

PROBLEMS BASED ON THE SPRING 2003
MATHEMATICS STANDARDS AND BENCHMARKS
FOR GRADE 7

WITHOUT EXTRA COMMENTARY

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The purpose of this link from my web-site is to identify a selection of problems aligned with the Minnesota mathematics standards and benchmarks for Grade 7 as adopted in Spring 2003. My focus consists of the standards and benchmarks themselves; the problems here serve to illuminate them. The benchmarks and standards that are particularly relevant for a particular problem are identified in the left-hand margins; for instance, 7-V.B.3 indicates the Grade-7 benchmark V.B.3 and 7-V.B refers to the corresponding standard. In another sense, the focus is the suitability of problems for the Minnesota Comprehensive Assessments (know as MCA's), but in saying this I want to emphasize that the opinions are mine alone, formed without consultation with Minnesota Department of Education. Relevant to the above concerns is a companion link which includes the problems from this link, along with a variety of comments.

I was one of approximately 40 members of the mathematics subcommittee of the Academic Standards Committee, formed by the Minnesota Commissioner of Education in February 2003. I strongly support the mathematics standards and benchmarks resulting from the work of that committee and which, on the basis of a law passed by the Legislature and signed by the Governor, became official in Spring 2003. Although there is no guarantee that this web-site item reflects the thinking within the Department of Education, I have tried very hard to reflect the standards and benchmarks accurately, taking care not to bend them in the direction of my individual views. [Even though I strongly support the standards and benchmarks document, there are places where I would have preferred the document to be a bit different, and I suspect that the same is true (but not for the same places) of every member of the mathematics subcommittee.]

Anticipating that I might want to modify this document from time to time, I have refrained from labeling the problems with numerals and am planning to change the date at the top any time I make additions or changes.

Since the standards are cumulative, all the K-7 benchmarks are relevant for the Grade-7 MCA. It seems to me that it is desirable for Grade-7 teachers to examine all the K-7 benchmarks giving special attention to those for grades 5-7, and in general for teachers to read the standards for a couple grades on either side of the grade they are teaching.

The variety of different problems that are consistent with the standards and benchmarks is very large—that is the power of mathematics; a manageable number of basic principles and techniques enables one to handle a myriad of different situations. So, of course, the problem list that follows cannot be viewed

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as comprehensive.

For problems in which students are to place the correct digits in boxes, a decimal point or comma is included between appropriate pairs of boxes when relevant. If the answer requires fewer digits than boxes, it is the left-hand box or boxes which should be left blank. [If the Grade-7 MCA were, in fact, to include such problems it would be important that students become familiar with the instructions some days in advance of the test.]

There is not a sharp demarcation separating problems appropriate for various grade levels. For instance, some of the problems described below for Grade 7 are also in the link for Grade 6. Typically, a problem that is appropriate for both the Grade-7 MCA and the Grade-6 MCA would be regarded as a more difficult problem for a sixth grader than it would be regarded for seventh graders.

It is clear from the benchmarks 7-II.B.6, 7-II.B.7, and 7-II.B.8, as well as some Grade-6 benchmarks that the Grade-7 MCA should contain a significant section where a calculator is permitted. It is also clear from standard 7-II.B itself and benchmark 7-II.A.1, in combination with benchmarks from earlier grades, that there are a wide variety of problems which the student should be able to handle by hand.

The first part of the list below is relevant for the non-calculator portion of the Grade-7 MCA, and later, an introductory sentence identifies the place where the 'calculator permitted' portion begins.

I want to again emphasize: Although the standards and the benchmarks accompanying them constitute an official document of the state of Minnesota, all the judgments about alignment of problems with the benchmarks and standards are mine; neither do they have any official standing nor have they been obtained in consultation with the Minnesota Department of Education. Also, they have not been reviewed by the University of Minnesota where I am a faculty member and, of course, they do not represent any official view of that institution.

7-II.A.1

Which of the following mixed numbers equals the improper fraction $13/5$?

- (a) $2\frac{3}{5}$
- (b) $3\frac{2}{5}$
- (c) $3\frac{2}{3}$
- (d) $10\frac{3}{5}$

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- 7-II.B.1** $\frac{2}{3} \div \frac{4}{9} =$
 (a) $8/27$
 (b) $2/3$
 (c) $3/2$
 (d) $27/8$
- 7-II.A.1** $62.5\% =$
 (a) $5/8$
 (b) $5/6$
 (c) $25/4$
 (d) $125/2$
- 7-II.B.5** $5^3 =$
 (a) 75
 (b) 125
 (c) 225
 (d) 243
- 7-V.C.1** Which of the following is the most appropriate physical unit with which to describe the capacity of the gasoline tank in an automobile?
 (a) centimeter
 (b) kiloliter
 (c) liter
 (d) meter
- 6-III.A.1** In the rectangular coordinate system, as usually drawn, which of the following is true about the line through the points $(1, -2)$ and $(-1, -2)$:
 (a) The line is horizontal.
 (b) The line is vertical.
 (c) The line is slanted with the lower part to the left and the higher part to the right.
 (d) The line is slanted with the higher part to the left and the lower part to the right.

