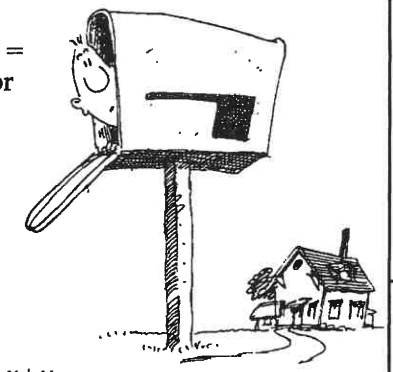
23. $\sqrt{16^{16}} = \sqrt{(16^8)^2} = 16^8$.
A) $16^8$ B) $16^4$ C) $4^8$ D) $4^4$ — **23. A**

24. $A = \pi r^2 = 3600\pi$, so $r^2 = 3600$, or $r = 60$. $C = 2\pi r$, so $C = 120\pi$.
A) 60 B) $60\pi$ C) 120 D) $120\pi$ — **24. D**

25. If $(n^2-1)(n^2-2)(n^2-3) = 0$, then $n^2-1 = 0$, or $n^2-2 = 0$, or $n^2-3 = 0$. Therefore, $n^2 = 1$, or $n^2 = 2$, or $n^2 = 3$. The only integers which satisfy any of these equations are 1 and -1. The number of times I moved by mail is 2.
A) 1 B) 2 C) 3 D) 6



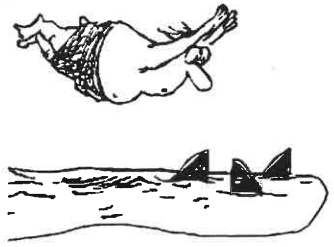
**25. B**

26. $\frac{y}{xy} + \frac{x}{xy} + \frac{1}{xy} = \frac{x+y+1}{xy}$.
A) 2 B) 3 C) $x+y+1$ D) $x+y$ — **26. C**

27. If $x^2 + y^2 = (x + y)^2$, then $x^2 + y^2 = x^2 + 2xy + y^2$. Thus, $2xy = 0$, so $xy = 0$.
A) 0 B) 1 C) 4 D) 16 — **27. A**

28. $(x^2+2x+1)+(x^2+4x+4)+(x^2+6x+9)-[(x^2+1)+(x^2+4)+(x^2+9)] = 12x$.
A) 0 B) $6x$ C) $9x$ D) $12x$ — **28. D**

29. Using $x > 0$, $\frac{x}{x+1} < \frac{2004}{2005} \Leftrightarrow x < 2004$. The largest integral solution is $x = 2003$. The sum of the digits of 2003 is 5, so I swam with 5 fish.
A) 4 B) 5 C) 6 D) 7



**29. B**

30. There are 5 ways to factor -16 into 2 integral factors ($-16\times1$, $-8\times2$, $-4\times4$, $-2\times8$, and $-1\times16$). Their sum is the value of $b$.
A) 3 B) 4 C) 5 D) 6 — **30. C**

*The end of the contest* **A**



MATH

**ALGEBRA COURSE 1 CONTEST**

*Math League Press, P.O. Box 17, Tenafly, New Jersey 07670-0017*

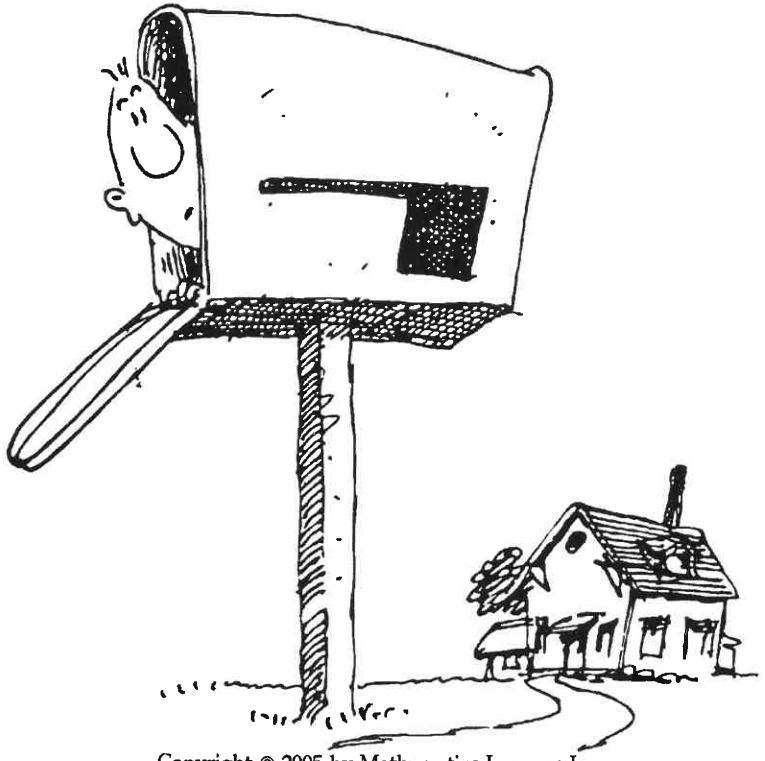
# Information & Solutions

*Spring, 2005*

**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 24 points (80% correct). Students with half that, 12 points, *deserve commendation!*
- **Answers & Rating Scale** Turn to page 151 for the letter answers to each question and the rating scale for this contest.



