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### Contact:

Michigan Department of Education  
Office of School Improvement  
Dr. Yvonne Caamal Canul, Director  
(517) 241-3147

[www.michigan.gov/mde](http://www.michigan.gov/mde)



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# A Parent's Guide to MATHEMATICS GRADE LEVEL CONTENT EXPECTATIONS

WHAT YOUR CHILD NEEDS  
TO KNOW BY THE END OF

## FOURTH GRADE







## A Parent's Guide to Grade Level Content Expectations

### Michigan Sets High Academic Standards – for ALL

This booklet is a part of Michigan's Mathematics and English Language Arts Grade Level Content Expectations (GLCE). It is just one in a series of tools available for schools and families. The Michigan Department of Education (MDE) will provide similar booklets for families of children in kindergarten through eighth grade by June, 2005.

Teacher versions of the Grade Level Content Expectations are finished for grades Kindergarten through eight. They state in clear and measurable terms what students in each grade are expected to know and be able to do. They also guide the design of the state's grade level MEAP tests required in the No Child Left Behind (NCLB) legislation.

Educators and classroom teachers from Michigan school districts have been involved in the development and/or review of Michigan's GLCE. The expectations were designed to ensure that students receive seamless instruction, from one grade to the next, leaving no gaps in any child's education. More importantly, they set high expectations in literacy and mathematics so we can better prepare all K-12 students for the challenges they will face in a global 21<sup>st</sup> century.

To learn more about the Michigan Curriculum Framework, visit [www.michigan.gov/mde](http://www.michigan.gov/mde) and click on "K-12 Curriculum."

## GLOSSARY TERMS



- algorithm** – a specific step-by-step procedure for any mathematical operation
- area** – the number of square units needed to cover the inside of a shape; rectangle, square, triangle, etc.
- bar graph** – uses bars to show data
- decimal** – a number that uses a decimal point to show tenths and hundredths Example: 2.43
- denominator** – the bottom number of a fraction that shows the number of equal parts in a whole (In  $\frac{1}{4}$ , 4 is the denominator)
- distributive property** – when multiplying any two numbers, the job can often be made easier by breaking (decomposing) the numbers into smaller pieces. The multiplication can then be *distributed* over those numbers. [ $ax(c+d)=ac+ad$ ]
- equilateral triangle** – a triangle whose sides are equal length and whose angles are equal measure
- face** – the 2-dimensional side of a 3-dimensional figure
- hundredth** – one out of 100 equal parts of a whole
- integer** – positive and negative whole numbers
- isosceles triangle** – a triangle with 2 sides of equal length and 2 angles of equal measure
- numerator** – the top number of a fraction that shows the number of equal parts compared to the number of parts in a whole, (In  $\frac{2}{3}$ , 2 is the numerator)
- parallel lines** – straight lines that are an equal distance from each other and never cross
- perimeter** – the distance around the outside of a shape
- perpendicular lines** – two lines which form right angles where they intersect
- prime number** – a whole number greater than 1 that has only two factors, itself and 1
- pyramid** – a 3-dimensional geometric figure whose base is a polygon (triangle, rectangle, etc.) and whose faces are triangular and meet at a common vertex
- right angle** – an angle that forms a square corner; measures  $90^\circ$
- right triangle** – a triangle with a right angle

## DATA AND PROBABILITY, continued.



- Order a given set of data, find the median, and specify the range of values.

Example:

9,6,13,7,10,11,7 order numbers → 6,7,7,9,10,11,13

9 is the median (middle number)

$13 - 6 = 7$

The range is the greatest number minus the least.

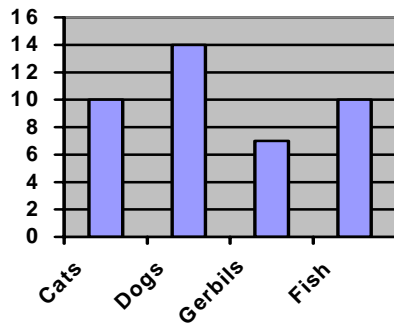
The range is 7.

- Solve problems using data presented in tables and bar graphs.

