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## Introduction

*Math Mammoth Grade 6 Review Workbook* is intended to give students a thorough review of sixth grade math, following the main areas of Common Core Standards for grade 6 mathematics. The book has both topical as well as mixed (spiral) review worksheets, and includes both topical tests and a comprehensive end-of-the-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 child from forgetting math skills during other break times, to prepare students who are going into seventh grade, or to give sixth grade students extra practice during the school year.

The topics reviewed in this workbook are:

- review of the four basic operations
- expressions and equations
- decimals
- ratios
- percent
- factoring
- fractions
- integers
- geometry
- statistics

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

The content for these is taken from the *Math Mammoth Grade 6 Complete Curriculum*, so this workbook works especially well to prepare students for grade 7 in Math Mammoth. However, the content follows a typical study for grade 6, so this workbook can be used no matter which math curriculum you follow.

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 the *Math Mammoth Grade 6 Complete Curriculum*, which has all the necessary instruction and lessons.

*I wish you success with teaching math!*

*Maria Miller, the author*



# Expressions and Equations Review

1. Write an expression.

- a. the difference between 6 and  $x$ , squared
- b. the quotient of 5 and the sum of  $x$  and 6
- c. 3 times the quantity 5 minus  $p$

2. Find the value of the expressions.

|                                   |                                    |
|-----------------------------------|------------------------------------|
| a. $(1 + 6)^2 + (10 - 2)^2$       | b. $5^2 \cdot 2^3$                 |
| c. $\frac{21 + 6}{2 \cdot 1 + 1}$ | d. $\frac{16}{2} \cdot (120 - 50)$ |

3. Find the value of the expressions.

|                           |                                         |
|---------------------------|-----------------------------------------|
| a. $2x + 18$ when $x = 5$ | b. $\frac{35}{z} \cdot 13$ when $z = 5$ |
|---------------------------|-----------------------------------------|

4. Write an expression for each situation.

- a. Three friends purchased a scuba diving outfit together for  $p$  dollars. They shared the cost equally. How much did each person pay?
- b. You bought modeling clay for \$3 and six boxes of crayons for  $c$  dollars each. What was the total cost?

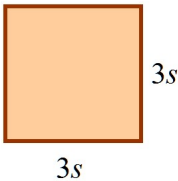
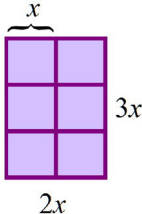
5. Label each thing below as an equation, inequality, or expression.

$$2x + 17 \quad 8 = 8 \quad y < 3 \quad 4x - 3 = 8 \quad \frac{4}{5}x - 16 \quad 4x + y^2 \geq 9 \quad M = \frac{44 - x}{5}$$

6. Simplify the expressions.

|                                        |                       |
|----------------------------------------|-----------------------|
| a. $t + t + t + 3$                     | b. $8d - 3d$          |
| c. $x \cdot x \cdot x$                 | d. $12x - 6 - 6x$     |
| e. $z \cdot z \cdot 8 \cdot z \cdot 2$ | f. $3x^2 + 5 + 11x^2$ |

7. Write an expression for *both* the area and perimeter of each rectangle. Give them in simplified form.

|                                                                                   |                                                                                     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |
| <p>a. <math>A =</math></p> <p><math>P =</math></p>                                | <p>b. <math>A =</math></p> <p><math>P =</math></p>                                  |

8. Multiply using the distributive property.

|                  |                  |
|------------------|------------------|
| a. $3(2x + 7) =$ | b. $8(9b + 5) =$ |
|------------------|------------------|

9. Think of the distributive property “backwards,” and factor these sums.

|                                                                                               |                                                                                                |
|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| a. $5x + 10 = \underline{\hspace{1cm}} (x + \underline{\hspace{1cm}})$                        | b. $6y + 10 = \underline{\hspace{1cm}} (\underline{\hspace{1cm}} + \underline{\hspace{1cm}})$  |
| c. $24b + 4 = \underline{\hspace{1cm}} (\underline{\hspace{1cm}} + \underline{\hspace{1cm}})$ | d. $25w + 40 = \underline{\hspace{1cm}} (\underline{\hspace{1cm}} + \underline{\hspace{1cm}})$ |

10. Solve the equations.

|                    |                          |                        |
|--------------------|--------------------------|------------------------|
| a. $7x = 784$      | b. $3 + z = 119$         | c. $\frac{x}{6} = 12$  |
| d. $5y + 8y = 784$ | e. $32 + x = 9 \cdot 40$ | f. $\frac{r}{6+4} = 7$ |

11. Write an equation for each situation EVEN IF you could easily solve the problem without an equation. Then solve the equation.

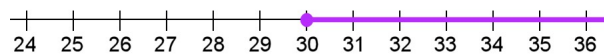
a. The value of a certain number of twenty-cent coins is 1,680 cents.  
How many twenty-cent coins are there?

b. The perimeter of a rectangle is 128 meters. One side is 21 meters.  
How long is the other side?

12. Write an inequality that corresponds to the number line plot.



a.



b.

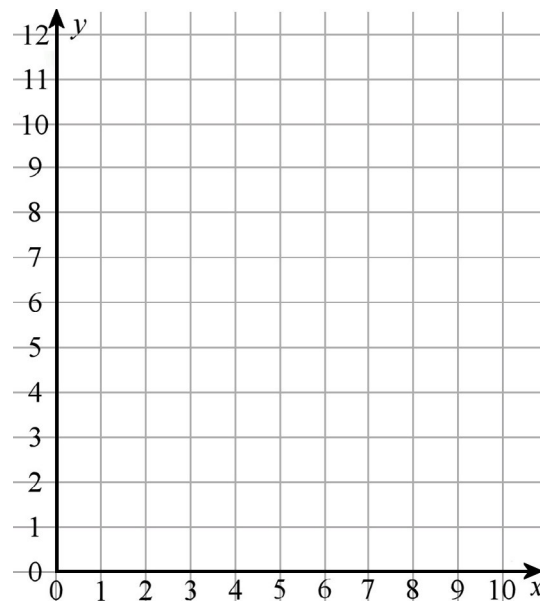
13. a. Solve the inequality  $y + 2 > 24$  in the set  $\{55, 44, 22, 23, 30\}$ .

b. What solutions does the inequality  $x + 7 \leq 14$  have in the set of even whole numbers?

14. Calculate the values of  $y$  according to the equation  $y = x + 3$ .

|          |   |   |   |   |   |   |
|----------|---|---|---|---|---|---|
| <b>x</b> | 1 | 2 | 3 | 4 | 5 | 6 |
| <b>y</b> |   |   |   |   |   |   |

Now, plot the points.



15. A train is traveling with a constant speed of 70 miles per hour. Consider the variables of time ( $t$ ), measured in hours, and the distance traveled ( $d$ ), measured in miles.

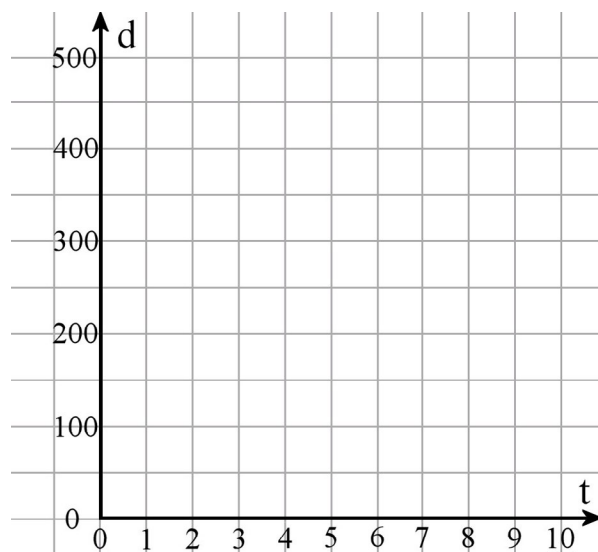
a. Fill in the table.

|                               |   |   |   |   |   |   |   |
|-------------------------------|---|---|---|---|---|---|---|
| <b><math>t</math> (hours)</b> | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| <b><math>d</math> (miles)</b> |   |   |   |   |   |   |   |

b. Plot the points on the coordinate grid.

c. Write an equation that relates  $t$  and  $d$ .

d. Which of the two variables is the independent variable?



