

Section 4

Mathematics Achievement

47 Questions

Time: 40 minutes

Each question is followed by four suggested answers. Read each question and then decide which one of the four suggested answers is best.

Find the row of spaces on your answer document that has the same number as the question. In this row, mark the space having the same letter as the answer you have chosen. You may write in your test booklet.

SAMPLE QUESTION:

Sample Answer

If $a = 3$, what is the value $a^2 + (3 \times 4) \div 6$?

A B C D

(A) 3.5

(B) 11

(C) 14.5

(D) 20

The correct answer is 11, so circle B is darkened.

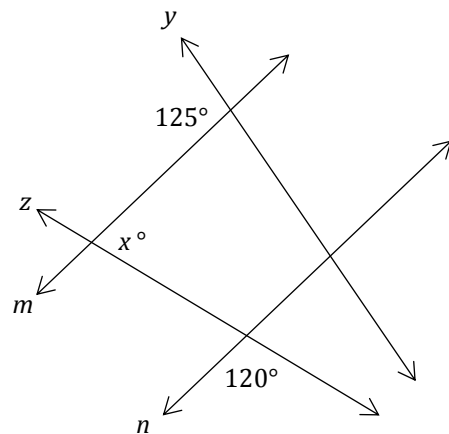
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- Which value is NOT equal to $4\sqrt{4}$?
 - $\sqrt{64}$
 - 8
 - $4^{\frac{3}{2}}$
 - 4^{-4}
- What is the value of the numerical expression $(1.5 \times 10^3) \times (2.0 \times 10^6)$?
 - 0.5×10^3
 - 3.5×10^6
 - 3.0×10^9
 - 3.4×10^{18}
- Augustus owns an analog clock. It takes twelve hours for the clock's hour hand to make one complete revolution around the clock's face. When Augustus first looked at the clock, it was 5:00pm. The next time he looked at the clock, it was 6:30pm. How many degrees did the clock's hour hand travel during this time?
 - 30°
 - 45°
 - 60°
 - 90°
- Jessica and Elise are both making posters for their school's club fair. Jessica can make a 12" by 12" poster in 30 minutes, and Elise can make an 18" by 12" poster in 45 minutes. Which girl would be able to make a 30" by 30" poster in the least amount of time?
 - Jessica
 - Elise
 - It would take them the same amount of time.
 - The answer cannot be determined from the information given.

- For what value(s) of x does $\frac{x^2-36}{x^0-4} = 0$?
 - $x = 6$ only
 - $x = -6$ and $x = 6$
 - $x = 4$
 - $x = 4, x = -6,$ and $x = 6$

- Parallel lines m and n are intersected by lines z and y .



Note: Figure is not to scale.

What is the value of x ?

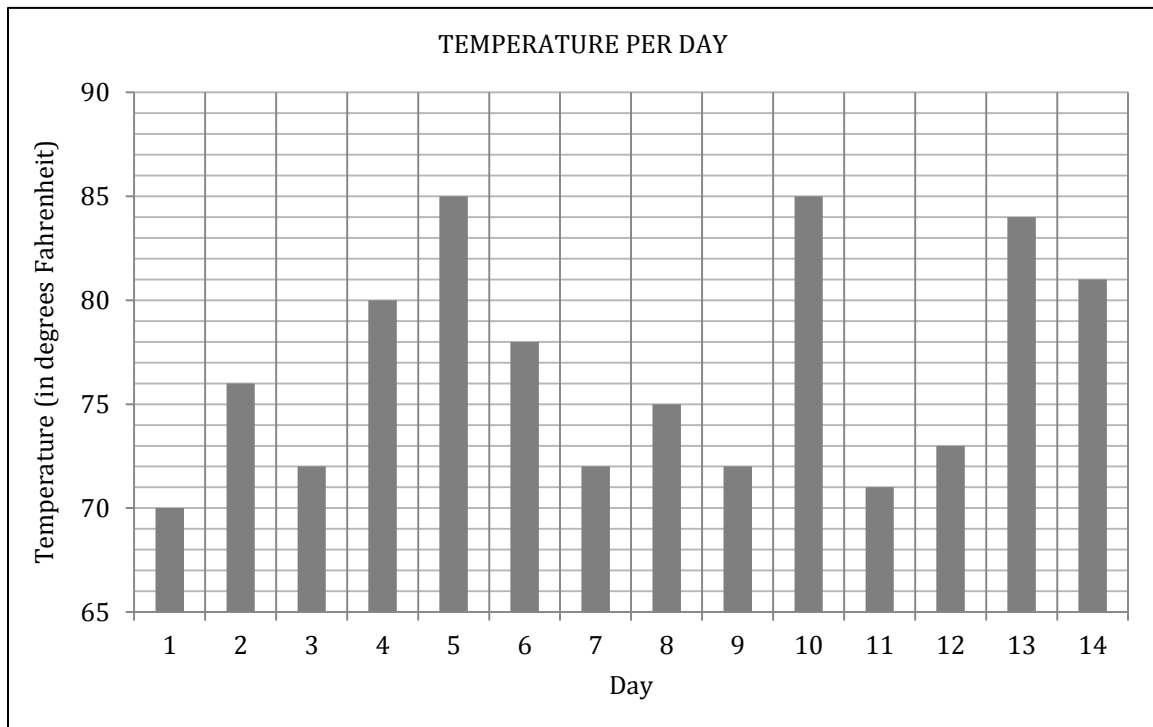
- 55
 - 60
 - 75
 - 90
- Point $(0, 4)$ lies on a circle whose center is $(4, 1)$. What is the area of the circle in square grid units?
 - 4π
 - 10π
 - 25π
 - 30π