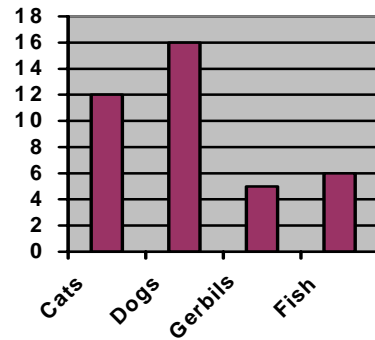
Example:

Compare data represented in two bar graphs and read bar graphs showing two data sets.

Number of Pets in Class A



Number of Pets in Class B



Which class has more dogs as pets?  
How much more?

Which class has the most pets altogether?

**Fourth Grade Mathematics** is the science of patterns and relationships. It is the language and logic of our technological world. Mathematical power is the ability to explore, to imagine, to reason logically and to use a variety of mathematical methods to solve problems – all important tools for children’s futures. A mathematically powerful person should be able to:

- reason mathematically.
- communicate mathematically.
- solve problems using mathematics.
- make connections within mathematics and between mathematics and other fields.



### Michigan’s **Mathematics Grade Level Content**

**Expectations** (GLCE) are organized into five strands:

- Number and Operations
- Algebra
- Geometry
- Measurement
- Data and Probability

By the end of fourth grade, students should have a good foundation in addition and subtraction of whole numbers and will have done much in multiplication and division of whole numbers. Work in number also extends to fractions and decimal fractions, using limited sets of fractions as the basis for building meaning for equivalent fractions, addition, subtraction, and fraction as part of a set of objects. Work in measurement becomes more complex with a focus on units and conversion within systems of units. In order to allow for the development of Number and Operations, there is a limited focus on Geometry, and Data and Probability.

### Glossary Terms

Words that have asterisks (\*) are defined in the Glossary located in the back of this booklet.

## NUMBER AND OPERATIONS

### Understand and Use Number Notation and Place Value

- Read and write numbers to 1,000,000; relate them to the quantities they represent.  
Compare (greater than  $>$  and less than  $<$ )  
Example:  
 $27 > 18$   
Order (least  $\rightarrow$  greatest or greatest  $\rightarrow$  least)  
 $231,551$ ;  $371,681$ ;  $421,791$ ;  $451,370$ ;
- Compose and decompose numbers using place value to 1,000,000's.  
Example:  
 $425,068$  is 4 one hundred thousands, 2 ten thousands, 5 thousands, 0 hundreds, 6 tens, and 8 ones  
 $400,000 + 20,000 + 5,000 + 0 + 60 + 8$ .
- Understand the magnitude of numbers up to 1,000,000; recognize the place values of numbers, and the relationship of each place value to the place to its right.  
Example: 800,000 is 800 thousands or 8000 hundreds.

### Use Factors and Multiples

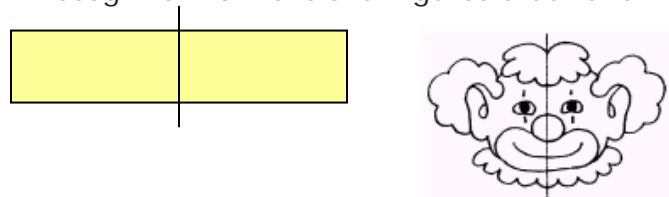
- Find all factors of a whole number up to 50, and list factor pairs.  
Example:  
 $24 = 1 \times 24, 2 \times 12, 3 \times 8, 4 \times 6$ ; factors of 24  
(1,2,3,4,6,8,12,24)
- Know that some numbers including 2, 3, 5, 7, and 11 have exactly two factors (1 and the number itself) and are called prime numbers.
- Solve problems about factors and multiples.  
Example:  
Since  $100 = 4 \times 25$ , and  $200 = 2 \times 100$ ,  
then  $200 = 2 \times 4 \times 25 = 8 \times 25$ .