# Mixed Review 1

1. Solve.

|           |          |                   |
|-----------|----------|-------------------|
| a. $10^5$ | b. $3^4$ | c. $10^5 \cdot 4$ |
|-----------|----------|-------------------|

2. Fill in.

a.  $(1.4 \text{ m})^2$  gives us the \_\_\_\_\_ of a \_\_\_\_\_ with sides \_\_\_\_\_ long.

b.  $(78 \text{ cm})^3$  gives us the \_\_\_\_\_ of a \_\_\_\_\_ with edges \_\_\_\_\_ long.

3. Three students were working on this problem:

Margie said the answer was 9 cm, Evelyn said it is 18 cm, and Henry said it is 36 cm.

The area of a square is  $81 \text{ cm}^2$ .  
What is its perimeter?

What do you think? Is one of them correct?

If so, how could you show the two others that that answer is indeed the correct answer?

4. Estimate the result in your head using rounded numbers. Find the exact value using a calculator.  
Also, find the error of estimation.

|                                                                                                      |                                                                                                         |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <p>a. <math>591 \cdot 57,200</math></p> <p>Estimation:</p> <p>Exact:</p> <p>Error of estimation:</p> | <p>b. <math>435,212 + 9,319,290</math></p> <p>Estimation:</p> <p>Exact:</p> <p>Error of estimation:</p> |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|

5. Hester and Holly are going to bake cookies for the school bake sale. Below you see the recipe they want to use. A single recipe makes  $2 \frac{1}{2}$  dozen cookies. *Triple* the recipe for them.

## Spice Cookies - makes $2 \frac{1}{2}$ dozen

$2 \frac{1}{4}$  cups of whole wheat flour  
 $\frac{1}{3}$  cup of honey  
 $\frac{1}{2}$  cup of unsweetened applesauce  
 $\frac{3}{4}$  teaspoon of nutmeg  
 $1 \frac{1}{2}$  teaspoons of cinnamon  
 $\frac{1}{2}$  teaspoon of ground cloves  
 $\frac{1}{3}$  cup of raisins  
 $\frac{3}{4}$  cup of walnuts

6. Write an expression.

a. the quotient of  $5s$  and 8

b. 7 times the quantity  $x$  plus 8

c.  $y$  less than 8

d. the quantity  $x$  minus 8, squared

7. Write as numbers.

a. 5 trillion, 51 billion, 27 thousand

b. 21 trillion, 650 billion, 99 million, 56

c.  $6 \cdot 10^6 + 2 \cdot 10^3 + 1 \cdot 10^0$

8. Solve. Notice carefully which operation(s) are done first.

a.  $4 \cdot 50 + \frac{310}{2} =$

b.  $\frac{4,800}{60} - (70 - 20) =$

9. A bicycle has been discounted by  $\frac{2}{10}$  of its price, and now it costs \$120.  
Find the price before the discount.

10. Divide. Use the space on the left to build a multiplication table for the divisor. Lastly, check.

$$79 \overline{) 562790}$$

$$\begin{array}{r} \cdot \quad 79 \\ \hline \end{array}$$

# Ratios Test

1. Write the equivalent ratios.

|                                        |                                            |                                                                |                                                       |
|----------------------------------------|--------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------|
| a. $\frac{3}{5} = \frac{18}{\text{■}}$ | b. $2 : 3 = 18 : \underline{\hspace{1cm}}$ | c. $\underline{\hspace{1cm}} \text{ to } 45 = 2 \text{ to } 9$ | d. $12 : 30 = \underline{\hspace{1cm}} \text{ to } 5$ |
|----------------------------------------|--------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------|

2. a. Draw a picture where there are 4 rectangles for each 3 triangles, and a total of 16 rectangles.

b. Fill in the unit rates:

\_\_\_\_\_ rectangles for 1 triangle

\_\_\_\_\_ triangles for 1 rectangle

3. Fill in the missing numbers to form equivalent rates.

|                                                                                                                              |                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| a. $\frac{4 \text{ L}}{10 \text{ m}^2} = \frac{\hspace{1cm}}{5 \text{ m}^2} = \frac{10 \text{ L}}{\hspace{1cm} \text{ m}^2}$ | b. $\frac{\$9}{6 \text{ min}} = \frac{\hspace{1cm}}{2 \text{ min}} = \frac{\hspace{1cm}}{10 \text{ min}} = \frac{\hspace{1cm}}{1 \text{ hour}}$ |
|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|

4. A mole can dig 3.6 meters in 36 minutes.

a. What is the unit rate?

b. Digging at the same speed, how far can the mole dig in 17 minutes?

5. You can buy 14 song downloads for \$2.10.  
How much would 3 songs cost?

6. The length and width of a rectangle are in a ratio of 8:5.  
The shorter side is 15 cm.

a. Find the longer side of the rectangle.

b. Find the area of the rectangle.

7. You are mixing juice concentrate and water in a ratio of 1:7.  
How much water and how much concentrate do you need  
to make 4 liters of diluted juice?

8. A large passenger plane burns 132 liters of fuel per 11 kilometers.

a. Write a rate from this, and simplify it to the lowest terms.

b. How far can the plane travel with 1,500 liters of fuel?

c. How many liters will the plane need to travel 240 kilometers?

9. Anita and Michael divided a job of folding advertisements  
for inserts in 1,200 newspapers in a ratio of 3:5. Calculate  
how many inserts each one of them folded.

10. Use ratios to convert the measuring units. 1 in. = 2.54 cm, and 1 ft = 30.48 cm.

a. 60 cm into inches

b. 4.5 feet into cm

# Mixed Review 7

1. Divide using long division in your notebook. Then, check your result.

|                                                                                    |                                                                                   |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>a.</b> $339,427 \div 26 =$ _____ R _____<br>_____ $\cdot$ _____ + _____ = _____ | <b>b.</b> $6,594 \div 145 =$ _____ R _____<br>_____ $\cdot$ _____ + _____ = _____ |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|

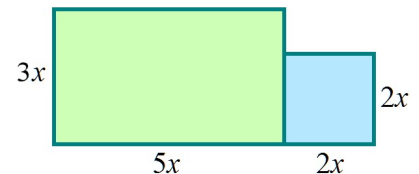
2. Compare and write  $<$ ,  $>$  or  $=$ .

|                                               |                                                  |                                                              |
|-----------------------------------------------|--------------------------------------------------|--------------------------------------------------------------|
| <b>a.</b> 659,000 <input type="text"/> $10^6$ | <b>b.</b> 10 billion <input type="text"/> $10^9$ | <b>c.</b> $10^6 + 10^2$ <input type="text"/> 1,001,000       |
| <b>d.</b> $4^3$ <input type="text"/> $3^4$    | <b>e.</b> $2^3$ <input type="text"/> $3^2$       | <b>f.</b> $9 \cdot 10^4$ <input type="text"/> $2 \cdot 10^5$ |

3. Evaluate the expressions when the value of the variable is given.

|                                   |                                        |
|-----------------------------------|----------------------------------------|
| <b>a.</b> $150 - 7s$ when $s = 9$ | <b>b.</b> $\frac{3+x}{x}$ when $x = 5$ |
|-----------------------------------|----------------------------------------|

4. Write in simplified form an expression for the area and an expression for the perimeter of the shape.



5. Simplify the expressions.

|                        |                                       |
|------------------------|---------------------------------------|
| <b>a.</b> $y + 7 + 3y$ | <b>b.</b> $r \cdot r \cdot r \cdot 8$ |
|------------------------|---------------------------------------|

6. Choose the expressions that have the value 6.

- |                           |                               |                                  |                                |
|---------------------------|-------------------------------|----------------------------------|--------------------------------|
| <b>a.</b> $18 \div 3$     | <b>b.</b> $1.8 \div 0.03$     | <b>c.</b> $0.18 \div 0.03$       | <b>d.</b> $1.2 \div 0.2$       |
| <b>e.</b> $360 \div 6$    | <b>f.</b> $3.6 \div 0.6$      | <b>g.</b> $0.00036 \div 0.00006$ | <b>h.</b> $0.9 \div 1.5$       |
| <b>i.</b> $0.9 \div 0.15$ | <b>j.</b> $0.009 \div 0.0015$ | <b>k.</b> $0.0012 \div 0.002$    | <b>l.</b> $0.0006 \div 0.0001$ |

7. One paper clip weighs 14 dg. They are sold in boxes of 200.

a. Calculate the weight of the box, in grams.

b. If someone wanted 1 kg of paperclips,  
how many boxes would he need to buy?

