Grades 5–8
MATHEMATICS

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WALCH PUBLISHING

Mathematics

Table of Contents

Grades 5–8
MATHEMATICS

Algebra

Tennessee became the 16th state of the United States when it joined the union on June 1 of this year. To learn the year Tennessee became a state, just solve this puzzle.

- My units digit is a perfect number.

- The sum of my thousands and tens digit is equal to $|-18 + 8|$.

- My hundreds digit is 5 more than $\sqrt{4}$.

- The sum of all of my digits is the same as the smallest prime number between 20 and 30.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

Mississippi became a state on December 10 of this year. It was the 20th state to join the Union. Solve this puzzle to learn the year.

- The two-digit number formed by my hundreds and units digits is 13 less than 10^2.

- The sum of all of my digits is 2 greater than the product of 5 and 3.

What year am I?

| _____ | _____ | _____ | _____ |
| Thousands | Hundreds | Tens | Units |

Missouri became the 24th state on August 10 of this year. To learn when Missouri became a state, just solve this puzzle.

- My hundreds digit is equal to $2(\sqrt[3]{64})$.

- My tens digit is equal to $\sqrt[3]{8}$.

- If my tens digit were 6 greater, my date would be a palindrome.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

Daily Warm-Ups: Algebra

On December 28 of this year, Iowa became the 29th state of the United States. Solve this puzzle to learn the year.

- My tens digit is $\frac{1}{2}$ of my hundreds digit; my units digit is 2 more than my tens digit. Their sum is 18.

- The sum of all of my digits is the prime number p that satisfies this inequality: $17 \leq p \leq 23$.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

Oregon became the 33rd state of the United States on February 14 of this year. Solve this puzzle to learn the year.

- The two-digit number formed by my hundreds and tens digits is equal to the value of n in this equation: $\frac{3}{5}n = 51$.

- The sum of my thousands and hundreds digits is equal to my units digit.

- Using order of operations, the sum of my digits is equal to $5 + 2^3 + \sqrt{16} + 3 \times 2$.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

Nebraska, our 37th state, joined the Union on March 1 of this year. To learn the year Nebraska became a state, just solve this problem.

- The two-digit number formed by my tens and units digits can be found by solving for x: $-9\frac{4}{7} = -\frac{1}{7}x$.

- The three-digit number formed by my thousands, hundreds, and tens digits is equal to $10^2 + 9^2 + \sqrt{25}$.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units
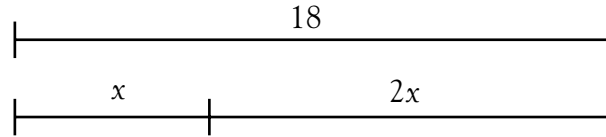
Utah became the 45th state on January 4 of this year.

To learn the year, just solve this puzzle.

- My units digit can be found by solving the equation shown in this diagram:

$$18$$

$$x \qquad\qquad 2x$$

- The two-digit number formed by my hundreds and tens digits is the largest prime number greater than 80 and less than 90.

- The sum of all of my digits is equal to 4!.

What year am I?

_____ _____ _____ _____

Thousands   Hundreds   Tens   Units

In this year, the first women to become FBI agents completed their training in Quantico, Virginia. The new agents were Susan Roley and Joanne Pierce. Solve this puzzle to learn the year.

- The two-digit number formed by my tens and units digits is equal to the complement of an 18° angle.

- My hundreds digit increased by 6 is equal to 15.

- The sum of all of my digits is equal to $|-9-10|$.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

The first woman
United States senator, Hattie Caraway, was elected from the state of Arkansas in this year. Solve the puzzle to learn the year.

- The two-digit number formed by my tens and units digits is equal to the fifth power of 2.

- My hundreds digit is equal to z in this equation: $\dfrac{4z + 8}{2} = 22$.

- The sum of all of my digits is equal to the sum of the first five counting numbers.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

On January 28 of this year, Louis Brandeis became the first American Jew to be appointed to the United States Supreme Court. Solve this puzzle to learn the year.

