23. The average number that the pigs wore was $(1+p)/2$. Multiply this average by the number of pigs to get the total, which is $p(1+p)/2$.

A) $\frac{1}{2}p(1+p)$ B) $p(1+p)$ C) $\frac{1}{2}(1+p)$ D) $\frac{1}{2}p(p-1)$

Answer: 23. A

24. $2\sqrt{8} = 4\sqrt{2}$. Adding this to $8\sqrt{2}$, the sum is $12\sqrt{2} = \sqrt{288}$.

A) $\sqrt{256}$ B) $\sqrt{288}$ C) $\sqrt{384}$ D) $\sqrt{512}$

Answer: 24. B

25. Only integer pairs $(-1,-1)$, $(-1,1)$, $(1,-1)$, $(1,1)$ satisfy $x^2+y^2 = 2$.

A) 2 B) 4 C) 6 D) 8

Answer: 25. B

26. If x is an even integer > 0, then $(-x)^x = x^x$, so $-x^x + x^x = 0$.

A) positive B) negative C) zero D) undefined

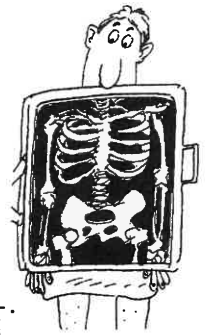
Answer: 26. C

27. $x^2+3\pi x+2\pi^2 = (x+\pi)(x+2\pi) = (2)(2+\pi) = 4+2\pi$.

A) $2+2\pi$ B) $4+\pi$ C) $2+\pi$ D) $4+2\pi$

Answer: 27. D

28. The sides of the x-ray screen have lengths $5x$ and $4x$, so the screen's area is $20x^2 = 20 \times$ (a perfect square). Divide each choice by 20. Only $8000 \div 20 = 400 = 20^2$ is the square of an integer.



A) 200 B) 600 C) 4000 D) 8000

Answer: 28. D

29. Avg. speed = (total distance) ÷ (total time), so $\frac{1}{k} = 2 \div (\frac{1}{k} + \frac{1}{r})$. Cross-multiply to get $\frac{1}{k} + \frac{1}{r} = 2k$. Now, $\frac{1}{r} = 2k - \frac{1}{k}$; so $r = \frac{k}{2k^2-1}$.

A) $\frac{k^2-2}{k}$ B) $\frac{2-k^2}{k}$ C) $\frac{k}{2k^2-1}$ D) $\frac{k^2+1}{2k}$

Answer: 29. C

30. The 2008th term of the sequence is $\frac{\sqrt{2^{2008}}}{2^{2008}} = \frac{2^{1004}}{2^{2008}} = \frac{1}{2^{1004}}$.

A) $\frac{1}{2^{1004}}$ B) $\frac{1}{1004}$ C) $\frac{1}{2^{2008}}$ D) $\frac{1}{2008}$

Answer: 30. A

The end of the contest **A**

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MATH

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Information & Solutions

Spring, 2008

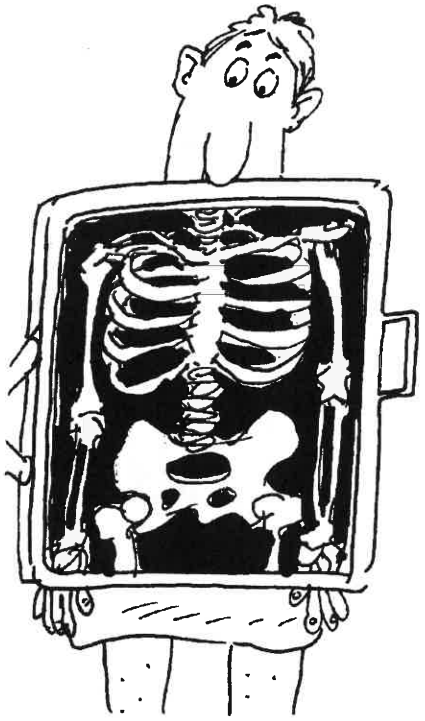
A

Contest Information

- **Solutions** Turn the page for detailed contest solutions (written in the question boxes) and letter answers (written in the *Answers* column to the right of each question).

- **Scores** Please remember that *this is a contest, not a test*—and there is no "passing" or "failing" score. Few students score as high as 30 points (75% correct). Students with half that, 15 points, *deserve commendation!*

- **Answers & Rating Scale** Turn to page 149 for the letter answers to each question and the rating scale for this contest.