8. Sandra gets paid \$6 for every 15 minutes she works. Fill in the missing numbers to form equivalent rates.

$$\frac{\quad}{5 \text{ min}} = \frac{\$6}{15 \text{ min}} = \frac{\quad}{20 \text{ min}} = \frac{\quad}{25 \text{ min}} = \frac{\quad}{1 \text{ hr}}$$

9. The width and length of a rectangle are in a ratio of 1:7, and its perimeter is 120 mm. Find the rectangle's width and length.

10. On average, Gary makes a basket eight times out of every ten shots.  
How many baskets can he expect to make when he practices 25 shots?

11. Solve the equations.

|           |                |           |                         |           |                |
|-----------|----------------|-----------|-------------------------|-----------|----------------|
| <b>a.</b> | $312 = x + 78$ | <b>b.</b> | $\frac{z}{2} = 60 + 80$ | <b>c.</b> | $7y - 2y = 45$ |
|           | =              |           | =                       |           | =              |
|           | =              |           | =                       |           | =              |

12. A car travels with a steady speed of 39 kilometers per 30 minutes. Fill in the table.

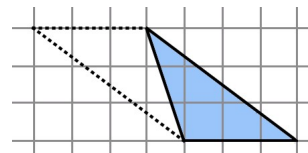
|                 |        |        |        |        |             |         |
|-----------------|--------|--------|--------|--------|-------------|---------|
| <b>Distance</b> |        | 39 km  |        |        |             |         |
| <b>Time</b>     | 10 min | 30 min | 50 min | 1 hour | 2 1/2 hours | 3 hours |

# Geometry Review

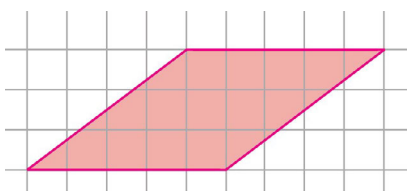
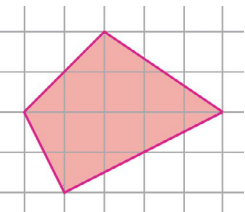
You can use a calculator in all the problems in this lesson.



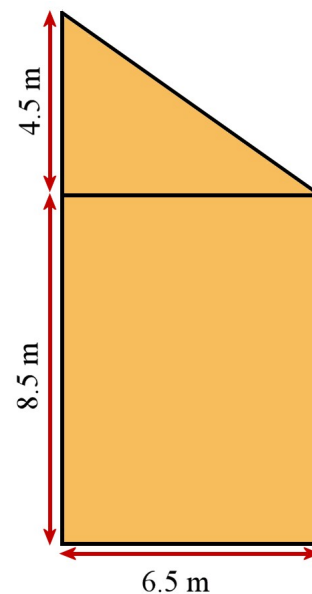
1. Explain how the area of the triangle is related to the area of the parallelogram.



2. Find the area of the quadrilaterals in square units.

|                                                                                                                     |                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <p><b>a.</b></p>  <p>A = _____</p> | <p><b>b.</b></p>  <p>A = _____</p> |
|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|

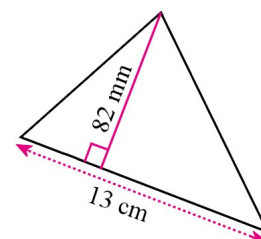
3. **a.** Jeremy planted a garden in the shape of the diagram at the right.  
Find the area of Jeremy's garden.



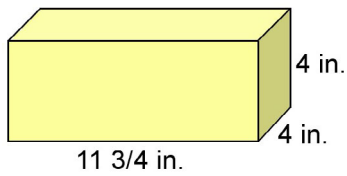
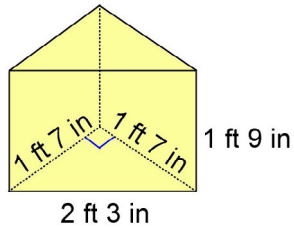
- b.** Jeremy planted a rectangular section measuring 3.5 m by 3 m with green beans. What percentage of his garden did he plant with green beans?

4. Find the area of this triangle:

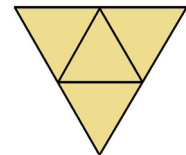
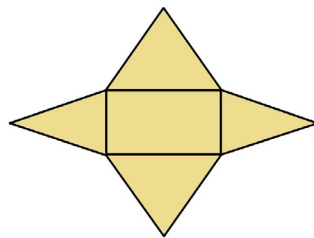
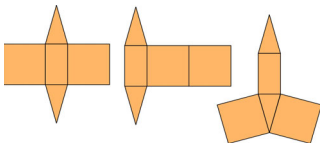
- a.** in square centimeters
- b.** in square millimeters



5. Draw a net and calculate the surface area. Round your answer to the nearest square centimeter.

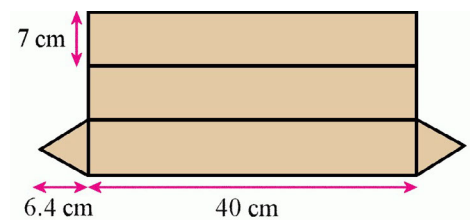


6. What are the names of the solids that can be constructed from these nets?

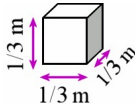


7. What solid can you build from this net?

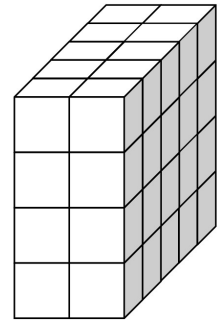
Calculate its surface area to the nearest square centimeter.



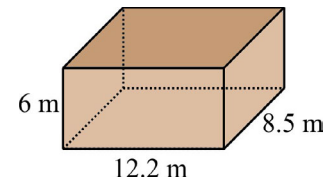
8. The edges of each little cube measure  $\frac{1}{3}$  m.



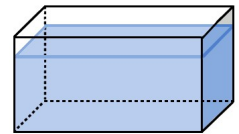
What is the total volume, in cubic meters, of the figure at the right?



9. This building has three stories. Calculate the volume of one story.



10. An aquarium measures 50 cm  $\cdot$  30 cm on the bottom, and its height is 40 cm.  
It is  $\frac{4}{5}$  filled with water.



How many cubic centimeters of water is in it?

How many milliliters of water is in it?  
(One cubic centimeter is one milliliter.)

How many liters?

# Mixed Review 16

*A calculator is not allowed.*

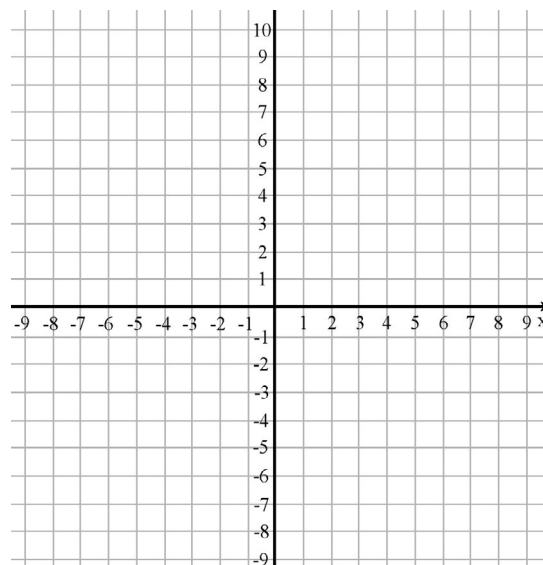
1. Move these points four units to the *left*:

$$(-5, 1) \rightarrow ( \quad , \quad )$$

$$(-2, -3) \rightarrow ( \quad , \quad )$$

$$(3, -7) \rightarrow ( \quad , \quad )$$

2. Sam and Matt divided a salary of \$180 in a ratio of 4:5.  
Calculate how much each boy got.



3. Find the greatest common factor of the given number pairs.

**a.** 56 and 70

**b.** 96 and 36

4. Find five numbers that are multiples of both 5 and 9.

5. Solve the equations by thinking logically.

**a.**  $4 \cdot \underline{\hspace{2cm}} = 0.0012$

**b.**  $0.2 \cdot \underline{\hspace{2cm}} = 0.06$

**c.**  $0.03 \cdot \underline{\hspace{2cm}} = 30$

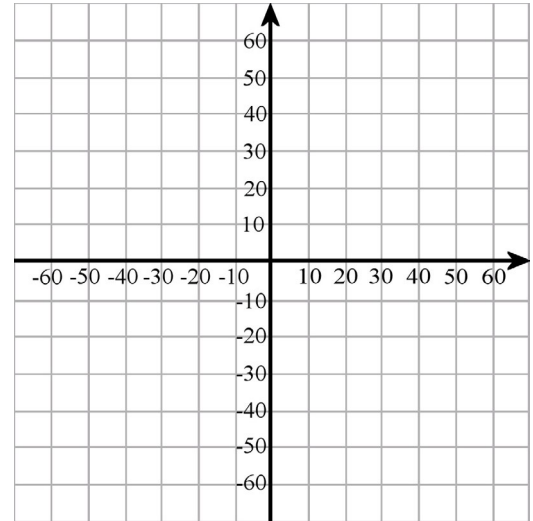
6. Solve the equations.