### Add and Subtract Whole Numbers

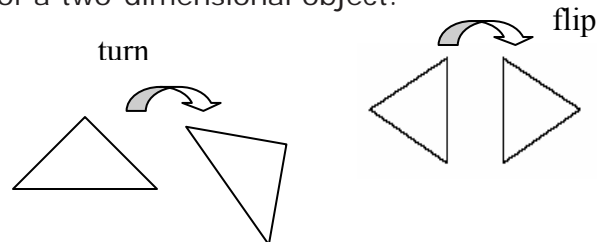
- Add and subtract whole numbers fluently.

## Recognize symmetry and transformations

- Recognize 2-dimensional figures that have line symmetry.



- Recognize rigid motion transformations (flips, slides, turns) of a two-dimensional object.

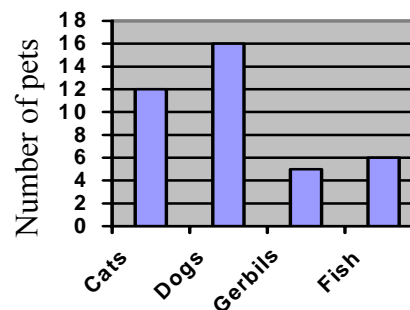


## DATA AND PROBABILITY

### Represent and Solve Problems for Given Data

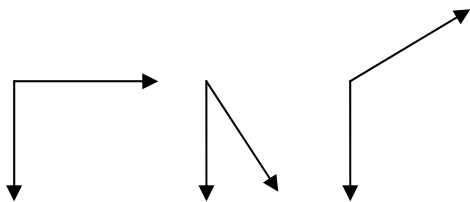
- Construct tables and bar graphs from given data.  
Example:  
The students in Class A made a list of their pets: 16 dogs, 5 gerbils, 6 fish and 12 cats. Make a bar graph that displays the students list of pets.

Title: Students' Pets of Class A



## Understand Right Angles

- Identify right angles and compare angles to right angles.

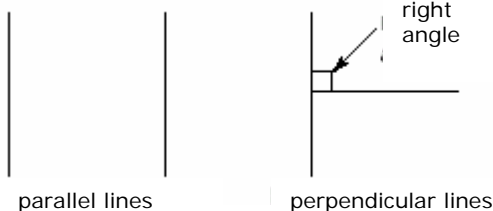


Which angle is smaller than a right angle?  
Which angle is larger than a right angle?

## GEOMETRY

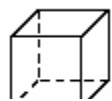
### Understand Perpendicular, Parallel, and Intersecting Lines

- Identify and draw perpendicular\*, parallel\*, and intersecting lines using a ruler and a tool or object with a square ( $90^\circ$ ) corner.

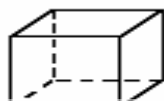


### Identify basic geometric shapes and their components, and solve problems

- Identify basic geometric shapes including isosceles\*, equilateral\* and right\* triangles, and use their properties to solve problems.
- Identify and count the faces\*, edges, and vertices\* of basic three-dimensional geometric solids including cubes, rectangular prisms, and pyramids\*; describe the shape of their faces.



cube



rectangular prism

## Multiply and Divide Whole Numbers

- Multiply two-digit numbers by a one digit number, using the distributive property\* to develop meaning for the algorithm\*.

Example:

$$21 \times 3 = (1 + 20) \times 3 = (1 \times 3) + (20 \times 3) = 3 + 60 = 63$$

Algorithm:

$$\begin{array}{r} 21 \\ \times 3 \\ \hline 63 \end{array}$$

- Multiply fluently any whole number by a one-digit number, and a three-digit number by a two-digit number.
- Divide numbers up to four digits by one-digit numbers and by 10.

Example:

$$6,035 \div 5 = 1,207 \quad 3,450 \div 10 = 345$$

- Find unknowns in equations.  
Example:  $a \div 10 = 25$ ,  $a=250$ ;  $125 \div b = 25$ ,  $b=5$ .
- Use the relationship between multiplication and division to simplify computations and check results.

Example:

$$280 \div 20 = ?$$

We know that 20 is  $2 \times 10$  so we can divide 280 by 10 to get 28. Then we can divide 28 by 2 to get 14.

We can check by multiplying  $14 \times 20$

$$(14 \times 10 = 140; 140 \times 2 = 280).$$

- Solve applied problems involving whole number multiplication and division.

