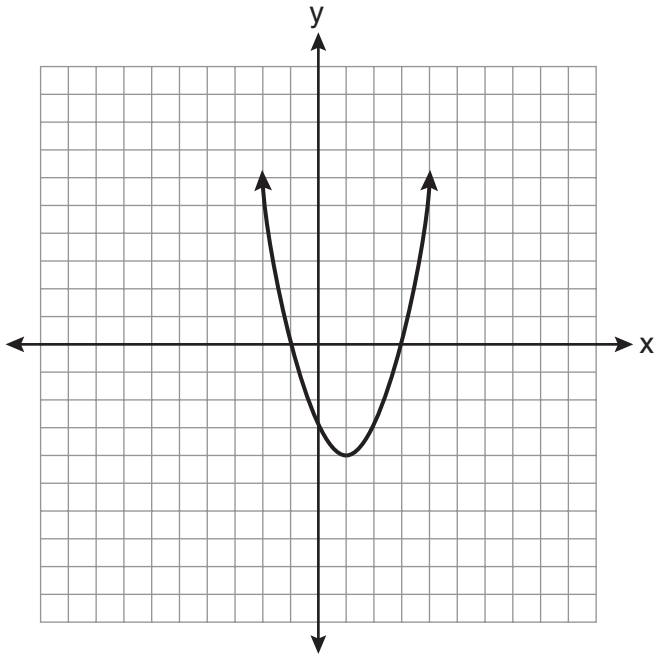
(1) $\frac{1}{5}$

(2) $\frac{3}{5}$

(3) $\frac{5}{3}$

(4) 5

5 What are the vertex and axis of symmetry of the parabola shown in the diagram below?



(1) vertex: (1,−4); axis of symmetry: $x = 1$

(2) vertex: (1,−4); axis of symmetry: $x = -4$

(3) vertex: (−4,1); axis of symmetry: $x = 1$

(4) vertex: (−4,1); axis of symmetry: $x = -4$

Use this space for computations.

6 Three high school juniors, Reese, Matthew, and Chris, are running for student council president. A survey is taken a week before the election asking 40 students which candidate they will vote for in the election. The results are shown in the table below.

Candidate's Name	Number of Students Supporting Candidate
Reese	15
Matthew	13
Chris	12

Based on the table, what is the probability that a student will vote for Reese?

(1) $\frac{1}{3}$ (3) $\frac{3}{8}$

(2) $\frac{3}{5}$ (4) $\frac{5}{8}$

7 Which linear equation represents a line containing the point (1,3)?

(1) $x + 2y = 5$ (3) $2x + y = 5$

(2) $x - 2y = 5$ (4) $2x - y = 5$

8 The expression $\sqrt{72} - 3\sqrt{2}$ written in simplest radical form is

(1) $5\sqrt{2}$ (3) $3\sqrt{2}$

(2) $3\sqrt{6}$ (4) $\sqrt{6}$

Use this space for computations.

9 In $\triangle ABC$, the measure of $\angle B = 90°$, $AC = 50$, $AB = 48$, and $BC = 14$. Which ratio represents the tangent of $\angle A$?