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- 7-II.B.2** Find the side-length of a square whose area is 729 square inches.
4-V.C.1
7-V.B.4
- (a) 9 inches
 - (b) 27 inches
 - (c) 81 inches
 - (d) 521, 441 inches
- 7-III.A.2** Find the slope of the line in a plane that passes through the points (4, 3) and (-1, 1) with, as usual, the axis for first coordinates being the horizontal axis.
- (a) $\frac{2}{5}$
 - (b) $\frac{3}{4}$
 - (c) $\frac{4}{3}$
 - (d) $\frac{5}{2}$
- 7-V.B.3** On a drawing of the floor plan of a particular house, one foot in the house is represented by $\frac{1}{8}$ of an inch. How long is the actual house if the length as measured on the drawing is $4\frac{3}{4}$ inches?
- (a) 17 feet 6 inches
 - (b) 19 feet
 - (c) 35 feet
 - (d) 38 feet
- 7-II.B.4** What does 5% of 2% equal?
- (a) 0.1%
 - (b) 0.4%
 - (c) 10%
 - (d) 40%
- 7-II.A.3** Which of the following statements is true?
7-II.B.1
- (a) $\frac{17}{12} < \frac{41}{29} < \frac{99}{70}$
 - (b) $\frac{17}{12} < \frac{99}{70} < \frac{41}{29}$
 - (c) $\frac{41}{29} < \frac{17}{12} < \frac{99}{70}$
 - (d) $\frac{41}{29} < \frac{99}{70} < \frac{17}{12}$

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7-V.B.1
7-I.3
5-I.2

Find the area of the region between a circle of radius 5 and a circle of radius 2 lying inside the circle of radius 5.

- (a) 3π
- (b) 7π
- (c) 21π
- (d) 29π

7-IV.A.2
6-IV.A.2
7-I.2

Three positive numbers have the property that one of them is larger than the sum of the other two. Which of the following four assertions is accurate.

- (a) The mean of the three numbers will definitely be less than the median of the three numbers.
- (b) The mean of the three numbers will definitely equal the median of the three numbers.
- (c) The mean of the three numbers will definitely be larger than the median of the three numbers.
- (d) Neither (a) nor (b) nor (c) is an accurate statement.

5-II.B.3

$$7.96 + 4.6 =$$

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6-II.B.5
6-II.B.4

Find the remainder for the division problem $735 \div 22$.

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7-II.B.1 Calculate $\frac{3}{4} \times \frac{5}{12}$, writing your answer in lowest terms. Enter the numerator in the left-hand boxes and the denominator in the right-hand boxes.

5-II.A.3
7-II.B.1 Take $\frac{11}{128}$ from $\frac{75}{128}$ and reduce the answer to lowest terms. Write the numerator in the left-hand boxes and the denominator in the right-hand boxes.

7-II.B.3
7-II.B.4 Find the new price of an article if the old price of \$60 has been increased by 7%. Enter the whole dollar amount in the left-hand boxes and the cents in the right hand-boxes.

6-II.B.4
4-III.B.2 Calculate 0.74×23.9 .

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7-II.B.4
7-I.3
7-I.1
6-II.B.3

Alphonso is buying a desk and chair. Both are on sale. The original price of the desk was \$100, but there is 20% off due to the sale. The original price of the chair was \$60 with 15% off due to the sale. How much does Alphonso have to pay for the desk-chair combination? (Assume that there is no sales tax.)

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7-IV.B1
6-II.A.2
7-II.A.1

To the nearest whole percent, what is the probability, in percentages, of rolling a three with a perfectly balanced die?

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7-I.3
6-II.B.3
7-I.1
5-II.B.5

A pound of cotton has been spun into a thread 8 miles in length. Allowing for 235 pounds of waste, how many pounds will it take to spin a thread to reach around the earth, supposing that distance to be 25,000 miles?

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7-II.B.1
7-II.B.8
6-II.B.2

Calculate

$$\frac{4}{21} - \frac{2}{35},$$

writing your answer in lowest terms. Enter the numerator in the left-hand boxes and the denominator in the right-hand boxes.