- The two-digit number formed by my tens and units digits is equal to $-10 - (-26)$.

- The two-digit number formed by my thousands and hundreds digits is the largest prime less than 20.

- The sum of all of my digits is equal to the value of this expression: $(-x)^2 + y$, where $x = 3$ and $y = 8$.

What year am I?

_____ _____ _____ _____

Thousands   Hundreds   Tens   Units

Daily Warm-Ups: Algebra

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On February 13 of this year, the first magazine was published in the United States. Called *American Magazine*, it was published by Andrew Bradford. Solve the puzzle to find the year.

- The two-digit number formed by my hundreds and tens digits is equal to the value of *x* in this equation: $\frac{1}{2}x = 7 + 2 \times 15$.

- My units digit is the largest single-digit prime.

- The sum of all of my digits is equal to the number of degrees in the complement of a 71° angle.

What year am I?

_____   _____   _____   _____
   Thousands   Hundreds   Tens   Units

On March 12 of this year, the first parachute jump from an airplane in the United States was made. (What do you think the statement, "Minds are like parachutes, they only function when they're open" means?)

- The two-digit number formed by my tens and units digits is equal to the value of q in this equation: $2(q + 6) = 4(q - 3)$.

- My hundreds digit is 1 more than the number of equilateral triangles in an octahedron.

- The sum of my digits is the same as a baker's dozen.

What year am I?

_____	_____	_____	_____
Thousands	Hundreds	Tens	Units

Hank Aaron hit the 715th home run of his career and broke Babe Ruth's record on April 8 of this year. He finished his career with a total of 755 home runs. Solve this puzzle to learn the year.

- My units digit is the length of side b on this triangle:

- The two-digit number formed by my hundreds and tens digits is the supplement of an 83° angle.

- The sum of all of my digits is equal to $\sqrt{625} - \sqrt{16}$.
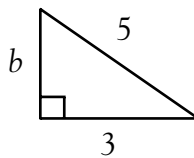
What year am I?

_____ _____ _____ _____
Thousands   Hundreds   Tens   Units

Gwendolyn Brooks became the first African-American woman to win the Pulitzer Prize on May 5 of this year. Solve this puzzle to learn the year.

- The two-digit number formed by my tens and units digits is equal to the value of the Roman numeral L.

- My hundreds digit is equal to the solution of the function $f(x) = 2x + 1$ when $x = 4$.

- The sum of all of my digits is $\sqrt{25 \times 9}$.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

Daily Warm-Ups: Algebra

On June 18 of this year, Sally Ride became the first American woman in space. She functioned as the mission specialist on a six-day flight of the space shuttle *Challenger*. Solve this puzzle to learn the year.

- The two-digit number formed by my hundreds and tens digits is equal to the supplement of an 82° angle.

- My units digit is equal to the value of d in this equation: $4(d - 7) + 2d = -10$.

- The sum of all of my digits is equal to $-3 + 2^3 \times 3$.

What year am I?

_____ _____ _____ _____
  Thousands   Hundreds   Tens   Units

On September 25 of this year, the first and only edition of *Public Occurrences Both Foreign and Domestick* was published in Boston. Although this was the first American newspaper, the authorities considered it to be "offensive," and it was suppressed immediately. Solve this puzzle to learn the year.

- My hundreds digit is 3 less than my tens digit; their sum is 15.

- The two-digit number formed by my tens and units digits is equal to $n^2 - n$ when $n = 10$.

- The sum of all of my digits is equal to $\sqrt{256}$.

What year am I?

_____ _____ _____ _____
Thousands   Hundreds   Tens   Units

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Daily Warm-Ups: Algebra

On January 13 of this year, the accordion was patented.

This is a musical instrument with keys, metal reeds, and bellows. Air is forced through the reeds by closing and opening the bellows. Solve this puzzle to learn the year.

