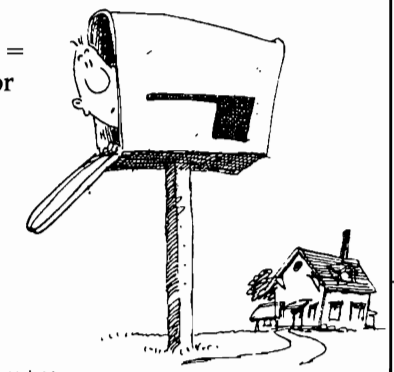
23. $\sqrt{16^{16}} = \sqrt{(16^8)^2} = 16^8$.
A) 16^8 B) 16^4 C) 4^8 D) 4^4 — **23. A**

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) 60π C) 120 D) 120π — **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



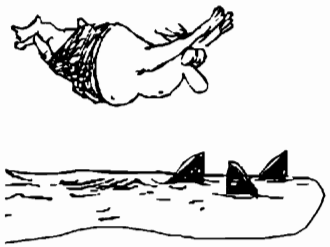
25. B

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 (-16×1, -8×2, -4×4, -2×8, and -1×16). Their sum is the value of b.
A) 3 B) 4 C) 5 D) 6 — **30. C**

The end of the contest **A**

Visit our Web site at http://www.mathleague.com

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ALGEBRA COURSE 1 CONTEST

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

Information & Solutions

Spring, 2005

A

Directions for Grading

- **Date** You may give this contest anytime after April 15. The *Algebra Course 1 Contest* is for use in your own school or district. We've enclosed a registration form for next year. Since results are *not* used for interschool comparisons, ***we do not enclose a score report form***.
- **Urgent questions?** Call 1-201-568-6328.
- **Scores** Remind students 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, *should be commended!*
- **Solutions** Detailed solutions appear in each question box, and letter answers are in the *Answers* columns on the right. You may copy this solution key and give a copy to every student who took this contest.
- **Awards** The original contest package contained 1 book award (and a bookplate you should affix to the book's inside front cover) for the 1st place student. We also enclosed 5 *Certificates of Merit*—1 each for the runner-up on each grade level, plus extras for ties.
- **Additional Book Awards & Additional Certificates** To give more than 1 book award, you may purchase additional books as described below. Do you need more Certificates of Merit? If so, send your name, school, and school mailing address to our mailer at: ***Math Certificates, P.O. Box 17, Tenafly, NJ 07670-0017***, and *include a self-addressed, stamped envelope (**2 stamps required**) large enough to hold certificates.*

  The school's top scorer will receive the book *Math Contests—High School (Vol. 3)*. Other high scorers will receive Certificates of Merit. In any one school year, no student may win both a book and a certificate. The book and certificates were in the original contest package.

  If needed, duplicate book awards may be ordered as described below.

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**

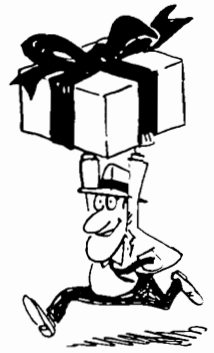
10. Any 2 lines of the form $2x+y = k$, with unequal k's, are parallel.
A) $2x+y = 3$ B) $2x+4y = 6$ C) $2x-y = 3$ D) $x+2y = -3$ — **10. A**

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**

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**

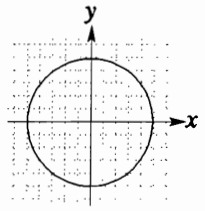
16. When $n = 6$, $n^n = 6^6 = (6^{6/2})^2 = (6^3)^2$, which is the square of 6^3.
A) 3 B) 5 C) 6 D) 7 — **16. C**

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**