

1. Solve: $\frac{20}{3x+6} - \frac{2}{3} = 1$

- A) $\left\{\frac{2}{3}\right\}$ B) $\left\{\frac{18}{5}\right\}$ C) $\left\{\frac{14}{5}\right\}$ D) $\{2\}$

2. Solve the equation for x: $\frac{x}{x-3} = \frac{3}{x-3} + 9$

- A) $x = 0$ B) $x = 3$ C) $x = \frac{24}{9}$ D) \emptyset

3. Find the exact distance between $(-2,5)$ and $(4,9)$.

- A) $4\sqrt{13}$ B) $2\sqrt{13}$ C) $4\sqrt{5}$ D) $2\sqrt{5}$

4. Find the midpoint between the ordered pairs $(-5,-20)$ and $(16,-4)$.

- A) $\left(\frac{11}{2}, -12\right)$ B) $(5, -12)$ C) $\left(\frac{21}{2}, 8\right)$ D) $\left(\frac{21}{2}, -8\right)$

5. Find the center of the circle given by $(x - 4)^2 + (y + 9)^2 = 25$.

- A) $(-4,9)$ B) $(4,-9)$ C) $(-2,3)$ D) $(2,-3)$

6. Which one of the following is the standard form of the equation of the circle whose center is at the point $(-5,1)$ and whose radius is 4?

- A) $(x - 5)^2 + (y + 1)^2 = 2$ B) $(x - 5)^2 + (y + 1)^2 = 16$
C) $(x + 5)^2 + (y - 1)^2 = 2$ D) $(x + 5)^2 + (y - 1)^2 = 16$

7. Find the center and radius of the circle given by $x^2 + y^2 - 4x + 6y - 3 = 0$.

- A) $(2,-3)$ and $r = 4$ B) $(-2,3)$ and $r = 4$
C) $(2,-3)$ and $r = 3$ D) $(-2,3)$ and $r = 3$

8. Solve: $x^2 - 6x = 0$

- A) $\{0\}$ B) $\{0,6\}$ C) $\{6\}$ D) $\{\pm\sqrt{6}\}$

9. Solve: $2x^2 - x - 4 = 0$

A) $x = \frac{1 \pm i\sqrt{33}}{4}$

B) $x = \frac{1 \pm i\sqrt{31}}{4}$

C) $x = \frac{-1 \pm \sqrt{33}}{4}$

D) $x = \frac{1 \pm \sqrt{33}}{4}$

10. Solve: $6x^2 + 4x = 2x + 8$

A) $\left\{2, -1, \frac{4}{3}\right\}$

B) $\left\{2, 1, -\frac{4}{3}\right\}$

C) $\left\{-1, \frac{4}{3}\right\}$

D) $\left\{1, -\frac{4}{3}\right\}$

11. Solve: $x^2 + 6x + 13 = 0$

A) $\{-3 \pm 2i\}$

B) $\{-3 \pm 4i\}$

C) $\{-3 \pm \sqrt{22}\}$

D) $\{-3 \pm 2\sqrt{22}\}$

12. The height of an object is given by $f(t) = -16t^2 + 112t + 128$, where t is the time in seconds that the object is in the air and $f(t)$ is the height in feet. When is the height 224 feet?

A) $t = 8$ seconds

B) $t = 6$ seconds

C) $t = 1$ second

D) $t = 1$ and 6 seconds

13. The diagonal of a rectangle is 17 inches long. If one side is 7 inches longer than the other side, find the length of the LONGER side of the rectangle.

A) 5 inches

B) 8 inches

C) 10 inches

D) 15 inches

14. Solve: $\sqrt{x+10} = x-2$

A) $\{-1\}$

B) $\{3\}$

C) $\{5\}$

D) $\{6\}$

15. Solve: $\frac{x+2}{x-2} = -\frac{3}{x}$

A) $\{-1, 6\}$

B) $\{-6, 1\}$

C) $\{2, 3\}$

D) $\{-2, -3\}$

16. Solve: $x^3 - 7x^2 + 4x - 28 = 0$

A) $\{-7, \pm 2\}$

B) $\{7, \pm 2i\}$

C) $\{7, -4\}$

D) $\{0, -4, 7\}$

17. Solve: $x^4 + 3x^2 - 54 = 0$

- A) $\{6, -9\}$ B) $\{-6, 9\}$ C) $\{\pm\sqrt{6}, \pm 3i\}$ D) $\{\pm i\sqrt{6}, \pm 3\}$