- The two-digit number formed by my tens and units digits is divisible by 2, 3, 6, 9, 18, and 27.

- The two-digit number formed by my thousands and hundreds digits is equal to the value of *n*: $3n + 6 = 4(n - 3)$.

- The sum of all of my digits is equal to the number of inches in $1\frac{1}{2}$ feet.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

On February 16 of this year, the tomb of King Tutankhamen was opened by archaeologists. It had been sealed for more than 3,000 years. Learn the year of this discovery by solving this puzzle.

- My tens digit is 1 less than my units digit; if they were the sides of a rectangle, its area would be 6 square units.

- My hundreds digit is 300% of my units digit.

- The sum of all of my digits is equal to the sum of the first five counting numbers.

What year am I?

_____   _____   _____   _____

  Thousands   Hundreds   Tens   Units

                                       www.walch.com

On March 26 of this year, Dr. Jonas Salk introduced the polio vaccine in the United States. To learn the year of this medical discovery that helped wipe out a terrible disease, solve this puzzle.

- My tens and units digits are prime numbers in reverse order; their product is 15.

- My hundreds digit is equal to the height (h) of this trapezoid whose area equals 99 square units:

- The sum of all of my digits is equal to 2×3^2.

What year am I?

_____ _____ _____ _____
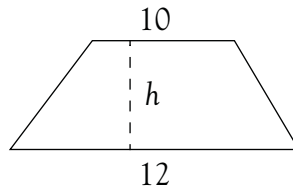
Thousands   Hundreds   Tens   Units

Unhappy with cloth diapers that leaked and had to be washed, Marion Donovan invented the disposable diaper in this year. When companies thought her product would be too expensive to produce, she went into business for herself. A few years later, she sold her business for $1 million. Solve this puzzle to learn the year.

- The two-digit number formed by my tens and units digits has the same value as the Roman numeral L.

- My hundreds digit is 1 less than twice my tens digit.

- The sum of all of my digits is equal to the sum of the first five counting numbers.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

On May 19 of this year, the Simplon Tunnel connecting Switzerland and Italy was officially opened. To learn the year, solve this puzzle.

- My units digit is equal to the value of n in this equation: $n + (-23) = -17$.

- The two-digit number formed by my hundreds and tens digit is equal to the sum of the even numbers greater than or equal to 2 and less than or equal to 18.

- The sum of all of my digits is equal to the value of m in this equation: $-59 + m = -43$.

What year am I?

_____ _____ _____ _____

Thousands   Hundreds   Tens   Units

On May 28 of this year, the Dionne quintuplets (Marie, Cecile, Yvonne, Emile, and Annette) were born in Ontario, Canada. They were the first quintuplets known to survive for more than a few hours after birth. Learn the year they were born by solving this puzzle.

- My tens digit is $\frac{1}{3}$ of my hundreds digit.

- My units digit is equal to the value of c in this equation: $-3 - (-c) = 1$.

- The sum of all of my digits is 8 less than the square of 5.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

On June 21 of this year, the wheat reaper was patented. Before this invention, only about 3 acres of wheat could be harvested each day; with the reaper, about 15 could be harvested. (What percent of increase does this represent?) Learn the year of this patent by solving this problem.

- My tens and units digits are consecutive integers with a sum of 7; my date is even.

- My hundreds digit is the same as the number of vertices on a cube.

- The sum of all of my digits is equal to $\sqrt{16}^{\,2}$.

What year am I?

| _____ | _____ | _____ | _____ |
| Thousands | Hundreds | Tens | Units |

On November 2 of this year, the largest airplane ever made took its one and only flight over Long Beach Harbor in California. The 200-ton plywood craft, which cost $25 million to build, was named the *Spruce Goose*. Learn the year of this flight by solving this puzzle.

- My tens digit is 5 less than my hundreds digit; my units digit is 2 less than my hundreds digit; the sum of the digits is 20.

