26. Ky rode 6 trains in less than an hour, taking both 8-minute and 14-minute train rides. Ky took at most __?__ 14-minute train rides.

A) 1 B) 2 C) 3 D) 4

26.

27. $2^{2022} + 2^{2022} = \underline{\ ?\ } \times 2^{2021}$

A) 1 B) 2 C) 4 D) 2^{2021}

27.

28. The cost of one pencil is half that of one pen. If I buy twice as many pens as pencils, what percent of the total cost is the cost of the pens?

A) 25% B) 50% C) 75% D) 80%

28.

29. How many more positive integers less than 1000 are divisible by 2, 3, and 7 than by 2, 3, 4, and 7?

A) 9 B) 11 C) 12 D) 22

29.

30. How many factors of 6^3 are perfect squares?

A) 4 B) 3 C) 2 D) 1

30.

31. I found a prize in 1 of every 7 candy bar wrappers I had. If candy bars are sold in packages of 6 bars, what is the least number of candy bar packages I could have bought to find 7^3 prizes?

A) 58 B) 343 C) 400 D) 401

31.

32. Every 8th person standing on a long line left, starting with the 8th person. What is the new position on the line for the person who had been 100th?

A) 84th B) 87th C) 88th D) 92nd

32.

33. The least common multiple of 2 two-digit whole numbers is the product of 4 different primes. The least such least common multiple is

A) 210 B) 132 C) 121 D) 120

33.

34. Axel and May must each paint half of a 1236 m fence. Axel paints at a constant rate of 3 m/min. May paints at a constant rate of 2 m/min. If they want to finish painting at the same time, how long after May starts should Axel start?

A) 1 min. B) 103 min. C) 123 min. D) 206 min.

34.

35. If the sum of the 10th and 22nd integers on a list of consecutive integers is 100, what is the 200th integer on the list?

A) 222 B) 224 C) 232 D) 234

35.

The end of the contest ✍ **6**
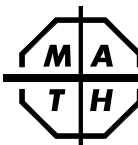
2021-2022 Annual 6th Grade Contest

Tuesday, February 15 (alternate date: February 22), 2022

6

Instructions

- **Time** Do *not* open this booklet until told by your teacher to begin. You might be *unable* to finish all 35 questions in the 30 minutes allowed.

- **Scores** Remember that *this is a contest, not a test*—there is no "passing" or "failing" score. Few students score 28 points (80% correct). Students with half that, 14 points, *should be commended!* High-scoring students may be invited to our "Math Camp" in July.

- **Results Posted Online** High-scoring contest results, both overall and regional, will be posted at *www.mathleague.com* no later than April 15.

- **Format, Point Value, & Eligibility** Every answer is an A, B, C, or D. Write answers in the *Answers* column. A correct answer is worth 1 point. Unanswered questions get no credit. You **may** use a calculator. You're eligible for this contest only if you are in grade 6 or below and only if you don't also take this year's Annual 7th or Annual 8th Grade Contest.

Please Print (*To the student: You must complete all items below*)

Last Name _____ First Name _____

School _____ Teacher _____ Grade Level _____

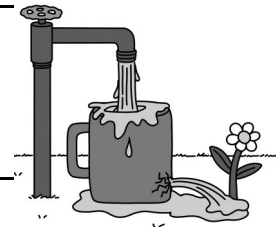Time at Start of Contest _____ Today's Date _____

Do Not Write In The Space Below

To the Teacher:
Please enter the score at the right before you return this paper to the student. *Papers with scores of 30 or higher must be held until June 1.* **Student's Score**: _____

1. $2021 \times 2022 = (2021 \times 2021) +$ _?_

   A) 1   B) 2021   C) 2022   D) 4043

   1.

2. Ada biked 1/2 the length of a bike trail. If she has 90 km of the trail left to bike, the length of the trail is _?_ km.

   A) 90.5   B) 135   C) 150   D) 180

   2.

3. How many digits of the product of 3000 and 45 000 are not zeros?

   A) 3   B) 4   C) 6   D) 10

   3.

4. The product of 12 and its greatest factor is

   A) 24   B) 72   C) 96   D) 144

   4.

5. The least common multiple of 6×100 and 9×100 is

   A) 12×100 B) 15×100 C) 18×100 D) 54×100

   5.