18. Which one of the following **does not** define y as a function of x ?

- A) $x^2 + y = 16$ B) $y = (x-3)^2 - 1$ C) $x + y = 3$ D) $x = y^2$

19. If $g(x) = -x^2 + 3$, then find $g(-4)$.

- A) 19 B) -13 C) -5 D) 11

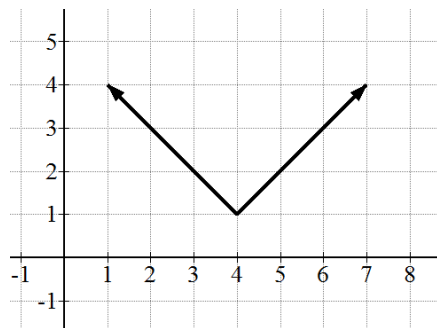
20. If $f(x) = x^2 + 2x$, then find $f(a+h) - f(a)$.

- A) $h^2 + 2a + 2h$ B) $h^2 + 4a + 2h$ C) $h^2 + 2ah + 2h$ D) $h^2 + 2h$

21. Find the average rate of change for $f(x) = 3x^2 - 2x$ on the interval $[-1, 2]$.

- A) 1 B) 5 C) -1 D) -5

22. Find the function for the given graph.

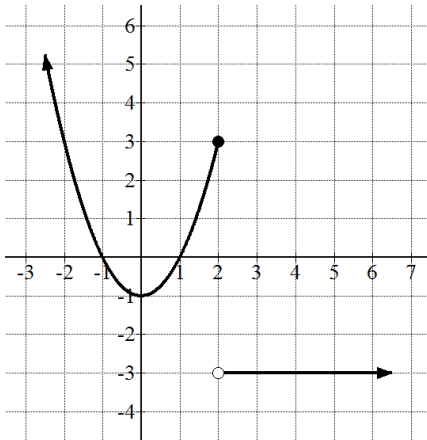


- A) $f(x) = |x - 4| + 1$ B) $f(x) = |x + 4| + 1$
 C) $f(x) = |x - 4| - 1$ D) $f(x) = |x + 4| - 1$

23. What are the transformations to $y = \sqrt{x}$ that are in $f(x) = 3\sqrt{x} + 2$?

- A) vertical stretch of 3 and left 2 units
 B) vertical shrink of 3 and left 2 units
 C) vertical stretch of 3 and up 2 units
 D) vertical shrink of 3 and up 2 units

24. Determine the piecewise function whose graph is given below.



A) $f(x) = \begin{cases} x^2 - 1, & x < 2 \\ -3, & x \geq 2 \end{cases}$

B) $f(x) = \begin{cases} x^2 - 1, & x \leq 2 \\ -3, & x > 2 \end{cases}$

C) $f(x) = \begin{cases} x^2 - 1, & x < 2 \\ x - 3, & x \geq 2 \end{cases}$

D) $f(x) = \begin{cases} x^2 - 1, & x \leq 2 \\ x - 3, & x > 2 \end{cases}$

25. State the domain of $g(x) = (x - 3)^2 + 1$

A) $[3, \infty)$

B) $[1, \infty)$

C) $(-\infty, \infty)$

D) $(-\infty, 3) \cup (3, \infty)$

26. State the domain of $h(x) = \sqrt{x - 3} + 1$

A) $[3, \infty)$

B) $[1, \infty)$

C) $(-\infty, \infty)$

D) $(-\infty, 3) \cup (3, \infty)$

27. Which function is neither even nor odd?

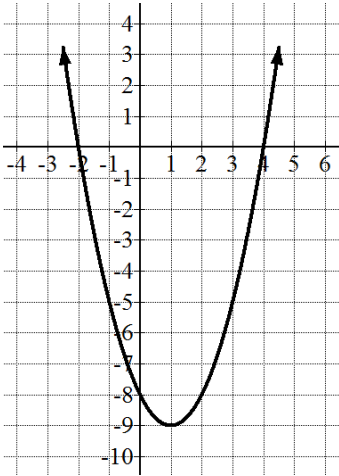
A) $f(x) = |x| - 3$

B) $g(x) = x^3 - 9x$

C) $h(x) = (x + 2)^2$

D) $j(x) = 3x^4 + 1$

Use the graph of $f(x) = x^2 - 2x - 8$ to answer problems 28 – 30.