- The sum of all of my digits is the missing number in this sequence: 1, 1, 2, 3, 5, 8, 13, __, 34, 55, . . .

What year am I?

_____ _____ _____ _____

   Thousands   Hundreds   Tens   Units

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On January 1 of this year, American patriot Paul Revere was born in Boston, Massachusetts. He is best known through Longfellow's poem "The Midnight Ride of Paul Revere." Solve this puzzle to learn the year.

- The two-digit number formed by my tens and units digits is equal to the value of w in $\frac{3}{5}w = w - 14$.

- My hundreds digit is 1 greater than twice my tens digit; their sum is 10.

- The sum of all of my digits is equal to the sum of the first four odd integers.

What year am I?

_____ _____ _____ _____

  Thousands   Hundreds   Tens   Units

On January 24 of this year, Native-American ballerina Maria Tallchief was born. To learn the year of her birth, solve this puzzle.

- The two-digit number formed by my tens and units digits is equal to the length of the hypotenuse of a right triangle with legs 15 and 20.

- The sum of my thousands and hundreds digits is equal to the product of my tens and units digits.

- The sum of all of my digits is equal to the value of y in this equation: $2y + 5 = y + 22$.

What year am I?

_____   _____   _____   _____
   Thousands   Hundreds   Tens   Units

On February 13 of this year, American artist Grant Wood was born in Anamosa, Iowa. His most famous painting is called *American Gothic*. (Can you describe this painting?)

- The three-digit number formed by my thousands, hundreds, and tens digits is equal to the value of x in this equation: $\sqrt{x+7} = 14$.

- My units digit is equal to the smallest of four consecutive even integers such that the third is equal to the sum of the first two and $\frac{3}{4}$ of the fourth.

- The sum of all of my digits is equal to two decades.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

On February 19 of this year, Polish astronomer Nicolaus Copernicus was born. He revolutionized scientific thought, arguing that the sun was at the center of our planetary system and that the earth revolved around it.

- My units digit is 1 less than my hundreds digit; my tens digit is 1 less than twice my hundreds digit. Their sum is 14.

- The sum of all of my digits is the sum of the first five counting numbers.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

On March 7 of this year, American naturalist Luther Burbank was born in Lancaster, Massachusetts. He is the creator and developer of many new varieties of flowers, fruits, vegetables, and trees. His birthday is celebrated as Bird and Arbor Day. Solve this puzzle to learn the day Burbank was born.

- My hundreds digit is twice my tens digit; my units digit is one greater than my hundreds digit. Their sum is 21.

- The sum of all of my digits is a multiple of 11.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

North Carolina became the 12th colony to join the Union. It became a state on November 21 of this year. To learn the year, just solve this puzzle.

- My hundreds, tens, and units digits are consecutive integers with a mean of 8; my hundreds digit is prime.

- My tens digit is equal to the sum of my thousands and hundreds digits.

- The sum of all of my digits is equal to the sum of the first five odd numbers.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

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Grades 5–8
MATHEMATICS

Brain Teasers

Numbers, Numeration, Operations, and Patterns

While washing up for dinner, Bernie notices something very peculiar about the bar of soap and the washcloth. With one swipe of the soap on the washcloth, he creates 10 bubbles. With another swipe, he creates 100 bubbles, yet he pops half of the first swipe's bubbles. On the third swipe, he makes 1,000 bubbles, and half of the second swipe's bubbles are popped.

If this pattern continues, how many bubbles will there be after the sixth swipe of the bar of soap?

The Mayans of Mexico used a method of dots and lines to show a period of time. Each dot represents a unit, and each bar represents 5 units. From the bottom position to the top position, the symbols refer to the number of days, months, and years, respectively. The example below shows 15 years, 11 months, and 8 days.

