

## Study Guide: Mathematics Competency Test for Prospective Master in Teaching Students - K-8 Certification Option

### NOTES REGARDING THE TEST:

- To meet the minimum competency level, you must achieve a score of 80% or higher. As the test can only be taken once, individuals scoring less than 80% must enroll in and successfully complete EDUC 412 or Math 200 or an approved equivalent course before entering the program. If you are entering the program in the Spring, you may take EDUC 412 (or its approved equivalent) during the Summer quarter between block I and block II of the MIT program.
- If you have successfully completed either of these courses, you need not take the test.
- If you decide to proceed with the test, please contact Kim Friedrich Disabilities Services - Seattle University, Loyola 101 (206)398-4378 [friedric@seattleu.edu](mailto:friedric@seattleu.edu) to schedule a time.
- Within approximately two weeks of your completion of the test, the MIT Program Administrative Assistant will contact you to inform you of your score.
- Although there will be a good deal of calculation necessary during this test, **we cannot allow the use of books, notes, or calculator.** This is because we will be trying to evaluate your understanding of and ability to clarify and demonstrate as well as to use some of the basic operations and concepts in elementary and middle school mathematics.
- Because the *process* is so important in teaching mathematics, you will need to show all of your work.

### Sample Problems - MIT Mathematics Competency Test for K-8 Teachers

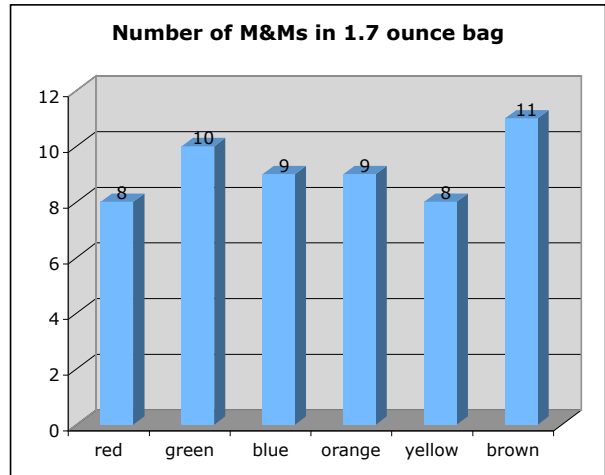
Here is a selection of problems and exercises that may be useful to you as you prepare for the MIT Mathematics Competency Test. These problems are meant to give you a feeling for the difficulty of the test. They are not meant to represent the length of the test nor the full range of skills or concepts addressed by the test. A list of these skills and concepts is included near the end of this study guide.

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- 1.) A Moped gets  $62\frac{2}{3}$  miles per gallon. To the nearest mile, how far can you get with \$10 if the price of gas is \$3.20/gallon?
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2.) A turkey takes 20 minutes per pound to cook at 350°F. It's a 15 lb turkey and it's been cooking for  $1\frac{3}{4}$  hours. How much longer does it have to go?

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3.) In a 7<sup>th</sup> grade class each student was given a bag of M&Ms for a class investigation. Each bag weighed 1.7 ounces. Each student counted the number of M&S of each color and recorded the results. The chart at right shows the means for each color.



a.) Which color was found most frequently?

b.) On average, how many M&Ms, regardless of color, were there in each of the 1.7 ounce bags?

c.) Assume that a 5.95 ounce bag of M&Ms has the same six colors in the same proportions as in the smaller bags. How many green M&Ms would you expect to find in the 5.95 ounce bag?

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4.) Let  $f(x) = \frac{7}{3x-5}$ . Find some values and make a quick sketch of the function. What happens when  $3x=5$  (when  $x = \frac{5}{3}$ )?

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5.) The 620 children at Scholar Elementary School are to be transported by bus to the zoo. Each bus can take 35 children.

a.) How many busses will be needed to take all 620 children to the zoo?

b.) Assuming that all of the busses are loaded to their capacity (35 children) except for the final bus, how many empty seats will there be on that final bus?

c.) If admission to the zoo costs \$3.50 per student, how much will it cost to get all 620 children into the zoo?

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Here are a couple of exercises. Please fill in the blanks. Show any work!

6.) a.)  $\left(\frac{2}{5}\right)^3 + \frac{3}{4} = \underline{\hspace{2cm}}$

b.)  $75.03 \times (-4.5) = \underline{\hspace{2cm}}$

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7.) A person who weighs 160 lbs needs 2000 calories per day. Assuming that caloric need is a function of weight, how many calories does a 28 pound child need?

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8a.) There are roughly 200 million cars in the US... If each of them has an average of 2000 inches of wiring, how many inches of wiring are there altogether?

b.) If 20% of the cars suddenly become eligible to be upgraded with 400 more inches of wiring, and 60% of those owners choose to do so, how much wire should be produced?

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9.) The members of a 12th grade class are sitting in a circle, holding hands, and meditating. They are evenly spaced and are numbered in order. Student number 7 is sitting directly across from student number 17. How many students are there?

