

## Algebra

1. If  $x = -3$ , what is the value of  $\frac{x^2 - 1}{x + 1}$  ?
- A.  $-4$   
B.  $-2$   
C.  $2$   
D.  $3\frac{2}{3}$   
E.  $5$
2. Doctors use the term *maximum heart rate (MHR)* when referring to the quantity found by starting with 220 beats per minute and subtracting 1 beat per minute for each year of a person's age. Doctors recommend exercising 3 or 4 times each week for at least 20 minutes with your heart rate increased from its *resting heart rate (RHR)* to its *training heart rate (THR)*, where

$$THR = RHR + .65(MHR - RHR)$$

Which of the following is closest to the *THR* of a 43-year-old person whose *RHR* is 54 beats per minute?

- A. 197  
B. 169  
C. 162  
D. 134  
E. 80
3. When getting into shape by exercising, the subject's maximum recommended number of heartbeats per minute ( $h$ ) can be determined by subtracting the subject's age ( $a$ ) from 220 and then taking 75% of that value. This relation is expressed by which of the following formulas?
- A.  $h = .75(220 - a)$   
B.  $h = .75(220) - a$   
C.  $h = 220 - .75a$   
D.  $.75h = 220 - a$   
E.  $220 = .75(h - a)$

4. An airplane flew for 8 hours at an airspeed of  $x$  miles per hour (mph), and for 7 more hours at 325 mph. If the average airspeed for the entire flight was 350 mph, which of the following equations could be used to find  $x$  ?
- A.  $x + 325 = 2(350)$
  - B.  $x + 7(325) = 15(350)$
  - C.  $8x - 7(325) = 350$
  - D.  $8x + 7(325) = 2(350)$
  - E.  $8x + 7(325) = 15(350)$
5. Which of the following is equivalent to  $3a + 4b - (-6a - 3b)$  ?
- A.  $16ab$
  - B.  $-3a + b$
  - C.  $-3a + 7b$
  - D.  $9a + b$
  - E.  $9a + 7b$
6. What is the sum of the polynomials  $3a^2b + 2a^2b^2$  and  $-ab^2 + a^2b^2$  ?
- A.  $3a^2b - ab^2 + 3a^2b^2$
  - B.  $3a^2b - ab^2 + 2a^2b^2$
  - C.  $2a^2b + 3a^2b^2$
  - D.  $2a^2b^3 + 2a^4b^4$
  - E.  $-3a^3b^3 + 2a^4b$
7. Which of the following is a factor of the polynomial  $x^2 - x - 20$  ?
- A.  $x - 5$
  - B.  $x - 4$
  - C.  $x + 2$
  - D.  $x + 5$
  - E.  $x + 10$
8. Which of the following is a factor of  $x^2 - 5x - 6$  ?
- A.  $(x + 2)$
  - B.  $(x - 6)$
  - C.  $(x - 3)$
  - D.  $(x - 2)$
  - E.  $(x - 1)$

9. If  $2(x - 5) = -11$ , then  $x = ?$

- A.  $-\frac{21}{2}$
- B.  $-8$
- C.  $-\frac{11}{2}$
- D.  $-3$
- E.  $-\frac{1}{2}$

10. If  $\frac{4}{5} + \left(-\frac{3}{10}\right) = x + 1\frac{1}{2}$ , then  $x = ?$

- A.  $2$
- B.  $1$
- C.  $-1$
- D.  $-2$
- E.  $-10$

11. For all nonzero  $r$ ,  $t$ , and  $z$  values,  $\frac{16r^3tz^5}{-4rt^3z^2} = ?$

- A.  $-\frac{4z^3}{r^2t^2}$
- B.  $-\frac{4r^2z^3}{t^2}$
- C.  $-\frac{4rz}{t}$
- D.  $-4r^4t^4z^7$
- E.  $-4r^2t^2z^3$

12. For all  $x > 0$  and  $y > 0$ , the radical expression  $\frac{\sqrt{x}}{3\sqrt{x} - \sqrt{y}}$  is equivalent to:

- A.  $\frac{3x - \sqrt{xy}}{9x + y}$
- B.  $\frac{3x - \sqrt{xy}}{3x + y}$
- C.  $\frac{3x + \sqrt{xy}}{9x - y}$
- D.  $\frac{3x + \sqrt{xy}}{3x - y}$
- E.  $\frac{x}{3x - y}$

13. For all  $x \neq -4$ , which of the following is equivalent to the expression below?

$$\frac{x^2 + 12x + 32}{x + 4}$$

- A.  $x + 3$   
B.  $x + 8$   
C.  $x + 11$   
D.  $x + 16$   
E.  $x + 28$
14. Which of the following is a simplified expression equal to  $\frac{9-x^2}{x-3}$  for all  $x < -3$  ?
- A.  $3x$   
B.  $x + 3$   
C.  $x - 3$   
D.  $-x + 3$   
E.  $-x - 3$
15. What is the slope of the line with the equation  $2x + 3y + 6 = 0$  ?
- A.  $-6$   
B.  $-3$   
C.  $-2$   
D.  $-\frac{2}{3}$   
E.  $\frac{2}{3}$
16. Point  $A(-4, 1)$  is in the standard  $(x, y)$  coordinate plane. What must be the coordinates of point  $B$  so that the line  $x = 2$  is the perpendicular bisector of  $\overline{AB}$  ?
- A.  $(-6, 1)$   
B.  $(-4, -1)$   
C.  $(-4, 3)$   
D.  $(-2, 1)$   
E.  $(8, 1)$

**Correct Answers for Sample Algebra Items**

**Item Number    Correct Answer**

1                    A

2                    D

3                    A

4                    E

5                    E

6                    A

7                    A

8                    B

9                    E

10                   C

11                   B

12                   C

13                   B

14                   E

15                   D

16                   E