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8. What is the value of the numerical expression $\sqrt{4 + 16}$?
- (A) $2\sqrt{5}$
(B) 4
(C) 6
(D) $10\sqrt{2}$
9. What is the result of the expression $\begin{bmatrix} 0 & 1 \\ 3 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 4 & 6 \\ 5 & 2 & 1 \end{bmatrix}$?
- (A) $\begin{bmatrix} 1 & 5 \\ 8 & 3 \end{bmatrix}$
(B) $\begin{bmatrix} 0 & 4 \\ 15 & 2 \end{bmatrix}$
(C) $\begin{bmatrix} 1 & 5 & 7 \\ 8 & 3 & 2 \end{bmatrix}$
(D) This operation is not possible.
10. The formula for the volume of a cone is $\frac{1}{3}\pi r^2 h$. A cone has a height of 8 cm and a volume of 24π cm³. What is the surface area of its base?
- (A) 4π cm²
(B) 9π cm²
(C) 12π cm²
(D) 36π cm²
11. Serena is making a graph of the heights and weights of all the students in her class. What is the most reasonable unit she should use to represent the students' weights?
- (A) milligrams
(B) meters
(C) cubic centimeters
(D) kilograms
12. Let $i^0 = x$. The value of x is a(n):
- (A) irrational number
(B) complex number
(C) whole number
(D) imaginary number
13. Pete has a drawer that contains 5 pairs of yellow socks, 6 pairs of black socks, 2 pairs of striped socks, and 7 pairs of white socks. Pete randomly selects one sock from the drawer and puts it on. Then, he randomly selects another. What is the chance that both socks are white?
- (A) $\frac{7}{20} \times \frac{13}{39}$
(B) $\frac{7}{40} \times \frac{7}{40}$
(C) $\frac{7}{20} + \frac{7}{20}$
(D) $\frac{7}{30} \times \frac{13}{39}$

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14. The bar graph below represents the temperature recorded on fourteen consecutive days.



What is the mode of the data?

- (A) 70°
- (B) 72°
- (C) 80°
- (D) 85°

15. The first six terms of an arithmetic sequence are shown below.

$$24, 17, 10, 3, -4, -11$$

Which expression represents the n th term in this sequence?

- (A) $n - 7$
- (B) $n + 7$
- (C) $-7n + 24$
- (D) $-7n + 31$

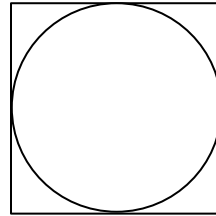
16. There are 5,280 feet in 1 mile and there are 3.28 feet in one meter. A cheetah can run up to 75 miles per hour. Which expression represents the cheetah's maximum speed in meters per second?