☰ (three bars)	(15 years)
● over ☰ (two bars)	$(2 \times 5 + 1 = 11$ months$)$
● ● ● over ─ (one bar)	$(3 + 5 = 8$ days$)$
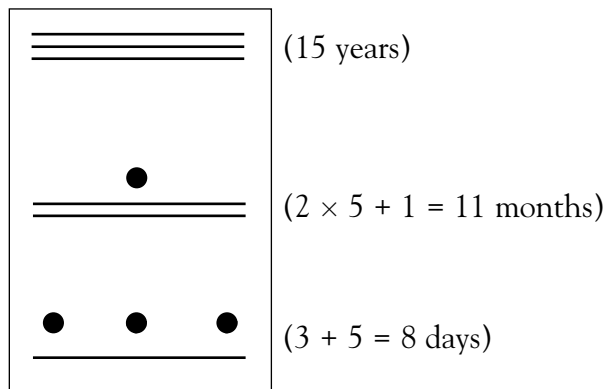
If today is April 23, 2006, write the exact age of a person born on March 9, 2001, using the Mayan method of calendar time. (Assume there are no leap years.)

Numbers, Numeration, Operations, and Patterns

A farmer has a super-chicken named Harriet. Harriet can lay 10 eggs at one time, all of which hatch female chicks. When the chicks grow up, they too will be able to lay 10 eggs that hatch hen chicks, and so will the generations to follow.

The farmer numbers his chicks consecutively. Assuming that each hen takes a break after laying her first 10 eggs, how is chick number 2 related to chick number 602?

The Wizard Wesley told his young apprentice that the gates to his castle can only be opened by creating a palindrome (a word or a number that reads the same forward and backward—for example, Hannah or 545). The wizard said, "Using the digits 1 through 4, find two 4-digit numbers that are palindromes and whose sum is a palindrome."

The young apprentice successfully opened the gates to the castle. Name two numbers that she might have used.

_____ and _____

Daily Warm-Ups: Math Brain Teasers

Mallard is a very orderly dog. In order, he chews on a bone, a shoe, a piece of bark, and a rubber steak. He then repeats this sequence. If he repeats the whole sequence several times, what will be the twenty-second item chewed on?

Daily Warm-Ups: Math Brain Teasers

Nester, a UFO fanatic, had a dream in which he was abducted by 11 little purple aliens. There were two types of purple alien: Byopics, which have 2 pink eyes, and Tryopics, which have 3 pink eyes.

If he remembers seeing 23 pink eyes, what is the greatest number of Byopics Nester could have dreamed he saw?

Daily Warm-Ups: Math Brain Teasers

A boy was standing on the shore of a lake. He threw a rock into the water. A grumpy old fish, not liking to be disturbed in this manner, threw 2 rocks back onto the beach. The boy threw another rock in the lake. This time the old fish threw 3 rocks back onto the beach. This continued with increasing fury from both the boy and the fish.

How many turns (one turn being that the boy throws a rock and then the fish throws one more rock than it did the last time) must take place until there are more than 50 additional rocks on the beach?

Look at each row of numbers in the pyramid. What number should replace the question mark in the middle of the bottom row?

				8				
		2	5	2				
	1	2	4	2	1			
1	2	1	3	1	2	1		
1	2	1	1	?	1	1	2	1

Daily Warm-Ups: Math Brain Teasers

Draw a star with seven points without lifting your pencil or retracing lines.

Geometry and the Coordinate Plane

A caterer is setting up for a party and is trying to arrange the tables. He needs a total of 10 tables. The party-giver wants the tables arranged in rows of 4.

How can the caterer set up 10 tables so that each one is in a row of 4?

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Geometry and the Coordinate Plane

A group of people are standing in a circle. They are spaced evenly apart. The ninth person is directly opposite the twenty-fifth person.

How many people are in the circle?

Geometry and the Coordinate Plane

A small town is setting up its first-ever sewer system. The sewer committee has worked out how many houses will need to be hooked up to the system, and what route the pipes will need to run underground. Now they are working on the final detail: manhole covers. These are the metal plates that form lids over the openings of manholes. The cover rests on a small lip inside the hole.

