

26. From 1 to 9 is one 1; from 10 to 19 is 11 1s; from 20 to 99 is 8 1s; from 100 to 109 is 11 1s, and from 110 to 111 is 5 1s. All together, we have  $(1 + 11 + 8 + 11 + 5)$  1s. That is a total of 36 1s.

A) 12      B) 22      C) 24      D) 36

27. The whole numbers with squares between 2 and 200 are 2, 3, 4, 5, . . . , 13, and 14. There are 13.

A) 12      B) 13      C) 24      D) 26

28. A baker is cutting circular cookies out of a flat rectangle of cookie dough. If the rectangle is 200 cm by 100 cm and the cookies have diameter 20 cm, the baker can cut 10 rows, with 5 cookies in each row.

A) 50              B) 63              C) 64              D) 200

29.  $0.02\%$  of  $20\% = 0.00004$ ;  $200\%$  of  $2000 = 4000 = 0.00004 \times 100\,000\,000$ .

A) 1000            B) 100 000        C) 1 000 000     D) 100 000 000

30. Since  $3\%$  of  $1200$  kg plus  $6\%$  of  $2400$  kg is  $180$  kg, and  $40\%$  of  $100$  kg is  $40$  kg, the remaining  $3500$  kg of ore has  $140$  kg of gold. Since  $140$  divided by  $3500 = 0.04$ , the remaining ore will be  $4\%$  gold.

A)  $2\%$             B)  $3\%$             C)  $4\%$             D)  $5\%$

31. There are 12 face diagonals and 4 diagonals passing through the interior.

A) 12              B) 14              C) 16              D) 24

32. Pick the hundreds digit, then the ones digit, then the tens digit. Based on the hundreds digit being even or odd, the count is  $3 \times 4 \times 7 + 2 \times 5 \times 7$ .

A) 154            B) 175            C) 185            D) 200

33. The whole-number factors of 36 are 1 and 36, 2 and 18, 3 and 12, 4 and 9, and 6. The product of their squares is  $36^9$ .

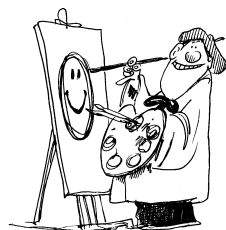
A)  $36^2$             B)  $36^4$             C)  $36^8$             D)  $36^9$

34. When the four members of the Beaverton family carry a log, each has a probability of **not** tripping of  $0.98$ . The probability of none of them tripping is  $0.98 \times 0.98 \times 0.98 \times 0.98 = (0.98)^4$ .

A)  $1 - (0.02)^4$     B)  $(0.98)^4$         C)  $(0.02)^4$         D)  $1 - (0.98)^4$

35. The largest prime factor of the product of all even numbers from 2 to 200 is the largest prime less than  $200 \div 2 = 100$ , which is 97.

A) 47              B) 97              C) 199             D) 2019



26.

D

27.

B

28.

A

29.

D

30.

C

31.

C

32.

A

33.

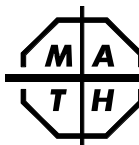
D

34.

B

35.

B



## Information & Solutions

8

Tuesday, February 19 (alternate date: February 26), 2019

### Directions for Grading

- Security and Solutions** Do not look at these solutions until after the contest. 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.
- Urgent Questions?** For appeals or answers to urgent questions, write to [comments@mathleague.com](mailto:comments@mathleague.com) or call 1-201-568-6328.
- 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 28 points (80% correct). Students with half that, 14 points, should be commended.
- Awards & Results** The original contest package contained 5 *Certificates of Merit*—1 each for the 3 highest scoring students on the contest, plus extras for ties. **Do you need more Certificates of Merit?** If so, include your name, school, and school mailing address in a letter to: **Math Certificates, P.O. Box 17, Tenafly, NJ 07670-0017**, and include a self-addressed, stamped envelope (**three 1st Class stamps req'd.**) large enough to hold certificates. Only scores submitted to our Internet Score Report Center by Fri., March 9, 2018 can be used in our *Summary of Contest Results newsletter*, which will be posted online no later than Fri., April 12, 2019.
- Return of Student Papers** *Originals* of contest papers with scores of 30 or more *must* be held until June 1. *Copies* of these papers, and originals of all other papers, should be returned to students after grading. Students scoring 30 points or more must confirm an *understanding* of the contest rules by signing the *Selected Math League Rules* (on the colored sheet of information and rules that accompanied the contests). Keep this signed sheet with the original contests until June 1. Please do not mail these to the League unless we ask you to do so.

Twenty-one books of past contests, *Grades 4, 5, & 6 (Vols. 1, 2, 3, 4, 5, 6, 7)*, *Grades 7 & 8 (Vols. 1, 2, 3, 4, 5, 6, 7)*, and *High School (Vols. 1, 2, 3, 4, 5, 6, 7)* are available, for \$12.95 per volume, from Math League Press, P.O. Box 17, Tenafly, NJ 07670-0017.