- (A) $\frac{75 \times 5,280}{3.28 \times 60 \times 60}$
- (B) $\frac{75 \times 5,280 \times 60}{3.28 \times 60}$
- (C) $\frac{75 \times 5,280 \times 3.28}{60 \times 60}$
- (D) $\frac{60 \times 60}{75 \times 5,280 \times 3.28}$

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17. A 40 foot tall building has a shadow that is 32 feet long. Lauren, who is 5 feet tall, is standing next to the building. What is the length of Lauren's shadow?
- (A) 2.5 feet
(B) 3 feet
(C) 4 feet
(D) 4.2 feet
18. The grocery store raised the price of bread by \$0.90 a loaf, which was a 30% increase in price. What was the original price of a loaf of bread?
- (A) \$2.60
(B) \$3.00
(C) \$3.30
(D) \$3.90
19. If $(2.85 + 7.15)\frac{m}{10} = 10$, then what is the value of m ?
- (A) 0
(B) 1
(C) 10
(D) 20
20. Which expression is equivalent to the expression $(2x^3y^4)(x^{-3}y^2) + 2y^6$?
- (A) $4y^6$
(B) $4x^9y^8$
(C) $2x^6y^6 + 2y^6$
(D) $4x^0y^{12}$
21. The least common multiple of 2, 4, and p is 12. What is a possible value for p ?
- (A) 2
(B) 4
(C) 5
(D) 6

22. A circle is inscribed in a square, as shown below.



The area of the circle is $9\pi \text{ cm}^2$. What is the area of the square?

- (A) 3 cm^2
(B) 9 cm^2
(C) 16 cm^2
(D) 36 cm^2
23. Hannah asked 180 students about their favorite ice cream preferences and used the data to make the table shown below.

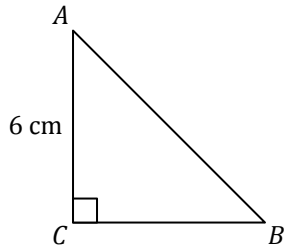
Flavor	Number of Students
chocolate	35
vanilla	60
strawberry	15
mint	25
cookie dough	45

If Hannah were to make a circle graph using this data, what would be the central angle of the portion of the graph representing vanilla?

- (A) 30°
(B) 60°
(C) 120°
(D) 180°

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24. Triangle ABC is shown. The length of AC is 6 cm. The measure of angle CAB is 50° .



The value of which expression is equal to the length of side AB ?

- (A) $\frac{6}{\sin 40^\circ}$
 - (B) $\frac{6}{\sin 90^\circ}$
 - (C) $6 \tan 50^\circ$
 - (D) $6 \sin 50^\circ$
25. A long distance phone call costs \$10.00 for the first ten minutes, and \$0.75 for each additional thirty seconds. Which of the following expressions, in dollars, represents the cost of a phone call lasting for 23 minutes?
- (A) $10.00 + 0.75(13)$
 - (B) $10.00 + 1.5(13)$
 - (C) $10.00 + 0.75 + 23$
 - (D) $10.00 + \frac{23}{0.75}$
26. At a fundraiser, there are 27 volunteers that need to be divided into groups. If at least 5 but no more than 9 people can be in a group, and no two groups can have the same number of volunteers, what is the smallest number of groups required to accommodate all 27 volunteers?
- (A) 4
 - (B) 5
 - (C) 7
 - (D) 8

27. The table below shows the result of a survey that asked 800 people if they liked country music or rock music.

Music Type	Number of People
Country	300
Rock	700

Based on this information, how many people liked both country and rock music?

- (A) 100
 - (B) 200
 - (C) 500
 - (D) 1000
28. In Figure 1, the perimeter of the two congruent trapezoids is 48.

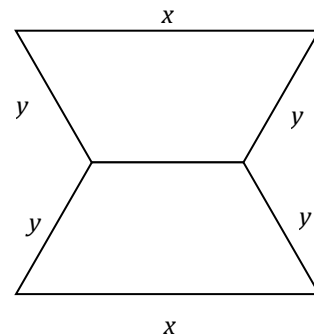


Figure 1

- If $x = 12$ cm, then what is the length of y ?
- (A) 24
 - (B) 12
 - (C) 8
 - (D) 6

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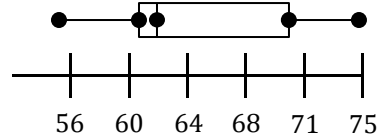
29. Sam needs to make a password that is four characters long. The first two characters must be alphabetical letters, and the second two characters must be numerical digits from zero through nine. None of the letters or numbers can be used more than once. How many different passwords are possible?