Traditionally, manhole covers are round. But some committee members want to do something different. They have decided on rectangular manhole covers, which they think will look more interesting. However, at a public meeting to display the designs, a middle-school student pointed out a problem in their design. The committee decided to go with round covers after all.

What problem did the student point out?

Geometry and the Coordinate Plane

Pagoda is an ancient Asian game. The object of the game is to move discs from one peg to another so that the discs are arranged from largest to smallest. The rules are that only one disc can be removed at a time, and a large disc may not be placed on top of a smaller disc.

What is the smallest number of moves it will take to move the discs to the peg on the right?
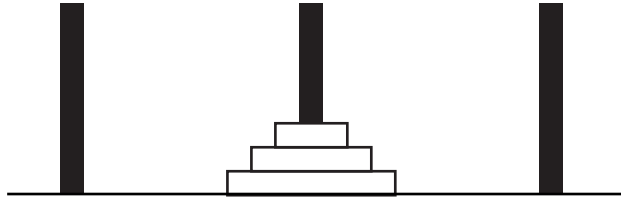
Geometry and the Coordinate Plane

Zipper, a cat with no common sense, is stuck 12 feet up a telephone pole. If a ladder is placed at a 45° angle against the telephone pole, what must be the length of the ladder, in feet, to reach Zipper?

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Geometry and the Coordinate Plane

Find the area of the figure, in square units.
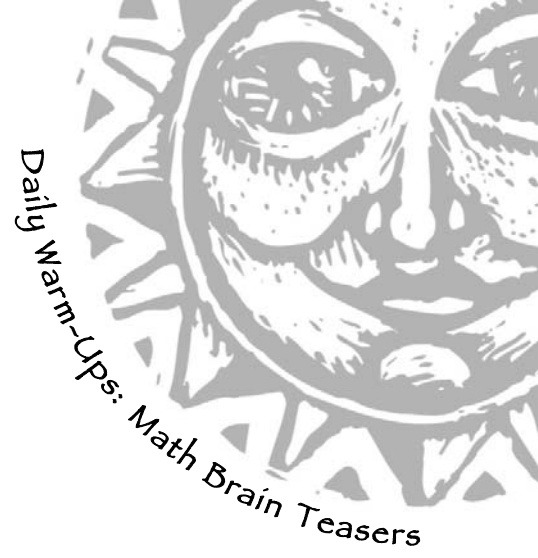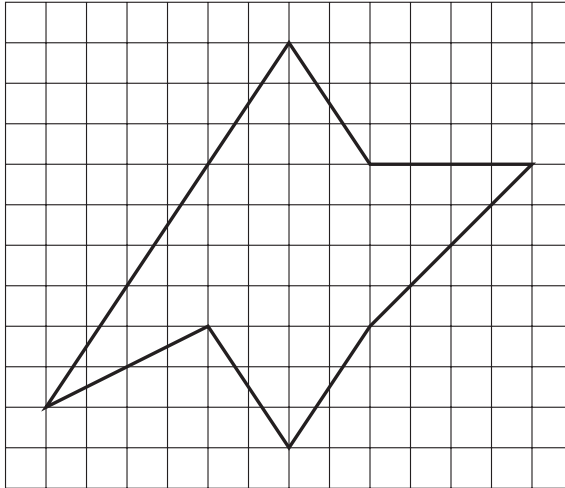
Divide the figure into two congruent shapes.
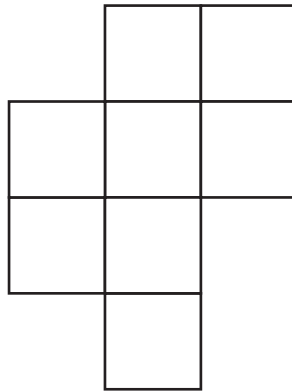
Geometry and the Coordinate Plane

An astronomer was plotting the coordinates of a space satellite when it was hit by an asteroid. This caused the satellite to drift clockwise on the coordinate plane to quadrant III, stopping at the same distance from the origin as it was in quadrant I.