**a.**  $0.5x = 30$

**b.**  $0.01x = 2$

**c.**  $c + 1.1097 = 3.29$

7. The grid represents a board game.  
Samantha has game pieces at  $(-50, 40)$  and  $(-50, -25)$ .



- How far apart are Samantha's two game pieces from each other?
- Hailey guessed, "Your game piece is at  $(10, 40)$ ." Samantha said, "You missed by \_\_\_\_\_ units!"
- Originally, Samantha had 6 game pieces in the game. What percentage of game pieces does she have left?

8. Find the better deal: an \$18 flash drive is discounted by 15%, and a \$20 flash drive is discounted by  $\frac{1}{5}$ .

9. Alice had a box of 90 oranges. She gave  $\frac{3}{5}$  of the oranges to Beatrice. Then, of what was left, she gave  $\frac{1}{4}$  to Michael. How many oranges does Alice have now? How many oranges did Michael get?

10. Asphalt paving costs \$1,250 for 500 square feet. Fill in the equivalent rates.

$$\frac{\quad}{100 \text{ ft}^2} = \frac{\quad}{200 \text{ ft}^2} = \frac{\quad}{500 \text{ ft}^2} = \frac{\quad}{2,000 \text{ ft}^2} = \frac{\quad}{2,400 \text{ ft}^2}$$

11. Add and subtract.

|                                                                               |                                                                          |                                                                           |                                                                             |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <b>a.</b> $-2 + (-11) = \underline{\quad}$<br>$(-11) + 2 = \underline{\quad}$ | <b>b.</b> $-1 + (-7) = \underline{\quad}$<br>$1 - 7 = \underline{\quad}$ | <b>c.</b> $10 - 17 = \underline{\quad}$<br>$-10 - 17 = \underline{\quad}$ | <b>d.</b> $7 - (-3) = \underline{\quad}$<br>$-3 - (-7) = \underline{\quad}$ |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------|

12. Multiply, and shade the grid to illustrate the multiplications.

|                                                                      |                                                                      |
|----------------------------------------------------------------------|----------------------------------------------------------------------|
| <p><b>a.</b></p> <p><math>\frac{4}{7} \cdot \frac{3}{4} =</math></p> | <p><b>b.</b></p> <p><math>\frac{1}{7} \cdot \frac{2}{3} =</math></p> |
|----------------------------------------------------------------------|----------------------------------------------------------------------|

# Statistics Review

*You may use a calculator in all questions in this lesson.*

1. Are these statistical questions or not? If not, change the question so that it becomes a statistical question.

a. Which kind of books do the visitors of this library like the best?

b. How many pages are in the book *How to Solve It* by G. Polya?

2. a. Find the mean, median and mode.

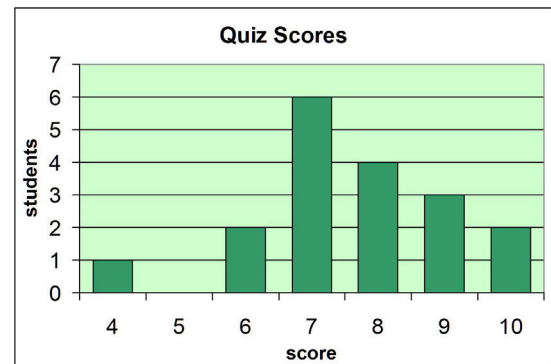
*Hint: recreate the list of the original data.*

Mean:

Median:

Mode:

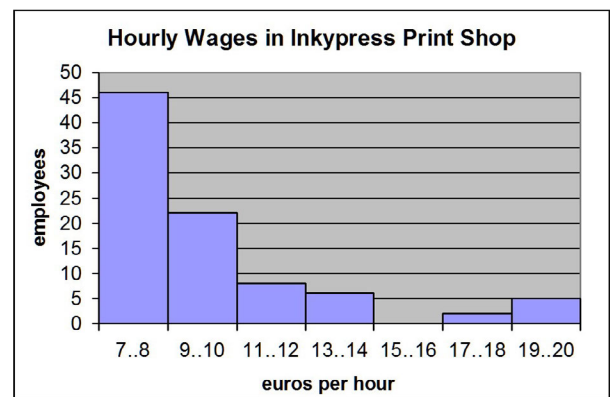
b. Describe the shape and any striking features of the distribution.



3. This graph shows the hourly wages in euros per hour of the 89 employees in the Inkypress Print Shop.

a. *About* what fraction of the people earn 7-8 euros/hour?

b. Describe the shape and any striking features of the distribution.



c. The mean is 9.66 euros/hour and the median is 8 euros/hour.

Which is better in describing the majority's wages in this print shop?

d. Which measure of variation should be used to describe this data, based on your answer to (c)?

4. a. Find the five-number summary and the interquartile range of this data set.

2, 5, 5, 6, 6, 7, 7, 7, 8, 8, 8, 9, 12

Minimum \_\_\_\_\_ First quartile \_\_\_\_\_ Median \_\_\_\_\_ Third quartile \_\_\_\_\_ Maximum \_\_\_\_\_

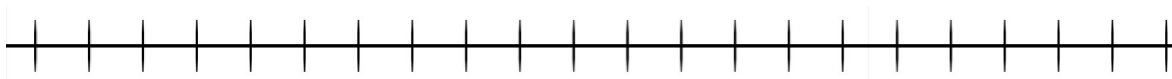
Interquartile range: \_\_\_\_\_

b. Make up a situation where this data could have come from.

c. Make a boxplot of the data. Don't forget to give it a title.



5. a. Make a dot plot for this set of data: 0, 1, 2, 2, 3, 3, 4, 4, 4, 4, 5, 5, 5, 6, 7, 8, 10, 13, 14, 20  
(number of sick days the employees of a small company had last year).



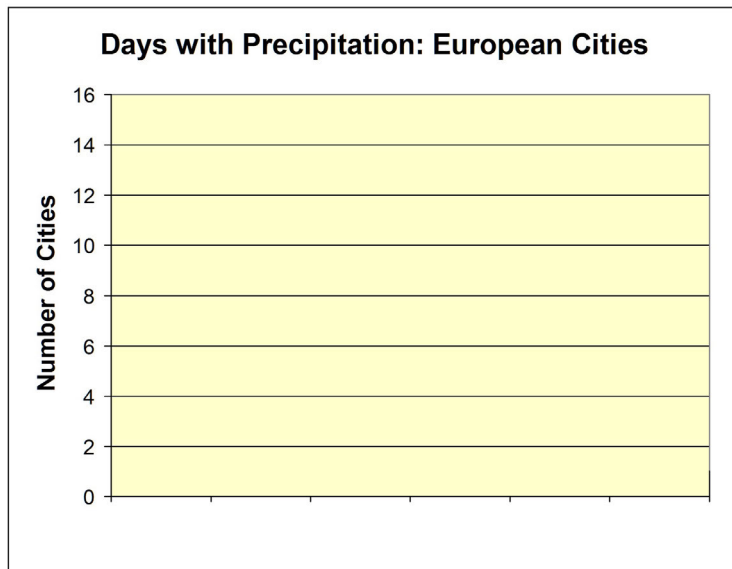
b. Calculate the mean and the mean absolute deviation. You can use the table below to help.

|                                    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |               |  |
|------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------|--|
|                                    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <i>mean</i>   |  |
| abs.<br>difference<br>from<br>mean |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <i>m.a.d.</i> |  |

6. a. This data gives you the average number of days with precipitation in a year in 32 major European cities. For example, on average, in Amsterdam it rains (at least a little bit) 132 days out of every 365 days.