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Answers

1. $1^{2005} + 1^{2005} = 1 + 1 = 2 = 2^1$.
A) $1^{4010}$ B) $2^1$ C) $2^{2005}$ D) $2^{4010}$


1. B

2. $n$ piles of 12 coconuts each = $(12n)$ coconuts = $(3\times 4n)$ coconuts = $4n$ piles of 3 coconuts each.
A) $n+3$ B) $n+4$ C) $3n$ D) $4n$

2. D

3. $x^{400}\div x^{100} = x^{(400\,-\,100)} = x^{300}$.
A) $x^{500}$ B) $x^{300}$ C) $x^4$ D) 4

3. B

4. $(-1)^1+(-1)^2+\ldots+(-1)^{99} = (-1)+(1)+\ldots+(-1) = 0+\ldots+(-1) = -1$.
A) 1 B) 0 C) -1 D) -99

4. C

5. Since $x^2-y^2 = (x+y)(x-y) = 10(x-y) = 10$, we see that $x-y = 1$.
A) 1 B) -1 C) 10 D) -10

5. A

6. Since $(2x)(5¢) + (x)(10¢) = 60¢$, add to get $20x¢ = 60¢$, so $x = 3$.
A) 6 B) 4 C) 3 D) 2

6. C

7. Since 8 is divisible by both 2 and 4, the l.c.m. of all three is 8.
A) 2 B) 8 C) 16 D) 64

7. B

8. $2 = \sqrt{4} = \sqrt{8/2} = \sqrt{8} \div \sqrt{2}$.
A) 4 B) $\sqrt{6}$ C) $\sqrt{4}$ D) $\sqrt{2}$

8. D

9. If $h$ = # of light helmets, then $2h$ = # of dark helmets. There are 6 more dark helmets than light ones, so $2h-h = 6$, or $h = 6$. The number of light helmets is 6.
A) 2 B) 3 C) 6 D) 12

9. C

10. Any 2 lines of the form $2x+y = k$, with unequal $k$'s, are parallel.
A) $2x+y = 3$ B) $2x+4y = 6$ C) $2x-y = 3$ D) $x+2y = -3$

10. A

11. The average is $x$, so the integers are $x-2$, $x-1$, $x$, $x+1$, and $x+2$.
A) $x-2$ B) $x-3$ C) $x-4$ D) $x-5$

11. A

Go on to the next page ➡ A



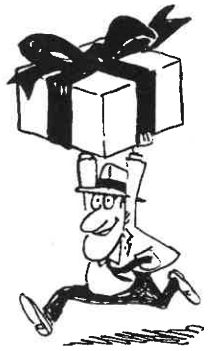


Answers

12. The average is $x$, so the integers are $x-4$, $x-2$, $x$, $x+2$, and $x+4$.
A) $x-2$ B) $x-3$ C) $x-4$ D) $x-5$

12. C

13. $2^{2004}$ is a factor of $2^{2005}$, so $2^{2004}$ is the g.c.f.
A) 1 B) 2 C) $2^{2004}$ D) $2^{2005}$



13. C

14. A horizontal line is parallel to the $x$-axis. I was the 7th caller to know that the slope of any such line is 0.
A) 0 B) 1 C) -1 D) nonexistent

14. A

15. $a$ = 100% of $a$ = $10\times 10\%$ of $a$ = $10b$.
A) $0.1b$ B) $b$ C) $9b$ D) $10b$

15. D

16. When $n = 6$, $n^n = 6^6 = (6^{6/2})^2 = (6^3)^2$, which is the square of $6^3$.
A) 3 B) 5 C) 6 D) 7

16. C

17. If $k = 4$, then $x^2+4x+4 = (x+2)(x+2) = 0$ and $x$ = -2 or -2.
A) 1 B) 2 C) 3 D) 4

17. D

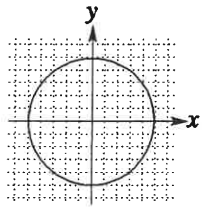
18. Jesse has worn the same hat for $d$ years. If he wears it for 12 more years, he will have worn this hat for $d^2$ years. So, $d+12 = d^2$, or $(d+3)(d-4) = 0$. Since $d > 0$, $d = 4$.
A) 4 B) 6 C) 8 D) 12

18. A

19. $|x| + |-x| = |x| + |x| = 2|x|$.
A) 0 B) $|x|$ C) $|-x|$ D) $2|x|$

19. D

20. Sketch circle $C$. Of the choices, only choice A, (0,5), is on circle $C$.
A) (0,5) B) (−5,−5) C) (−10,0) D) (5,5)




20. A

21. The 4 positive factors of $ab$ are 1, $a$, $b$, and $ab$.
A) 4 B) 3 C) 2 D) 1

21. A

22. Since $(-x)^{100} = (-1)^{100}(x^{100}) = 1\times x^{100}$, choice B is correct.
A) 100 B) 1 C) -1 D) -100

22. B

Go on to the next page ➡ A