Plot the coordinates for the satellite's new position. Then draw the satellite where it should be in quadrant III.
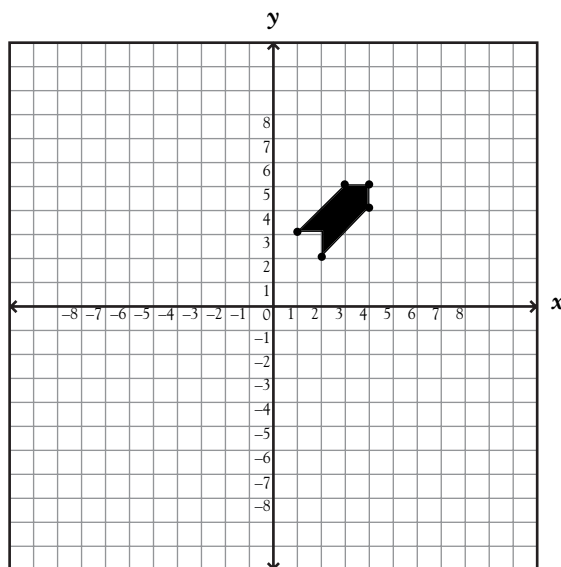
Geometry and the Coordinate Plane

A *fractal* is a geometric pattern that is repeated at increasingly smaller or larger scales. The first three drawings below show three stages of a fractal based on triangles. Look at them carefully. Then draw the next two stages for the fractal at the bottom of the page.
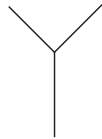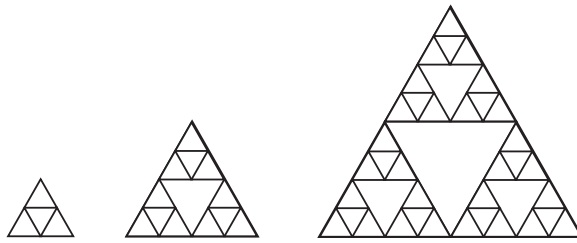
Money

The rules of a coin game state that a move is a jump over one or two coins at a time. What is the smallest number of moves it would take to get the following coins in the order P–P–P–N–N–N, with no gaps between coins?

Daily Warm-Ups: Math Brain Teasers

Money

What is the smallest number of coins that can be combined to make 99 cents?

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Money

A swindler is playing a shell game. He has 5 pennies, 3 nickels, and 2 dimes. There are 5 cents under the first shell, 15 cents under the second shell, and 20 cents under the third shell. You do not know which coins are under each shell. You are allowed to see one coin at a time under the shell that holds 15 cents.

If you see a dime and a penny, can you tell which coins are under the three shells?

Money

Every January, Eva's parents decide what her weekly allowance will be for the coming year. This year, Eva has suggested a change. Instead of giving her the same amount every week, she suggests that her parents give her a varying amount. The first month, they can give her just 5 cents a week. Each month, they should double the previous month's allowance. Eva's parents accept her proposal.

If most months that year have 4 weeks each, and April, June, September, and November each have 5 weeks, how much allowance will Eva receive over the course of the year?

Money

At the counter in a mini-market, there is a jar that says, "Give a penny, take a penny." There are 91 pennies in the jar at the start of the day. The first customer takes one penny from the jar. The next customer takes two pennies.

If this pattern continues, with each customer taking one penny more than the customer before, how many customers will it take to empty the jar?

Money

Little Red Riding Hood's grandmother has given her a big jar that she has been using to collect coins. Among the coins are 18 quarters. Her grandmother says that she can have all the coins if $\frac{1}{2}$ of the quarters go into her college savings account, $\frac{1}{3}$ of them go toward a new CD player, and $\frac{1}{9}$ go toward something fun. After happily agreeing to this, Little Red digs through the quarters and finds that one quarter is actually a subway token.

How many quarters should go in each category?