Example:

Six students each baked 3 dozen cookies for a school bake sale.

How many cookies were made in all?

$$[6 \times (3 \times 12)], 6 \times 36 = 216 \text{ cookies.}$$

If the students sold the cookies 3 for \$1.00, how much money would the students make?

$$216 \div 3 = \$ 72.00$$

## Read, Interpret and Compare Decimal Fractions

- ❑ Read and interpret decimals up to two decimal places; relate to money and place value decomposition. 2.43 is read as “2 and 43 hundredths”. This is the same as \$ 2.43 where 2 represents whole dollars and 43 represents 43 cents.
- ❑ Know that terminating decimals represent fractions whose denominators are 10 (tenths), 10 x 10 (hundredths), etc.  
Example: Powers of 10  
Example:  $\rightarrow .1 = \frac{1}{10}$   $.05 = \frac{5}{100}$
- ❑ Locate tenths and hundredths on a number line.
- ❑ Read, write, interpret, and compare decimals up to two decimal places.  
Example:  $0.43 > 0.4$ ;  $0.05 < 0.5$
- ❑ Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths.  
Example:  $.50 = \frac{1}{2}$  or  $\frac{2}{4}$   $.25 = \frac{1}{4}$   $.75 = \frac{3}{4}$

### Ways to Praise Your Child...

**You are doing a terrific job!**  
**This is correct!**  
**You are catching on quickly!**  
**I am very proud of you!**  
**You are making great progress!**


## Use Perimeter and Area Formulas

- ❑ Know and understand the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using the formulas.

### Rectangle:

4

Perimeter =  $2 \times \text{length} + 2 \times \text{width}$

3 

$= (2 \times 3) + (2 \times 4)$


$= 6 + 8 = 14 \text{ units}$

Area =  $\text{length} \times \text{width}$  in square units

$= 3 \times 4 = 12 \text{ square units}$

### Square

Perimeter = 4 multiplied by a side length

3 

$4 \times 3 = 12 \text{ units}$

Area =  $\text{side} \times \text{side}$  in square units

$3 \times 3 = 9 \text{ square units}$

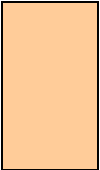
- ❑ Find one dimension of a rectangle given the other dimension and its perimeter or area.

**length = x; width = 3ft**

Perimeter =  $x + x + 3 + 3 = 16\text{ft.}$

$2x + 6 = 16 \text{ ft.}$

$x = 5 \text{ ft} = \text{length}$

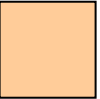
$2x = 10 \text{ ft.}$   3 ft.

- ❑ Find the side of a square given its perimeter or area.

Each side = 5ft.

Area =  $s \times s$

Area = 25 sq. ft.  $s = 5 \text{ ft.}$

 5ft.

5ft.



## MEASUREMENT

### Measure using common tools and appropriate units

- ❑ Measure using common tools and select appropriate units of measure.

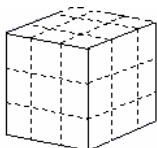
Example:

To measure the classroom which tool would you use? Which unit would be used? A meter or yard stick would be used, using meters, feet or yards as units of measure. To determine the length of a book a ruler would be used and the unit would be inches or centimeters.

- ❑ Measure and compare integer\* temperatures in degrees.

- ❑ Measure surface area of cubes and rectangular prisms by covering and counting area of the faces.

Example: The surface area of one face of this cube is 9 square units. There are 6 faces that are all the same side so the surface area of the cube is 54 square units (9x6.)



### Convert measurement units

- ❑ Carry out the following conversions from one unit of measure to a larger or smaller unit of measure:
  - meters(m) to centimeters(cm) 1 m = 100 cm,
  - kilograms(kg) to grams (g), liters (l) to milliliters (ml),
  - hours to minutes, 1 minutes to seconds,
  - years to months; 1 year=12 months
  - weeks to days; 1 week=7 days
  - feet to inches; 1 foot=12 inches
  - ounces to pounds; 1 pound=16 ounces

## Understand Fractions

- ❑ Understand fractions as parts of a set of objects.

