



1. $(-9 + 5i) + (-3 + 3i)$

DO YOUR FIGURING HERE

- A. -4
- B. 4
- C. $-4i$
- D. $-8i$
- E. $-12 + 8i$

2. An event coordinator is planning a party and needs 5 liters of juice for every 12 guests. There are 3 liters of juice available, and there will be 36 guests at the party. How many additional liters of juice are needed?

- F. 3
- G. 4
- H. 12
- I. 15
- J. 18

3. In the standard (x,y) coordinate plane, the vertices of a rectangle are A(1,1), B(5,1), C(5,3), and D (1,3). The rectangle is translated to the right 2 units and then down 5 units. What are the new coordinates of point B after these translations are performed on the rectangle?

- A. (0,3)
- B. (3,-1)
- C. (7,3)
- D. (7,-4)
- E. (10,-1)

4. During a certain game, the probability of randomly drawing card B is $\frac{2}{3}$. What is the probability of randomly drawing a card that is not card B?

- F. $\frac{1}{6}$
- G. $\frac{1}{5}$
- H. $\frac{1}{3}$
- I. $\frac{4}{9}$
- J. $\frac{2}{3}$



5. The yearly profits, in dollars, of a small business are modeled by $P(t) = t^3 + 3t^2 - 4$, where P is the yearly profit and t is the number of years since the business started. What are the profits of this small business, in dollars, after the first 5 years of business?

A. \$46
B. \$71
C. \$96
D. \$136
E. \$196

DO YOUR FIGURING HERE

6. At Swan Lake, Cindy's Kayak Rentals charges \$5 per 30 minutes to rent 1 kayak. What is the dollar amount charged to rent 3 kayaks for 2 hours at Cindy's?

A. \$10
B. \$15
C. \$20
D. \$30
E. \$60

7. This weekend, Aisha drove $2\frac{1}{3}$ times the number of miles she drove last weekend. She drove 26 miles last weekend. How many feet did Aisha drive this weekend? (Note: 1 mile = 5,280 feet)

A. 12,320
B. 137,280
C. 149,600
D. 320,320
E. 457,600

8. A certain map is scaled such that 5 cm on the map represents 100 actual miles. To the nearest centimeter, what length on the map represents a distance of 680 actual miles?

F. 20
G. 34
H. 68
I. 105
J. 136



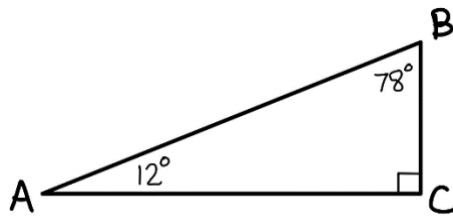
9. Lucas is making picture frames to sell at the local arts and crafts sale. Each picture frame costs Lucas \$15 to make, and he will sell them for \$25 each. What is the minimum number of picture frames he can make and sell to earn a profit of at least \$150?

A. 4
B. 6
C. 9
D. 10
E. 15

DO YOUR FIGURING HERE

10. In the right triangle shown, $m\angle A = 12^\circ$ and $m\angle B = 78^\circ$. Which of the following is equal to $\sin(78^\circ)$?

F. $\cos(12^\circ)$
G. $\cos(78^\circ)$
H. $\sin(12^\circ)$
I. $\tan(12^\circ)$
J. $\tan(78^\circ)$



11. A survey was conducted at a certain high school in which students were asked whether they play video games and whether they participate in any school sports. The partially completed 2-way table gives some of the results of the 736 students who responded. How many of the students who responded participate in a sport but do not play video games?

	Participates in a Sport	Does Not Participate in a Sport	Total
Plays Video Games	110		
Does Not Play Video Games		278	
Total		462	736

A. 164
B. 168
C. 184
D. 194
E. 348



12. Carla, Donna, and Ted played 68 games of a 3-person board game. The 3 possible outcomes for each game are a single winner, a 2-person tie, or a 3-person tie. Ted is a single winner in 15 of the games and Donna is a single winner in 17 of the games. Ted tied 6 games with Carla, 2 games with Donna, and had a three-way tie with both Carla and Donna 5 times. If Carla and Donna tied 2 times, in how many games was Carla a single winner?