28. State the domain and range of $f(x) = x^2 - 2x - 8$.

- | | |
|--|---|
| A) Domain: $(-\infty, \infty)$
Range: $(-\infty, \infty)$ | B) Domain: $(-\infty, \infty)$
Range: $[-8, \infty)$ |
| C) Domain: $[1, \infty)$
Range: $[-9, \infty)$ | D) Domain: $(-\infty, \infty)$
Range: $[-9, \infty)$ |

29. Where is $f(x) = x^2 - 2x - 8$ increasing?

- | | | | |
|------------------|-------------------|------------------|--------------------|
| A) $(4, \infty)$ | B) $(-\infty, 1)$ | C) $(1, \infty)$ | D) $(-\infty, -2)$ |
|------------------|-------------------|------------------|--------------------|

30. Use interval notation to express the solution to $f(x) > 0$.

- | | | | |
|-------------------|------------------|--------------|-------------------------------------|
| A) $(-8, \infty)$ | B) $(1, \infty)$ | C) $(-2, 4)$ | D) $(-\infty, -2) \cup (4, \infty)$ |
|-------------------|------------------|--------------|-------------------------------------|

31. Find $\left(\frac{f}{g}\right)(5)$ for $f(x) = x^2 - 9$ and $g(x) = x - 3$.

- | | | | |
|---------------|------------|------------------|------|
| A) $5(x + 3)$ | B) $x + 3$ | C) $\frac{1}{8}$ | D) 8 |
|---------------|------------|------------------|------|

32. Find $(f + g)(x)$ for $f(x) = 2x - 4$ and $g(x) = 3x + 1$.

- | | | | |
|-------------|----------------|------------|---------------|
| A) $5x - 3$ | B) $5x^2 - 3x$ | C) $x - 3$ | D) $x^2 - 3x$ |
|-------------|----------------|------------|---------------|

33. Find $(f \circ g)(x)$ for $f(x) = x^2 + 1$ and $g(x) = x - 2$.

- A) $x^2 + 5$ B) $x^2 - 3$ C) $x^2 - 4x + 5$ D) $x^2 - 4x + 3$

34. Find $(f \circ g)(2)$ for $f(x) = -7x + 3$ and $g(x) = x^2 + 4$.

- A) -53 B) 59 C) 125 D) 292

35. Which function is NOT one-to-one?

- A) $f(x) = \frac{5}{2}x - 4$ B) $g(x) = \sqrt{x - 3} + 1$
 C) $h(x) = x^2 - 2$ D) $j(x) = (x - 1)^3$

36. Find $f^{-1}(x)$, for $f(x) = \frac{3}{4}x - 2$.

- A) $f^{-1}(x) = \frac{4}{3x-8}$ B) $f^{-1}(x) = \frac{4}{3}x - \frac{8}{3}$
 C) $f^{-1}(x) = \frac{4}{3}x + \frac{8}{3}$ D) $f^{-1}(x) = \frac{4}{3}x + 2$

37. Find $f^{-1}(x)$, for $f(x) = (x - 2)^3 + 4$.

- A) $f^{-1}(x) = (x + 2)^3 - 4$ B) $f^{-1}(x) = \sqrt[3]{x - 2} + 4$
 C) $f^{-1}(x) = \sqrt[3]{x - 4} + 2$ D) $f^{-1}(x) = \sqrt[3]{x + 4} - 2$

38. If P varies inversely as w, and $P = \frac{2}{3}$ when $w = \frac{1}{4}$, then what is P when $w = \frac{1}{6}$?

- A) 1 B) 16 C) $\frac{4}{9}$ D) 4

39. The value of y varies directly as x and inversely as the square of t. Find the constant of variation if $y = 7$ when $x = 9$ and $t = 6$.

