Mathematics Test

Time: 60 minutes for 60 questions

Directions: Each question has five answer choices. Choose the best answer for each question, and then shade in the corresponding oval on your answer sheet.

1. Jackson worked 25 hours and received $225. At the same rate of pay, how much would he make if he worked 40 hours?

   (A) $300
   (B) $325
   (C) $350
   (D) $360
   (E) $400

2. What is the missing number in the sequence 1, 5, 10, 16, 23, 31, __?

   (F) 37
   (G) 38
   (H) 39
   (J) 40
   (K) 41

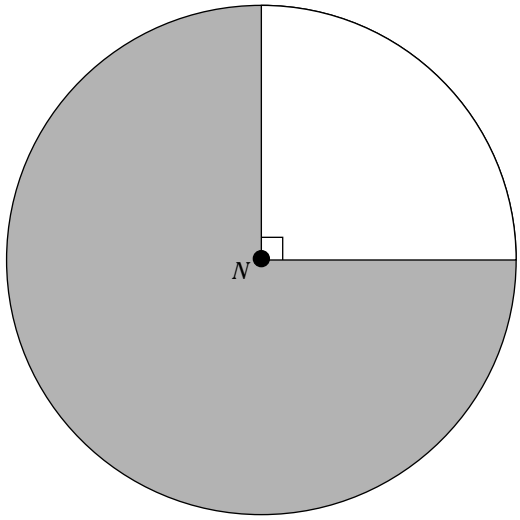
3. If $x = 6$ and $y = -2$, what is the value of $3xy + 2x^2 - y^3$?

   (A) 44
   (B) 48
   (C) 50
   (D) 52
   (E) 56

4. Noreen recently took a job helping people register to vote. The job has a mandatory 10-day period of probation during which her success rate is strictly monitored. On her first day, she registered 30 people. Then, for each of the next 9 days, she registered 4 more people than she did on the previous day. How many people did she register altogether during her probationary period?

   (F) 300
   (G) 340
   (H) 480
   (J) 560
   (K) 600

5. In the following figure, the circle centered at N has a radius of 4. What is the area of the shaded region?



   (A) 3π
   (B) 6π
   (C) 9π
   (D) 12π
   (E) 16π

6. Tara's three bowling scores in a tournament were 167, 178, and 186. What was her average score for the tournament?

   (F) 176
   (G) 177
   (H) 178
   (J) 179
   (K) 180

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7. What is the value of k if $\sqrt{10k+3} = 5$?

(A) 0.2
(B) 2
(C) 2.2
(D) 2.8
(E) 4.7

8. Which of the following is equivalent to $-8(x-2) < 3x - 6$?

(F) $x < 2$
(G) $x > 2$
(H) $x \geq -2$
(J) $x < -2$
(K) $x > -2$

9. How many different positive integers are factors of both 28 and 42?

(A) 1
(B) 2
(C) 3
(D) 4
(E) More than 4

10. What is the slope of a line that includes the points (–4, 1) and (10, –6)?

(F) 2
(G) $\frac{1}{2}$
(H) $-\frac{1}{2}$
(J) $\frac{6}{7}$
(K) $-\frac{7}{6}$

11. If $3x + 5y = 4$, which of the following is equivalent to the expression $(6x + 10y)(100x + 100y)$?

(A) $100x + 100y$
(B) $200x + 200y$
(C) $400x + 400y$
(D) $800x + 800y$
(E) $1{,}600x + 1{,}600y$

12. What is the value of x if $x^2 - 5x - 14 = 0$ and $x > 0$?

(F) 2
(G) 4
(H) 5
(J) 7
(K) 9

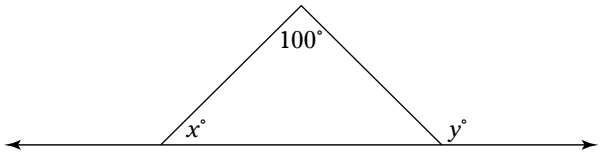
13. If $\frac{3n}{2} = \frac{4n+3}{3}$, then $n =$