7-II.A.2
6-II.B.6

The quotient $(4 \times 10^4) \div (5 \times 10^2)$ can be written as a one-digit integer times a power of 10. Write the one-digit integer in the left-hand box and the power of 10 in the right-hand boxes.

7-III.B.3
7-III.B.1
7-II.B.5

Suppose x , y , and z are related by the formula $z = xy^2$. Find x when $y = 3$ and $z = 126$.

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6-II.B.8
6-II.A.1

What percentage of the following numbers are greater than $-3\frac{2}{5}$:

-7 , 7 , $-7/2$, $7/2$, -3.72 , 3.72 , -3 , 3 , $-2/7$, $2/7$?

5-IV.A.4
7-I.3
7-I.5
6-II.B.4

During one June, the precipitation amounts in Phoenix, Arizona were 0.4 inches total for the period June 1 through June 10, 1.3 inches total from June 11 through June 20, and 0.7 inches total during the last ten days of the month. Calculate the mean daily rainfall correct to 3 places to the right of the decimal point.

6-II.B.2
6-II.B.1

What is the greatest common divisor of 468 and 1248?

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7-II.B.4
7-II.B.1
7-II.B.8

Calculate

$$5\frac{5}{6} \times 2\frac{4}{5}$$

Write the answer as a mixed number with the fractional part in lowest terms. Then place the numerator of the fractional part of the answer in the left-hand boxes and the denominator of the fractional part in the right-hand boxes.

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7-II.B.1
7-V.C

The perimeter of a certain square is $27\frac{13}{16}$ inches. Find the length of each side in inches, writing your answer as an improper fraction in lowest terms. Enter the numerator in the left-hand boxes and the denominator in the right-hand boxes.

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7-III.B.3
7-I.3
4-V.B.1
5-I.2

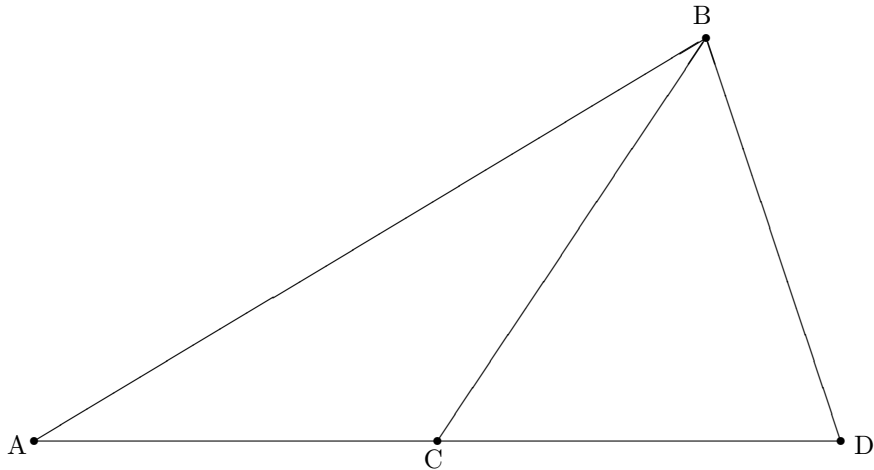
The formula for the surface area of a rectangular parallelepiped in which two faces are squares is $2(x^2 + 2xy)$, where x is the edge length of the square faces and y is the length of the other edges of the parallelepiped. Find y when the surface area equals 410 and $x = 5$. *Reminder:* A rectangular parallelepiped has six faces all of which are rectangles; and in this problem two of those rectangles happen to be squares. *Hint:* The answer is a whole number.

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6-V.B.1
6-V.B.2

In the following picture, the line through the points A and D passes through the point C , and both triangles are isosceles triangles. In the left-hand triangle the vertices at A and B each have measure 25° . In the right-hand triangle the vertices at B and C have the same measure. Calculate the measure in degrees of the vertex D . The picture has *not* been drawn accurately.



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7-II.A.1

Write $3.4\overline{87}$ as a fraction in lowest terms. [Note: the bar above 87 indicates that the decimal numeral goes on forever with the repeating pattern 87.] Enter the numerator in the left-hand boxes and the denominator in the right-hand boxes.

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6-IV.B.2
5-IV.B.1
7-I.6

A deck consisting of four cards labeled A, B, C, and D is shuffled and then the top two cards are drawn in order. Make a list describing the possible outcomes of this experiment. Then calculate the probability that A is the first card or D is the second card.

7-IV.B.2

A die is rolled three times in succession, and each of the three times a five is obtained. Some people might say that the probability of obtaining a five on the next role equals $1/6$, whereas others might say that this probability is significantly larger than $1/6$. Depending on one's point of view, one can support either of these assertions. Explain.