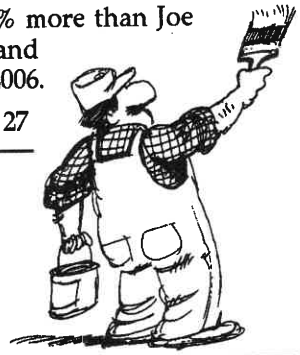


Answers

1. $(2 + 0 + 0 + 8)^0 = 10^0 = 1$.
A) 0 B) 1 C) 4 D) 9
1. B

2. If $x^2 = 10$, then $(x+1)(x-1) = x^2 - 1 = 10 - 1 = 9$.
A) 99 B) 11 C) 9 D) -1
2. C

3. The 36 houses painted in 2007 were 50% more than Joe painted in 2006. Since 12 is 50% of 24, and $24+12 = 36$, Joe painted 24 houses in 2006.
A) 12 B) 18 C) 24 D) 27



3. C

4. $x^2-1 = (x+1)(x-1)$ is divisible by $x+1$, so the fraction in A reduces to $x-1$.
A) $\frac{x^2-1}{x+1}$ B) $\frac{x^2-2}{x+2}$
C) $\frac{x^2-3}{x+3}$ D) $\frac{x^2-4}{x+4}$
4. A

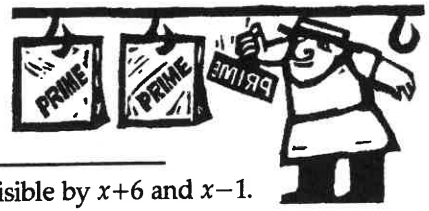
5. The 2009 factors of 2^{2008} are $1, 2^1, 2^2, \ldots, 2^{2007}$, and 2^{2008}.
A) 1 B) 2007 C) 2008 D) 2009
5. D

6. Since $100(x+y) = (x+y)(x+y)$, it follows that $100 = x+y$.
A) 10 B) 100 C) 100+100 D) 100^2
6. B

7. $(x^2+2x+1) - (x^2-2x+1) = x^2+2x+1-x^2+2x-1 = 4x$.
A) 0 B) $-2x^2$ C) $2x$ D) $4x$
7. D

8. Since $a \geq b > 0$ and $ab = 64$, $(a,b) = (64,1), (32,2), (16,4)$, or $(8,8)$.
A) 7 B) 6 C) 4 D) 3
8. C

9. The # between 50 & 150 whose $\sqrt{\ }$ is prime is 121. The sum of its digits is 4.
A) 2 B) 4
C) 11 D) 121



9. B

10. $x^2+5x-6 = (x+6)(x-1)$ is divisible by $x+6$ and $x-1$.
A) $x-6$ B) $x-3$ C) $x-2$ D) $x-1$
10. D

11. Since $|x-y| > x-y$, it follows that $x-y < 0$, from which $y > x$.
A) $y > x$ B) $x > y$ C) $y < 0$ D) $x > 0$
11. A

Go on to the next page ➡ A

Answers

12. The only 16 consecutive integers whose sum is 8 are the integers $-7, -6, \ldots, 7, 8$.
A) -6 B) -7 C) -8 D) -16

12. B

13. The y-intercept of $y = x+1$ is 1, so let $x = 1$ and $y = 0$. That works in choice A.
A) $0 = 1-1$ B) $0 = 1$
C) $0 = 1+1$ D) $0 = 1^2$
13. A

14. Since $(x-1)(x+1)(x-2)(x+2) = (x^2-1)(x^2-4) = x^4-5x^2+4$, the result, with like terms combined, has exactly 3 terms.
A) 3 B) 6 C) 9 D) 12
14. A

15. $x[x(x^2)^2]^2 = x[x(x^4)]^2 = x[x^5]^2 = x[x^{10}] = x^{11}$.
A) x^8 B) x^9 C) x^{10} D) x^{11}
15. D

16. $x^2+bx+12 = (x\pm1)(x\pm12)$ or $(x\pm2)(x\pm6)$ or $(x\pm3)(x\pm4)$.
A) 6 B) 5 C) 4 D) 3
16. A

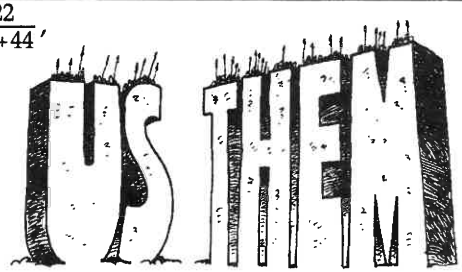
17. The line $y = -4x$ goes through QII, the origin, and QIV.
A) $y = 2x+4$ B) $y = -2x+4$ C) $y = 4x$ D) $y = -4x$
17. D

18. Since $\frac{1}{4x^4-4}$ is undefined if $4x^4-4 = 0$, it's undefined if $x = \pm1$.
A) 0 B) ±1 C) ±2 D) ±4
18. B

19. $999\,999^{6x} \div 999\,999^{3x} = 999\,999^{6x-3x} = 999\,999^{3x}$.
A) $999\,999^2$ B) $999\,999^{2x}$ C) $999\,999^{3x}$ D) $999\,999^3$
19. C

20. Write each in the form $y = mx+b$. Choice D has slope 2.
A) $y = -x+2$ B) $y = x-2$ C) $y = -2x+2$ D) $y = 2x-2$
20. D

21. Since $\frac{2.2}{3.3+4.4} \times \frac{10}{10} = \frac{22}{33+44}$, our score and theirs would have been the same if they also had a score of $\frac{22}{33+44} + 1.1$.
A) 0.011 B) 0.11
C) 1.1 D) 11



21. C

22. If $x < 0$, then $x^2 > 0$ and $x^3 < 0$, so $x^2 > x^3$.
A) $x > x^2$ B) $x > x^3$ C) $x^2 > x^3$ D) $x^3 > x^2$
22. C

Go on to the next page ➡ A