DO YOUR FIGURING HERE

- F. 8
G. 17
H. 19
I. 21
J. 32
13. Given that $f(x) = 9x - 2$ and $g(x) = 7x + 10$, it must be true that $f(g(x)) = ?$
- A. $63x + 88$
B. $63x - 4$
C. $63x - 20$
D. $63x^2 - 20$
E. $63x^2 + 76x - 20$

14. What is the sum of the 2 solutions of the equation $x^2 + 3x - 28 = 0$?

DO YOUR FIGURING HERE

- F. -28
- G. -7
- H. -3
- I. 0
- J. 4

15. Which of the following decimals has the greatest value?

- A. 0.1234
- B. $0.123\overline{4}$
- C. $0.12\overline{34}$
- D. $0.1\overline{234}$
- E. $0.\overline{1234}$

16. Which of the following expressions is equal to the expression $\frac{(\sqrt{50})x^3y^{-5}}{x^2}$ for all nonzero values of x and y ?

- F. $25xy^2$
- G. $(25\sqrt{2})xy^5$
- H. $\frac{(5\sqrt{2})x}{y^5}$
- I. $\frac{(5\sqrt{2})x^{\frac{3}{2}}}{y^5}$
- J. $\frac{(5\sqrt{2})x^5}{y^5}$

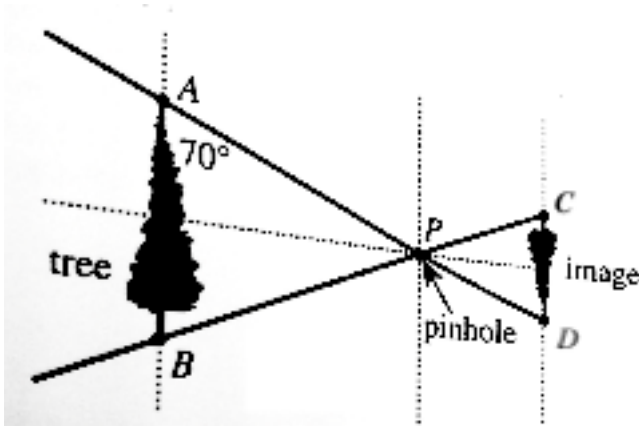
17. What is the product when $3x^2$ is multiplied by the sum of $6x$ and $2x + 1$?

- A. $3x^2 + 8x + 1$
- B. $24x^3 + +1$
- C. $24x^3 + 3x^2$
- D. $36x^3 + 3x^2$
- E. $36x^4 + 18x^3$



18. The figure below illustrates how the image of a tree is produced by a pinhole camera. Point P lies on \overline{AD} , on \overline{BC} , and on the perpendicular bisector of each of the 2 parallel segments \overline{AB} and \overline{CD} . The measure of $\angle BAP$ is 70° . What is the measure $\angle CPD$?

DO YOUR FIGURING HERE



- F. 35°
 G. 40°
 H. 55°
 I. 60°
 J. 70°
19. Let function p be defined by $p(x) = 8x^2 - 5x + 3$. Let function h be defined by $h(x) = x^2 - 8x + 6$. Let function r be defined by $r(x) = p(x) + h(x)$. then $r(x) = ?$
- A. $-4x^2 + 9$
 B. $9x^2 - 13x + 9$
 C. $-4x^3 + 9$
 D. $9x^3 - 13x^2 + 9x$
 E. $9x^4 - 13x^2 + 9$
20. Given the equation $\sqrt{x+1} - 2 = 2$ is true, what is the value of x ?
- F. -1
 G. 1
 H. 3
 I. 15
 J. 17



21. For a certain function f , $f(3) = 4$. What is $f(3 + 2)$?

DO YOUR FIGURING HERE

- A. 2
- B. 5
- C. 6
- D. 7
- E. Cannot be determined from the given information.

22. For a craft project, 2 groups of 4 students donated paper towel rolls throughout the school year. The number of rolls donated by 3 students in Group 1 was the same number of rolls donated by 3 students in Group 2. The 4th student in Group 1 donated 31 rolls. The 4th student in Group 2 donated 71 rolls. Within each group of 4 students, all the rolls were collected and redistributed so that each student had the same number of rolls. After redistribution, each student in Group 1 had 28 rolls. After redistribution, how many rolls did each student in Group 2 have?