(A) 6
(B) 7
(C) 9
(D) 11
(E) 13

14. If the height of an equilateral triangle is 9, what is its area?

(F) 27
(G) 54
(H) 81
(J) $27\sqrt{3}$
(K) $54\sqrt{3}$

15. In the following figure, what is the value of y in terms of x?



(A) $x + 80$
(B) $80 - x$
(C) $x + 100$
(D) $x - 100$
(E) $100 - x$

16. If 15% of n is 300, what is 22% of n?

(F) 400
(G) 440
(H) 480
(J) 525
(K) 550

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17. What is the formula of a line that is perpendicular to $y = \frac{1}{3}x + 9$ and includes the point (3, 4)?

(A) $y = \frac{1}{3}x + 5$

(B) $y = -\frac{1}{3}x + 13$

(C) $y = 3x + 5$

(D) $y = -3x + 5$

(E) $y = -3x + 13$

18. Two values of m satisfy the equation $|5m - 11| - 3m = 9$. What is the result when you multiply these two values together?

(F) 2.5

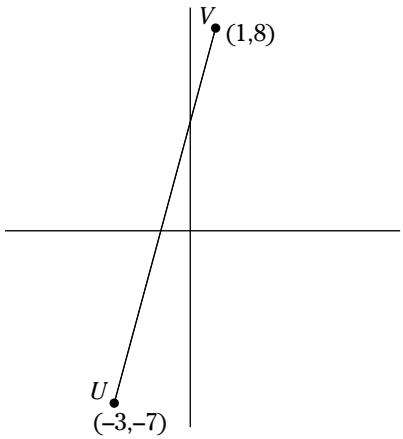
(G) 2.75

(H) 3.2

(J) 3.75

(K) 4.25

19. In the following figure, what is the midpoint of $\overline{UV}$?



(A) $\left(-1, \frac{1}{2}\right)$

(B) $\left(-1, \frac{3}{2}\right)$

(C) $\left(-1, -\frac{1}{2}\right)$

(D) $\left(-2, \frac{1}{2}\right)$

(E) $\left(-2, -\frac{3}{2}\right)$

20. If $f(x) = x^2 + 9$ and $g(x) = 24 + 4x$, what is the value of $\frac{f(4)}{g(-1)}$?

(F) 0.75

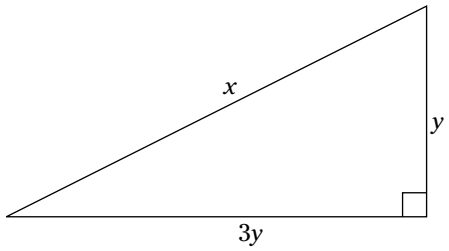
(G) 0.8

(H) 1.2

(J) 1.25

(K) 1.75

21. In the following figure, what is the value of x in terms of y?



(A) $10y$

(B) $10y^2$

(C) $y\sqrt{10}$

(D) $\sqrt{10y}$

(E) $10\sqrt{y}$

22. Two variables, v and w, are inversely proportional such that when $v = 7$, $w = 14$. What is the value of w when $v = 2$?

(F) 1

(G) 4

(H) 14

(J) 28

(K) 49

23. The ratio of adults to girls to boys on a class field trip was 1:4:5. If the trip included 6 more boys than girls, how many adults were with the group?

(A) 3

(B) 4

(C) 6

(D) 8

(E) 12

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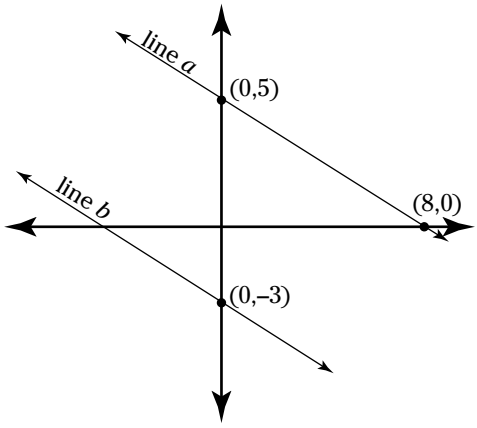
24. In the following figure, line a and line b are parallel and pass through the points shown. What is the equation for line b?