- A) $\frac{7\sqrt{6}}{9}$ B) $\frac{7}{4}$ C) $\frac{28}{9}$ D) 28

40. For $f(x) = -4(x + 3)^2 + 5$, what is the equation of the axis of symmetry?
A) $x = 3$ B) $x = -3$ C) $y = 5$ D) $y = -5$
41. For $f(x) = -4(x + 3)^2 + 5$, where is the function decreasing?
A) $(-3, \infty)$ B) $(-\infty, -3)$ C) $(5, \infty)$ D) $(-\infty, 5)$
42. For $f(x) = -4(x + 3)^2 + 5$, what is the maximum or minimum value of the function?
A) minimum = 5 B) maximum = 5 C) minimum = -3 D) maximum = -3
43. Find the coordinates of the vertex of the parabola given by $y = 2x^2 + 4x - 3$.
A) $(-1, 5)$ B) $(-1, -5)$ C) $(1, -5)$ D) $(1, 5)$
44. Express the parabola $y = 2x^2 - 16x + 9$ as $y = a(x - h)^2 + k$
A) $y = 2(x - 4)^2 - 23$ B) $y = 2(x + 4)^2 - 23$
C) $y = 2(x - 4)^2 + 9$ D) $y = 2(x + 4)^2 + 105$
45. Find the y- and x-intercepts for the quadratic function, $f(x) = x^2 + 3x - 4$.
A) $(0, -4), (4, 0), (-1, 0)$ B) $(0, 4), (4, 0), (-1, 0)$
C) $(0, 4), (-4, 0), (0, 1)$ D) $(0, -4), (-4, 0), (1, 0)$
46. The height of an object is given by $f(t) = -16t^2 + 112t + 128$, where t is the time in seconds that the object is in the air and $f(t)$ is the height in feet. What is the maximum height of the object?
A) 128 feet B) 320 feet C) 324 feet D) 716 feet

47. Find the quotient and remainder of $(5x^4 + 17x^3 + 10x^2 + 13x - 14) \div (x + 3)$.
- A) quotient: $5x^3 + 2x^2 + 9x + 14$
remainder: -17
- B) quotient: $5x^3 + 2x^2 + 4x + 13$
remainder: -53
- C) quotient: $5x^3 + 2x^2 + 4x + 1$
remainder: -17
- D) quotient: $5x^3 + 32x^2 + 106x + 331$
remainder: 979
48. For the polynomial function given by $f(x) = x^3 + 7x^2 - 2x - 8$, which of the following values is a zero?
- A) -8 B) $-3 + \sqrt{17}$ C) 1 D) 4
49. For the polynomial equation given by $2x^3 - 3x^2 - 11x + 6 = 0$, which of the following values is a root?
- A) -3 B) -1 C) 2 D) 3
50. Which polynomial has the end behavior described by $y \rightarrow -\infty$ as $x \rightarrow \infty$?
- A) $f(x) = 2x^4 + 4x^2 - 6x + 9$ B) $f(x) = x^5 - 4x^2 - 6x + 9$
- C) $f(x) = -4x^5 - 4x^2 - 6x - 9$ D) $f(x) = 3x^4 + 4x^3 - 6x + 9$
51. What information can multiplicity of roots provide about the graph of a polynomial?
- A) Where the graph crosses the x- and y-axis.
B) Whether the graph will or will not cross the x-axis at an x-intercept.
C) The domain of the graph of the polynomial.
D) The range of the graph of the polynomial.
52. If the value of 3 is a zero of the polynomial function $f(x)$, then which of the following statements is true?
- A) $(x - 3)$ is a factor of $f(x)$ B) $(x + 3)$ is a factor of $f(x)$
- C) $x = -3$ is a root of $f(x) = 0$ D) $f(-3) = 0$