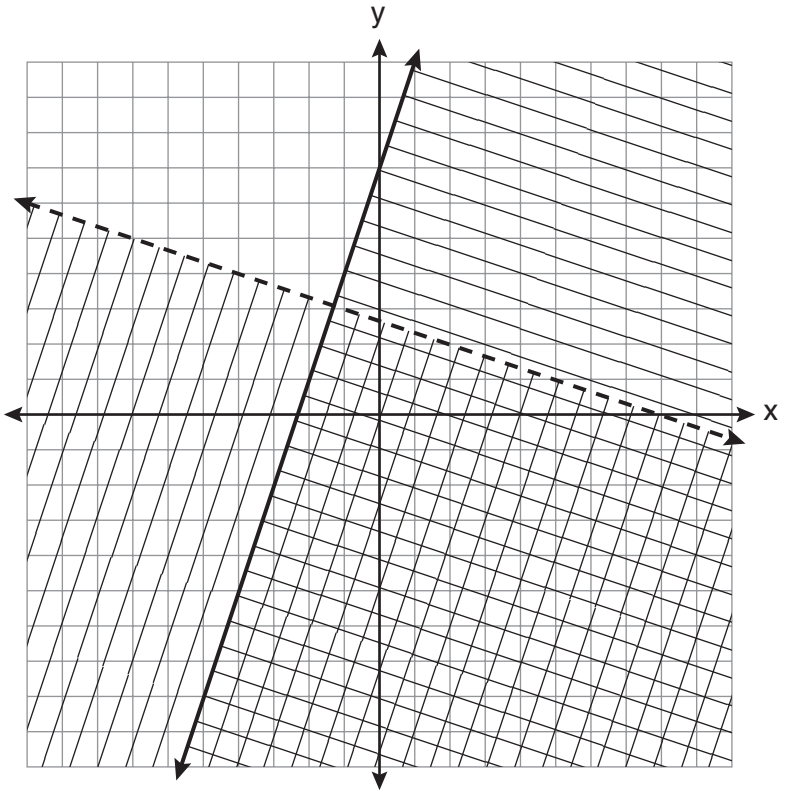
(1) $\frac{14}{50}$

(2) $\frac{14}{48}$

(3) $\frac{48}{50}$

(4) $\frac{48}{14}$

10 Which ordered pair is in the solution set of the system of linear inequalities graphed below?



(1) $(1,-4)$

(2) $(-5,7)$

(3) $(5,3)$

(4) $(-7,-2)$

Use this space for computations.

11 Which table does *not* show bivariate data?

(1)

Height (inches)	**Weight** (pounds)
39	50
48	70
60	90

(2)

Gallons	**Miles Driven**
15	300
20	400
25	500

(3)

Quiz Average	**Frequency**
70	12
80	15
90	6

(4)

Speed (mph)	**Distance** (miles)
40	80
50	120
55	150

12 What is the solution of the system of equations $c + 3d = 8$ and $c = 4d - 6$?

(1) $c = -14, d = -2$

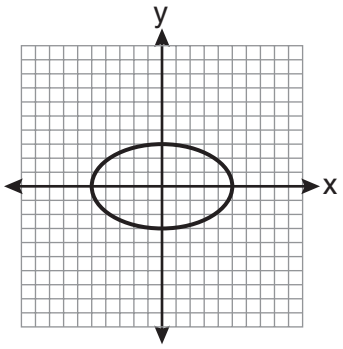
(2) $c = -2, d = 2$

(3) $c = 2, d = 2$

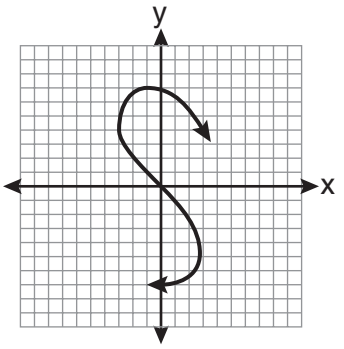
(4) $c = 14, d = -2$

Use this space for computations.

13 Which graph represents a function?



(1)



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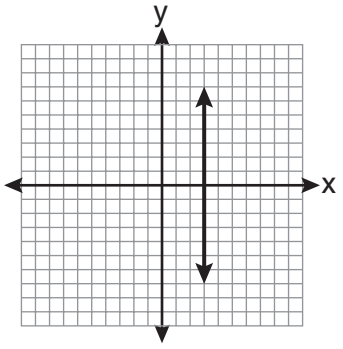
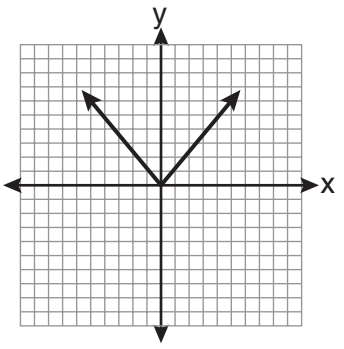


(2)



(4)

14 The algebraic expression $\frac{x-2}{x^2-9}$ is undefined when x is

(1) 0

(2) 2

(3) 3

(4) 9

Use this space for computations.

15 The graphs of the equations $y = 2x - 7$ and $y - kx = 7$ are parallel when k equals

(1) -2

(2) 2

(3) -7

(4) 7

16 Which verbal expression is represented by $\frac{1}{2}(n - 3)$?

(1) one-half n decreased by 3

(2) one-half n subtracted from 3

(3) the difference of one-half n and 3

(4) one-half the difference of n and 3

17 The freshman class held a canned food drive for 12 weeks. The results are summarized in the table below.

Canned Food Drive Results

Week	1	2	3	4	5	6	7	8	9	10	11	12
Number of Cans	20	35	32	45	58	46	28	23	31	79	65	62

Which number represents the second quartile of the number of cans of food collected?

