# Franklin Math Bowl

# Algebra I Exam

# 2002

1. Solve for x: $2(x-3)+5=(2x-1)-5(1-x)$

   a) $x=1$ b) $x=3$ c) $x=\frac{1}{2}$ d) $x=-1$

2. Solve for y: $4-3y \le 2(5-y)$

   a) $y \le 6$ b) $y<6$ c) $y \ge -6$ d) $y \ge -3/2$

3. Solve for B: $2B^2+5B-3=0$

   a) B = 2 or B = 1
   b) B = ½ or B = -3
   c) B = 2 or B = 3
   d) B = - 1/2 or B = 3

4. Solve for $\theta$: $\theta^2-\theta-6>0$

   a) $1<\theta<6$
   b) $-2<\theta<3$
   c) $\theta<-2$ or $\theta>3$
   d) $\theta>3$

5. Simplify: $\dfrac{\frac{x}{2}-\frac{4}{x^2}}{\frac{1}{x}-\frac{2}{x^2}}$

   a) $\dfrac{x^2+2x+4}{2}$ b) $\dfrac{x^3}{4-x^2}$

   c) $-(x-4)$ d) $\dfrac{(x-4)(x-x^2)}{2-x^2}$

6. Let $f(x) = 1 - 3x^2$ and $g(x) = 2x + 5$. Find $f(g(x))$.

a) $7 - 6x^2$ b) $-3 - 6x^2$

c) $4x^2 + 20x + 23$ d) $-12x^2 - 60x - 74$

7. The sum of two numbers is 12. The difference between them is 4. What are the two numbers?

a) 8 and –4 b) 8 and 4 c) -8 and –4 d) 6 and –6

8. What is the domain of the function $f(x) = \sqrt{4-x}$ ?

a) $4 \geq x$ b) $4 > x$ c) $x > -4$ d) $x \geq 0$

9. The solution for $3 < |2x - 5|$ is

a) $1 < x < 9$ b) $1 < x < 4$ c) $x < 1$ or $4 < x$ d) $4 < |x|$

10. Tub A contains a solution that is 10% hydrochloric acid. Tub B contains 3 liters of a solution that is 50% hydrochloric acid. How much of the liquid from Tub A must be carefully added to Tub B so that the new mixture in Tub B is 40% hydrochloric acid?

a) 1 liter b) 2 liters c) 2/3 liter d) 3 liters

11. Find the greatest common divisor for these two expressions:

$(x-2)^2(x^2-x-12)$ and $(x-2)(x^2+x-6)$

a) $x-2$ b) $(x-2)(x+3)$

c) $(x-2)^2(x+3)$ d) $(x-2)^2(x+3)(x-4)$

12. The unique solution to this system of equations is

$$2x - 3y = 4$$
$$5x - 6y = 10$$

a) $(-2, 0)$ b) $(0, 2)$ c) $(5, 2)$ d) $(2, 0)$

13. Keith can paint a certain room by himself in 4 hours. Michael can paint the same room by himself in 6 hours. How long will it take them to paint the room together?

a) 2.4 hours b) 4.2 hours c) 5 hours d) 5/12 hours.

14. The least common multiple of these two expressions is

$x^4 y^6 z$ and $x^5 y^2 z^7$

a) $x^4 y^2 z$ b) $x^5 y^6 z^7$ c) $x^9 y^8 z^8$ d) $x y^4 z^6$

15. Solve for x: $\frac{2}{x} + \frac{3}{x-1} = 4 + \frac{3}{x^2 - x}$

a) x = 5/4 and x = 1 b) x = 1 and x = 5 c) x = 5 d) x = 5/4

16. The perimeter of a rectangle is three times its width. Its length is five meters. What is the width of the rectangle?

a) 5 m b) 15 m c) 10 m d) 30 m

17. The prime factorization of 1200 is

a) $12 \times 100$ b) $10^2 \times 12$ c) $2^4 \times 75$ d) $2^4 \times 3 \times 5^2$

18. Evaluate $3\,|\,-2 + 1\,| - |\,6 - 5\,| \cdot |\,12 / 3\,|$

a) -1 b) 1 c) $3\,|\,1\,| - |\,-1\,| \cdot |\,4\,|$ d) 0

19. Simplify $(xy)^2(x^{-2}y^3)^4(x^3z)^{-1}$

a) $\frac{x^2y^{14}}{z}$ b) $\frac{y^{14}}{x^9z}$ c) $\frac{x^2y^{14}}{x^{11}z}$ d) $-8x^2y^4z$

20. An air taxi service can sell a maximum of 500 tickets for seats on a certain airplane. When the tickets cost $100 each, all of the tickets will sell. For every $10 increase in the price of a ticket, 1 more ticket will not be sold. Find expressions for the ticket price and the number of tickets that will be sold if 't' tickets are not sold.

a) price = 100 + 10 t
tickets = 500 – t

b) price = 500 – 10 t
tickets = 100 + t

c) price = 100 - 10 t
tickets = 500 + t

d) price = 100
tickets = 500

21. Which of the following is a linear expression?

a) $2 + xy$ b) $2x^2 + 3y$ c) $3x - 2/y$ d) $2x + 3y$

22. Suppose a, b, and c are real numbers. Which statement reflects the distributive property of multiplication over addition?

a) $a(b + c) = ab + ac$

b) $a(bc) = (ab)c$

c) $a/(b + c) = a/b + a/c$

d) $ab = ba$

23. Put these numbers in increasing order: 50% 1/5 5/11 $0.\overline{50}$

a) 1/5, 5/11, $0.\overline{50}$, 50%
b) 50%, 1/5, 5/11, $0.\overline{50}$
c) 1/5, 5/11, 50%, $0.\overline{50}$
d) 5/11, $0.\overline{50}$, 50%, 1/5

24. Which of 1/3, $\sqrt{3}$, 33/47, $\pi$ are irrational numbers?

a) $\sqrt{3}$, $\pi$ b) 1/3, 33/47 c) only $\sqrt{3}$ d) $\sqrt{3}$, 33/47, $\pi$

**25. The solution to this system of equations consists of three numbers. What is the sum of the three numbers?**

$$x + 3y - z = 2$$
$$3x - 3y + 2z = -2$$
$$-x + 6y - \tfrac{1}{2}z = 13$$

**a)** 13 **b)** $5\frac{1}{3}$ **c)** $7\frac{2}{3}$ **d)** $-2\frac{2}{3}$