
TEST 2

MATH 221: BASIC CONCEPTS OF ELEMENTARY MATHEMATICS I

Name _____

Instructions: Check that your test consists of 25 problems. Put your name in the space provided above. Answer each multiple choice question below. Each problem is worth 4 points with the same scoring procedure as used on the quizzes. A blank page is provided at the end of this test for your work.

1. What is the value of $42_{\text{five}} - 23_{\text{five}}$?

- (a) 24_{five} (b) 21_{five} (c) 14_{five} (d) 11_{five}

2. What is the value of $110_{\text{two}} + 11_{\text{two}}$?

- (a) 1001_{two} (b) 1101_{two} (c) 1011_{two} (d) 1010_{two}

3. In the lattice addition problem illustrated to the right, what digit should go in the triangle containing the question mark?

- (a) 3 (b) 2 (c) 6 (d) 4

$$\begin{array}{r}
 6345 \\
 + 4388 \\
 \hline
 \begin{array}{|c|c|c|c|}
 \hline
 \diagup & \diagup & \triangle & \diagup \\
 \hline
 \end{array}
 \end{array}$$

4. Little Tommy has done the column addition problem to the right. However, there is a question mark where a number should be. What number should he put where the question mark appears?

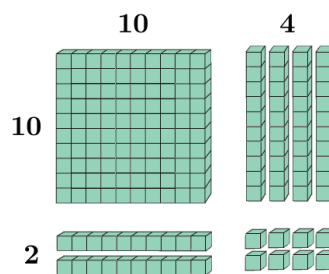
- (a) 19 (b) 10
(c) 9 (d) 0

$$\begin{array}{r}
 389 \\
 + 413 \\
 \hline
 7912 \\
 \hline
 7?12 \\
 \hline
 802
 \end{array}$$

5. What is the value of $25 \cdot 109 \cdot 5 \cdot 8 \cdot 3$?

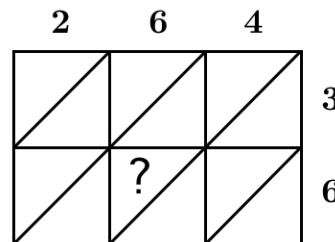
- (a) 109,000 (b) 1,090,000 (c) 327,000 (d) 3,270,000

6. What arithmetic computation is illustrated by the figure to the right?



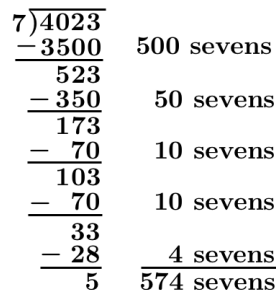
- (a) $10 \cdot 10 + 2 \cdot 4$ (b) $10 \cdot 2 + 10 \cdot 4$
 (c) $12 \cdot 14$ (d) $21 \cdot 41$

7. A student decides to use lattice multiplication to calculate 264×36 . He sets up his work as shown to the right. Which number below should he put in the small triangle containing the question mark?



- (a) 3 (b) 5 (c) 6 (d) 8

8. A division problem is correctly performed by using repeated division as shown to the right. What is the remainder in this division problem?



- (a) 574 (b) 4023 (c) 4 (d) 5

9. A person wants to mentally compute the sum

$$37 + 76 + 18 + 13 + 24 + 82 + 83.$$

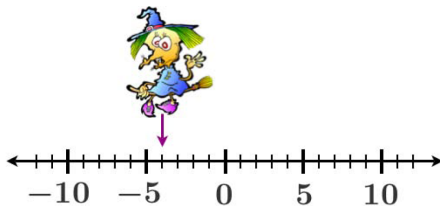
The person notices that compatible numbers can be used to perform the mental computation by pairing the numbers in a convenient way. One of the numbers, however, appearing in the sum above is not part of a compatible pair. Which number is it?

- (a) 37 (b) 76 (c) 82 (d) 83

10. A student is asked to use chip arithmetic to calculate $-3 - 2$ (negative 3 minus 2). She begins by placing 3 red chips on her desk. What is the next step the student should do for a proper use of the chip model? (Note: the next step might not be the last step.)

- (a) Flip over two of the red chips so that they become blue chips.
 (b) Place down two more red chips to make a total of five red chips.
 (c) Take away two of the red chips leaving just one red chip on the desk.
 (d) Place down a blue chip and a red chip and then do it again so that there are five red chips and two blue chips on the table.

11. A student is in the process of using the number-line model to compute $-4 - -4$ (that is, negative 4 minus negative 4). She has made the rather elegant drawing below showing her work.