- (A) $26 \times 26 \times 10 \times 10$
- (B) $26 \times 25 \times 10 \times 9$
- (C) $\frac{26}{26} \times \frac{25}{26} \times \frac{10}{10} \times \frac{9}{10}$
- (D) $\frac{1}{26} \times \frac{1}{26} \times \frac{1}{10} \times \frac{1}{10}$

30. If $30 + m^{1/2} = 30$, then what is $30 \times m$?

- (A) 31
- (B) 30
- (C) 1
- (D) 0

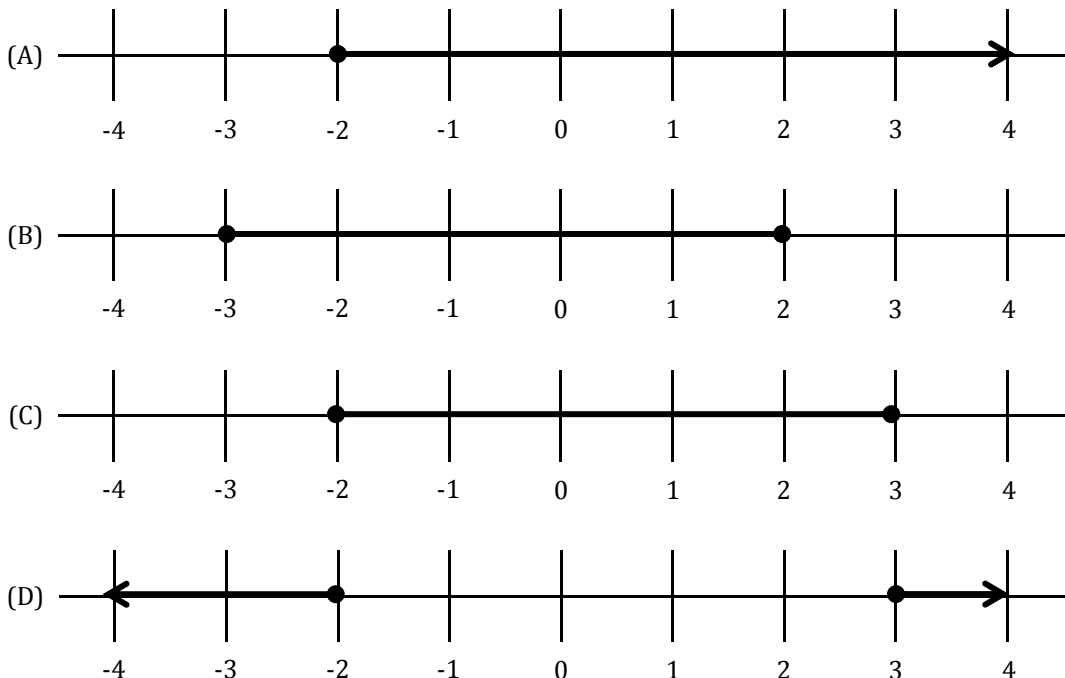
31. The box-and-whisker plot below represents the heights of thirty people in Jessica's family.



What is the median height of Jessica's family members?

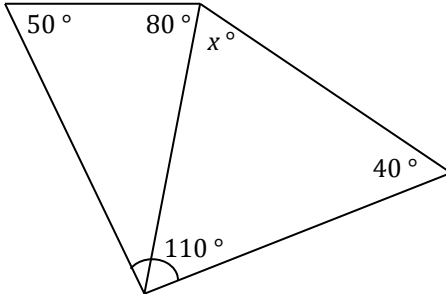
- (A) 56
- (B) 62
- (C) 65
- (D) 75

32. Which number line below represents the solution set of the inequality $|2x - 1| \leq 5$?



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33. In the figure below, two adjacent triangles form a quadrilateral. The measures of the angles of these triangles are shown below.



Note: figure is not to scale.

What is the value of x ?

- (A) 50
 (B) 65
 (C) 80
 (D) 85
34. A and B have an average of 15. If A is greater than B , which of the following MUST be true?
- (A) $A - B = 15$
 (B) $\frac{A}{B} \times 2 = 15$
 (C) $A = 12$ and $B = 18$
 (D) $(A + B) \div 2 = 15$

35. The table below shows the amount of sun exposure given to five different plants and each plant's growth over the day.