(1) 29.5

(2) 30.5

(3) 40

(4) 60

Use this space for computations.

18 Which expression represents $\frac{-14a^2c^8}{7a^3c^2}$ in simplest form?

(1) $-2ac^4$

(2) $-2ac^6$

(3) $\frac{-2c^4}{a}$

(4) $\frac{-2c^6}{a}$

19 Which value of x is the solution of $\frac{x}{3} + \frac{x+1}{2} = x$?

(1) 1

(2) -1

(3) 3

(4) -3

20 When 36 is subtracted from the square of a number, the result is five times the number. What is the positive solution?

(1) 9

(2) 6

(3) 3

(4) 4

21 Which interval notation represents the set of all numbers greater than or equal to 5 and less than 12?

(1) [5, 12)

(2) (5, 12]

(3) (5, 12)

(4) [5, 12]

Use this space for computations.

22 Four hundred licensed drivers participated in the math club's survey on driving habits. The table below shows the number of drivers surveyed in each age group.

Ages of People in Survey on Driving Habits

Age Group	Number of Drivers
16–25	150
26–35	129
36–45	33
46–55	57
56–65	31

Which statement best describes a conclusion based on the data in the table?

(1) It may be biased because no one younger than 16 was surveyed.

(2) It would be fair because many different age groups were surveyed.

(3) It would be fair because the survey was conducted by the math club students.

(4) It may be biased because the majority of drivers surveyed were in the younger age intervals.

23 A formula used for calculating velocity is $v = \frac{1}{2}at^2$. What is a expressed in terms of v and t?

(1) $a = \frac{2v}{t}$

(2) $a = \frac{2v}{t^2}$

(3) $a = \frac{v}{t}$

(4) $a = \frac{v}{2t^2}$

Use this space for computations.

24 What is the sum of $\frac{-x + 7}{2x + 4}$ and $\frac{2x + 5}{2x + 4}$?

(1) $\frac{x + 12}{2x + 4}$

(2) $\frac{3x + 12}{2x + 4}$

(3) $\frac{x + 12}{4x + 8}$

(4) $\frac{3x + 12}{4x + 8}$

25 Steve ran a distance of 150 meters in $1\frac{1}{2}$ minutes. What is his speed in meters per hour?

(1) 6

(2) 60

(3) 100

(4) 6,000

26 How many different three-letter arrangements can be formed using the letters in the word *ABSOLUTE* if each letter is used only once?

(1) 56

(2) 112

(3) 168

(4) 336

27 Factored completely, the expression $3x^2 - 3x - 18$ is equivalent to

(1) $3(x^2 - x - 6)$

(2) $3(x - 3)(x + 2)$

(3) $(3x - 9)(x + 2)$

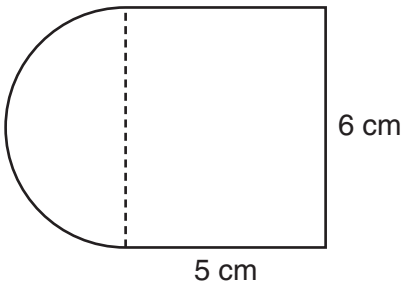
(4) $(3x + 6)(x - 3)$

Use this space for computations.

28 Which quadrant will be completely shaded in the graph of the inequality $y \leq 2x$?

(1) Quadrant I
(2) Quadrant II
(3) Quadrant III
(4) Quadrant IV

29 A figure is made up of a rectangle and a semicircle as shown in the diagram below.



What is the area of the figure, to the *nearest tenth of a square centimeter*?

(1) 39.4
(2) 44.1
(3) 48.8
(4) 58.3

30 The value, y, of a \$15,000 investment over x years is represented by the equation $y = 15000(1.2)^{\frac{x}{3}}$. What is the profit (interest) on a 6-year investment?

(1) \$6,600
(2) \$10,799
(3) \$21,600
(4) \$25,799

Part II

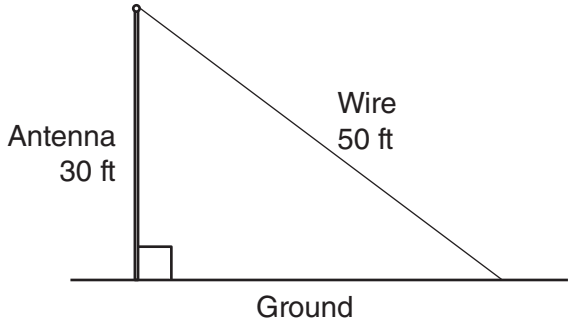
Answer all 3 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [6]

31 Alexis calculates the surface area of a gift box as 600 square inches. The actual surface area of the gift box is 592 square inches. Find the relative error of Alexis' calculation expressed as a decimal to the *nearest thousandth.*

32 Perform the indicated operation: $-6(a - 7)$

State the name of the property used.

