

Hawai'i Post-Secondary Math Survey -- Content Items

Section I: Number sense and numerical operations --

Several numerical operations skills are listed below. Please rank each on a scale from 1 (not essential) to 10 (most essential) for a student to be successful in the entry-level course you identified in question #3.

7) Compute with rational numbers fluently and accurately without a calculator

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

8) Recognize and apply magnitude (absolute value) and ordering of real numbers

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

9) Understand that to solve certain problems and equations, number systems need to be extended from whole numbers to the set of all integers (positive, negative and zero), from integers to rational numbers, from rational numbers to real numbers (rational and irrational numbers) and from real numbers to complex numbers; define and give examples of each of these types of numbers.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

10) Understand the capabilities and the limitations of calculators and computers in solving problems.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

Section II: Algebra --

Several skills related to algebra are listed below. Please rank each on a scale from 1 (not essential) to 10 (most essential) for a student to be successful in the entry-level course you identified in question #3.

11) Perform basic operations on algebraic expressions fluently and accurately.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

12) Add, subtract and multiply polynomials; divide a polynomial by a low-degree polynomial.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13) Factor polynomials by removing the greatest common factor; factor quadratic polynomials.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14) Add, subtract, multiply, divide and simplify rational expressions.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15) Evaluate polynomial and rational expressions and expressions containing radicals and absolute values at specified values of their variables.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16) Understand functions, their representations and their properties.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17) Understand functional notation and evaluate a function at a specified point in its domain.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18) Apply basic algebraic operations to solve equations and inequalities.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19) Solve quadratic equations in one variable.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20) Graph a variety of equations and inequalities in two variables, demonstrate understanding of the relationships between the algebraic properties of an equation and the geometric properties of its graph, and interpret a graph.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21) Graph exponential functions and identify their key characteristics.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

22) Solve problems by converting the verbal information given into an appropriate mathematical model involving equations or systems of equations; apply appropriate mathematical techniques to analyze these mathematical models; and interpret the solution obtained in written form using appropriate units of measurement.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

23) Recognize and solve problems that can be modeled using a system of two equations in two variables, such as mixture problems.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

24) Recognize and solve problems that can be modeled using a finite geometric series, such as home mortgage problems and other compound interest problems.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25) Understand the binomial theorem and its connections to combinatorics, Pascal's triangle and probability.

	1	2	3	4	5	6	7	8	9	10
1 = not essential 10 = most essential	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section III: Geometry --

Several geometric skills are listed below. Please rank each on a scale from 1 (not essential) to 10 (most essential) for a student to be successful in the entry-level course you identified in question #3.

26) Understand the different roles played by axioms, definitions and theorems in the logical structure of mathematics, especially in geometry.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

27) Identify, explain the necessity of and give examples of definitions, axioms and theorems.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

28) State and prove key basic theorems in geometry such as the Pythagorean theorem, the sum of the angles of a triangle is 180 degrees, and the line joining the midpoints of two sides of a triangle is parallel to the third side and half its length.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

29) Recognize that there are geometries, other than Euclidean geometry, in which the parallel postulate is not true.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

30) Identify and apply the definitions related to lines and angles and use them to prove theorems in (Euclidean) geometry, solve problems, and perform basic geometric constructions using a straight edge and compass.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

31) Know the basic theorems about congruent and similar triangles and use them to prove additional theorems and solve problems.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

32) Know the definitions and basic properties of a circle and use them to prove basic theorems and solve problems.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

33) Apply the Pythagorean theorem, its converse and properties of special right triangles to solve problems.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

34) Use rigid motions (compositions of reflections, translations and rotations) to determine whether two geometric figures are congruent and to create and analyze geometric designs.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

35) Know about the similarity of figures and use the scale factor to solve problems.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

36) Know that geometric measurements (length, area, perimeter, volume) depend on the choice of a unit and that measurements made on physical objects are approximations; calculate the measurements of common plane and solid geometric figures.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

37) Visualize solids and surfaces in three-dimensional space when given two-dimensional representations (e.g., nets, multiple views) and create two-dimensional representations for the surfaces of three-dimensional objects.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

38) Represent geometric objects and figures algebraically using coordinates; use algebra to solve geometric problems.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

39) Describe a line by a linear equation.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

40) Find the distance between two points using their coordinates and the Pythagorean theorem.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

41) Understand basic right-triangle trigonometry and apply it to solve problems.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

42) Use the standard formula for the area of a triangle, $A = 1/2 bh$, to explain the area formula, $A = 1/2 ab \sin C$ where a and b are the lengths of two sides of a triangle and C is the measure of the included angle formed by these two sides, and use it to find the area of a triangle when given the lengths of two of its sides and the included angle.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

43) Derive basic formulas involving these functions, and use these functions and formulas to solve problems.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

Section IV: Data Interpretation, Statistics and Probability -- Several data interpretation skills are listed below. Please rank each on a scale from 1 (not essential) to 10 (most essential) for a student to be successful in the entry-level course you identified in question #3.

44) Explain and apply quantitative information.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

45) Explain and critique alternative ways of presenting and using information.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

46) Evaluate reports based on data published in the media by considering the source of the data, the design of the study, and the way the data are analyzed and displayed.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

47) Recognize when arguments based on data confuse correlation with causation.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

48) Explain the use of data and statistical thinking to draw inferences, make predictions and justify conclusions.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

49) Explain the differences between randomized experiments and observational studies.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

50) Explain and apply probability concepts and calculate simple probabilities.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

51) Explain how the law of large numbers can be applied in simple examples.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

Section V: Mathematical Reasoning -- Several mathematical reasoning skills are listed below. Please rank each on a scale from 1 (not essential) to 10 (most essential) for a student to be successful in the entry-level course you identified in question #3.

52) Use inductive and deductive reasoning to arrive at valid conclusions.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

53) Use multiple representations (literal, symbolic, graphic) to represent problems and solutions.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

54) Understand the role of definitions, proofs and counter-examples in mathematical reasoning; constructing simple proofs.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

55) Use the special symbols of mathematics correctly and precisely.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

56) Recognize when an estimate or approximation is more appropriate than an exact answer and understand the limits on precision of approximations.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

57) Distinguish relevant from irrelevant information, identify missing information, and either find what is needed or make appropriate estimates.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

58) Recognize and use the process of mathematical modeling and recognize and clarify mathematical structures that are embedded in other contexts, formulate a problem in mathematical terms, use mathematical strategies to reach a solution, and interpret the solution in the context of the original problem.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

59) When solving problems, think ahead about strategy, test ideas with special cases, try different approaches, check for errors and reasonableness of solution as a regular part of routine work, and devise independent ways to verify results.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

60) Shift regularly between the specific and the general, use examples to understand general ideas, and extend specific results to more general cases to gain insight.

1 2 3 4 5 6 7 8 9 10

1 = not essential 10 = most essential

Section VI: Mathematics subject strands essential for this course --

The following question asks you to consider the five separate strands of mathematics skills and the degree to which each is essential for student success in the entry-level course you identified in question #3. (1 = not essential, 10 = most essential)

61) Mathematics subject strands essential for this course:

	1	2	3	4	5	6	7	8	9	10
Number Sense and Numerical Operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Algebra	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geometry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Data Interpretation, Statistics and Probability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mathematical Reasoning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

62) Please identify any other essential skills that first time freshmen need to be successful in your entry-level, credit bearing course.