math MAMMOTH

Grade 8 Review Workbook

- Laws of exponents
- Geometric transformations
- Volume
- Linear equations
- Functions
- Irrational numbers
- The pythagorean theorem
- Systems of linear equations
- Bivariate data

Maria Miller

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Introduction

Math Mammoth Grade 8 Review Workbook is intended to give students a thorough review of eighth grade math, following the main areas of grade 8 mathematics based on the Common Core Standards. This means the book includes some topics typically found in algebra 1 courses, plus some geometry and statistics. The book has both topical as well as mixed (spiral) review worksheets, and includes both topical tests and a comprehensive end-of-year test. The tests can also be used as review worksheets, instead of tests.

You can use this workbook for various purposes: for summer math practice, to keep the student from forgetting math skills during other break times, to prepare students who are going into ninth grade or algebra 1, or to give eighth grade students extra practice during the school year.

The topics reviewed in this workbook are:

- exponents, scientific notation, and significant digits

- geometry

- linear equations

- introduction to functions

- graphing linear equations

- irrational numbers and the Pythagorean Theorem

- systems of linear equations

- bivariate data

In addition to the topical reviews and tests, the workbook also contains many cumulative (spiral) review pages.

The content for these is taken from *Math Mammoth Grade 8*.

Please note this book does not contain lessons or instruction for the topics. It is not intended for initial teaching. It also will not work if the student needs to completely re-study these topics (the student has not learned the topics at all). For that purpose, please consider *Math Mammoth Grade 8*, which has all the necessary instruction and lessons.

I wish you success with teaching math!

Maria Miller, the author

Exponents and Scientific Notation Review

1. Find the value of the expressions.

a. $(-2)^4 =$	**b.** $-2^4 =$	**c.** $8^{-2} =$	**d.** $5^2 \cdot 5^8 \cdot 5^{-7} =$
e. $11 \cdot 10^{-2} =$	**f.** $10^3 + 10^4 =$	**g.** $\left(\dfrac{2}{-3}\right)^3 =$	**h.** $\dfrac{12^7}{12^5} =$

2. Write an equivalent expression using the exponent laws, without negative exponents.

a. $(a^{-1})^4 =$	**b.** $(2x)^3 =$	**c.** $(5x)^{-2}$	**d.** $-2s^5 t^7 t^3 \cdot 4s^8 =$
e. $\dfrac{9a^7}{30a^5} =$	**f.** $\dfrac{x^3}{x^{-2}} =$	**g.** $\left(\dfrac{3x}{-4}\right)^3 =$	**h.** $\left(\dfrac{2a^2}{b}\right)^5 =$

3. Find the value of each unknown.

a. $8^x 8^5 = 8^{24}$	**b.** $(7^8)^{-3} = \dfrac{1}{7^y}$	**c.** $\left(\dfrac{2}{3}\right)^x = \dfrac{16}{81}$	**d.** $\dfrac{(-3)^x}{(-3)^5} = -27$	**e.** $(3^z)^2 = 9^4$

4. Find the true statements.

a. $(a \cdot b)^2 = a^2 \cdot b^2$	**b.** $a^m \cdot a^n = a^{m+n}$	**c.** $(a \cdot b)^{-3} = \dfrac{1}{ab^3}$	**d.** $(a + b)^2 = a^2 + b^2$

5. Natalie wrote the prime factorization of 21,600. Find the error.

$$21{,}600$$
$$= 100 \cdot 216$$
$$= 10^2 \cdot 6^3$$
$$= (2 \cdot 5)^2 \cdot (2 \cdot 3)^3$$
$$= 2^2 \cdot 5^2 \cdot 2^2 \cdot 3^3$$
$$= 2^4 \cdot 3^3 \cdot 5^2$$

6. There is one pretty simple number x for which the expression $(x + 1)^3$ is equal to $x^3 + 1$. Find that number.

7. Calculate. Give each answer to a reasonable accuracy.

a. 164.3 km ÷ 2.5 hr	**b.** 3.6 m + 89 m + 0.3 m	**c.** $5.210 \cdot 10^9$ dollars ÷ 365

8. Calculate. Give each answer to a reasonable accuracy.

    a. Sydney jogs through a 3.5-km jogging track twice every week.
    What is the total distance she jogs in a year?

    b. Your car's odometer shows you traveled 624.6 miles since you last filled your fuel tank. To fill
    your tank this time, it took 24.3 gallons of gas. What is your gas mileage (in miles per gallon)?

    c. What is the area of a rectangle with 2.3 m and 11.9 m sides?

9. Complete the chart by rewriting each distance in scientific notation.

Planet	Average distance from sun (km)	In scientific notation (km)
Mercury	58,000,000	
Jupiter	778,570,000	
Neptune	4,495,000,000	

10. Radioactive elements undergo radioactive decay, where they lose energy by
radiation. Half-life is the time required for exactly half of these entities to
decay, on average.