The end of the contest 8

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Steven R. Conrad, Daniel Flegler, and Adam Raichel, contest authors

1. $(4 \times 6 \times 8 \times 10) \div (6 \times 8 \times 10) = 4 \times 1 \times 1 \times 1 = 4$ . A) 3      B) 4      C) 12      D) $3 \times 6 \times 8 \times 10$	1. B
2. $2 \div 3 = 0.666\dots$ ; this rounds to 0.67. A) 0.33      B) 0.66      C) 0.67      D) 0.70	2. C
3. Their ages in days are consecutive integers. Since $132 = 11 \times 12$ , the product of their ages in days could be 132. A) 33      B) 132      C) 245      D) 246	3. B
4. The largest even divisor of 200 is 200, and the largest odd divisor of 200 is 25; $200 \div 25 = 8$ . A) 4      B) 8      C) 20      D) 200	4. B
5. An equilateral triangle with integer side-lengths has a perimeter that is a multiple of 3. The area of the square must also be a multiple of 3. If the length of a side of the square is 12, its area is 144. A) 12      B) 10      C) 8      D) 4	5. A
6. We can pay \$12.50 using 50 quarters. That leaves \$0.10, which I can pay using one dime. The smallest number of coins is 51. A) 51      B) 52      C) 54      D) 55	6. A
7. Since the sum of the digits of 2019 is divisible by 3, 2019 is also. A) 1      B) 3      C) 19      D) 673	7. B
8. Since it is possible that the four integers do not include a multiple of 5, their product might not be divisible by a multiple of 5. A) 4      B) 6      C) 10      D) 12	8. C
9. There are 28 days in 4 weeks. There are $24 \times 28$ hours in 28 days. A) 48      B) 96      C) 336      D) 672	9. D
10. Try each choice and find the correct one. Since 10 divided by $1/10$ is 100, choice D is correct. A) $\frac{1}{10}$ B) $\frac{1}{5}$ C) $\frac{1}{2}$ D) 10	10. D
11. The height of the smoke is 100000 cm. To convert to km, divide by $10^2 \times 10^3 = 10^5$ . A) 1      B) 10      C) 100      D) 1000	11. A
12. Since $180^\circ \div (4 + 5 + 6) = 180^\circ \div (15) = 12^\circ$ , the measures are $4 \times 12^\circ = 48^\circ$ , $5 \times 12^\circ = 60^\circ$ , and $6 \times 12^\circ = 72^\circ$ . Finally, $72^\circ - 48^\circ = 24^\circ$ . A) $12^\circ$ B) $24^\circ$ C) $30^\circ$ D) $36^\circ$	12. B



13. The population of a town started at 1000, then went up to 1100, then down to 880, then up to 968. A) 968      B) 972      C) 1000      D) 1024	13. A
14. Divide each choice by 5. The quotients are 10, 15, 20, and 25. Since $15 + 60$ is 75, choice B is correct. A) 50      B) 75      C) 100      D) 125	14. B
15. Each pair of angles in any rectangle is supplementary. A) triangle      B) square      C) rectangle      D) hexagon	15. C
16. Drop the zeroes and evaluate: choices become 64, 243, 256, and 125. A) $2^{600}$ B) $3^{500}$ C) $4^{400}$ D) $5^{300}$	16. A
17. $(2^{100} \times 4^{50}) \div 2 = (2^{100} \times 2^{100}) \div 2 = 2^{200} \div 2^1 = 2^{199}$ . A) $2^{75}$ B) $2^{100}$ C) $2^{149}$ D) $2^{199}$	17. D
18. The pattern for the ones digits of powers of 3 is 39713971..., and the 333rd digit is 3. A) 1      B) 3      C) 7      D) 9	18. B
19. On a series of tests, Gus got 100 once, 90 twice, and 80 five times. The total of these 8 tests is 680, and the average is 85. A) 80      B) 85      C) 90      D) 92	19. B
20. The product of 1 and 5 is 5. A) 5      B) 10      C) 35      D) 40	20. A
21. The probability of heads then tails then heads is $0.5 \times 0.5 \times 0.5 = 0.125$ . A) 0.125      B) 0.25      C) 0.375      D) 0.5	21. A
22. There are 45 days from January 31 through March 16. Rui ate 180 jellybeans in those 45 days, or 4 jellybeans each day. There are 30 days from January 1 through January 30. Rui ate 120 jellybeans on those days, so Rui had $560 + 120$ jellybeans on January 1. A) 600      B) 650      C) 680      D) 740	22. C
23. Jake used 40 boxes of tissues a day or 5760 tissues. Since $5760 \div 24 = 240$ , he used 240 per hour or 4 per minute. A) 2      B) 3      C) 4      D) 5	23. C
24. $5184 = 64 \times 81$ ; its odd divisors are 1, 3, 9, 27, and 81. A) 1      B) 2      C) 4      D) 5	24. D
25. Only choice A is an even multiple of 5. A) 120      B) 125      C) 164      D) 212	25. A