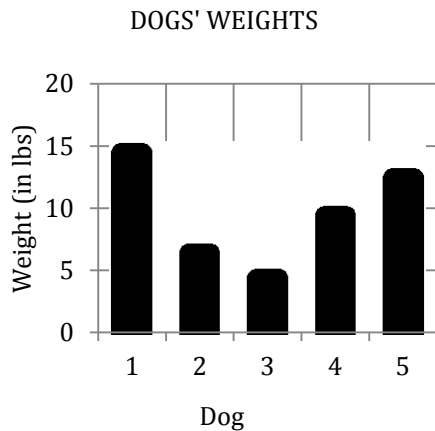
Amount of Sun Exposure (Hours)	Growth (Millimeters)
1	1.5
2	3
3	4.5
4	6
5	7.5

If you were to create a graph of this data with the amount of sun exposure on the x -axis and the amount of growth on the y -axis, what would the slope of the line be?

- (A) -1.5
 (B) 0
 (C) 1.5
 (D) 2.0

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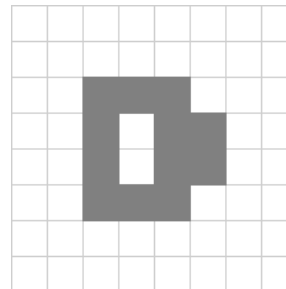
36. The bar graph below represents the weights, in pounds, of 5 different dogs.



If 5 more dogs with an average weight of 5 pounds are added, what will be the approximate average weight of all 10 dogs?

- (A) 5
 - (B) 7.5
 - (C) 10
 - (D) 55
37. In the first round of a spelling contest, each student had to spell 2 words. Miriam took an average of 10 seconds to spell each word. Jake and Rafael took an average of 15 seconds per word, and Sam took an average of 5 seconds per word. At the end of the first round, what was the total time for all 4 students?
- (A) 30 seconds
 - (B) 60 seconds
 - (C) 90 seconds
 - (D) 100 seconds

38. The area of each grid square shown is 10 cm².



What is the area of the shaded region?

- (A) 60 cm²
 - (B) 100 cm²
 - (C) 120 cm²
 - (D) 140 cm²
39. If $y(x + 2)(x - 2) = 2x^2 - 8$, which of the following could be the value of y ?
- (A) 0
 - (B) 1
 - (C) 2
 - (D) 4
40. Let $\sqrt{2x} = i$. What is the value of x ?
- (A) $2i$
 - (B) $\frac{i}{2}$
 - (C) $i^{1/2}$
 - (D) $-\frac{1}{2}$
41. If $f(x) = |-(x^2) - 3|$, then what is the value of $f(-1)$?
- (A) -4
 - (B) -3
 - (C) 3
 - (D) 4

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42. A line with points (0, 1) and (2, -3) is plotted on a graph. What is the slope of the line?

- (A) -3
- (B) -2
- (C) $-\frac{1}{2}$
- (D) 2

43. The ratio of mammals to reptiles at the zoo was 4:1. For every 20 mammals, how many reptiles were there?

- (A) 80
- (B) 20
- (C) 5
- (D) 4

44. The table below shows the probability that Melinda will pick each color button out of a bag.

Color	Probability
Blue	$\frac{3}{10}$
Red	$\frac{1}{5}$
Green	$\frac{3}{10}$
Purple	$\frac{1}{5}$

If she selects a button at random, which color(s) is she most likely to select?

- (A) Blue
- (B) Red
- (C) Blue or green
- (D) Red or purple

45. Which of the following expressions represents the complete factorization of $x^4 - 16$?

- (A) $(x - 4)(x + 4)$
- (B) $(x^2 - 4)(x^2 + 4)$
- (C) $4(x^1 - 4)$
- (D) $(x + 2)(x - 2)(x^2 + 4)$

46. The following stem-and-leaf-plot represents the weight of 12 people.

Stem	Leaf
9	8 9 9
10	5
11	6 7 9
12	1 3 8
13	1
14	
15	7

What is the range of the data?

- (A) 59
- (B) 98
- (C) 99
- (D) 157

47. What is the result of the expression

$$\begin{bmatrix} 1 & 4 \\ 7 & 2 \end{bmatrix} + \begin{bmatrix} 2 & 3 \\ 0 & 1 \end{bmatrix} ?$$

- (A) $\begin{bmatrix} 3 & 7 \\ 7 & 3 \end{bmatrix}$
- (B) $\begin{bmatrix} 1 & 1 \\ 7 & 1 \end{bmatrix}$
- (C) $\begin{bmatrix} 2 & 12 \\ 0 & 2 \end{bmatrix}$
- (D) $\begin{bmatrix} 7 & 3 \\ 0 & 1 \end{bmatrix}$

STOP. Do not go on until told to do so.