53. Which of the following functions has zeros of 3 and $-4i$?

A) $f(x) = x^3 - 3x^2 + 16x - 48$

B) $f(x) = x^3 + 3x^2 + 16x + 48$

C) $f(x) = x^3 - 3x^2 - 16x + 48$

D) $f(x) = x^3 + 3x^2 - 16x - 48$

54. Find the y-intercept of $f(x) = (x - 2)^2(x + 3)(x - 4)$.

A) $(0, -48)$

B) $(0, -24)$

C) $(0, 24)$

D) $(0, 48)$

55. Identify the behavior of the graph at the x-intercept for $f(x) = (x - 2)^2(x + 3)(x - 4)$.

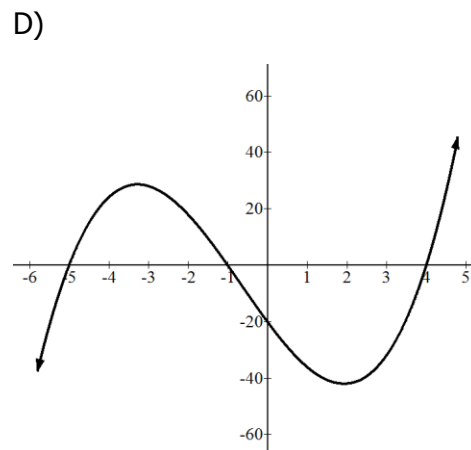
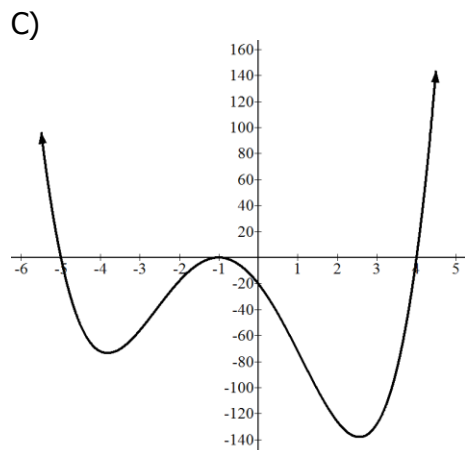
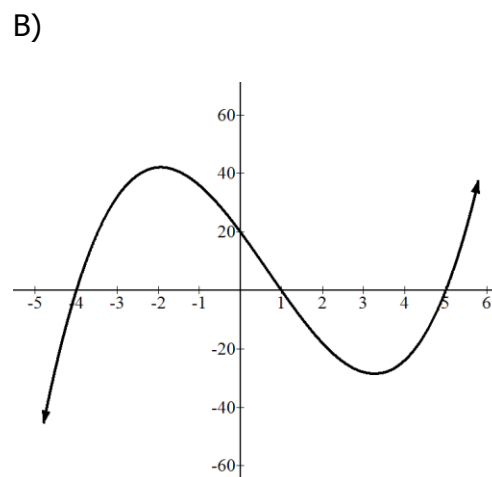
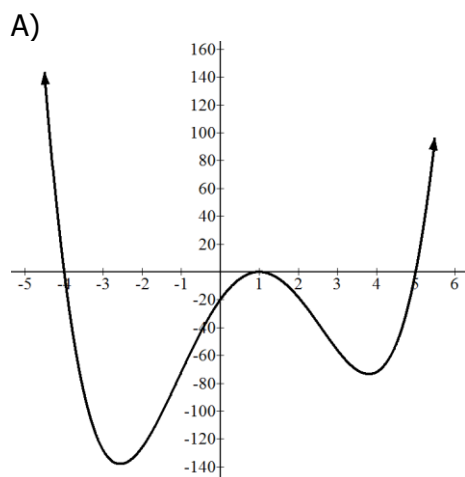
A) cross at $(2, 0)$

B) does not cross at $(2, 0)$

C) cross at $(-2, 0)$

D) does not cross at $(-2, 0)$

56. Identify the graph of $f(x) = (x + 1)^2(x + 5)(x - 4)$.



57. Use the graph of $f(x) = x^3 - 4x$ to solve the inequality given by $x^3 - 4x < 0$.
- A) $(-2, \infty)$ B) $(0, \infty)$ C) $(-\infty, -2) \cup (0, 2)$ D) $(-2, 0) \cup (2, \infty)$
58. Find the equation of the vertical asymptote of $f(x) = \frac{x+6}{x-3}$.
- A) $x = -6$ B) $x = -2$ C) $x = 0$ D) $x = 3$
59. Find the equation of the horizontal asymptote of $f(x) = \frac{4x-1}{7x-9}$.
- A) $y = \frac{9}{7}$ B) $y = 0$ C) $y = \frac{1}{9}$ D) $y = \frac{4}{7}$
60. Find the domain of $f(x) = \frac{x+2}{x^2-9}$.
- A) $(-\infty, 0) \cup (0, \infty)$ B) $(-\infty, -2) \cup (-2, \infty)$
C) $(-\infty, -3) \cup (3, \infty)$ D) $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$
61. State the domain and range of $f(x) = 3^{x+5} - 1$.
- A) Domain: $(-5, \infty)$ B) Domain: $(-\infty, \infty)$
Range: $(-1, \infty)$ Range: $(-1, \infty)$
C) Domain: $(-5, \infty)$ D) Domain: $(-\infty, \infty)$
Range: $(-\infty, \infty)$ Range: $(-\infty, \infty)$
62. Find the equation of the asymptote of $g(x) = e^{x-3} + 2$.
- A) $x = 3$ B) $x = -3$ C) $y = 2$ D) $y = -2$
63. Solve: $\left(\frac{1}{9}\right)^{x+4} = 27^{3x}$.
- A) $x = -\frac{5}{2}$ B) $x = -1$ C) $x = -\frac{8}{11}$ D) $x = 2$