(F) $y = \frac{5}{8}x - 3$

(G) $y = -\frac{5}{8}x + 5$

(H) $y = -\frac{5}{8}x - 3$

(J) $y = \frac{8}{5}x + 5$

(K) $y = -\frac{8}{5}x - 3$

25. A bag contains 7 black socks, 12 white socks, and 17 red socks. If you pick one sock at random from the bag, what is the probability that it will NOT be white?

(A) $\frac{1}{2}$

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

(C) $\frac{3}{4}$

(D) $\frac{7}{12}$

(E) $\frac{7}{36}$

26. If $\tan\theta = \frac{4}{3}$, then $\sin\theta =$

(F) $\frac{3}{4}$

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

(H) $\frac{4}{5}$

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

(K) $\frac{5}{4}$

27. If $pq = 3$, then $p^3q^4 + p^4q^5 =$

(A) $12q$

(B) $7p + 9q$

(C) $12p + 20q$

(D) $96p$

(E) $108q$

28. Jane ran around the perimeter of a rectangular park at a constant rate of 10 feet per second. The park has an area of 67,500 square feet, and its length is exactly three times its width. For how many seconds did Jane run?

(F) 60

(G) 120

(H) 240

(J) 360

(K) 480

Use this information to answer Questions 29 and 30: Danielle's phone plan charges her $30 per month for the first 200 minutes and then $0.10 per minute for each subsequent minute.

29. Which of the following functions takes an input of any whole number value of $x \geq 200$ and outputs the value for $f(x)$ as the amount of dollars Danielle would pay for x minutes of phone usage?

(A) $f(x) = 0.1x + 10$

(B) $f(x) = 0.1x + 20$

(C) $f(x) = 0.1x + 30$

(D) $f(x) = 0.1x + 200$

(E) $f(x) = 0.1x + 230$

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30. If Danielle paid exactly \$100 last month, how many minutes did she use?

(F) 700

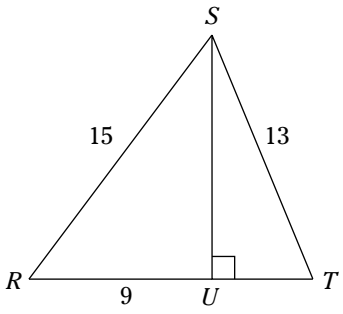
(G) 800

(H) 900

(J) 1,000

(K) 1,200

31. What is the area of $\triangle RST$ in the following figure?



(A) 84

(B) 91

(C) 96

(D) 105

(E) 120

32. Antoine bought a new electric guitar that cost \$588.60 after 9% sales tax was added. What was the price of the guitar without tax?

(F) \$536

(G) \$540

(H) \$542

(J) \$545

(K) \$548

33. Which of the following points on the *xy*-graph is the *x*-intercept of the equation $y = 2x - 8$?

(A) (0, 4)

(B) $(0, \frac{1}{4})$

(C) (4, 0)

(D) (–4, 0)

