

22. The sum of three or more consecutive terms is never as large as the first term and never as small as the sum of the first two terms.

- A) $-\frac{1}{3} < x < -\frac{1}{12}$ B) $-\frac{1}{12} < x < 0$ C) $0 < x < \frac{1}{12}$ D) $\frac{1}{12} < x < \frac{1}{3}$

22.

D

23. If $|x + y| > x + y$, then $x + y < 0$. Either $x < 0$ and $y < 0$, or the variable with the greater absolute value is negative.

- A) $x < 0$ B) $x > 0$ C) $y < 0$ D) $y > 0$

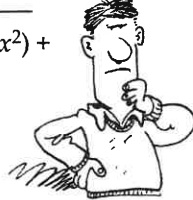


23.

A

24. Use algebraic division or note that $x^3 - 2x + 1 = (x^3 - x^2) + (x^2 - 2x + 1) = -x^2(1 - x) + (1 - x)(1 - x)$.

- A) $-x^2 - x + 1$ B) $-x^2 + x - 1$
C) $x^2 - x - 1$ D) $x^2 + x - 1$



24.

A

25. $63 = 3^2 \times 7^1$ needs one 3 and two 7s to be a cube. $3^1 \times 7^2 = 147$.

- A) 7 B) 83 C) 147 D) 3969

25.

C

26. The area of a circle of radius r is πr^2 . The side-length of the square is $2r$, so the area of the square is $(2r)^2 = 4r^2$. The ratio is thus $\pi r^2 / 4r^2 = \pi/4$.

- A) $\frac{2}{r}$ B) $\frac{\pi}{4}$ C) $\frac{\pi r}{4}$ D) $\frac{r}{4}$

26.

B

27. Factoring, $y = (x - 2)(x - 4)[(x - 6) + (x - 8) + (x - 10)] = (x - 2)(x - 4)(3x - 24) = 3(x - 2)(x - 4)(x - 8)$. When $y = 0$, $x = 2, 4$, or 8 . These are the only points at which the graph crosses the x -axis.

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

27.

C

28. The students' heights total $150 \text{ cm} \times 56 = 8400 \text{ cm}$. If the boys' heights total $165 \text{ cm} \times 21 = 3465 \text{ cm}$, then the girls' heights must total $8400 - 3465 = 4935 \text{ cm}$. The average girl's height is $4935 \text{ cm} \div 35 = 141 \text{ cm}$.

- A) 135 B) 141 C) 151 D) 155



28.

B

29. $5^n + 5^n + 5^n + 5^n + 5^n = 5(5^n) = 5^{n+1}$; $n + 1 = 50$; $n = 49$.

- A) 10 B) 21 C) 38 D) 49

29.

D

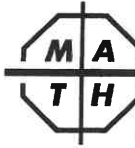
30. $2(2x - 5y) + 3(3x + 4y) = 13x + 2y$; $2(11) + 3(7) = 43$.

- A) 4 B) 18 C) 43 D) 62

30.

C

The end of the contest **A**



Information & Solutions

Spring, 2009

Contest Information

A

- **Solutions** Turn the page for detailed contest solutions (written in the question boxes) and letter answers (written in the *Answer Column* to the right of each question).
- **Scores** Please remember that *this is a contest, and not a test*—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 and Rating Scales** Turn to page 150 for the letter answers to each question and the rating scale for this contest.