- F. 28
- G. 30
- H. 34
- I. 36
- J. 38

23. Given the true inequality $\frac{w}{27} > \frac{16-w}{2}$, which of the following statements about w must be true?

- A. w is positive
- B. w is negative
- C. w is odd
- D. w is even
- E. w is an integer

24. B is an irrational number. Which of the following statements must be true about the value of $20B$?

- F. The value is imaginary
- G. The value is irrational
- H. The value is neither rational nor irrational
- I. The value is rational
- J. The value is undefined



25. What is the slope of a line that is perpendicular to $y = 4x + 12$?

FR!

DO YOUR FIGURING HERE.

26. If $4x^2 - 9y^2 = 25$ and $2x - 3y = 5$, what is $2x + 3y$?

- A. 5
- B. 10
- C. 25
- D. 125
- E. 625

27. To get a driver's license, an applicant must pass a written test and a driving test. In a certain city, past records show that 65% of the applicants pass the written test and 90% of those who have passed the written pass the driving test. Based on these figures, approximately how many applicants in a random group of 1,000 applicants in this city would be expected to get driver's licenses?

- A. 35
- B. 585
- C. 600
- D. 800
- E. 825

28. A vector with initial point $(2, -1)$ and terminal point $(-3, 7)$ is translated so that its initial point is at the origin in the standard (x, y) coordinate plane. What are the (x, y) coordinates of its terminal point after the translation?

FR!



29. A line in the standard (x, y) coordinate plane is parallel to the y -axis and 3 units to the right of the y -axis. Which of the following is an equation of the line?

A. $y = 3$
 B. $x = 3$
 C. $y = 3x$
 D. $y = x + 3$
 E. $x = y + 3$

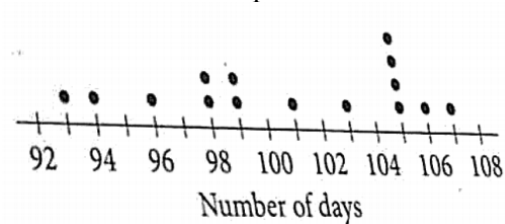
DO YOUR FIGURING HERE.

30. Function f is an exponential function. The table gives some values of x and $f(x)$. Which of the following is $f(x)$?

x	$f(x)$
-1	$\frac{2}{3}$
0	4
1	24
2	144

F. $2(6)^x$
 G. $4(6)^x$
 H. $6(2)^x$
 I. $4(x)^2$
 J. $6(x)^4$

31. The dot plot shows the number of days from being planted to being harvested for 15 different canola plants.



What is the median number of days?

FR!



32. The graph of $(x - 4)^2 - 9(y + 5)^2 = 100$ is a hyperbola in the standard (x, y) coordinate plane. What is the point of intersection of the hyperbola's asymptotes?

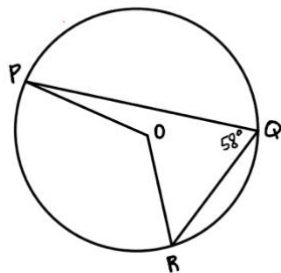
DO YOUR FIGURING HERE.

- F. $(-6, -9)$
- G. $(-4, 5)$
- H. $(-1, 9)$
- I. $(1, 9)$
- J. $(4, -5)$

33. The cost of filling an aquarium with treated water is \$2.10 per cubic foot of volume. How much will it cost to fill an aquarium whose shape is a rectangular prism with inner dimensions of 54 inches and 84 inches by 36 inches with treated water?

FR!

34. A circle with center O is shown. P , Q , and R , are points on the circle. Given $m\angle PRQ = 62^\circ$, what is $m\angle POQ$?



- F. 58°
- G. 87°
- H. 100°
- I. 116°
- J. 174°



35. To increase the mean of 7 numbers by 4, by how much would the sum of the 7 numbers have to increase?

DO YOUR FIGURING HERE.

- A. 2
- B. 7
- C. 9
- D. 14
- E. 28

36. A new housing development is being built with 3 house models: the Raritan, the Milestone, and the Duke. Houses are either sold, under contract, or unsold, as shown in the table. What is the probability that a randomly selected unsold home is of the milestone Model?

FR!

	Raritan	Millstone	Duke
Sold	22	40	48
Under Contract	35	26	14
Unsold	32	13	50

37. Rectangle R lies in a quadrant of the standard (x, y) coordinate plane. Reflecting R across the x -axis will result in rectangle R' . Reflecting R' across the y -axis will result in rectangle R'' . If one of the original coordinates of rectangle R can be represented by $(-A, B)$, which of the following could be a coordinate on rectangle R'' ?