Prefix	Meaning
milli	10^{-3}
micro	10^{-6}
nano	10^{-9}

    The half-life of thorium-217 is 240 microseconds, and the half-life of uranium-216
    is 4.3 milliseconds.

    a. Write these two amounts in scientific notation, in *seconds*.

    b. How much longer is the half-life of uranium-216 than the half-life of
    thorium-217? Give your answer in milliseconds.

11. The average speed of a garden snail is about $1.3 \cdot 10^{-2}$ m/s. The average speed of a cheetah is about
27.7 m/s. About how many times faster is the cheetah than the garden snail?

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Mixed Review 3

1. Change the base of each power expression.

a. $8^6 = (2^{\boxed{}})^6 = 2^{\boxed{}}$	**b.** $64^3 = (4^{\boxed{}})^{\boxed{}} = 4^{\boxed{}}$	**c.** $100^5 = (10^{\boxed{}})^{\boxed{}} = 10^{\boxed{}}$

2. In each case, find the value of the two similar expressions.

a.	b.	c.	d.
$5 \cdot 4^3 =$	$(-5)^3 =$	$-3^{-2} =$	$2 \cdot 5^{-2} =$
$(5 \cdot 4)^3 =$	$-5^3 =$	$(-3)^{-2} =$	$(2 \cdot 5)^{-2} =$

3. The mass of the sun is about $2 \cdot 10^{30}$ kg, and the mass of the earth is about $6 \cdot 10^{24}$ kg. About how many times the mass of the earth is the mass of the sun? Give your answer in scientific notation.
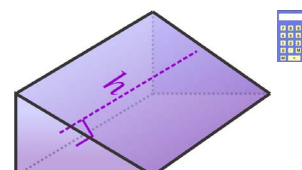
4. Join equivalent expressions with a line. Some expressions will not be joined.

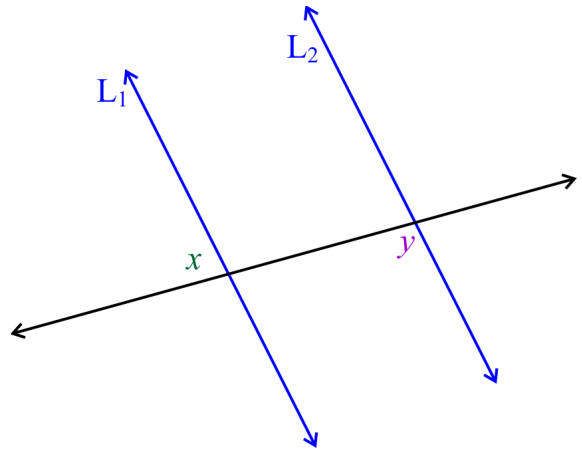|			
$\dfrac{a^2}{b^2}$	$9a^6$	$(3a^3)^2$	$-3a^2$
$3a^6$	$\dfrac{(3a)^2}{b}$	$\left(\dfrac{a}{b}\right)^2$	$\dfrac{3a^2}{b}$
$\dfrac{9a^2}{b}$	$\dfrac{a^2}{b}$	$3a^{3^2}$	$3a^9$

5. Find the measure of angle x. Explain your reasoning.

39°   74°
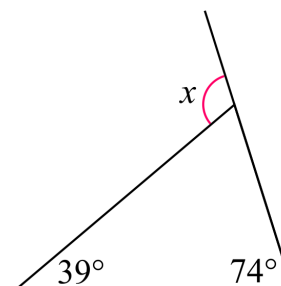
6. Find the volume of this triangular prism, if its height is 36 cm and its base is a right triangle with 10 cm, 15 cm, and 18 cm sides.

7. Two parallel lines, L_1 and L_2, are cut by a transversal.
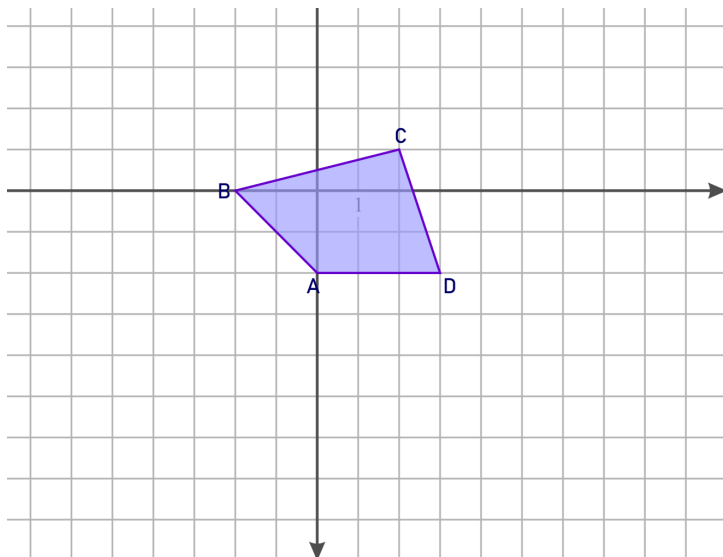   If angle x is 76°, find the angle measure of y, and explain
   how you know that.