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- 6-V.C.1** Here are two facts about liquid measure:
7-V.C (i) one gill equals one-fourth of a pint;
7-I.4 (ii) one U.S. barrel equals $31\frac{1}{2}$ gallons.
7-I.3 How many gills are there in $\frac{2}{3}$ of a barrel?
7-II.B.1

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The following problems are designed with the **calculator portion of the Grade-7 MCA** in mind.

7-II.B.6

Find

$$(27.314 + 15.337) \times 2.1223.$$

The best 5-digit approximation of the answer equals

- (a) 59.863
- (b) 59.864
- (c) 90.518
- (d) 90.519

7-II.B.6

With accuracy in two places to the right of the decimal point,

7-I.1

$$7.77 \times [3329.23 - (45872.1 - 955.25)]$$

equals

- (a) $-337,980.39$
- (b) $-323,135.81$
- (c) $-20,959.23$
- (d) $-19,048.71$

7-II.B.5

Calculate 3×5^6 . *Reminder:* The four options below are sufficiently different that one can actually avoid using a calculator by instead making an estimate.

7-II.B.6

7-II.B.7

7-I.1

7-II.B.8

- (a) 23,328
- (b) 46,875
- (c) 1,889,568
- (d) 11,390,625

6-V.C.1

One mile equals 5280 feet. To the nearest one-hundredth of a mile, how many miles are 205,321 feet?

6-II.A.2

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6-V.B.3
6-V.C.1

The circumference of a certain circle equals 7 feet, 5 inches. Calculate its radius to the nearest inch. You may use the approximation 3.14 for π or you may use the key for π itself on your calculator.

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7-II.B.2
6-V.C.3
7-I.4
7-I.1

To three decimal-place accuracy find the edge length in inches of a square whose area equals that of a rectangle whose edge length measurements are 5 inches and 12 inches.

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7-II.B.3
7-I.3
7-I.1

To what amount does \$3050 grow after 4 years 8 months at an annual simple interest rate of $5\frac{1}{4}$ per cent. Round your answer to nearest cent.

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6-II.B

Calculate the following sum to the nearest one-hundredth:

$$4.592 +^{-} 3.4449 + 4\frac{7}{17} +^{-} 2\frac{8}{9}$$

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7-I.3

6-II.B.4

7-I.1

Points A and B are 17.2 miles apart. John bicycles from A to B at an average speed of 6.7 miles per hour and returns from B to A at an average speed of 4.3 miles per hour. What is John's average speed in miles per hour for the round trip: A to B and back to A? Round your answer to the nearest 0.1 miles per hour.

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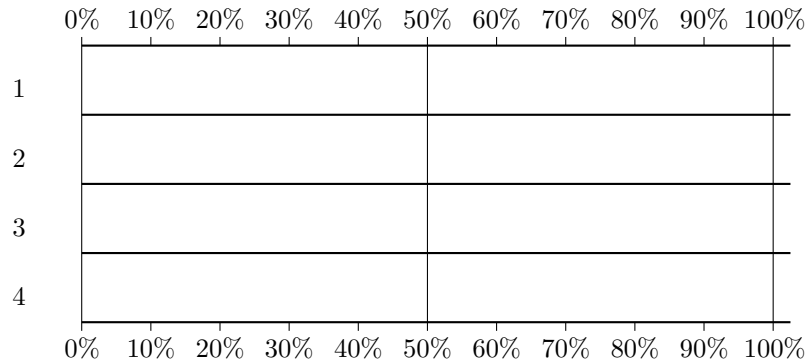
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7-II.A.1
6-IV.B.1
6-IV.A.1

A 4-faced die with the faces labeled as 1, 2, 3, and 4 is rolled 5128 times. [It is not known whether the die is well-balanced.] The results are:

- 1 occurred 1013 times
- 2 occurred 1380 times
- 3 occurred 1502 times
- 4 occurred the other times

Make an accurate bar graph showing the percentages of times that each of the four numbers occurred.



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- 7-II.B.3**
7-II.B.7
7-I.3
7-I.4
7-I.1
7-II.B.7
- Sometime ago a merchant set the price of a certain object at \$75.95. He has not been able to sell it so he has decided he would like to lower the price and advertise a sale. However, he is only willing to lower the price to \$69.50. He has decided he would like to advertise this price as 30% off the regular price. To do so, he must first raise the regular price from the original \$75.95 and, by law, keep it at that price for 21 days in order to advertise that price as the regular price. By what percentage should the merchant raise his price in order to accomplish his goal of a subsequent reduction by 30% percent to \$69.50? Round your answer up to the nearest tenth of a percent.

The views and opinions expressed in this link are strictly those of Bert Fristedt. The contents have been neither reviewed nor approved by the University of Minnesota.