6. If the sum of the measures of two angles of an isosceles triangle is 60°, then the triangle must be

   A) scalene   B) equilateral   C) acute   D) obtuse

   6.

7. $3000 \times 3000 = 3^2 \times$ _?_

   A) 1000   B) 100^2 C) 1000^2 D) $10\,000^2$

   7.

8. The total value of 175 dimes is _?_ less than the total value of 175 quarters.

   A) $17.50   B) $26.25   C) $43.75   D) $61.25

   8.

9. Twenty percent of 12 345 equals 12 345 divided by

   A) 2   B) 5   C) 20   D) 2469

   9.

10. What is the least even integer with exactly 2 different odd factors?

    A) 6   B) 10   C) 12   D) 14

    10.

11. My candle can burn for a total of 48 hours. I burn it for at least 4 hours a day. If I want to burn my candle on exactly 8 days, I can burn it for at most _?_ hours on a single day.

    A) 16   B) 20   C) 22   D) 24

    11.

12. How many factors of $11 \times 12 \times 13 \times 14$ are prime?

    A) 2   B) 3   C) 4   D) 5

    12.

13. What is the greatest common factor of 4^{16} and 16^4?

    A) 4^2 B) 4^4 C) 4^8 D) 4^{12}

    13.
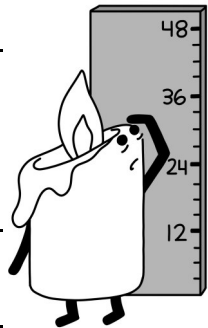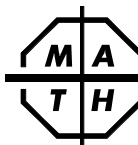
14. Edie first counted 100 nickels, then 100 dimes. The total value of the last 150 coins she counted was

    A) $7.50   B) $12.50   C) $15.00   D) $55.00

    14.

15. I filled an empty 600 ml jug with water at a constant rate of 60 ml/sec. If the jug leaked at a constant rate of 10 ml/sec., how many seconds did it take to fill half the jug?

    A) 3   B) 5   C) 6   D) 8

    15.

16. If Shane sailed 8^3 km, Shane sailed _?_ m.

    A) 8×10^3 B) $8^3 \times 10^3$ C) 1800^3 D) 8000^3

    16.

17. How many 3-digit integers are squares of 2-digit integers?

    A) 21   B) 22   C) 23   D) 899

    17.

18. Bo's first day of 6th grade was a Tuesday. If Bo's last day of 6th grade was 210 days later, then Bo's last day of 6th grade was a

    A) Tuesday   B) Wednesday   C) Thursday   D) Friday

    18.

19. If the average of the 9 smallest of 100 consecutive integers is 2022, then the average of the 9 greatest of the 100 integers is

    A) 2113   B) 2117   C) 2118   D) 2122

    19.

20. How many 2-digit positive integers are divisible by each of their digits?

    A) 14   B) 22   C) 25   D) 31

    20.

21. Aya had a jar of red pins and blue pins. Of these, 40% were blue. After Aya added green pins, only 20% of the pins were blue. What percent of all the pins were green?

    A) 20%   B) 30%   C) 40%   D) 50%

    21.

22. The product of the remainders from dividing my secret number by 2, by 3, by 4, and by 5 is greater than 0. My secret number could be

    A) $5 \times 7 \times 11$ B) $7 \times 8 \times 9$ C) $7 \times 9 \times 11$ D) $7 \times 11 \times 13$

    22.

23. Each cafeteria table has either 2 or 3 students seated. What is the least possible number of tables used if 136 students are seated?

    A) 45   B) 46   C) 47   D) 68

    23.

24. How many integers less than 100 can be written as the product of exactly 3 different prime numbers?

    A) 7   B) 6   C) 5   D) 4

    24.

25. The measures of 2 angles of a right triangle differ by 80°. The smallest possible integer measure of an acute angle of this triangle is

    A) 5°   B) 10°   C) 80°   D) 85°

    25.

26. Ky rode 6 trains in less than an hour, taking both 8-minute and 14-minute train rides. Ky could take **1** 14-minute ride and 5 8-minute rides.

    A) 1   B) 2   C) 3   D) 4

    26. A

27. $2^{2022} + 2^{2022} = 2 \times 2^{2022} = \underline{\mathbf{2 \times 2}} \times 2^{2021}$.