33 A communications company is building a 30-foot antenna to carry cell phone transmissions. As shown in the diagram below, a 50-foot wire from the top of the antenna to the ground is used to stabilize the antenna.



Find, to the *nearest degree*, the measure of the angle that the wire makes with the ground.

Part III

Answer all 3 questions in this part. Each correct answer will receive 3 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [9]

34 Given: $A = \{18, 6, -3, -12\}$

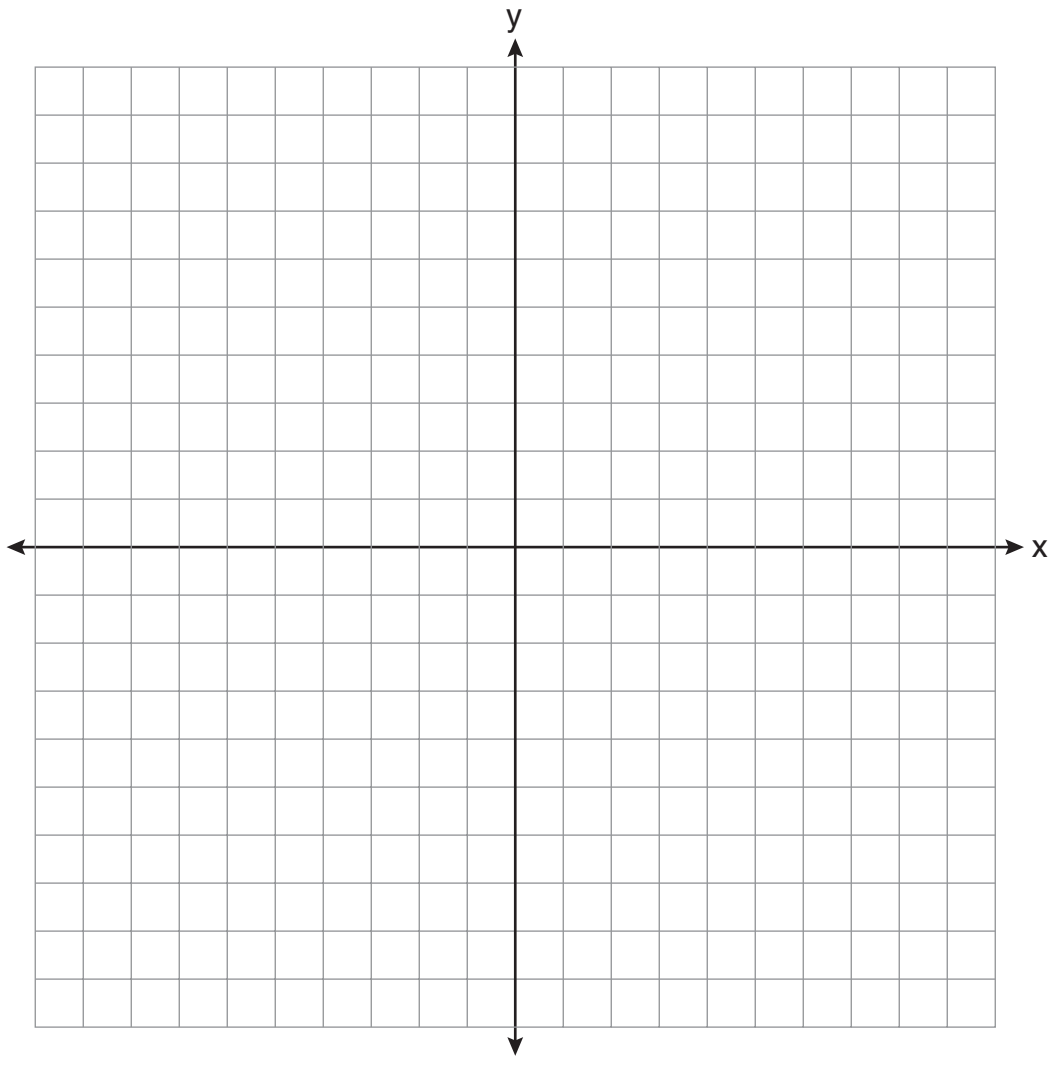
Determine all elements of set A that are in the solution of the inequality $\frac{2}{3}x + 3 < -2x - 7$.