- A. (A, B)
- B. $(-A, B)$
- C. $(A, -B)$
- D. $(-2A, 2B)$
- E. $(2a, -2B)$



38. Vicky will order shirts for an event. The company that makes the shirts sells T-shirts for \$6 each and sweatshirts for \$8 each. Each T-shirt comes in one of 2 different styles, and each sweatshirt comes in one of 3 different styles. Each T-shirt and sweatshirt come in one of 12 different colors and one of 4 different sizes. Vicky will order 1 T-shirt and 1 sweatshirt of each possible combination of style, color, and size. How much will Vicky spend on only the T-shirts for her shirt order?

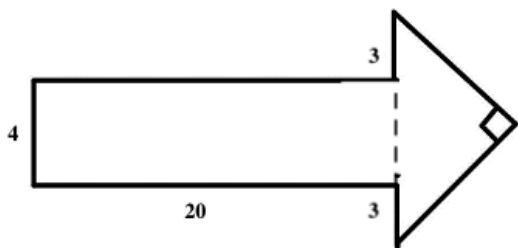
DO YOUR FIGURING HERE.

- F. \$108
G. \$216
H. \$576
I. \$816
J. \$1,152

39. Which of the following is 1 of the solutions of the quadratic equation $2x^2 + 3x + 5 = 0$

- A. $-\frac{3}{4} + i\frac{\sqrt{31}}{4}$
B. $\frac{3}{4} + i\frac{\sqrt{31}}{4}$
C. $\frac{3}{4} - i\frac{\sqrt{31}}{4}$
D. $-\frac{3}{4} - i\sqrt{31}$
E. $\frac{-3}{4} + i\sqrt{31}$

40. The arrow shown in the figure below is composed of a rectangle and an isosceles triangle, and the given dimensions are in inches. What is the area, in square inches, of the arrow?



- F. 88
G. 92
H. 96
I. 102
J. 105



41. In Mrs. Miller's class, 50% of the student's final grade is determined by tests and quizzes, 20% by homework, and 30% by the final exam. If David, one of her students, currently has a 95-homework average, and test and quiz grades of 78, 82, 88, and 95. What score does he need on the final exam in order to have at least a 90 in the class? (Note: There will be no more quizzes, and the exam score will be a whole number)

A. 90
B. 94
C. 95
D. 98
E. 100

DO YOUR FIGURING HERE.

42. A contestant played a trivia game in which he earned 100 points for a correct answer and lost 50 points for an incorrect answer.

- He ended the 1st round with 450 points.
- He ended the 2nd round with 300 points.

The contestant answered only 5 questions correctly in the 2nd round, and there was no other way to earn or lose points. Exactly how many questions did the contestant answer **incorrectly** in the 2nd round? (Note: Points earned in the 1st round are retained into the 2nd round.)

F. 5
G. 9
H. 13
I. 15
J. 19

43. Consider the graph of $y = \frac{2}{x^2+4}$ in the standard (x, y) coordinate plane. Which of the following is the equation of a vertical asymptote of the graph?

A. $x = -4$
B. $x = -2$
C. $x = 2$
D. $x = 2i$
E. $x = 4$



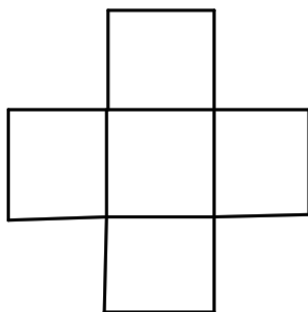
44. Pat and Malik made a total of 25 hats. Pat made 3 more hats than Malik made. If Pat made p hats, which of the following equations can be used to solve for p ?

DO YOUR FIGURING HERE.

- A. $p + (p - 3) = 25$
 B. $p + (p + 3) = 25$
 C. $\frac{p+(p-3)}{2} = 25$
 D. $\frac{p+(p+3)}{2} = 25$
 E. $p + 2(p - 3) = 25$

45. If a cube shaped box has its top removed and its remaining sides folded down, it forms the shape diagramed below. If the total area of the figure is 855 square inches, what was the volume of the original box? (Rounded to the nearest whole number).

FR!