    A) 1   B) 2   C) 4   D) 2^{2021}

    27. C

28. Find the total cost of 2 pens and 1 pencil. Since 2 pens cost 4 times as much as 1 pencil, 2 pens cost 4/5 = **80%** of the total cost.

    A) 25%   B) 50%   C) 75%   D) 80%

    28. D

29. The numbers divisible by 2, 3, and 7 but not by 4 are products of 42 and an odd integer. There are **12** such numbers less than 1000.

    A) 9   B) 11   C) 12   D) 22

    29. C

30. The factors of 6^3 that are perfect squares are 1^2, 2^2, 3^2, and 6^2.

    A) 4   B) 3   C) 2   D) 1

    30. A

31. To get 343 prizes, I must have bought at least 7×343 = 2401 candy bars. Since candy bars are sold in packages of 6, that's 2401÷6 = 400 R1 packages. I must have bought at least **401** packages.

    A) 58   B) 343   C) 400   D) 401

    31. D

32. To determine how many people left the line, divide 100 by 8 and ignore the remainder. Since 100 ÷ 8 = 12 R4, 12 people left the line. The 100th person is now the **88th** person on line.

    A) 84th   B) 87th   C) 88th   D) 92nd

    32. C

33. The l.c.m. of 2 two-digit whole numbers is the product of 4 different primes. The least such multiple is 10×21 = 14×15 = 2×3×5×7.

    A) 210   B) 132   C) 121   D) 120

    33. A

34. Axel and May must each paint half of 1236 m of fence, or 618 m of fence. Axel can paint 618 m in 618 ÷ 3 = 206 min. May can paint in 618 ÷ 2 = 309 min. Alex should start 309 − 206 = **103** min. after May starts so they finish at the same time.

    A) 1 min.   B) 103 min.   C) 123 min.   D) 206 min.

    34. B

35. The integer halfway between the 10th and 22nd integers is the 16th one; its value is 1/2 of 100 = 50. The 200th integer is 50 + (200 − 16).

    A) 222   B) 224   C) 232   D) 234

    35. D

The end of the contest ✍ **6**

Visit our Website at http://www.mathleague.com
Steven R. Conrad, Daniel Flegler, Jeannine Kolbush, and Adam Raichel, contest authors

SIXTH GRADE MATHEMATICS CONTEST

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

Information & Solutions

6

*Tuesday, February 15 (alternate date: February 22), 2022*

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 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 5, 2021 can be used in our *Summary of Contest Results newsletter,* which will be posted online no later than Fri., April 9, 2021.

- **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.

Answers

1. $2021 \times (2021+1) = (2021\times2021) + (2021\times1) = (2021\times2021) + \underline{\textbf{2021}}$.
    A) 1   B) 2021   C) 2022   D) 4043

    1. B

2. Ada biked 1/2 of a trail. She has 90 km or 1/2 left. The part left must also be 90 km long. The trail's length is 90+90 = **180** km.
    A) 90.5   B) 135   C) 150   D) 180

    2. D

3. The product of 3000 and 45 000 is 135 000 000. It has **3** non-zero digits.
    A) 3   B) 4   C) 6   D) 10

    3. A

4. The product of 12 and its greatest factor (which is 12) is **144**.
    A) 24   B) 72   C) 96   D) 144

    4. D

5. The l.c.m. of $(2\times3) \times 100$ and $(3\times3) \times 100$ is $(2\times3\times3)\times100 = \textbf{18} \times \textbf{100.}$
    A) 12×100 B) 15×100 C) 18×100 D) 54×100

    5. C

6. If the sum of the measures of two angles of a triangle is 60°, then the measure of the third angle is 120° and the triangle is **obtuse**.
    A) scalene   B) equilateral   C) acute   D) obtuse

    6. D

7. $3000 \times 3000 = (3\times1000) \times (3\times1000) = 3^2 \times \underline{\textbf{1000}^2}.$
    A) 1000   B) 100^2 C) 1000^2 D) $10 000^2$

    7. C

8. The total value of 175 dimes is $17.50 and the total value of 175 quarters is $43.75. Their difference in value is **$26.25**.
    A) $17.50   B) $26.25   C) $43.75   D) $61.25

