1. Sum of roots is \( \frac{-b}{a} = \frac{-4}{2} = 2 \).

2. \( \sum_{x=1}^{10} (x(x+1)) = \sum_{x=1}^{10} x^2 + \sum_{x=1}^{10} x = 385 + 55 = 440 \)

3. Add the second and third equations and get \( v + 2w + x + y = 4 \). Note that the first equation is \( v + 2w + 4x + y = 4 \). Subtracting the two gives \(-3x = 0 \rightarrow x = 0\).

4. Susan paints \( \frac{1}{2} \) a barn each day and Pam paints \( \frac{1}{4} \) a barn each day, so together they paint \( \frac{3}{4} \) a barn each day so they paint 30 barns in 40 days.

5. \(|x^2 - 1| \geq 0\), so \(|x^2 - 1| + 4 \geq 4\) so 4 is the minimum.

6. \(3 \mid x - 1 \mid - x - 1 \mid + 4 \mid x - 1 \mid = 6 \mid x - 1 \mid = 18 \rightarrow x - 1 = 3 \rightarrow x = -2, 4 \rightarrow sum = 2 \)

7. \(41^2 - 17^2 = (41 - 17)(41 + 17)\), which is divisible by 58
   \(19^4 - 16 = 361 - 4\), which is divisible by 365
   \(18^2 + 22^2 = 1089 + 484\), which is divisible by 4
   \(12^2 + 11^2 = (12 + 11)(12 - 11)\), which is divisible by 23
   So none are prime.

8. By definition of inverse, for any function \( g(x) \) with an inverse, \( g(g^{-1}(l)) = 1 \).

9. Let \( x = \sqrt{\pi + \sqrt{\pi + \sqrt{\pi + \ldots}}} \) so \( x = \sqrt{\pi + x} \rightarrow x^2 - x - \pi = 0 \). We want the positive root since the radical is obviously positive: \( \frac{1 + \sqrt{1 + 4\pi}}{2} \).

10. For the sum to be even, there has to be either 0 odd terms, 2 odd terms, or 4 odd terms. This is just as likely as the opposite, which is 5 odd terms (0 even), 3 odd terms (2 even) or 1 odd term (4 even), so the probability \( A \) is just \( \frac{1}{2} \).

11. By the AM-GM theorem, the geometric mean of 69 and 71 is less than their arithmetic mean, so \( \sqrt{(69)(71)} < \frac{69 + 71}{2} = 70 \), and \( \sqrt{(69)(71)} > \sqrt{(69)(69)} = 69 \), so \( \sqrt{(69)(71)} \) is between 69 and 70, so the answer is 70.

12. \( \sum_{x=0}^{10} y \sum_{x=0}^{10} x^2 = \sqrt{y} \sum_{x=0}^{10} x = 55 \sqrt{y} = 220 \rightarrow y = 16 \).
13. Distance is \( \sqrt{(4 - 3)^2 + (7 - 1)^2} = \sqrt{37} \).

14. \( y = x^2 - 2\sqrt{2}x + 2 = (x - \sqrt{2})^2 \), so there are no rational roots.

15. \( y = 2x \) has slope 2, so any line that is perpendicular to \( y = 2x \) has slope \(-\frac{1}{2}\).

16. Say the shoes originally cost \( x \). After the first discount, the cost is down to \( \frac{6x}{10} \), but after the markup it’s back up to \( \frac{72x}{100} \). After the final discount the price is down to \( \frac{36x}{100} = 9 \rightarrow x = 25 \).

17. \( x + y = \sqrt{48}, xy = 4 \rightarrow x^2 + y^2 = (x + y)^2 - 2xy = 48 - 8 = 40 \)

18. \( (4 + 2i)^2 - (4 - 2i)^2 = (4 + 2i + 4 - 2i)(4 + 2i - 4 + 2i) = (8)(4i) = 32i \)

19. \( \frac{x^4y^2zx}{xyz^4} = \frac{x^4y}{z^3} \).

20. Set the two equal. \(-x^2 = 2x + 1 \rightarrow x^2 + 2x + 1 = 0 \rightarrow x = -1 \rightarrow (-1, -1) \)

21. Perimeter is sum of lengths of sides \((x + 2y - 1) + (y + 4) + (y - x + 4) = 4y + 7 \)

22. Call the sides \( a, b \) \( a > b \).

\[ a + b = 9, \quad ab = 17 \rightarrow b = \frac{17}{a} \rightarrow a + \frac{17}{a} = 9 \rightarrow a^2 - 9a + 17 = 0 \rightarrow a = \frac{9 + \sqrt{13}}{2} \]

23. \( \log 4^{10} = 10 \log 4 = 20 \log 2 = 6 \), \( \log 5^9 = 9 \log 5 = 9(1 - \log 2) = 6.3 \), so \( 5^9 \) is larger.

24. Number of gophers goes up by a factor of 13, so 91 gophers can lay 182 eggs in 14 minutes. Now double the time, so 91 gophers can lay 364 eggs in 28 minutes.

25. \( x + 2y - 1 = 0 \rightarrow y = -\frac{1}{2}x + \frac{1}{2} \), so slope is \(-\frac{1}{2}\).