

 CollegeBoard

**CLEP**<sup>®</sup>

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# **CLEP** College Mathematics

AT A GLANCE

## Description of the Examination

The College Mathematics examination covers material generally taught in a college course for nonmathematics majors and majors in fields not requiring knowledge of advanced mathematics.

The examination contains approximately 60 questions to be answered in 90 minutes. Some of these are pretest questions that will not be scored.

An online scientific (nongraphing) calculator will be available during the examination. Although a calculator is not necessary to answer most of the questions, there may be a few problems whose solutions are difficult to obtain without using a calculator. Since no calculator is allowed during the examination except for the online calculator provided, it is recommended that prior to the examination you become familiar with the use of the online calculator.

**For more information about the scientific (nongraphing) calculator, please visit the College Mathematics description on the CLEP® website, [clep.collegeboard.org](http://clep.collegeboard.org).**

It is assumed that candidates are familiar with currently taught mathematics vocabulary, symbols, and notation.

## Knowledge and Skills Required

Questions on the College Mathematics examination require candidates to demonstrate the following abilities in the approximate proportions indicated:

- Solving routine, straightforward problems (about 50% of the examination)
- Solving nonroutine problems requiring an understanding of concepts and the application of skills and concepts (about 50% of the examination)

The subject matter of the College Mathematics examination is drawn from the following topics. The percentages next to the main topics indicate the approximate percentage of exam questions on that topic.

### 20% ALGEBRA AND FUNCTIONS<sup>1</sup>

- Solving equations, linear inequalities, and systems of linear equations by analytic and graphical methods
- Interpretation, representation, and evaluation of functions: numerical, graphical, symbolic, and descriptive methods
- Graphs of functions: translations, horizontal and vertical reflections, and symmetry about the x-axis, the y-axis, and the origin
- Linear and exponential growth
- Applications

### 10% COUNTING AND PROBABILITY

- Counting problems: the multiplication rule, combinations, and permutations
- Probability: union, intersection, independent events, mutually exclusive events, complementary events, conditional probabilities, and expected value
- Applications

### 15% DATA ANALYSIS AND STATISTICS

- Data interpretation and representation: tables, bar graphs, line graphs, circle graphs, pie charts, scatterplots, and histograms
- Numerical summaries of data: mean (average), median, mode, and range
- Standard deviation and normal distribution (conceptual questions only)
- Applications

### 20% FINANCIAL MATHEMATICS

- Percents, percent change, markups, discounts, taxes, profit, and loss
- Interest: simple, compound, continuous interest, effective interest rate, effective annual yield or annual percentage rate (APR)
- Present value and future value
- Applications

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1. Types of functions that will be considered are linear, polynomial, radical, exponential, logarithmic, and piecewise defined.

## 10% GEOMETRY

- Properties of triangles and quadrilaterals: perimeter, area, similarity, and the Pythagorean theorem
- Parallel and perpendicular lines
- Properties of circles: circumference, area, central angles, inscribed angles, and sectors
- Applications

## 15% LOGIC AND SETS

- Logical operations and statements: conditional statements, conjunctions, disjunctions, negations, hypotheses, logical conclusions, converses, inverses, counterexamples, contrapositives, and logical equivalence
- Set relationships, subsets, disjoint sets, equality of sets, and Venn diagrams
- Operations on sets: union, intersection, complement, and Cartesian product
- Applications

## 10% NUMBERS

- Properties of numbers and their operations: integers and rational, irrational, and real numbers (including recognizing rational and irrational numbers)
- Elementary number theory: factors and divisibility, primes and composites, odd and even integers, and the fundamental theorem of arithmetic
- Measurement: unit conversion, scientific notation, and numerical precision
- Absolute value
- Applications

## Study Resources

Most textbooks used in college-level mathematics courses cover the topics in the outline given earlier, but the approaches to certain topics and the emphasis given to them may differ. To prepare for the College Mathematics exam, it is advisable to study one or more introductory college-level mathematics textbooks, which can be found in most college bookstores or online. Elementary algebra textbooks also cover many of the topics on the College Mathematics exam. When selecting a textbook, check the table of contents against the knowledge and skills required for this test. Visit [clep.collegeboard.org/earn-college-credit/practice](https://clep.collegeboard.org/earn-college-credit/practice) for additional math resources. You can also find suggestions for exam preparation in Chapter IV of the *CLEP Official Study Guide*. In addition, many college faculty post their course materials on their schools' websites.

## Sample Test Questions

The following sample questions don't appear on an actual CLEP examination. They are intended to give potential test takers an indication of the format and difficulty level of the examination and to provide content for practice and review. Knowing the correct answers to all of the sample questions isn't a guarantee of satisfactory performance on the exam.

**Directions:** An online scientific calculator will be available for the questions on this test. Some questions will require you to select from among four choices. For these questions, select the BEST of the choices given. Some questions will require you to type a numerical answer in the box provided. Some questions refer to a table in which statements appear in the first column. For each statement, select the correct properties by checking the appropriate cell(s) in the table.

### NOTES:

- Unless otherwise specified, the domain of any function  $f$  is assumed to be the set of all real numbers  $x$  for which  $f(x)$  is a real number.
- Figures that accompany questions are intended to provide information useful in answering the questions. The figures are drawn as accurately as possible EXCEPT when it is stated in a specific question that the figure is not drawn to scale.
- If a principal of  $P$  dollars is invested at an annual interest rate  $r$ , compounded  $n$  times per year, and no further withdrawals or deposits are made to the account, then the future value  $A$ , the account balance after  $t$  years, is given by the formula  $A = P \left( 1 + \frac{r}{n} \right)^{nt}$ .
- If a principal of  $P$  dollars is invested at an annual interest rate  $r$ , compounded continuously, and no further withdrawals or deposits are made to the account, then the future value  $A$ , the account balance after  $t$  years, is given by the formula  $A = Pe^{rt}$ .
- At an interest rate  $r$ , compounded  $n$  times per year, the effective annual yield or annual percentage rate (APR), is given by the formula  $APR = \left( 1 + \frac{r}{n} \right)^n - 1$ .