    8. B

9. $0.20\times12 345 = 2469$ and $12 345\div2469 = 5$; thus, $12 345\div\textbf{5} = 2469$.
    A) 2   B) 5   C) 20   D) 2469

    9. B

10. The least such integer is $1\times2\times3 = \textbf{6}$. Its odd factors are 1 and 3.
    A) 6   B) 10   C) 12   D) 14

    10. A

11. My candle can burn for a total of 48 hours. I burn it for at least 4 hours a day. If I want to burn my candle on exactly 8 days, I can burn it for 4 hours on each of 7 days and **20** hours on one day.
    A) 16   B) 20   C) 22   D) 24

    11. B

12. The prime factors of $11\times12\times13\times14$ are 2, 3, 7, 11, 13.
    A) 2   B) 3   C) 4   D) 5

    12. D

13. $16^4 = (4\times4)\times(4\times4)\times(4\times4)\times(4\times4) = 4^8$. The g.c.f. of 4^{16} and 4^8 is $\textbf{4}^8$.
    A) 4^2 B) 4^4 C) 4^8 D) 4^{12}

    13. C

Answers
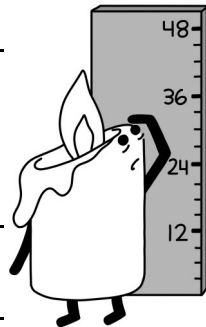
14. Edie first counted 100 nickels, then 100 dimes. The last 150 coins were 50 nickels and 100 dimes. These are worth $2.50 + $10 = **$12.50**.
    A) $7.50   B) $12.50   C) $15.00   D) $55.00

    14. B

15. I filled a 600 ml jug with water at a rate of 60 ml/sec. If the jug leaked at a rate of 10 ml/sec, it was filled at a rate of 50 ml/sec. It took $300\div50 = \textbf{6}$ seconds to fill half the jug.
    A) 3   B) 5   C) 6   D) 8

    15. C

16. 1 km = 1000 m; $8^3\times1000$ m = $\textbf{8}^3 \times \textbf{10}^3$ m.
    A) 8×10^3 B) $8^3 \times 10^3$ C) 1800^3 D) 8000^3

    16. B

17. $10^2 = 100$ and $31^2< 1000<32^2$; there are **22** integers from 10 to 31.
    A) 21   B) 22   C) 23   D) 899

    17. B

18. Bo's 1st day of 6th grade was a Tuesday. Bo's last day was 210 days later. Since 210 is a multiple of 7, Bo's last day was also a **Tuesday**.
    A) Tuesday   B) Wednesday   C) Thursday   D) Friday

    18. A

19. The 9 largest such integers are each 91 greater than the 9 smallest such integers, so their average is 91 greater than 2022—that's **2113**.
    A) 2113   B) 2117   C) 2118   D) 2122

    19. A

20. The **14** integers are: 11, 12, 15, 22, 24, 33, 36, 44, 48, 55, 66, 77, 88, 99.
    A) 14   B) 22   C) 25   D) 31

    20. A

21. Aya had a jar of red pins and blue pins. Of these, 40% were blue. If she started with 60 red and 40 blue pins (pick any convenient number), she must have added 100 green pins. Of 200 pins, 100 or **50%** were green.
    A) 20%   B) 30%   C) 40%   D) 50%

    21. D

22. My secret number is not divisible by 2, 3, 4, or 5. The only choice listed that is not divisible by any of these is choice **D**.
    A) $5 \times 7 \times 11$ B) $7 \times 8 \times 9$ C) $7 \times 9 \times 11$ D) $7 \times 11 \times 13$

    22. D

23. Since $136\div3 = 45$ R1, 45 tables of 3 seat all but 1 student. If there are 44 tables with 3 seated at each, there could be 2 tables with 2 at each.
    A) 45   B) 46   C) 47   D) 68

    23. B

24. The only such integers equal $2\times3\times5$, $2\times3\times7$, $2\times3\times11$, $2\times3\times13$, and $2\times5\times7$. In all, there are **5** such integers.
    A) 7   B) 6   C) 5   D) 4

    24. C

25. The measures of the angles of the right triangle could be 5°, 85°, and 90° or 10°, 80°, and 90°. The smallest of these is **5°**.
    A) 5°   B) 10°   C) 80°   D) 85°

    25. A