Create a histogram from this data. Make six bins.

| Days with Rain | Frequency |
|----------------|-----------|
|                |           |
|                |           |
|                |           |
|                |           |
|                |           |
|                |           |



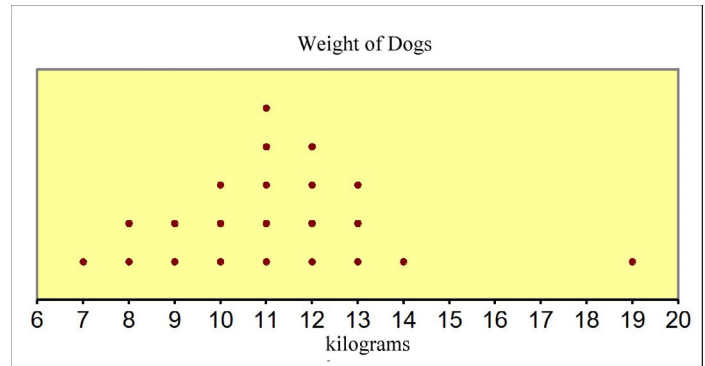
- b. Describe the shape and any striking features of the distribution.

- c. Choose a measure of center that describes the data well, and determine its value.

- d. (Optional.) This data can also easily be plotted in a stem-and-leaf plot. Make a stem-and-leaf plot and compare it visually to the histogram you made.

| City                   | Days with Rain |
|------------------------|----------------|
| Athens, Greece         | 43             |
| Madrid, Spain          | 63             |
| Bucharest, Romania     | 72             |
| Lisbon, Portugal       | 77             |
| Rome, Italy            | 78             |
| Budapest, Hungary      | 81             |
| Sofia, Bulgaria        | 81             |
| Istanbul, Turkey       | 84             |
| Warsaw, Poland         | 93             |
| Prague, Czech Republic | 94             |
| Zagreb, Croatia        | 95             |
| Tirana, Albania        | 98             |
| Vienna, Austria        | 98             |
| Kiev, Ukraine          | 99             |
| Copenhagen, Denmark    | 102            |
| Stockholm, Sweden      | 105            |
| Berlin, Germany        | 106            |
| London, UK             | 109            |
| Paris, France          | 111            |
| Oslo, Norway           | 113            |
| Helsinki, Finland      | 115            |
| Riga, Latvia           | 120            |
| Moscow, Russia         | 121            |
| Luxembourg, Luxembourg | 122            |
| Vilnius, Lithuania     | 122            |
| Zurich, Switzerland    | 125            |
| Tallinn, Estonia       | 127            |
| Dublin, Ireland        | 129            |
| Hamburg, Germany       | 129            |
| Amsterdam, Netherlands | 132            |
| Reykjavík, Iceland     | 148            |
| Brussels, Belgium      | 199            |

7. Make up a situation where this data was measured, and write a summary to go with this graph.



8. **a.** Make a stem-and-leaf plot of this data.

78 82 84 75 90 66 77 64 112 84 85 92

(The height of a group of toddlers, in centimeters.)

- b.** Find the median.
- c.** Describe the shape and any striking features of the distribution.

| Stem | Leaf |
|------|------|
|      |      |

$$8|2 = 82$$

---

# Grade 6 End-of-the-Year Test

## Instructions

This test is quite long, because it contains lots of questions on all of the major topics covered in the *Math Mammoth Grade 6 Complete Curriculum*. Its main purpose is to be a diagnostic test—to find out what the student knows and does not know. The questions are quite basic and do not involve especially difficult problems.

Since the test is so long, I do not recommend that you have the student do it in one sitting. You can break it into 3-5 parts and administer them on consecutive days, or perhaps on morning/evening/morning/evening. Use your judgment.

**A calculator is not allowed, except in the problems about measurement units and about geometry.**

The test is evaluating the student's ability in the following content areas:

- exponents, expanded form and rounding
- writing and simplifying expressions
- the distributive property
- the concept of an equation and solving simple equations
- the concept of inequality
- all operations with decimals
- conversions between measuring units
- basic ratio concepts
- the concept of percentage, finding percentages and finding the percent of a number
- prime factorization, the greatest common factor and the least common multiple
- the four operations with fractions, focusing on division of fractions
- basic concepts related to integers
- addition and subtraction of integers
- the area of triangles, parallelograms, and polygons
- surface area and nets
- the volume of rectangular prisms
- describing statistical distributions
- measures of center
- statistical graphs

### ***Instructions to the student:***

Do not use a calculator, except in the sections and exercises marked with a calculator symbol. Answer each question in the space provided.

### ***Instructions to the teacher:***

In order to continue with the *Math Mammoth Grade 7*, I recommend the student score a minimum of 80% on this test, and that the teacher or parent review with the student any content areas in which the student may be weak. Students scoring between 70% and 80% may also continue with grade 7, depending on the types of errors (careless errors or not remembering, versus a lack of understanding). Use your judgment.

My suggestion for points per item is as follows. The total is 193 points. A score of 154 points is 80%.

| Question #                       | Max. points | Student score |
|----------------------------------|-------------|---------------|
| <b>Basic Operations</b>          |             |               |
| 1                                | 2 points    |               |
| 2                                | 3 points    |               |
| 3                                | 2 points    |               |
| 4                                | 2 points    |               |
| <i>subtotal</i>                  |             | / 9           |
| <b>Expressions and Equations</b> |             |               |
| 5                                | 4 points    |               |
| 6                                | 2 points    |               |
| 7                                | 2 points    |               |
| 8                                | 1 point     |               |
| 9                                | 2 points    |               |
| 10                               | 2 points    |               |
| 11                               | 2 points    |               |
| 12                               | 2 points    |               |
| 13                               | 2 points    |               |
| 14                               | 2 points    |               |
| 15                               | 1 point     |               |
| 16                               | 2 points    |               |
| 17                               | 2 points    |               |
| 18                               | 2 points    |               |
| 19                               | 4 points    |               |
| <i>subtotal</i>                  |             | / 32          |
| <b>Decimals</b>                  |             |               |
| 20                               | 2 points    |               |
| 21                               | 2 points    |               |
| 22                               | 1 point     |               |
| 23                               | 2 points    |               |
| 24                               | 2 points    |               |
| 25                               | 1 point     |               |
| 26                               | 2 points    |               |
| 27                               | 2 points    |               |
| 28a                              | 1 point     |               |
| 28b                              | 2 points    |               |
| 29                               | 3 points    |               |
| <i>subtotal</i>                  |             | / 20          |

| Question #               | Max. points | Student score |
|--------------------------|-------------|---------------|
| <b>Measurement Units</b> |             |               |
| 30                       | 3 points    |               |
| 31                       | 1 point     |               |
| 32                       | 2 points    |               |
| 33                       | 3 points    |               |
| 34                       | 6 points    |               |
| 35                       | 4 points    |               |
| <i>subtotal</i>          |             | / 19          |
| <b>Ratio</b>             |             |               |
| 36                       | 2 points    |               |
| 37                       | 2 points    |               |
| 38                       | 2 points    |               |
| 39                       | 2 points    |               |
| 40                       | 2 points    |               |
| 41                       | 2 points    |               |
| 42                       | 2 points    |               |
| <i>subtotal</i>          |             | / 14          |
| <b>Percent</b>           |             |               |
| 43                       | 3 points    |               |
| 44                       | 4 points    |               |
| 45                       | 2 points    |               |
| 46                       | 2 points    |               |
| 47                       | 2 points    |               |
| <i>subtotal</i>          |             | /13           |

| Question #                               | Max. points | Student score |
|------------------------------------------|-------------|---------------|
| <b>Prime Factorization, GCF, and LCM</b> |             |               |
| 48                                       | 3 points    |               |
| 49                                       | 2 points    |               |
| 50                                       | 2 points    |               |
| 51                                       | 2 points    |               |
| 52                                       | 2 points    |               |
| <i>subtotal</i>                          |             | /11           |
| <b>Fractions</b>                         |             |               |
| 53                                       | 4 points    |               |
| 54                                       | 2 points    |               |
| 55                                       | 2 points    |               |
| 56                                       | 2 points    |               |
| 57                                       | 3 points    |               |
| <i>subtotal</i>                          |             | /13           |
| <b>Integers</b>                          |             |               |
| 58                                       | 2 points    |               |
| 59                                       | 2 points    |               |
| 60                                       | 2 points    |               |
| 61                                       | 4 points    |               |
| 62                                       | 5 points    |               |
| 63                                       | 6 points    |               |
| 64                                       | 4 points    |               |
| <i>subtotal</i>                          |             | /25           |

| Question #        | Max. points | Student score |
|-------------------|-------------|---------------|
| <b>Geometry</b>   |             |               |
| 65                | 2 points    |               |
| 66                | 1 point     |               |
| 67                | 3 points    |               |
| 68                | 4 points    |               |
| 69                | 2 points    |               |
| 70a               | 1 point     |               |
| 70b               | 3 points    |               |
| 71                | 4 points    |               |
| 72a               | 1 point     |               |
| 72b               | 2 points    |               |
| <i>subtotal</i>   |             | /23           |
| <b>Statistics</b> |             |               |
| 73a               | 5 points    |               |
| 73b               | 1 point     |               |
| 74a               | 3 points    |               |
| 74b               | 1 point     |               |
| 75a               | 2 points    |               |
| 75b               | 1 point     |               |
| 75c               | 1 point     |               |
| <i>subtotal</i>   |             | /14           |
| <b>TOTAL</b>      |             | /193          |