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26. Melinda has just been given a new music player that can hold 2,400 average length songs. She has had it for 12 weeks and has already acquired 450 songs.

a.) If she continues to acquire songs at this rate how many weeks will it take her to reach the music player's capacity (2,400 songs)?

b.) If she paid 99 cents for each of her 450 songs, how much money has she spent on them?

c.) If the average length for her 450 songs is  $3\frac{1}{2}$  minutes, how long would it take her to listen to all of the songs?

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12.) Joe has:

1 pair of brown and 1 pair of orange pants;

1 brown, 1 orange and 1 teal shirt, and

1 silver, 1 green, 1 tan, and 1 red sweater.

How many different combinations can he wear?

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13.) Please list the terms that complete a possible pattern in each of the following. Classify each as an arithmetic or geometric sequence or neither.

a.) 0, 1, 3, 6, 10, \_\_, \_\_, \_\_, ....

b.) 1, 8, 27, 64, \_\_, \_\_, \_\_, ....

Give an expression for the  $n$ th term in this sequence.

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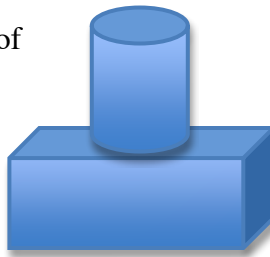
14.) Audrey's salary this year is \$38,500. She received a whopping 4% raise from last year to this year. What was her last year's salary to the nearest dollar?

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15.) What is the volume and surface area of the figure shown below which consists of a rectangular box with a cylinder attached to the top?

The box has a length of 8 cm, a depth of 2 cm and a height of 2 cm.

The cylinder had a height of 3 cm and a radius of 1 cm.



These and other important concepts and skills needed by elementary mathematics educators are addressed in the text used in EDUC 412 - Mathematics for K-8 Teachers. The current text is by Tom Bassarear, (2005). Mathematics for Elementary School Teachers. (3<sup>rd</sup> Edition ) Houghton Mifflin Company.

Another useful text is A Problem Solving Approach to Mathematics for Elementary School Teachers (any edition), by Billstein, Libeskind, and Lott.

Either text should be adequate. The important thing is to examine the topics listed below and to brush up as needed on those concepts and skills.

Math 200, offered in the Mathematics department at Seattle University, is considered an equivalent to EDUC 412. If you successfully complete either of these courses, you need not take the test. These courses are highly recommended for all MIT students intending to teach mathematics at the elementary or middle school level.

The topics that are addressed in the Mathematics Competency Exam come from the Washington State K-8 Mathematics Standards. Below you will find a brief summary. You can find these topics explained, read student expectations and see examples of relevant problems in a document available on the Web at <http://www.k12.wa.us/mathematics/Standards.aspx> Click on: [K-8 Mathematics](#) (124 pages, 6.0 MB).

# Washington State Mathematics Core Content Areas: Grades K-8 <http://www.k12.wa.us/mathematics/Standards.aspx>

- K:**
- 1 WHOLE NUMBERS
  - 2 PATTERNS AND OPERATIONS
  - 3 OBJECTS AND LOCATIONS IN SPACE
- 1<sup>ST</sup>:**
- 1 WHOLE NUMBER RELATIONSHIPS
  - 2 ADDITION AND SUBTRACTION
  - 3 GEOMETRIC ATTRIBUTES
  - 4 CONCEPTS OF MEASUREMENT
- 2<sup>ND</sup>:**
- 1 PLACE VALUE AND THE BASE TEN SYSTEM
  - 2 ADDITION & SUBTRACTION
  - 3 MEASUREMENT
- 3<sup>RD</sup>:**
- 1 ADDITION, SUBTRACTION, AND PLACE VALUE
  - 2 CONCEPTS OF MULTIPLICATION & DIVISION
  - 3 FRACTION CONCEPTS
  - 4 GEOMETRY – E.G., QUADRILATERALS, PERIMETER, & RIGHT ANGLES
- 4<sup>TH</sup>:**
- 1 MULTI-DIGIT MULTIPLICATION
  - 2 FRACTIONS DECIMALS & MIXED NUMBERS
  - 3 CONCEPT OF AREA
- 5<sup>TH</sup>:**
- 1 MULTI-DIGIT DIVISION
  - 2 ADDITION & SUBTRACTION OF FRACTIONS AND DECIMALS
  - 3 TRIANGLES & QUADRILATERALS
  - 4 REPRESENTATION OF ALGEBRAIC RELATIONSHIPS
- 6<sup>TH</sup>:**
- 1 MULTIPLICATION & DIVISION OF FRACTIONS & DECIMALS
  - 2 MATHEMATICAL EXPRESSIONS AND EQUATIONS (ALGEBRA)
  - 3 RATIOS, RATES & PERCENTS
  - 4 TWO-DIMENSIONAL FIGURES
- 7<sup>TH</sup>:**
- 1 RATIONAL NUMBERS AND LINEAR EQUATIONS
  - 2 PROPORTIONALITY & SIMILARITY
  - 3 SURFACE AREA & VOLUME
  - 4 PROBABILITY & DATA
- 8<sup>TH</sup>:**
- 1 LINEAR FUNCTIONS & EQUATIONS
  - 2 PROPERTIES OF GEOMETRIC FIGURES
  - 3 SUMMARY & ANALYSIS OF DATA SETS