(E) $(-\frac{1}{4}, 0)$

34. What is the determinant of the matrix $\begin{vmatrix} 3 & 6 \\ -1 & 2 \end{vmatrix}$?

(F) 0

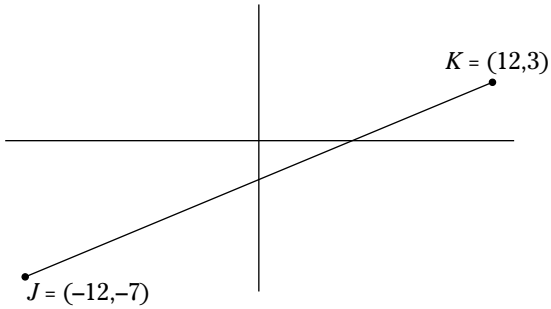
(G) 12

(H) |0|

(J) |6|

(K) |12|

35. In the following figure, what is the length of $\overline{JK}$?



(A) 24

(B) 25

(C) 26

(D) 27

(E) 28

36. If $\left(\frac{1}{49}\right)^{n+3} = \sqrt{7}$, then $n =$

(F) $-\frac{7}{4}$

(G) $\frac{9}{4}$

(H) $-\frac{11}{4}$

(J) $-\frac{13}{4}$

(K) $\frac{15}{4}$

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37. A 25-foot ladder stands against a vertical wall at an angle of n degrees with the ground. If $\sin n = \frac{4}{5}$, how far is the base of the ladder from the wall?

(A) 12

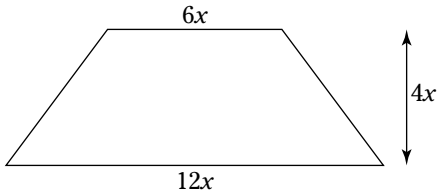
(B) 13

(C) 14

(D) 15

(E) 16

38. In the following figure, if the dimensions of the trapezoid are as shown and the area of the trapezoid is 144, what is the value of x?



(F) 2

(G) 3

(H) 4

(J) 6

(K) 8

39. Ansgar is writing a novel. He writes seven days a week. On each of those days he writes for at least 4 hours but never more than 8 hours. Last week, he wrote for exactly 46 hours. What is the maximum number of days on which he could have written for 8 hours?

(A) 2 days

(B) 3 days

(C) 4 days

(D) 5 days

(E) 6 days

40. Which of the following is a possible value of x if $5x^2 - 10x + 4 = 0$?

(F) $2\sqrt{5}$

(G) $1+2\sqrt{5}$

(H) $1+\frac{\sqrt{5}}{5}$

(J) $2+\frac{\sqrt{5}}{10}$

(K) $10+\frac{\sqrt{5}}{10}$

41. If you multiply a number by 3 and then add 40, the result is the same as if you first add 17 and then multiply by 2. What is the result if you subtract 9 from the number and then multiply by 4?

(A) –60

(B) –72

(C) –84

(D) –108

(E) –124

42. If $7x + 4y = 18$ and $3x + y = -3$, what is the value of $x + y$?

(F) 9

(G) 11

(H) 12

(J) 14

(K) 15

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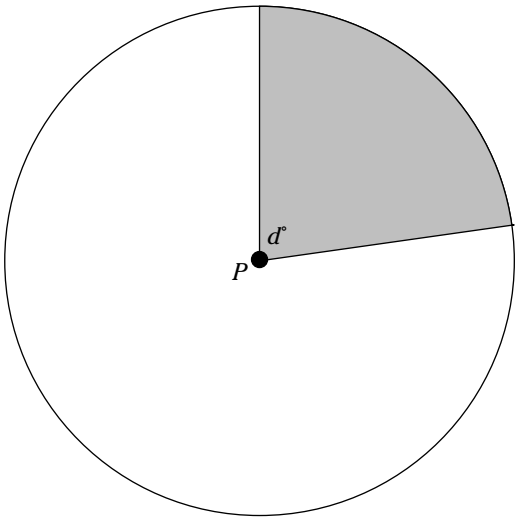
43. In the following figure, the area of the shaded region is 20% of the area of the whole circle centered at P. The angle shown measures d degrees. What is its measurement in radians?