# Math Mammoth End-of-the-Year Test - Grade 6

## Basic Operations

1. Two kilograms of ground cinnamon is packaged into bags containing 38 g each. There will also be some cinnamon left over. How many bags will there be?
2. Write the expressions using an exponent. Then solve.
  - a.  $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
  - b. five cubed
  - c. ten to the seventh power
3. Write in normal form (as a number).
  - a.  $7 \cdot 10^7 + 2 \cdot 10^5 + 9 \cdot 10^0$
  - b.  $3 \cdot 10^8 + 4 \cdot 10^6 + 5 \cdot 10^5 + 1 \cdot 10^2$
4. Round to the place of the underlined digit.
  - a. 6,299,504  $\approx$  \_\_\_\_\_
  - b. 6,609,942  $\approx$  \_\_\_\_\_

## Expressions and Equations

5. Write an expression.
  - a. 2 less than  $s$
  - b. the quantity  $7 + x$ , squared
  - c. 5 times the quantity  $y - 2$
  - d. the quotient of 4 and  $x^2$
6. Evaluate the expressions when the value of the variable is given.

a.  $40 - 8x$  when  $x = 2$

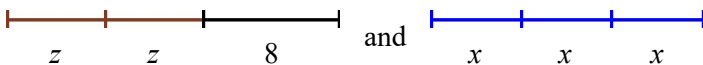
b.  $\frac{65}{p} \cdot 3$  when  $p = 5$

7. Write an expression for each situation.

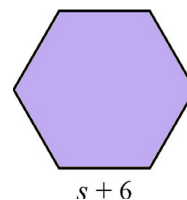
a. You bought  $m$  yogurt cups at \$2 each and paid with \$50.  
What is your change?

b. What is the area of a square with side length  $s$ ?

8. Write an expression for the total length of the line segments, and simplify it.



9. Write an expression for the perimeter of the figure, and simplify it.



10. Write an expression for the area of the figure, and simplify it.



11. Simplify the expressions.

a.  $9x - 6x$

b.  $w \cdot w \cdot 7 \cdot w \cdot 2$

12. Multiply using the distributive property.

a.  $7(x + 5) =$

b.  $2(6p + 5) =$

13. Find the missing number in the equations.

a.  $\underline{\hspace{1cm}} (6x + 5) = 12x + 10$

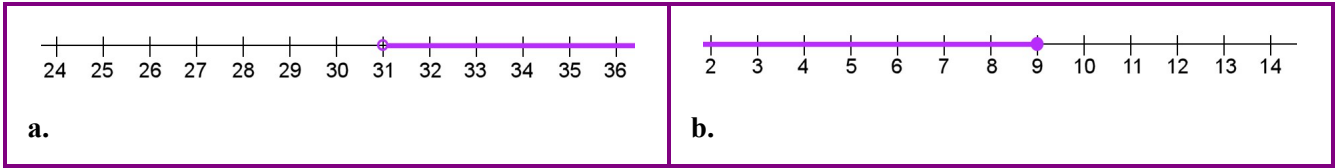
b.  $5(2h + \underline{\hspace{1cm}}) = 10h + 30$

14. Solve the equations.

a.  $\frac{x}{31} = 6$

b.  $a - 8.1 = 2.8$

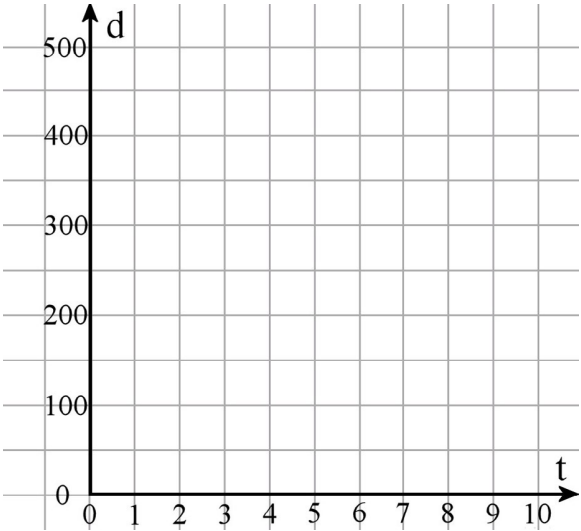
15. Which of the numbers 0, 1, 2, 3 or 4 make the equation  $\frac{8}{y^2} = 2$  true?
16. Write an equation EVEN IF you could easily solve the problem without an equation! Then solve the equation. The value of a certain number of quarters (25-cent coins) is 1,675 cents. How many coins are there?
17. Write an inequality for each phrase. You will need to choose a variable to represent the quantity in question.
- a. Eat at most five pieces of bread.
  - b. You have to be at least 21 years of age.
18. Write an inequality that corresponds to the number line plot.



19. A car is traveling with a constant speed of 80 kilometers per hour. Consider the variables of time ( $t$ ), measured in hours, and the distance traveled ( $d$ ), measured in kilometers.
- a. Fill in the table.

|             |   |   |   |   |   |   |   |
|-------------|---|---|---|---|---|---|---|
| $t$ (hours) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| $d$ (km)    |   |   |   |   |   |   |   |

- b. Plot the points on the coordinate grid.
- c. Write an equation that relates  $t$  and  $d$ .
- d. Which of the two variables is the independent variable?



## Decimals

20. Write as decimals.

a. 13 millionths

b. 2 and 928 ten-thousandths

21. Write as fractions or mixed numbers.

a. 0.00078

b. 2.000302

22. Find the value of the expression  $x + 0.07$  when  $x$  has the value 0.0002.

23. Calculate mentally.

a.  $0.8 \div 0.1 =$

b.  $0.06 \cdot 0.008 =$

24. a. Estimate the answer to  $7.1 \cdot 0.0058$ .

b. Calculate the exact answer.

25. What number is 22 ten-thousandths more than  $1 \frac{1}{2}$ ?

26. Multiply or divide.

a.  $10^5 \cdot 0.905 =$

b.  $24 \div 10^4 =$

27. Divide, and give your answer as a decimal. If necessary, round the answers to three decimal digits.

a.  $175 \div 0.3$

b.  $\frac{2}{9}$

28. Annie bought 0.75 kg of cocoa powder, which cost \$12.92 per kg.

a. Estimate the cost.

b. Find the exact amount she had to pay.

29. Alyssa and Anna bought three toy cars for their three cousins from a store online.

The price for one car was \$3.85. A shipping fee of \$4.56 was added to the total cost. The two girls shared the total cost equally. How much did each girl pay?

### Measurement Units

*A calculator is allowed in this section.*



30. Convert to the given unit. Round your answers to two decimals.

a. 178 fl. oz. = \_\_\_\_\_ qt

b. 1.267 lb = \_\_\_\_\_ oz

31. How many miles is 60,000 inches?

32. A big coffee pot makes 2 quarts of coffee.

How many 6-ounce servings can you get from that?

33. A pack of 36 milk chocolate candy bars costs \$23.20. Each bar weighs 1.6 oz.

Calculate how much one pound of these chocolate bars would cost (price per pound).



34. Convert the measurements. You can write the numbers in the charts to help you.

a. 39 dl = \_\_\_\_\_ L

b. 15,400 mm = \_\_\_\_\_ m

c. 7.5 hm = \_\_\_\_\_ cm

d. 597 hl = \_\_\_\_\_ L

e. 7.5 hg = \_\_\_\_\_ kg

f. 32 g = \_\_\_\_\_ cg

|    |    |     |   |    |    |    |
|----|----|-----|---|----|----|----|
|    |    |     |   |    |    |    |
| kl | hl | dal | l | dl | cl | ml |

|    |    |     |   |    |    |    |
|----|----|-----|---|----|----|----|
|    |    |     |   |    |    |    |
| kg | hg | dag | g | dg | cg | mg |

|    |    |     |   |    |    |    |
|----|----|-----|---|----|----|----|
|    |    |     |   |    |    |    |
| km | hm | dam | m | dm | cm | mm |

35. **a.** One brick is 215 mm long. How many of these bricks, put end to end, will cover 5.15 meters of wall?