8. A triangle with vertices A(−1, 2), B(−3, 2),
   and C(−4, 4) is first reflected in the y-axis and
   then rotated 90° clockwise around the origin.
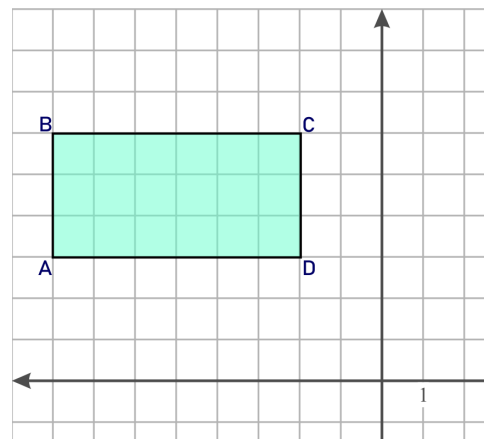   What are the coordinates of the vertices of the
   resulting triangle?
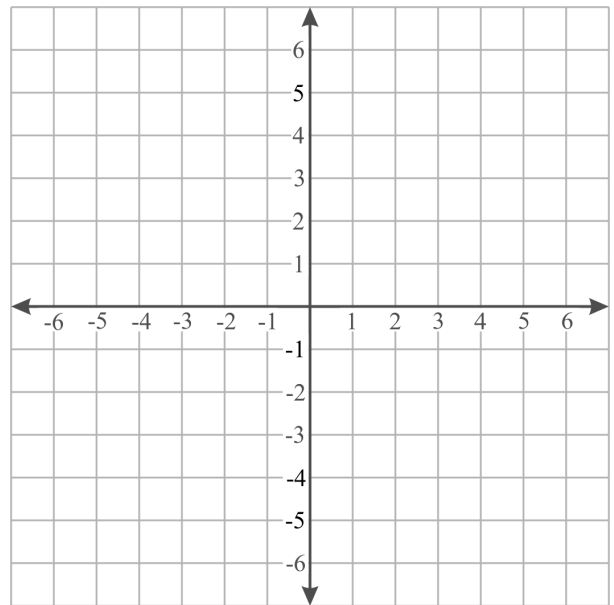
9. Dilate each figure with origin as center and with
   the given scale factor.

a. scale factor 3

b. scale factor 1/2

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Irrational Numbers and
the Pythagorean Theorem Test

A calculator is not allowed for the first page of the test.

1. Find the correct statements.

   a. 0.141414 is rational because its decimal expansion repeats.

   b. $\sqrt{111}$ is irrational because it is a square root of a number that is not a perfect square.

   c. 2π is irrational because π is irrational, and an irrational number multiplied by a rational number is irrational.

   d. $\dfrac{\sqrt{64}}{3}$ is rational because it is a ratio of two whole numbers.

2. Write the two consecutive integers between which the square or cube root lies.

a. _____ < $\sqrt{44}$ < _____	**b.** _____ < $-\sqrt{5}$ < _____	**c.** _____ < $\sqrt[3]{21}$ < _____

3. Plot the following numbers *approximately* on the number line. Do not use a calculator.

   $-\sqrt{25}$ $\qquad\qquad$ $\sqrt{80}-5$ $\qquad\qquad$ $\sqrt[3]{27}$ $\qquad\qquad$ $-2\sqrt{2}$ $\qquad\qquad$ π $\quad$ $\sqrt{35}\,/2$

```
  |----|----|----|----|----|----|----|----|----|----|----|----|
 −5   −4   −3   −2   −1    0    1    2    3    4    5    6    7
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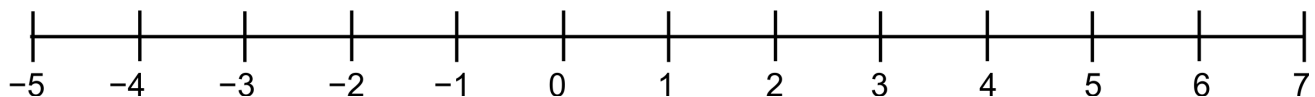
4. Solve. Give the final answers in exact form.

a. $x^2 = 37$	**b.** $5a^2 = 90$	**c.** $w^3 = 125$

5. Write the repeating decimal $0.\overline{23}$ as a fraction.

A calculator is allowed for the remaining portion of the test.
Please return the first page of the test to your teacher before continuing.

6. The two legs of a right triangle are $\sqrt{21}$ and $\sqrt{15}$. How long is the hypotenuse?

7. Find the distance between $(-2, 5)$ and $(10, 8)$. Give your answer rounded to two decimals.

8. Elizabeth runs around this track for morning exercise. Find the total distance she runs if she does three loops around this track.

0.4 km

0.5 km

0.7 km