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

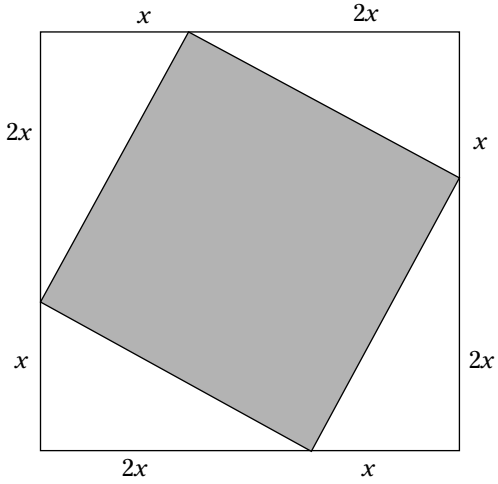
(B) $\frac{2}{5}\pi$

(C) $\frac{4}{5}\pi$

(D) $\frac{2}{15}\pi$

(E) $\frac{4}{15}\pi$

44. In the following figure, the area of the large square is 81. What is the area of the shaded square?



(F) 45

(G) $5\sqrt{3}$

(H) $3\sqrt{5}$

(J) $9\sqrt{5}$

(K) $\sqrt{45}$

45. Let $f(x) = x^2 + 10x + 2$. If $g(x)$ is a transformation that moves $f(x)$ both one unit up and one unit to the right, then $g(x) =$

(A) $x^2 + 8x - 6$

(B) $x^2 + 9x + 3$

(C) $x^2 + 10x - 6$

(D) $x^2 + 11x + 3$

(E) $x^2 + 12x + 6$

46. If $\frac{a+b}{10} = \frac{a-0.1b^2}{a-b}$, what is the value of a?

(F) 0.01

(G) 0.1

(H) 1

(J) 10

(K) 100

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47. A password for a computer system requires exactly 6 characters. Each character can be either one of the 26 letters from A to Z or one of the ten digits from 0 to 9. The first character must be a letter and the last character must be a digit. How many different possible passwords are there?

(A) less than 10^7

(B) between 10^7 and 10^8

(C) between 10^8 and 10^9

(D) between 10^9 and 10^{10}

(E) more than 10^{10}

48. On the xy-plane, what is the area of a circle with this equation: $(x + 3)^2 + (y - 4)^2 = 49$?

(F) 5π

(G) 7π

(H) 25π

(J) 49π

(K) 125π

49. Which of the following is equal to $\sin x \sec x$?

(A) $\tan x$

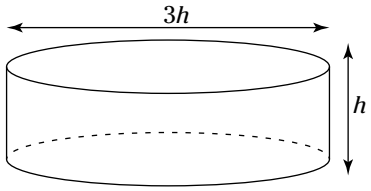
(B) $\cot x$

(C) $\cos x \tan x$

(D) $\cos x \csc x$

(E) $\cot x \csc x$

50. The following figure shows a cylindrical tank whose diameter is 3 times the length of its height. The tank holds approximately 231.5 cubic meters of fluid. Which of the following answer choices most closely approximates the height of the tank?



(F) 2 meters

(G) 3 meters

(H) 4 meters

(J) 5 meters

(K) 6 meters

51. Paulette, Quentin, and Rosie each donated money to a charity. Paulette gave as much money as Quentin and Rosie gave together. If Quentin had given three times more than he gave, he would have given $40 more than Paulette. And if Rosie had given $20 less, she would have given half as much as Paulette. How much did Paulette give?