- b.** Calculate the answer to the previous question again, assuming 1 cm of mortar is laid between the bricks.

## Ratio

36. **a.** Draw a picture where there are a total of ten squares, and for each two squares, there are three triangles.

- b.** Write the ratio of squares to all triangles, and simplify this ratio to the lowest terms.

37. Write ratios of the given quantities. Then, simplify the ratios. You will need to *convert* one quantity so it has the same measuring unit as the other.

|                          |                            |
|--------------------------|----------------------------|
| <b>a.</b> 3 kg and 800 g | <b>b.</b> 2.4 m and 100 cm |
|--------------------------|----------------------------|

38. Express these rates in the lowest terms.

|                        |                                                          |
|------------------------|----------------------------------------------------------|
| <b>a.</b> \$56 : 16 kg | <b>b.</b> There are six teachers for every 108 students. |
|------------------------|----------------------------------------------------------|

39. Change to unit rates.

|                                  |                                    |
|----------------------------------|------------------------------------|
| <b>a.</b> \$20 for five T-shirts | <b>b.</b> 45 miles in half an hour |
|----------------------------------|------------------------------------|

40. **a.** It took 7 hours to mow four equal-size lawns. At that rate, how many lawns could be mowed in 35 hours? You can use the table below to help.

|              |  |  |  |  |  |
|--------------|--|--|--|--|--|
| <b>Lawns</b> |  |  |  |  |  |
| <b>Hours</b> |  |  |  |  |  |

- b.** What is the unit rate?

41. Joe and Mick also worked on a project unequally. They decided to divide their pay in a ratio of 3:4 (3 parts for Joe, 4 parts for Mick). The total pay was \$180. Calculate how much Mick got.

42. Use the given ratios to convert the measuring units. If necessary, round the answers to three decimal digits.

a. Use  $1 = \frac{1.6093 \text{ km}}{1 \text{ mi}}$  and convert 7.08 miles to kilometers.

7.08 mi =

b. Use  $1 = \frac{1 \text{ qt}}{0.946 \text{ L}}$  and convert 4 liters to quarts.

4 L =

## Percent

43. Write as percentages, fractions and decimals.

a. \_\_\_\_\_% =  $\frac{35}{100}$  = \_\_\_\_\_

b. 9% =  $\frac{\text{yellow box}}{\text{yellow box}}$  = \_\_\_\_\_

c. \_\_\_\_\_% =  $\frac{\text{yellow box}}{\text{yellow box}}$  = 1.05

44. Fill in the table, using mental math.

45. A pair of roller skates is discounted by 40%. The normal price is \$65. What is the discounted price?

|                   | 510 |
|-------------------|-----|
| 1% of the number  |     |
| 5% of the number  |     |
| 10% of the number |     |
| 30% of the number |     |

46. A store has sold 90 notebooks, which is 20% of all the notebooks they had. How many notebooks did the store have at first?

47. Janet has read 17 of the 20 books she borrowed from the library. What percentage of the books she borrowed has she read?

## Prime Factorization, GCF, and LCM

48. Find the prime factorization of each of the following numbers. Below, write the prime factorization as a product.

|                    |                    |                    |
|--------------------|--------------------|--------------------|
| <b>a. 45</b><br>/\ | <b>b. 78</b><br>/\ | <b>c. 97</b><br>/\ |
|                    |                    |                    |
| 45 =               | 78 =               | 97 =               |

49. Find the least common multiple of these pairs of numbers.

|                   |                   |
|-------------------|-------------------|
| <b>a. 2 and 8</b> | <b>b. 9 and 6</b> |
|                   |                   |

50. Find the greatest common factor of the given number pairs.

|                     |                     |
|---------------------|---------------------|
| <b>a. 30 and 16</b> | <b>b. 45 and 15</b> |
|                     |                     |

51. List three different multiples of 28 that are more than 100 and less than 200.

52. First, find the GCF of the numbers. Then factor the expressions using the GCF.

|                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>a.</b> The GCF of 18 and 21 is _____<br>$18 + 21 = \underline{\hspace{1cm}} \cdot \underline{\hspace{1cm}} + \underline{\hspace{1cm}} \cdot \underline{\hspace{1cm}} = \underline{\hspace{1cm}} (\underline{\hspace{1cm}} + \underline{\hspace{1cm}})$ |
| <b>b.</b> The GCF of 56 and 35 is _____<br>$56 + 35 = \underline{\hspace{1cm}} (\underline{\hspace{1cm}} + \underline{\hspace{1cm}})$                                                                                                                     |

## Fractions

53. Solve.

|                                                        |                                                       |
|--------------------------------------------------------|-------------------------------------------------------|
| <p>a. <math>\frac{4}{5} \div \frac{1}{5}</math></p>    | <p>b. <math>3\frac{1}{8} \div 1\frac{1}{2}</math></p> |
| <p>c. <math>1\frac{1}{3} \cdot 7\frac{1}{2}</math></p> | <p>d. <math>2\frac{4}{5} + 1\frac{3}{8}</math></p>    |

54. Write a division sentence, and solve.

How many times does  go into  ?

55. Write a real-life situation to match this fraction division:  $1\frac{3}{4} \div 3 = \frac{7}{12}$ .

56. How many  $\frac{3}{4}$ -cup servings can you get from  $7\frac{1}{2}$  cups of coffee?

57. A rectangular room measures  $3\frac{3}{4}$  meters by 5 meters. It is divided into three equal parts. Calculate the area of one of those parts.

# Integers

58. Compare the numbers, writing  $<$  or  $>$  in the box.

a.  $0 \square -3$       b.  $-2 \square -8$

59. Write a comparison to match each situation (with  $<$  or  $>$ ).

a. The temperature  $-7^{\circ}\text{C}$  is warmer than  $-12^{\circ}\text{C}$ .

b. Harry has \$5. Emily owes \$5.

60. Find the difference between the two temperatures.

a.  $-13^{\circ}\text{C}$  and  $10^{\circ}\text{C}$

b.  $-9^{\circ}\text{C}$  and  $-21^{\circ}\text{C}$

61. Write using mathematical symbols, and simplify (solve) if possible.

a. The opposite of 7

b. the absolute value of  $-6$

c. the absolute value of 5

d. the absolute value of the opposite of 6

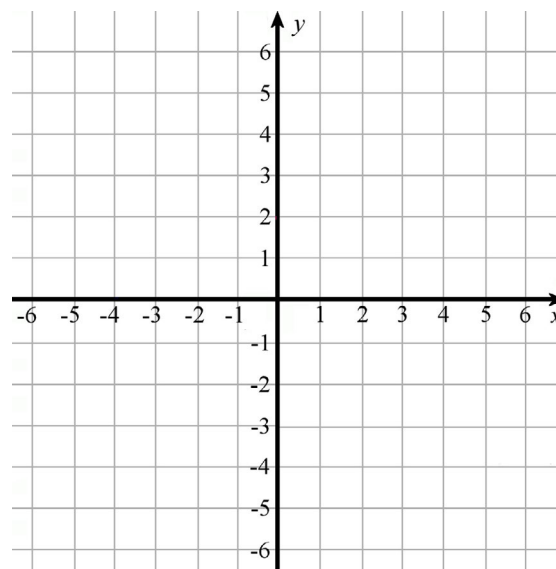
62. a. Plot the point  $(-5, 3)$ .

b. Reflect the point in the  $x$ -axis .

c. Now, reflect the point you got in (b) in the  $y$ -axis.

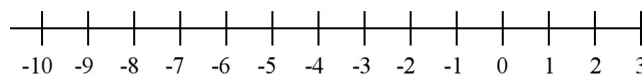
d. Join the three points with line segments.

What is the area of the resulting triangle?

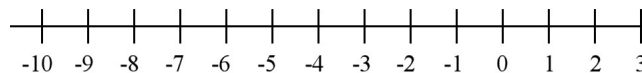


63. Draw a number line jump for each addition or subtraction sentence, and solve.

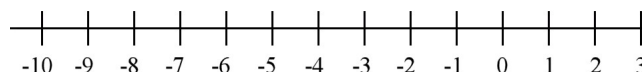
a.  $-2 + 5 = \underline{\hspace{2cm}}$



b.  $-2 - 4 = \underline{\hspace{2cm}}$



c.  $-1 - 5 = \underline{\hspace{2cm}}$



64. Write an addition or subtraction in the box to match each situation, and fill in the blanks.

- a. Elijah has saved \$10. He wants to buy shoes for \$14.  
That would make his money situation to be \_\_\_\_\_.

