

Elem. Ed. Math I — Exam 1

Do the problems in order in your bluebook. Show your work. Explain and justify your answers.

1. Without adding all the terms up by hand, compute the sum $9 + 10 + 11 + \dots + 66$.
2. The statement “the next term in the sequence 1,4,9,... is 25” is an example of what type of reasoning ?
3. The set X has 63 nonempty subsets. Find the cardinality of X .
4. Consider the sets $A = \{x \mid x = 2k - 1, \text{ where } k \text{ is an integer and } 1 \leq k \leq 3\}$ and $B = \{k \mid k \text{ is an integer and } 1 \leq k \leq 3\}$. Find $A - B$.
5. Draw a Venn diagram showing two nonempty sets A and B for which $A \neq B$ and $A \cup B = A$.
6. Suppose $A = \{1, 2, 9\}$ and $B = \{0, 2\}$. Find $A \times B$.
7. Suppose $f(x) = x^2 + 1$ and the domain is $\{-2, 0, 2\}$. Describe $f(x)$ using two sets with directed arrows.
8. Write the contrapositive of the statement “if I studied then I will pass”.
9. A snail climbs 4 inches up a wall each day, but slips down 2 inches each night. If the wall is 3 feet high and the snail started at the halfway point, when will it reach the top ?
10. Use a Venn diagram to determine if the following is a valid syllogism:
College classes are always a lot of fun.
Math 201 is a college class.
Therefore, Math 201 is always a lot of fun.
11. Use a truth table to determine when if ever the formula $(\neg q) \rightarrow p$ is true ?
12. Suppose $f(x) = 2x - 3$ and $g(x) = x^2 + 3$. Draw a “black box” diagram for the composite function $(g \circ f)(x)$ and compute its value when $x = 4$.

Elem. Ed. Math I — Exam 2

Do the problems in order in your bluebook. Show your work. Explain and justify your answers in details, labelling any figures you choose to use.

1. Show how the comparison model illustrates $8 - 3$
2. Is the set of even positive integers closed under multiplication? Why or why not?
3. Rainman likes to make addition problems as easy as possible. When faced with the problem of computing $27 + 16$, he instead did the addition $30 + 13$. Explain.
4. Use the charged pattern model to illustrate $5 + (-8)$.
5. Draw and label a geometric figure that models $(X + 1)(Y + 1) = XY + X + Y + 1$
6. Working in base six, compute $3324_6 \div 4_6$.
7. Use patterns to illustrate $2 - 6$.
8. What method makes the addition problem $12 + 45 + 18 + 39 + 15 + 11$ easier?
9. What is the least whole number n for which $17n > 408$.
10. Let $A_{12} = 10$ and $B_{12} = 11$. Compute $A_{12} \cdot 3B_{12}$, working in base twelve.
11. Use a model of your choice to illustrate $(-2) \cdot (-3)$.
12. Compute $3112_5 - 2414_5$ in base five.

Elem. Ed. Math I — Exam 3

Do the problems in order in your bluebook. Show your work. No calculators allowed. Explain and justify your answers in details, labelling any figures you choose to use.

1. For what possible digits “ b ” is the number $143b27$ divisible by 3 ?
2. You sell math T-shirts for \$12 each, using the proceeds to buy calculators at \$54 each. Assuming there is no money left over, what is the least number of T-shirts sold ?
3. Working modulo 6, find all a for which $a \cdot 4 = 0$.
4. Draw and subdivide a geometric figure in order to illustrate $1/3$. Then draw a second one showing how the first one is modified to illustrate the fact that $1/3 = 2/6$.
5. Two classes take the same exam. In the first class 18 out of 28 pass, while in the second class 15 out of 25 pass. Which class did better ?
6. Use the Euclidean algorithm to reduce the fraction $132/276$ to simplest form.
7. A calculator is on sale at $\frac{1}{3}$ off for \$70. What was the original price ?
8. Professor Zer is reading a bestselling math book. He has finished $\frac{2}{5}$ of the book and has 45 pages left. How many pages has he read so far ?

Do the problems in order in your bluebook. Show your work. No calculators allowed. Explain and justify your answers in detail.

1. A bike shop inspects 50 bikes and finds that 40 need new tires while 30 need new gears. Find the least possible number that needs both. Draw a Venn diagram.
2. Find all subsets of the set $B = \{3, 5, x\}$.
3. Use a Venn diagram to determine if the following is valid (be sure to label it):
Everyone taking a math class is happy.
Socrates is not taking any math classes
Therefore, Socrates is not happy.
4. Let $A = \{x \mid x \text{ is an even integer}\}$ and $B = \{k \mid k \text{ is an integer and } 1 \leq k \leq 9\}$. Find $B - A$.
5. Use the charged pattern model to illustrate $4 + (-6)$. Explain how it works.
6. Draw and label a geometric figure that illustrates the distributive law. (Be sure to explain exactly how the figure illustrates the distributive law.)
7. Use patterns to illustrate $3 - 4$. Explain how it works.
8. Compute $34_5 \cdot 14_5$ and $2312_5 - 344_5$ working in base five.
9. Professor Zer has saved 145 math articles and 120 statistics articles from assorted publications. He wants to file these in folders so that each folder contains only math articles or only statistics articles. And he wants each folder to contain exactly the same number of articles. What is the greatest number of articles he could place in each folder?
10. Working modulo 7, find all a for which $1 + (4 \cdot a) = 0$.
11. Two classes take the same exam. In the first class 18 out of 27 pass, while in the second class 17 out of 25 pass. Which class did better? (Do not use decimals.)
12. Use the Euclidean algorithm to reduce the fraction $325/1612$ to simplest form.
13. Gauss won some money at a math contest. He decided to go on a shopping spree. He spent \$63 on a new calculator and $3/5$ of what then remained on a Math T-shirt. He used all of the remaining money to buy $1\frac{1}{3}$ pounds of special coffee beans which were on sale at \$9 a pound (at a savings of $\frac{1}{10}$ off). Determine how much money Gauss had won.