(A) $80

(B) $120

(C) $160

(D) $200

(E) $240

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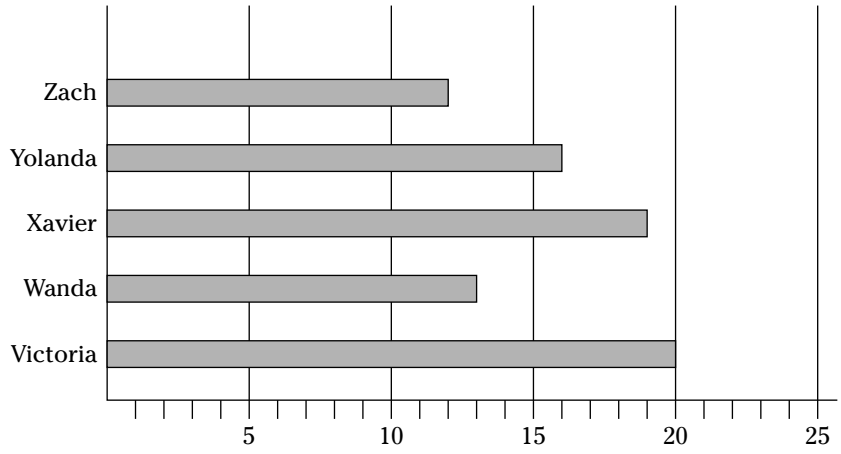
To answer Questions 52 and 53, use the following graph, which provides information about the number of new clients five salespeople registered last month.



52. What percentage of the new clients did Yolanda register?

(F) 18%

(G) 20%

(H) 22%

(J) 24%

(K) 25%

53. Suppose that next month Victoria registers twice as many clients as she did this month and that each of the other four salespeople registers the same number of clients as he or she did this month. In this case, what percentage of clients will Victoria have registered?

(A) 36%

(B) 40%

(C) 44%

(D) 48%

(E) 50%

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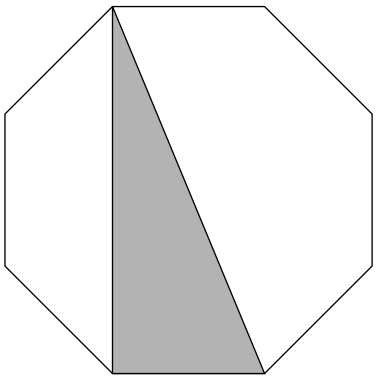
54. In the following figure, the regular octagon has a side with a length of 1. What is the area of the shaded region?



(F) $\sqrt{2}+1$

(G) $\sqrt{2}+2$

(H) $\frac{\sqrt{2}+1}{2}$

(J) $\frac{\sqrt{2}}{2}+1$

(K) $\frac{\sqrt{2}}{2}+2$

55. If $\frac{a}{c}-\frac{a}{b}=\frac{b-c}{a}$, with $a>0$, $b>0$, and $c>0$, what is the value of a in terms of b and c?

(A) $b-c$

(B) $\sqrt{bc}$

(C) $\sqrt{b-c}$

(D) $\frac{\sqrt{b-c}}{bc}$

(E) $\frac{\sqrt{bc}}{b-c}$

56. At 10:00, Angela starts from her home and runs at a constant pace to Kathleen's house, which is exactly 2 miles away. Immediately, she and Kathleen turn around and walk back to Angela's house exactly 4 miles an hour slower than Angela ran. When they arrive at Angela's house, the time is 10:45. At what speed did Angela run?

(F) 6 miles per hour

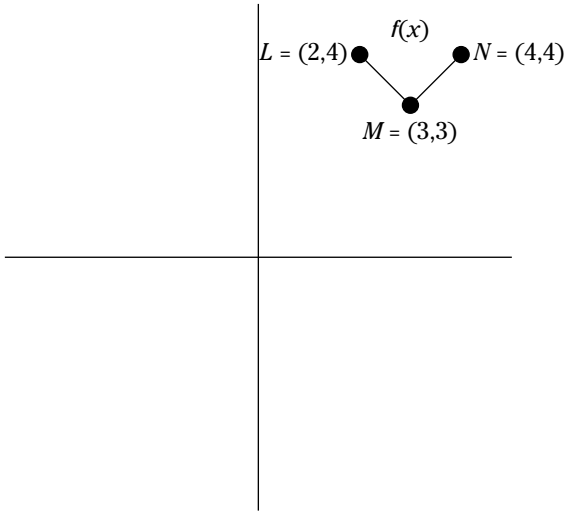
(G) 6.5 miles per hour

(H) 7 miles per hour

(J) 7.5 miles per hour

(K) 8 miles per hour

57. The following figure shows $f(x)$, which includes points L, M, and N plus the line segments $\overline{LM}$ and $\overline{MN}$. Which of the following functions is equivalent to $f(x)$?