Example:

What fraction of these letters are vowels: W, **A**, L, O, R, **U**? There are 6 letters and 2 of the letters are vowels so the fraction of the set that is vowels is  $\frac{2}{6}$ . 6 is the

denominator\* and represents the total amount in the set. 2 is the numerator\* which indicates the part of the set that is vowels.

- ❑ Locate and compare fractions on the number line, including improper fractions\* and mixed numbers with denominators\* of 12 or less.

Example: Find  $\frac{3}{4}$  and  $\frac{5}{4}$  on the number line.

Which is closest to  $\frac{1}{2}$ ? Which is closest to 1? to 2?

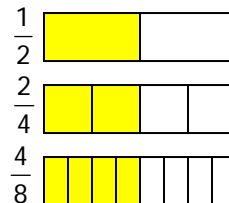
Find  $\frac{5}{4}$  on the number line. Is it greater than, less than or

equal to  $1\frac{3}{4}$ ?

- ❑ Understand the relationships among halves, fourths and eighths and among thirds, sixths and twelfths.

$$\frac{4}{8} = \frac{2}{4} = \frac{1}{2}; \quad \frac{8}{12} = \frac{4}{6} = \frac{2}{3}$$

- ❑ Explain why these fractions are equivalent using fraction strips or the number line.



- ❑ Write improper fractions\* as mixed numbers, and understand that a mixed number represents the number of "wholes" and the part of a whole remaining.

Example:

$$\frac{5}{3} = \frac{3}{3} + \frac{2}{3} \rightarrow \frac{3}{3} = 1 \text{ therefore } \frac{5}{3} = 1 + \frac{2}{3} = 1\frac{2}{3}$$

## Understand Fractions, continued

- Compare and order up to three fractions with denominators 2, 4, and 8, and 3, 6, and 12, including improper fractions and mixed numbers.

Example: Put these numbers in order:  $\frac{5}{3}, \frac{2}{6}, 1\frac{3}{6}$ .

## Add and Subtract Fractions

- Add and subtract fractions less than 1 with denominators 12 or less and including 100, in cases where the denominators are equal or when one denominator is a multiple of the other.

Example:

$$\frac{1}{12} + \frac{5}{12} = \frac{6}{12}; \quad \frac{1}{6} + \frac{5}{12} = \frac{7}{12}; \quad \frac{3}{10} - \frac{23}{100} = \frac{7}{100}$$

- Solve for the unknown in equations such as:

$$\frac{2}{5} + x = \frac{3}{5}, \quad x = \frac{1}{5} \quad \text{or} \quad \frac{4}{5} - y = \frac{1}{5}, \quad y = \frac{3}{5}$$

## Multiply Fractions by Whole Numbers

- Multiply fractions by whole numbers, using repeated addition, and area or array models.

$$\left(\frac{3}{1}\right) \times \frac{1}{4} = \frac{3}{4} \rightarrow \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$$

## Add and Subtract Decimal Fractions

- Use mathematical statements to represent problems that use addition and subtraction of decimals with up to two digits; solve. Add and subtract decimals up to two decimal places.

Example: Write a statement that represents the following problem: Jane had \$15.75. She spent \$7.70.

How much money does she have left?

$$\text{Money left} = 15.75 - 7.70 = 8.05$$

## Multiply and divide decimal fractions



- Multiply and divide decimals up to two decimal places by a one-digit whole number where the result is a terminating decimal.

Example:

$$\begin{array}{r} 0.42 \quad 3 = 0.14 \\ .14 \quad .27 \\ \times 3 \quad \times 5 \\ \hline .42 \quad 1.35 \end{array}$$

## Estimate

- Estimate the answers to calculations involving addition, subtraction, or multiplication of whole numbers using mental math strategies.
- Know when approximation is appropriate and use it to check the reasonableness of answers; be familiar with common place-value errors in calculations.

## Problem-solving

- Solve applied problems using the four basic arithmetic operations for appropriate fractions, decimals, and whole numbers.

### Study Tip...

**Following directions is very important in school and at home. Make sure your child develops the habit of carefully reading the directions for their homework.**