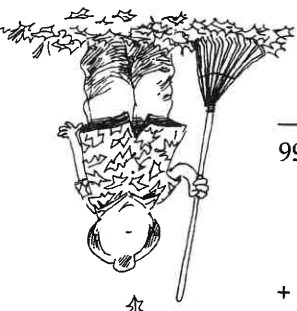


1.	D	If $m = 2, a = 3$, and $t = 5$, then $2 + 3 + 5 + h = 22$. So $10 + h = 22$, and $h = 12$.
2.	C	21 centuries = 21×100 years = 2100 years. 2100 years = $210 \times (10 \text{ years}) = 210$ decades.
3.	B	$(x + 2x + 4x + 6x) + (1 + 3 + 5 + 7) = 13x + 16$. A) $12x + 16$ B) $13x + 16$ C) $13x + 12$ D) $16x + 13$
4.	A	For the square of a number to be less than the number itself, the number must be positive and less than 1. The only choice that is both positive and less than 1 is choice A. A) $\frac{1}{3}$ B) $-\frac{1}{1}$ C) 3 D) -3
5.	B	$(x + 1)(x - 1) - (x + 2)(x - 2) = (x^2 - 1) - (x^2 - 4) = x^2 - 1 - x^2 + 4 = 3$. A) -5 B) 3 C) $2x^2 - 5$ D) $2x^2 + 3$
6.	C	If $x^2 = 3$, then $x^4 = (x^2)^2 = (3)^2 = 9$. Thus, $x^4 - 3 = 6$. A) 0 B) 3 C) 6 D) 9
7.	D	$x + 200\%$ of $x = x + 2x = 3x$. A) $x + 200$ B) $x + 300$ C) $2x$ D) $3x$
8.	A	If $x = y$, then $(x - y) = 0$. $(x + y)(x - y) = (x + y)(0) = 0$. A) 0 B) $x^2 - 2xy + y^2$ C) $x^2 + 2xy - y^2$ D) $x^2 + y^2$
9.	B	$ca^2 = c \times a^2 = c \div 1/a^2$. A) $\frac{a}{1}$ B) $\frac{1}{a^2}$ C) $\frac{c}{a^2}$ D) $\frac{a^2}{c}$
10.	C	Since 10p is divisible by 10 and p, 10p cannot be a prime number. A) $p + 10$ B) $p - 10$ C) 10p D) $p + 1000$
11.	D	If the greatest of the integers is x, then $x + (x - 1) + (x - 2) + (x - 3) + (x - 4) = 10055$. Therefore, $5x - 10 = 10055$, $5x = 10065$, and $x = 2013$. A) 2009 B) 2010 C) 2012 D) 2013



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12.	C	In y min, Ben runs xy m. Since $1 \text{ m} = 1/1000 \text{ km}$, $xy \text{ m} = xy/1000 \text{ km}$. A) $\frac{1000y}{x}$ B) $\frac{1000x}{y}$ C) $\frac{1000}{xy}$ D) $\frac{1000}{xy}$
13.	C	$5^{777} = 5^{555} \times 5^{222}$, so both are divisible by 5^{555} . A) 5 B) 5^{111} C) 5^{555} D) 5^{777}
14.	A	For any $y > 1$, the larger the exponent of y, the larger the value. The largest exponent is in A. A) y^{2008} B) $\sqrt[4008]{y}$ C) $(y^{2008})^8$ D) $y^{2 \cdot 1008}$
15.	B	The intercepts are $(x, 0)$ and $(0, y)$; the slope will be $(y - 0) \div (0 - x) = y \div (-x) = -(y \div x)$. Both y and x are positive, so $-(y \div x)$ is negative. A) positive B) negative C) 0 D) undefined
16.	D	$2^{100} \times (-2)^{101} \div 2^{202} = 2^{100} \times (-2^{101}) \div 2^{202} = -2^{201} \div 2^{202} = -1 \div 2^1 = -1/2$. A) 2 B) -2 C) $\frac{1}{2}$ D) $-\frac{1}{2}$
17.	D	If $(x - 11)^2 = 1$, then $x - 11 = 1$ or $x - 11 = -1$. So, $x = 12$ or $x = 10$. A) -2 B) 1 C) 2 D) 22
18.	B	If $x = 25$, then $x^3 = 25^3 = (5^3)^3 = (5^3)^2 = 125^2$. A) 20 B) 25 C) 30 D) 35
19.	A	Perpendicular lines have negative reciprocal slopes; if the slope of l is 2, the perpendicular slope is $-1/2$, and the sum $3/2$. A) $\frac{3}{2}$ B) $\frac{7}{3}$ C) $\frac{5}{9}$ D) $\frac{7}{8}$
20.	A	Charlie didn't make such a good deal! $x = (-6) + (-5) + (-4) + (-3) + (-2) + (-1) + 0 + 1 + 2 + 3 + 4 + 5 + 6 = 0$. Since Charlie's teacher agrees to pay Charlie $\$5 + x$, his pay is $\$5$ regardless of how many hours he works. A) $\$5$ B) $\$26$ C) $\$131$ D) $\$156$
21.	D	Plot $(2, 6)$ and $(14, 1)$. The y-coordinate of the third vertex is 6, so move along the line $y = 6$ to find a point that forms a right angle when connected to the two given vertices. A) 1 B) 2 C) 6 D) 14



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