46. A certain store is giving away 2 randomly selected coupons of different products to all of its shoppers. Some of the coupons offer a free chocolate chip cookie, and some offer a free brownie. The probability that a shopper will get a coupon that offers a chocolate chip cookie is $\frac{14}{33}$. The probability that a shopper will get a coupon that offers a brownie is $\frac{16}{33}$. Suppose that getting a coupon for a chocolate chip cookie and getting a coupon for a brownie are independent events. Which answer is the best approximation for the difference in likelihood between getting a coupon for a chocolate chip cookie or brownie, and getting a coupon for a chocolate chip cookie and brownie?

DO YOUR FIGURING HERE.

- A. $\frac{14}{33} \times \frac{16}{33}$
 B. $\frac{14}{33} + \frac{16}{33}$
 C. $1 - \frac{14}{33} \times \frac{16}{33}$
 D. $\frac{14}{33} \times \frac{16}{33} - \left(\frac{14}{33} + \frac{16}{33} \right)$
 E. $\frac{14}{33} + \frac{16}{33} - \frac{14}{33} \times \frac{16}{33}$
47. A group of friends decided to divide the \$800 cost of a trip equally among themselves. When two of the friends decided not to go on the trip, those remaining still divided the \$800 cost equally, but each friend's share of the cost increased by \$20. How many friends were in the group originally?
- A. 4
 B. 8
 C. 10
 D. 16
 E. 20
48. In the standard (x, y) coordinate plane, the graph of the function $y = \sqrt{x}$ is transformed by shifting up 2 coordinate units, shifting right 3 coordinate units, and reflecting across the line $y = 2$. Which of the following is an equation of the final graph?
- A. $y = -\sqrt{x+3} + 2$
 B. $y = -\sqrt{x-3} + 2$
 C. $y = \sqrt{-x+3} + 2$
 D. $y = \sqrt{x-3} + 2$
 E. $y = \sqrt{x+3} + 2$





49. Haruka is a long-distance runner who competes both in 10,000-meter races and in marathons, which are run over a distance of 26.2 miles. Given that 1.0 kilometer is approximately 0.625 miles, which of the following distances, in miles, is closest to the difference between the distances Haruka runs in a marathon and in a 10,000-meter race?

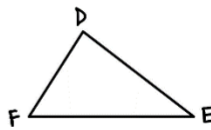
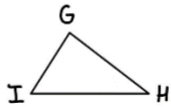
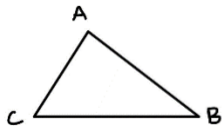
DO YOUR FIGURING HERE.

FR!

50. The expression $\frac{1}{x+2} + \frac{15}{9x+18}$ is equivalent to:

- A. $\frac{8}{5(x+2)}$
 B. $\frac{16}{10x+20}$
 C. $\frac{16}{9x+18}$
 D. $\frac{24}{9x+18}$
 E. $\frac{15}{9x^2+36x+36}$

51. For the 3 triangles shown in the figure below, C is congruent to $\triangle DEF$ ($\triangle ABC \cong \triangle DEF$), and $\triangle DEF$ is similar to $\triangle GHI$ ($\triangle DEF \cong \triangle GHI$). Which of the following distances is necessarily equal to $\frac{(FE)(GH)}{(HI)}$?



- A. AB
 B. AC
 C. BC
 D. EF
 E. HI



52. Michael's Cycles sells their standard level bicycle for s dollars and their advanced level bicycle for a dollars. The price of the advanced level bicycle is x dollars more than one fourth of the price of the standard level bicycle. Which of the equations must be true?

DO YOUR FIGURING HERE

F. $\frac{1}{4}s - x = a$

G. $4a - 4x = 5$

H. $4a + 4x = 5$

I. $4c - 4a = 5$

J. $\frac{1}{4}x - 5 = a$

53. In the standard (x,y) coordinate plane, points $A(-1,2)$ and $C(7,-10)$ are the endpoints of line segment \overline{AC} . If the length of \overline{AB} is $\frac{1}{4}$ the length of \overline{BC} , what are the coordinates of B ?

A. $(1,-1)$

B. $(\frac{3}{2}, -2)$

C. $(2,-3)$

D. $(3,-4)$

E. $(5,-7)$



54. Below is a probability distribution for a local restaurant where R represents the number of stars out of 5 left by a customer, and $P(R)$ represents the percentage of customers who have left that rating. If the number of 1 star reviews is reduced from 8% to 4% and the number of 5 star reviews is increased 4% from $P(5)$, which of the following answers is closest to the change in expected value/average number of stars?