- b. A fish was swimming at the depth of 2 m. Then it sank 1 m.  
Now it is at the depth of \_\_\_\_\_ m.

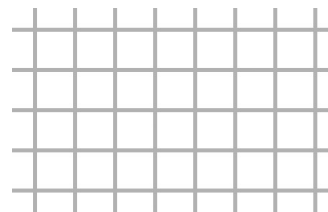
## Geometry

A calculator is allowed in this section.

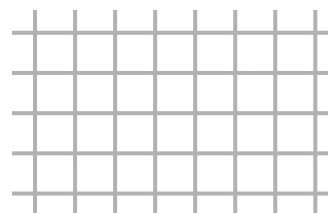


65. Draw in the grid a right triangle with a base of 4 units and a height of 3 units.

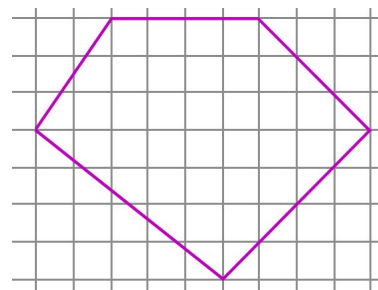
Calculate its area.



66. Draw in the grid a parallelogram with an area of 15 square units.



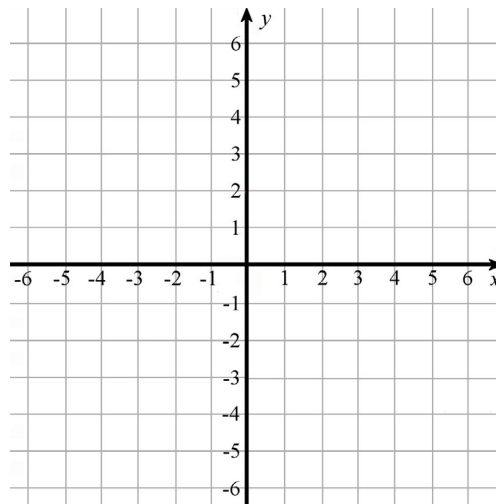
67. Find the area of this polygon, in square units.



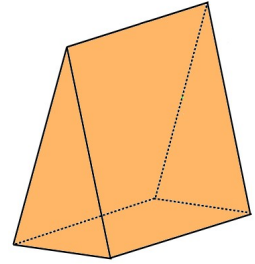
68. Draw a quadrilateral in the grid with vertices  $(-5, 5)$ ,  $(-5, -3)$ ,  $(2, -1)$ , and  $(2, 4)$ .

What is the quadrilateral called?

Find its area.

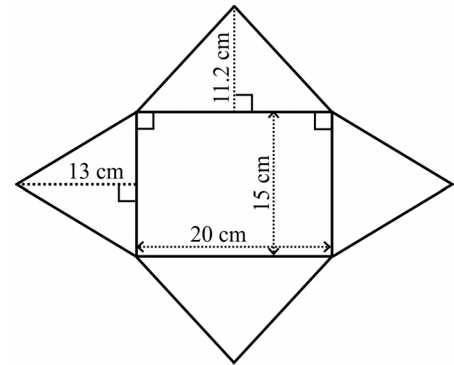


69. Name this solid. Draw a sketch of its net.

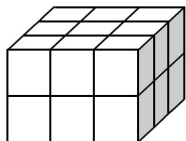


70. a. Name the solid that can be built from this net.

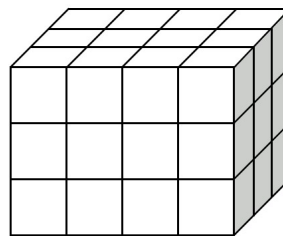
b. Calculate its surface area.



71. The edges of each little cube measure  $\frac{1}{2}$  unit. Write a multiplication using for the total volume of each figure, and solve.



a.



b.

72. A box containing a construction toy measures 4.4 cm by 21.6 cm by 15 cm.



a. Calculate the volume of the box, to the nearest ten cubic centimeters.

b. Calculate its surface area, to the nearest ten square centimeters.

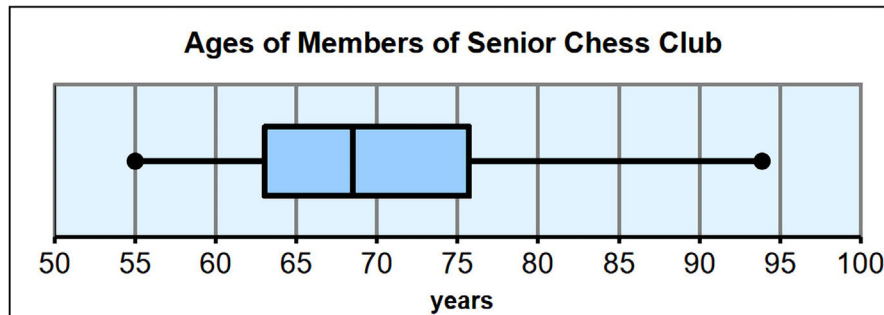
## Statistics

73. a. Fill in the five-number summary using the boxplot.

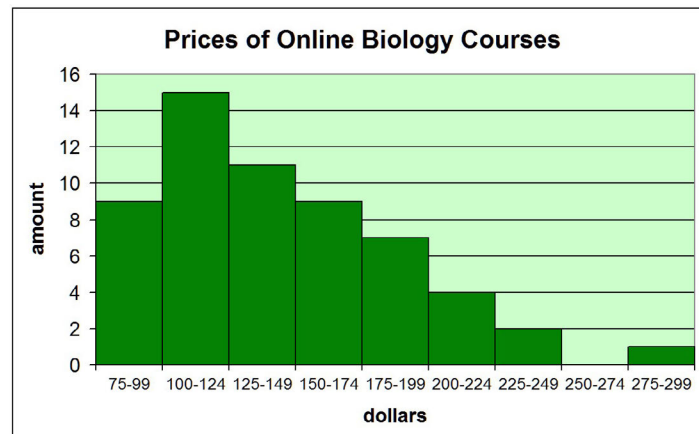
Minimum: \_\_\_\_\_ First quartile: \_\_\_\_\_ Median: \_\_\_\_\_ Third quartile: \_\_\_\_\_ Maximum: \_\_\_\_\_

b. Fill in:

Based on the interquartile range, half of the members are between \_\_\_\_ and \_\_\_\_ years old.



74. a. Describe the overall shape or pattern of the distribution, including any striking deviations from the overall pattern (outliers, gaps, additional minor peaks/clusters).

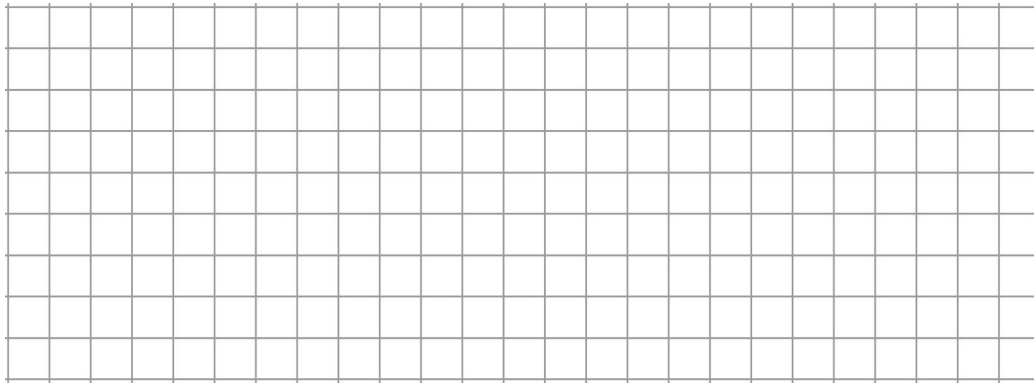


b. Which measure of center, mean, median, or mode, would best describe the central tendency of this distribution?

75. **a.** Create a dot plot from this data.

9 10 5 6 4 8 7 3 8 4 7 7 5 7 8 9 5 6 6 7

(points on a math quiz of a group of students)



**b.** Describe the shape of the distribution.

**c.** Choose a measure of center to describe the data, and determine its value.

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