(A) $f(x+6)$

(B) $f(x-6)$

(C) $f(6-x)$

(D) $-f(x+6)$

(E) $-f(x-6)$

58. If $\log_9 n=\frac{1}{2}$ and $n>0$, what is the value of $\sqrt{n}$?

(F) 3

(G) $\sqrt{3}$

(H) $\sqrt[3]{3}$

(J) $\sqrt{8}$

(K) $\sqrt[3]{9}$

59. In the complex numbers, where $i=\sqrt{-1}$, the conjugate of any value $a+bi$ is $a-bi$. What is the result when you multiply $2+7i$ by its conjugate?

(A) 45

(B) –45

(C) $45i$

(D) 53

(E) $53i$

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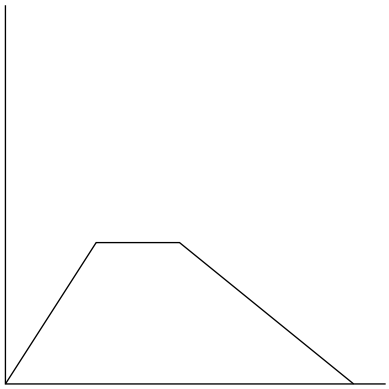
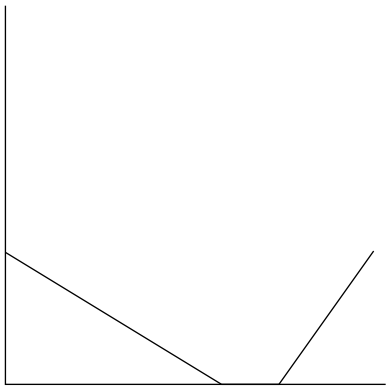
60. Jacob works as a lifeguard at a local pool. At the beginning of a 12-hour overnight shift, the pool was full, and Jacob began draining it. After 2 hours, the pool was completely empty. He spent 3 hours cleaning the pool and then began filling it up again. The pool finished filling just as his shift ended. Which of the following graphs accurately describes the amount of water in the pool throughout Jacob's shift?

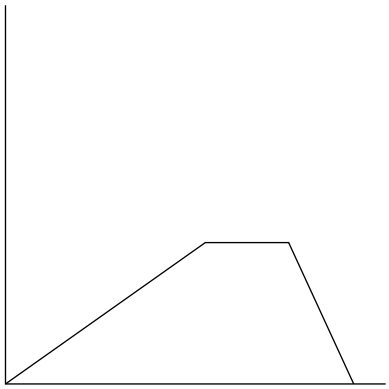
(F)



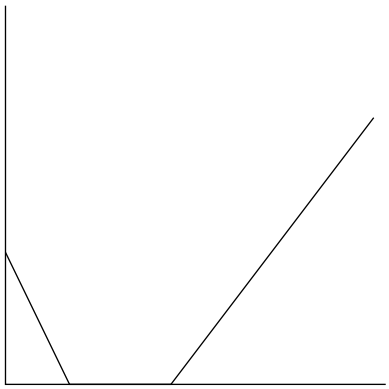
(G)



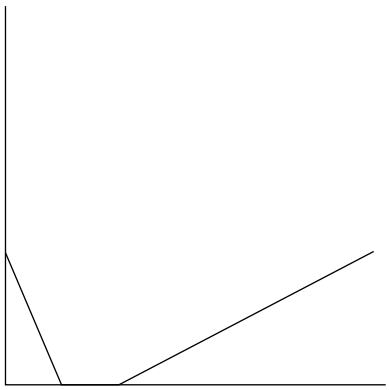
(H)



(J)



(K)



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