Franklin Math Bowl
Algebra I
2010

All answers are presented accurate to three decimal places unless otherwise noted. Good luck!

1. Assuming that $x^2 - 2x - 15 \neq 0$, simplify $\frac{x^2+2x-35}{x^2-2x-15}$.

    a. $\frac{7}{3}$ b. $\frac{x+7}{x+3}$ c. $\frac{x-7}{x-3}$ d. $\frac{7}{x+3}$ e. $\frac{-7}{3}$

2. You pay \$20 for a pair of pants. The pants were marked down 30% from its original price. Tax is assessed at 9.5%. Which of the following equations when solved for x will find the original cost?

    a. $20 = .3x + .095 * .3x$ b. $20 = .3x + .095x$ c. $20 = .7x + .095 * .7x$
    d. $20 = .7x + .095x$ e. $20 = .3x + .095 * .7x$

3. Solve for x: $4x + 3 = 3x - 4$.

    a. $x = -1$ b. $x = 7$ c. $x = 1$ d. $x = \frac{4}{3}$ e. $x = -7$

4. Solve the equation $4x^2 - 9x - 5 = 0$.

    a. $\frac{9\pm\sqrt{161}}{8}$ b. $\frac{9\pm1}{8}$ c. $\frac{-4\pm\sqrt{196}}{18}$ d. $\frac{-9\pm\sqrt{161}}{8}$ e. No real solutions

5. If $S = 1+2+\cdots+n$, then S can also be written as $S = n+(n-1)+\cdots+1$. Adding the two equations and solving for S, we obtain

    a. $S = \frac{n}{2}$ b. $S = \frac{n^2+1}{2}$ c. $S = \frac{n(n+1)}{2}$ d. $S = \frac{n^2(n+1)}{2}$ e. $S = \frac{n(n+1)^2}{2}$

6. The solutions of the equation $x^2 + x - 20 = 0$ are

      a. both real   b. both imaginary
      c. one real, one imaginary   d. impossible to determine

7. Suppose that Sue has three quarters, four dimes, and five pennies in her pocket. Assuming that she pulls a coin out at random, what is the probability that it is a quarter?

                 a. .125   b. .25   c. .333   d. .417   e. .75

8. Assuming $x \neq 0$ and $x \neq \frac{-1}{9}$, simplify

$$\frac{\frac{1}{x} + 3}{\frac{1}{3x} + 3}$$

         a. $\frac{3+9x}{1+9x}$ b. 3   c. 1   d. $\frac{1+9x}{3+9x}$ e. $\frac{1}{3}$

9. Find the radius of a circle if its area is twice the circumference.

        a. $r = 0$ b. $r = \frac{1}{4}$ c. $r = \frac{1}{2}$ d. $r = 2$ e. $r = 4$

10. The parabola $y = x^2 + 6x + 2$ has its vertex at

        a. (-3,-7)   b. (-3,29)   c. (3,22)   d. (3,-7)   e. (-6,2)

11. Find the volume of the box with width 1.8 m, length 1.5 m, and height 3.7 m.

       a. $7 \ m^3$ b. $4.86 \ m^3$ c. $8.325 \ m^3$ d. $24.642 \ m^3$ e. $9.99 \ cm^3$

12. Solve for x:

$$\frac{3}{x} + \frac{1}{4} = 1$$

     a. $x = 3$ b. $x = 4$ c. $x = \frac{1}{4}$ d. $x = \frac{1}{2}$ e. $x = 0$

13. Solve the inequality $x^2 - 3x - 18 < 0$.

     a. $x < -6$ or $x > 3$ b. $-6 < x < 3$ c. $x < -3$ or $x > 6$
     d. $-3 < x < 6$ e. None of the above

14. Find the equation of the line passing through the points $(3, 6)$ and $(-2, 7)$.

     a. $y = -5x + 21$ b. $y = \frac{-1}{5}x + \frac{33}{5}$ c. $y = \frac{-1}{5}x + \frac{27}{5}$
     d. $y = \frac{1}{5}x + \frac{27}{5}$ e. $y = -5x - 9$