35 Graph and label the following equations on the set of axes below.

$$y = |x|$$

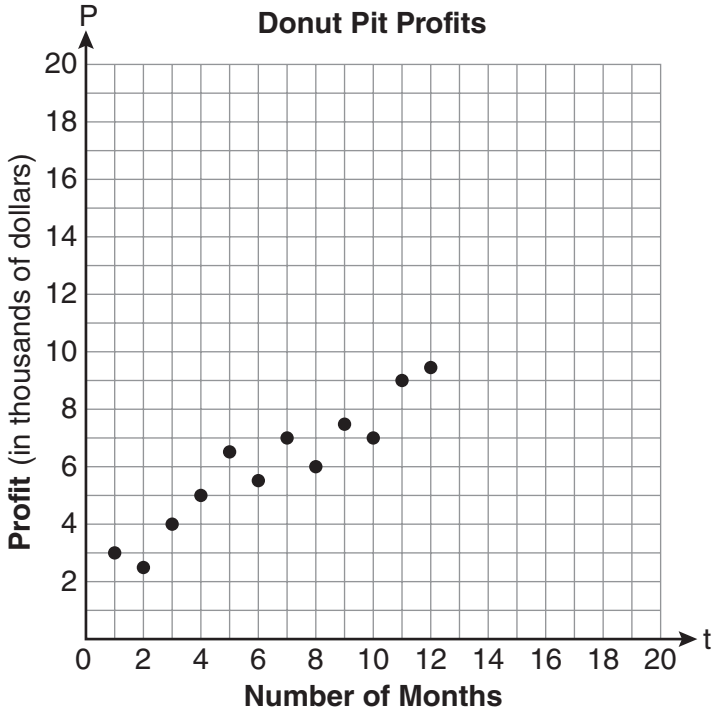
$$y = \left|\frac{1}{2}x\right|$$

Explain how *decreasing* the coefficient of x affects the graph of the equation $y = |x|$.



36 Megan and Bryce opened a new store called the Donut Pit. Their goal is to reach a profit of $20,000 in their 18th month of business. The table and scatter plot below represent the profit, *P*, in thousands of dollars, that they made during the first 12 months.

t (months)	1	2	3	4	5	6	7	8	9	10	11	12
P (profit, in thousands of dollars)	3.0	2.5	4.0	5.0	6.5	5.5	7.0	6.0	7.5	7.0	9.0	9.5



Draw a reasonable line of best fit.

Using the line of best fit, predict whether Megan and Bryce will reach their goal in the 18th month of their business.

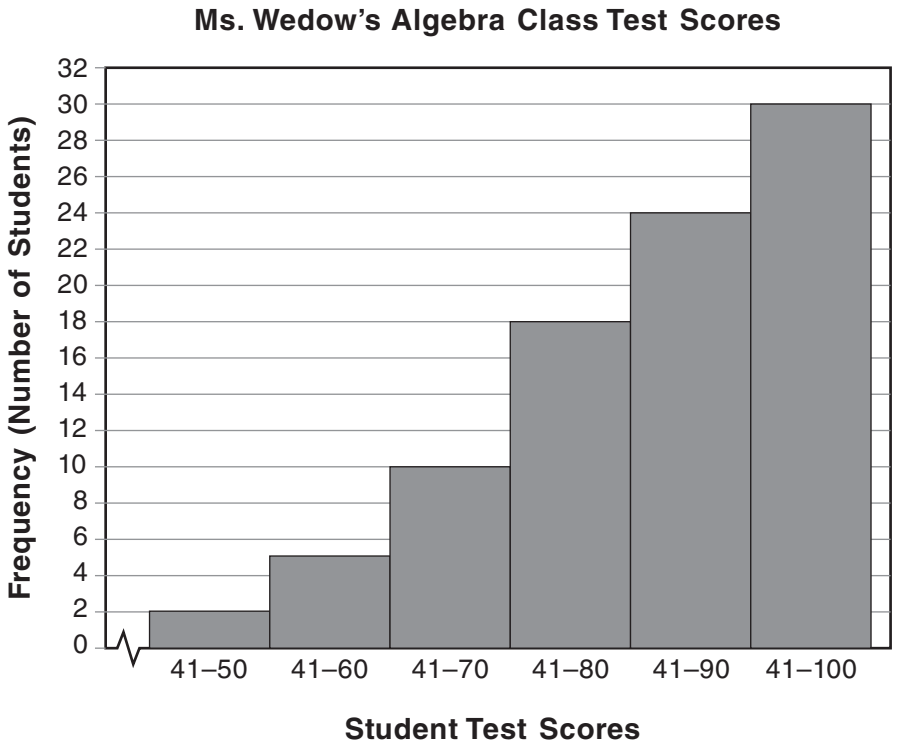
Justify your answer.