64. Solve: $4^{2x} = \left(\frac{1}{8}\right)^{x+4}$.

- A) $x = -12$ B) $x = -\frac{12}{7}$ C) $x = -\frac{4}{7}$ D) $x = 4$

65. Find the investment needed to obtain a balance of \$12,000 after 18 years for a continuously compounded account earning 6.5% annual interest.

$$A = Pe^{rt}$$

- A) \$625 B) \$1884 C) \$3724 D) \$4879

66. Find the balance if \$2500 is invested in an account that pays interest compounded continuously at a rate of 4% for 3 years.

- A) \$2819 B) \$3000 C) \$7806 D) \$8300

67. For the exponential decay model given by $A = A_0e^{-0.021t}$, how much of the material remains after 32 years if the initial amount is 45 grams?

- A) 12.44 g B) 22.98 g C) 88.12 g D) 1410.08 g

68. Find $\frac{f(x+h)-f(x)}{h}$ for $f(x) = x^2 - 8x + 3$.

- A) $x^2 - 8x + 3 + h$ B) $2x + h$
 C) $2x + h^2 - 8h$ D) $2x + h - 8$

69. Find the x-value of the solution to the system.

$$\begin{aligned} 6x + 7y &= -10 \\ -2x - 8y &= -8 \end{aligned}$$

- A) $x = -4$ B) $x = -\frac{26}{7}$ C) $x = -\frac{34}{5}$ D) $x = -\frac{9}{2}$

70. Find the x-value of the solution to the system.

$$\begin{aligned} 3x - 6y &= 9 \\ y &= \frac{1}{2}x - 1 \end{aligned}$$

- A) $x = -1$ B) $x = 6$ C) $x = 9$ D) no solution

71. A total of \$2000 is invested into 2 accounts paying 3% and 5% simple annual interest. After 1 year, the total interest from the 2 accounts is \$86. Find the system of equations used to determine how much is invested in each account.

A) $x + y = 2000$
 $3x + 5y = 86$

B) $x + y = 2000$
 $0.03x + 0.05y = 86$

C) $x + y = 86$
 $3x + 5y = 2000$

D) $x + y = 86$
 $0.03x + 0.05y = 2000$

72. Find the x-value of the solution to the system.

$$\begin{aligned}x + 3y + z &= 3 \\5y + 2z &= 0 \\2x - y - z &= 5\end{aligned}$$

A) $x = -2$

B) $x = 4$

C) $x = 5$

D) no solution

73. Find the y-value of the solutions to the system.

$$\begin{aligned}x^2 + y &= 23 \\x - y &= -3\end{aligned}$$

A) -5 and 4

B) 5 and -4

C) -2 and 7

D) 8 and -1

74. Find the y-value of the solutions to the system.

$$\begin{aligned}x + xy &= 48 \\x - y &= 3\end{aligned}$$

A) -8 and 6

B) 8 and -6

C) -11 and 3

D) 5 and -9

75. Which of the ordered pairs is NOT part of the solution set for the system of inequalities?

$$\begin{aligned}y &\leq 5 - x^2 \\y &> x - 1\end{aligned}$$

A) (1,4)

B) (1,2)

C) (0,-1)

D) (-1,0)

Answers

1 D	16 B	31 D	46 C	61 B
2 D	17 C	32 A	47 C	62 C
3 B	18 D	33 C	48 B	63 C
4 A	19 B	34 A	49 D	64 C
5 B	20 C	35 C	50 C	65 A
6 D	21 A	36 C	51 B	66 A
7 A	22 A	37 C	52 A	67 B
8 B	23 C	38 A	53 A	68 D
9 D	24 B	39 D	54 A	69 A
10 D	25 C	40 B	55 B	70 D
11 A	26 A	41 A	56 C	71 B
12 D	27 C	42 B	57 C	72 B
13 D	28 D	43 B	58 D	73 C
14 D	29 C	44 A	59 D	74 D
15 B	30 D	45 D	60 D	75 C