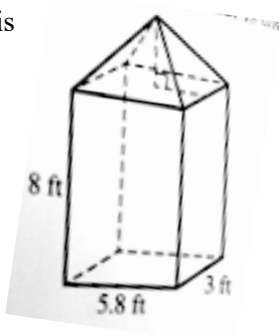
R	$P(R)$
1	0.08
2	0.03
3	0.10
4	0.42
5	$P(5)$

- F. 0.04
 G. 0.07
 H. 0.11
 I. 0.16
 J. 0.22
55. Given $i^2 = -1$, what is the value of $i + i^2 + i^3 + \dots + i^{97} + i^{98}$?

- A. 0
 B. -1
 C. 1
 D. $-i$
 E. i

56. The right rectangular prism shown in the figure below is 8 feet high, 3 feet wide, and 5.8 feet long. A rectangular pyramid is set on top of the prism so that the base of the pyramid is the top face of the prism. The total volume of the figure is 145 cubic feet. To the nearest 0.1 foot, what is the height of the pyramid?

(Note: The volume of a pyramid is $\frac{1}{3}Bh$ where B is the area of the base and h is the height of the pyramid.)



- F. 1.0
 G. 1.9
 H. 3.1
 I. 8.3
 J. 25.0

DO YOUR FIGURING HERE

57. For real number values of x , what is the range of the function
 $y = \frac{3}{2}\sin(2x - 1) - 3$?

FR!

DO YOUR FIGURING HERE

58. A recent research study found that the average height of an adult male in the United States is 5 feet 9 inches tall. The study also concluded that 95% of adult males in the United States are between 5 feet 3 inches tall and 6 feet 3 inches tall. In inches, which of the following values could be the standard deviation of this data set?

- A. 3
- B. 4
- C. 6
- D. 12
- E. 18

59. The sum of the infinite geometric series $-27 + 9 - 3 + \dots$ is closest to which of the following?

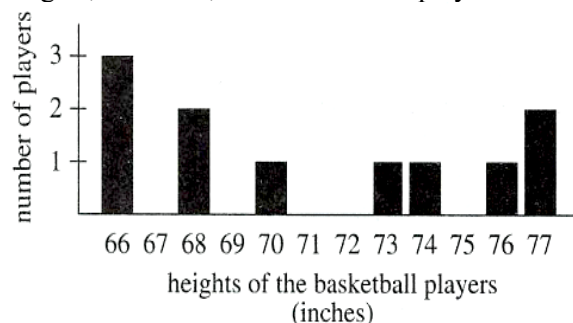
- A. -20
- B. -16
- C. -12
- D. -9
- E. 0

60. The LED screens used on Apple iPhones have a height to width ratio of 20:9. If the diagonal length of the phone screen is d inches, which expression gives the width, in inches, in terms of d ?

FR!



61. The frequency histogram below shows the distribution of heights, in inches, of 11 basketball players.



Using the data from the frequency histogram, what is the sum of the mean and median of this distribution?

62. In the standard (x, y) coordinate plane, what is the y -intercept of the graph of the function $y = f(x)$ defined below?

$$f(x) = \begin{cases} x^2 - 1 & \text{for } x < -3 \\ 2x - 3 & \text{for } -3 \leq x \leq 2 \\ |x - 3| & \text{for } x > 2 \end{cases}$$

- A. -5
B. -3
C. -1
D. 2.5
E. 3
63. The rectangular screen of the high-definition television shown below has a

G. $\begin{bmatrix} 2a & 4b \\ 6c & 5d \end{bmatrix}$

H. $\begin{bmatrix} (2a + 4b) \\ (6c + 5d) \end{bmatrix}$

I. $[(2a + 6c)(4b + 5d)]$

J. $\begin{bmatrix} (2a + 4c) & (2b + 4d) \\ (6c + 5d) & (6a + 5b) \end{bmatrix}$

K. $\begin{bmatrix} (2a + 4c) & (2b + 4d) \\ (6a + 5c) & (6b + 5d) \end{bmatrix}$

END OF TEST

**STOP! DO NOT RUN THE PAGE UNTIL TOLD TO DO SO.
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