What is the next step she should do? (Be careful!! She is NOT at the very beginning of the problem. She is *somewhere* in the middle of it.)

- (a) She should flip the witch so that the witch is looking in the opposite direction.
 - (b) She should turn the witch upside down so that it is pointing upward.
 - (c) She should move the witch forward four units.
 - (d) She should move the witch backward four units.
12. What property of the integers is illustrated by

$$(-3) \cdot (4 + 5) = (-3) \cdot 4 + (-3) \cdot 5?$$

- (a) the commutative property of multiplication of integers
 - (b) the associative property of multiplication of integers
 - (c) the closure property of multiplication of integers
 - (d) the distributive property of multiplication over addition of integers
13. Which one of the following is false?

- (a) All nonzero integers divide 0.
- (b) If $d \mid a$, then d divides every multiple of a .
- (c) The expressions $b \mid a$ and $b \div a$ have the same meaning.
- (d) If $d \mid a$ and $d \mid b$, then $d \mid (a + b)$.

14. Which one of the following is false?

- (a) 24 is a multiple of 4
- (b) 4 is divisible by 24
- (c) 4 is a divisor of 24
- (d) 4 is a factor of 24

15. What is the least natural number divisible by each natural number less than or equal to 16?

- (a) $2^3 \cdot 3^2 \cdot 5 \cdot 7 \cdot 11 \cdot 13$ (b) $2^4 \cdot 3^3 \cdot 5^2 \cdot 7 \cdot 11 \cdot 13$
(c) $2^4 \cdot 3^2 \cdot 5 \cdot 7 \cdot 11 \cdot 13$ (d) $2^3 \cdot 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13$

16. Which of the choices below is a divisor of the number

$$71717171717171717?$$

The number contains the digit 7 eight times and the digit 1 seven times.

- (a) 4 (b) 6 (c) 9 (d) 11

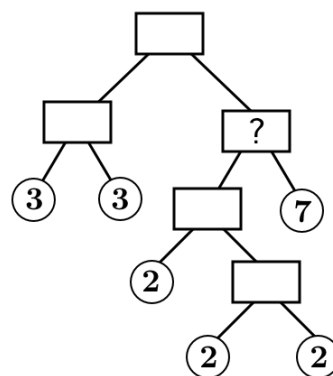
17. If 42 divides n , then how many of the numbers

$$3, 7, 14, 210, 420$$

must also divide n ?

- (a) 2 (b) 3 (c) 4 (d) 5

18. In the factor tree to the right, there are numbers missing in the rectangles. What number belongs in the rectangle which contains the question mark?



- (a) 56 (b) 63
(c) 28 (d) 14

19. John is taking a test that asks for the value of the product

$$4 \cdot 23 \cdot 37 \cdot 119 \cdot 331 \cdot 953 \cdot 2027.$$

He panics and then realizes that he is taking a multiple choice test and all he really has to do is to eliminate three wrong choices. The various choices he is given are indicated below. He remembers his divisibility tests and is able to quickly determine the correct choice. What is the correct choice?

- (a) 259006793830046 (b) 259006793830036
(c) 259006793830006 (d) 259006793830086

20. Which one of the following is *not* a divisor of 500000292?

- (a) 8 (b) 11 (c) 12 (d) 18

21. Which one of the following is a prime?

- (a) 119 (b) 211 (c) 221 (d) 253

22. Which of the following is the value of

$$\text{GCD}(2^3 \cdot 3 \cdot 5, 2 \cdot 3^2, 2^2 \cdot 3 \cdot 5^2) ?$$

- (a) $2 \cdot 3 \cdot 5$ (b) $2^6 \cdot 3^4 \cdot 5^3$ (c) $2 \cdot 3$ (d) $2^3 \cdot 3^2 \cdot 5^2$

23. Which of the following is the value of

$$\text{LCM}(2^3 \cdot 3 \cdot 5, 2 \cdot 3^2, 2^2 \cdot 3 \cdot 5^2) ?$$

- (a) $2 \cdot 3 \cdot 5$ (b) $2^6 \cdot 3^4 \cdot 5^3$ (c) $2 \cdot 3$ (d) $2^3 \cdot 3^2 \cdot 5^2$

24. If a and b are positive integers and $\text{LCM}(a, b) = a$, then which of the following *must* be true?

- (a) $a = b$ (b) a and b have no common prime divisors
(c) a divides b (d) b divides a

25. Note that the factor trees for 360 and 11250 are given below. Which of the following is the value of $\text{GCD}(360, 11250)$?

- (a) 90 (b) 4
(c) 125 (d) 45000