15. Suppose that Alice made 62 on her first test. What score does she need to get on the second test to have an average of 74?

     a. 66   b. 74   c. 86   d. 92   e. 101

16. Solve $12 = 5 + \sqrt{8x - 15}$.

     a. $x = -8$ b. $x = -1$ c. $x = 41/8$ d. $x = 8$ e. $x = 10$

17. Give the reasons for each of the following three identities:

     1) $x(y - z) = xy - xz$ 2) $xy = yx$ 3) $x + 0 = x$

a) commutative, associative, distributive

b) distributive, commutative, associative

c) distributive, associative, commutative

d) distributive, commutative, identity

e) associative, commutative, identity

18. Find the mean and median of the set $\{7, 10, 2, 4, 7\}$.

    a. 6 and 7.   b. 7 and 6   c. 6 and 6   d. 7 and 7   e. None of the above

19. At a particular store, you buy two shirts and three pairs of pants for $40. Your friend buys three shirts and two pairs of pants for $50. How much do shirts (s) and pants (p) cost in dollars?

    a. $\begin{matrix} s = 4, \\ p = 4 \end{matrix}$ b. $\begin{matrix} s = 4, \\ p = 14 \end{matrix}$ c. $\begin{matrix} s = 14, \\ p = 4 \end{matrix}$ d. $\begin{matrix} s = 14, \\ p = 14 \end{matrix}$ e. $\begin{matrix} s = 28, \\ p = 20 \end{matrix}$

20. A particular store sells shirts for $10, pants for $25, and shoes for $25. How many ways are there to sell *exactly* $50?

    a. 1   b. 2   c. 3   d. 4   e. 5

21. A standard deck of cards has 26 red cards and 26 black cards. Suppose that the deck is well shuffled and dealt into two piles with 26 cards each. What is the probability that the number of red cards in the first stack is the same as the number of black cards in the second?

    a. 0   b. .25   c. .5   d. .75   e. 1

22. Suppose that it takes Alice four hours to rake the leaves in a yard. It takes Bob five hours to rake the leaves in the same yard. How long (in hours) will it take them to rake the leaves if they work together?

    a. .45   b. 2.222   c. 3   d. 4.5   e. 9

23. How many positive whole numbers less than or equal to 1000 are divisible by 2 or 5 (possibly both)?

   a. 400   b. 500   c. 600   d. 700   e. 800

24. Yvette and Zoe live three miles away from school. One day, they decide to race home from school on their bikes. Yvette gives Zoe a two minute head start. If Zoe's average speed is 15 miles per hour, what is the average speed that Yvette must maintain to arrive home at the same time as Zoe?

a. 12 mph   b. 17 mph   c. 18 mph   d. 36 mph

e. Yvette cannot beat Zoe home.

25. By dipping a pen once into an inkwell, we can draw the following figure which contains four triangles.
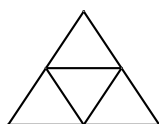
How many times must we dip a pen into an inkwell to draw the following figure which has thirty-six triangles?
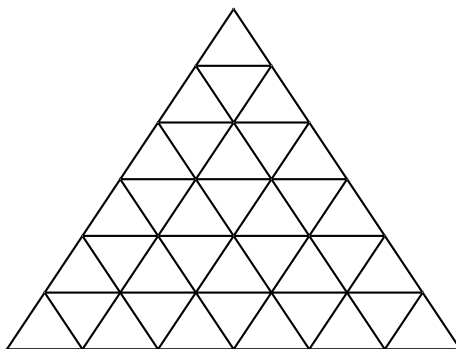
a. 5   b. 6   c. 7   d. 8   e. 9

Solutions to Franklin Math Bowl Algebra 2010

1.b	2.c	3. e	4. a	5. c
6.a	7.b	8.a	9.e	10.a
11. e	12.b	13. d	14. b	15. c
16. d	17. d	18. a	19. c	20. d
21. e	22. b	23. c	24. c	25. a