Part IV

Answer all 3 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

37 Express in simplest form: $\dfrac{x^2 + 9x + 14}{x^2 - 49} \div \dfrac{3x + 6}{x^2 + x - 56}$

38 The diagram below shows a cumulative frequency histogram of the students' test scores in Ms. Wedow's algebra class.



Determine the total number of students in the class.

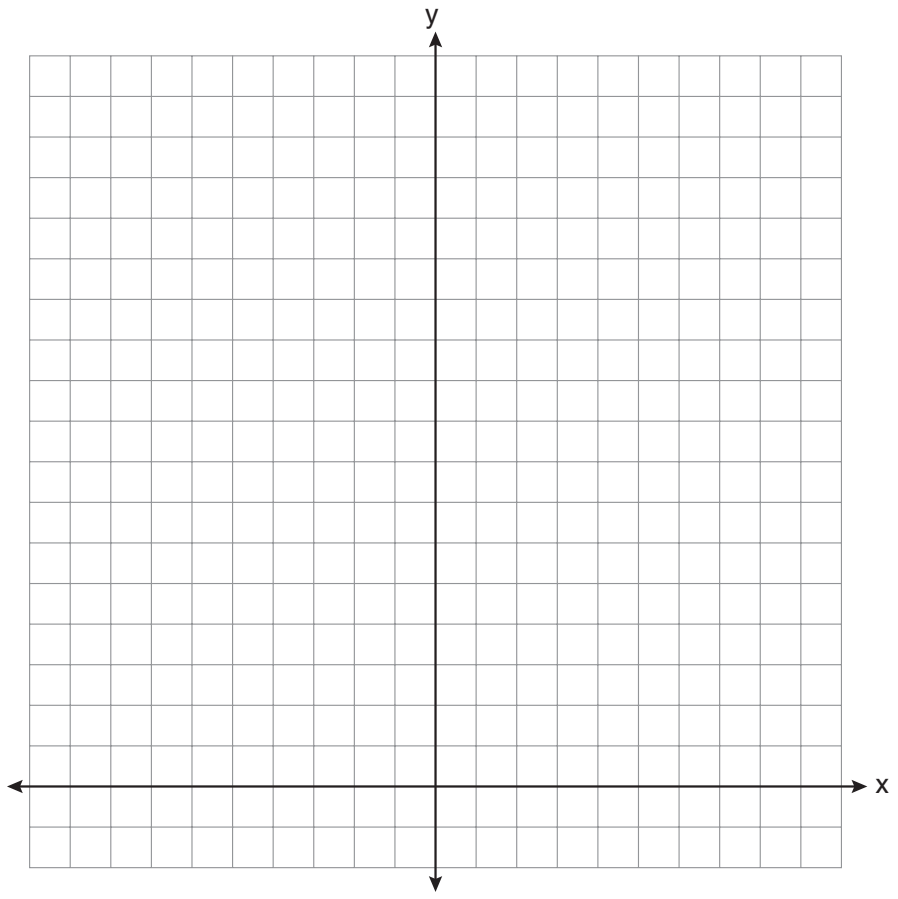
Determine how many students scored higher than 70.

State which *ten-point* interval contains the median.

State which *two ten-point* intervals contain the same frequency.

39 On the set of axes below, solve the following system of equations graphically for all values of x and y.

$$y = -x^2 - 4x + 12$$
$$y = -2x + 4$$



Part I

Allow a total of 60 credits, 2 credits for each of the following. Allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 4	(9) 2	(17) 3	(25) 4
(2) 4	(10) 1	(18) 4	(26) 4
(3) 3	(11) 3	(19) 3	(27) 2
(4) 2	(12) 3	(20) 1	(28) 4
(5) 1	(13) 4	(21) 1	(29) 2
(6) 3	(14) 3	(22) 4	(30) 1
(7) 3	(15) 2	(23) 2	
(8) 3	(16) 4	(24) 1	