- Audrey deposited \$10,000 into a 3-year certificate of deposit that earned 10% annual interest, compounded annually. Audrey made no additional deposits to or withdrawals from the certificate of deposit. What was the value of the certificate of deposit at the end of the 3-year period?

- \$13,000
- \$13,300
- \$13,310
- \$13,401

- $\frac{(4 \times 10^{-5})^2}{(2 \times 10^6)^3} =$

- $2 \times 10^{-28}$
- $1.3 \times 10^{-2}$
- $1.6 \times 10^{10}$
- $2 \times 10^{14}$

- If  $P$  dollars is invested in a savings account that pays 5% annual interest, compounded continuously, in how many years will the account value be equal to  $2P$  dollars?

- $\ln(2^{20})$  years
- $\ln(2^5)$  years
- 10 years
- 20 years

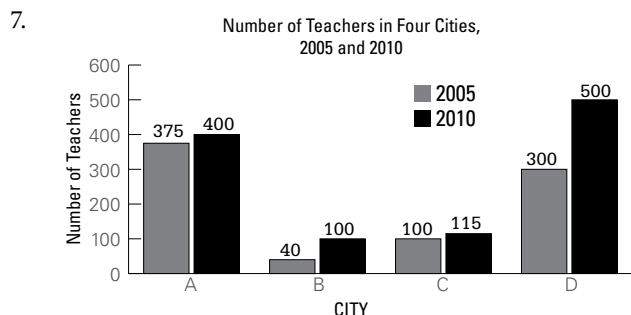
- Assume that  $a$  and  $b$  are positive integers. For each statement below, determine whether the statement is true or false, and indicate your answer in the appropriate box.

Statement	True	False
If $a$ is divisible by $b$ , then $a^2$ is divisible by $b^2$ .		
If $a^2$ is divisible by $b$ , then $a$ is divisible by $b$ .		
If $a$ is divisible by $b^2$ , then $a$ is divisible by $b$ .		

- From 1950 to 1990 the population of Country W increased by 40%. From 1990 to 2012 the population of Country W increased by 10%. What is the percentage increase in the population of Country W from 1950 to 2012?

%

6. Let  $P(E)$  represent the probability of event  $E$ . Let  $A$  and  $B$  be events with  $P(A) = 0.3$ ,  $P(B) = 0.7$ , and  $P(A \cap B) = 0.2$ . What is the value of  $P(A \cup B)$ ?
- A. 1.0  
 B. 0.9  
 C. 0.8  
 D. 0.7



The chart above shows the number of teachers in City A, City B, City C, and City D in 2005 and 2010. Which city had the greatest percentage increase in the number of teachers from 2005 to 2010?

- A. City A  
 B. City B  
 C. City C  
 D. City D
8. If  $f(x) = x^2 + x - 6$  and  $g(x) = \frac{x-2}{x+3}$ , then  $f(g(2)) =$
- A.  $-\frac{56}{9}$   
 B. -6  
 C. 0  
 D.  $f(g(2))$  is undefined
9. There are 220 seniors at a certain school. Among all seniors, 45 took calculus, 55 took physics, and 10 took both. How many seniors took neither calculus nor physics?
- A. 90  
 B. 100  
 C. 120  
 D. 130

10.

Airline/Departure	Morning	Afternoon	Total
Airmoon flights	4	6	10
Airsun flights	7	8	15
Total	11	14	25

There are 10 Airmoon flights and 15 Airsun flights daily from Yorktown to New City, as shown in the table below. The table shows that 4 Airmoon and 7 Airsun flights depart in the morning and the remaining flights depart in the afternoon. If a flight is to be selected at random from among the flights that depart in the afternoon from Yorktown to New City, what is the probability that the flight selected will be an Airmoon flight?

- A.  $\frac{6}{25}$   
 B.  $\frac{6}{14}$   
 C.  $\frac{10}{25}$   
 D.  $\frac{14}{25}$

11. In a sleep study there are 50 people who are 20 years old, 50 people who are 25 years old, and 50 people who are 30 years old. If an additional 20-year-old person participates in the study, what happens to the average age, the median age, and the age range of the participants in the study?

	Increases	Decreases	Does Not Change
Average age			
Median age			
Age range			

## Credit Recommendations

The American Council on Education has recommended that colleges grant six credits for a score of 50, which is equivalent to a course grade of C, on the CLEP College Mathematics exam. Each college, however, is responsible for setting its own policy. For candidates with satisfactory scores on the College Mathematics examination, colleges may grant credit toward fulfillment of a distribution requirement, or for a particular course that matches the exam in content. Check with your school to find out the score it requires for granting credit, the number of credit hours granted, and the course that can be bypassed with a passing score.

### Answers to Sample Questions:

1-C; 2-A; 3-A; 4-see below; 5-54; 6-C; 7-B; 8-B; 9-D; 10-B, 11-see below

Statement	True	False
If $a$ is divisible by $b$ , then $a^2$ is divisible by $b^2$ .	✓	
If $a^2$ is divisible by $b$ , then $a$ is divisible by $b$ .		✓
If $a$ is divisible by $b^2$ , then $a$ is divisible by $b$ .	✓	

	Increases	Decreases	Does Not Change
Average age		✓	
Median age			✓
Age range			✓