Money

Bob had a car accident, and his car needed repairs. The repairs would take several days, so Bob needed to rent a car. Bob was able to rent a car for $24 a day. His insurance company offered to pay him $16 a day for every day he rented the car. However, they also offered to pay him $10 a day for every day he did *not* rent the car. Bob wants to rent the car for a few days and do without the car for a few days.

Is there any combination of rental days and non-rental days that will let Bob come out even—that is, receive exactly enough money from the insurance company to pay for the car rental?

Measurement

Lance Legstrong cycles every day. His route is both circular and hilly. Each hill is as steep going up as it is coming down. When he leaves his driveway, he turns left. He travels up a hill, then down a hill, then along a straightaway. Then he goes up another hill, then there is another straightaway, then he goes up another hill, then down a hill.

Today, he decides to turn right as he leaves his driveway. Will his route be less strenuous?

Where does $1\frac{1}{2}$ plus $11\frac{1}{2}$ equal 1?

Measurement

You may have heard the story of how Hannibal crossed the Alps with an army and a number of elephants. To move all his supplies, he must have used carts as well as elephants.

Imagine that some of Hannibal's carts had three wheels, one in the front and two in the back. For safety, each had a spare wheel, and the wheels were rotated so that all four wheels got the same amount of wear.

If Hannibal's entire route was 1,000 miles long, how many miles of wear were put on each wheel?

Measurement

Berto's Buckets manufactures buckets in many different sizes. Berto is trying to describe all the sizes in a certain product line to a customer, but he has forgotten a few. The sizes increase according to a regular pattern.

Help Berto find the sizes of the missing buckets.

Size 1
1 quart

Size 2
1 gallon

Size 3
_____

Size 4
4 gallons

Size 5
_____

Size 6
9 gallons

Measurement

If you drop a 2-pound weight from a height of 2 feet into a 2-quart container of water that is at 45° C, and drop another 2-pound weight of the same mass and volume from the same height into another 2-quart container of water that is at 0° C, which weight will hit the bottom of the container first?

Measurement

Phillip was flying around the world in a straight line in his specially designed hot-air balloon. One day he realized that he had sailed 2 miles south, but he was now actually traveling north.

How can this be?

Measurement

Ebenezer has two antique clocks. He sets both clocks to 1:00 P.M. Soon he realizes that one clock loses 10 seconds per minute.

When the correctly working clock shows 2:00 P.M., what will the malfunctioning clock show?

Data Analysis, Statistics, Combinations, and Probability

A student is given 11 quarters and 11 dimes. Her teacher tells her to place the coins in two bags. Once the coins are in the bags, the teacher will choose a coin from one of the bags. If the coin is a dime, the student gets to keep all the coins. If the coin is a quarter, the teacher takes back the coins.

The student wants to keep the coins. How can she put the coins in the bags to give herself the greatest chance of keeping them?

Data Analysis, Statistics, Combinations, and Probability

Popcorn and cranberries are being strung in an alternating pattern (that is, pcpcpc . . .) for a winter holiday decoration. When the decoration is finished, it is tied off to make a circle. The finished decoration cannot include a piece of popcorn beside another piece of popcorn, or a cranberry beside another cranberry.

What numbers of popcorn pieces and cranberries can be used to make a string?

Data Analysis, Statistics, Combinations, and Probability

At a birthday party, there are three flavors of ice cream: Fudge Ripple, Strawberry-Kiwi, and Cookie Dough Chunk. Each guest can have one or two flavors on a cone.

How many possible combinations are there?

Data Analysis, Statistics, Combinations, and Probability

On his way out the door on a cold and snowy morning, Russ needed a pair of mittens. In a bin of mittens, there were 12 red mittens, 12 blue mittens, and 12 black mittens. All mittens can be worn on either the left hand or the right hand.

What is the greatest number of mittens Russ can pull out before he gets a pair of mittens that are the same color?

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Fractions, Ratios, Decimals, and Percents

At a Halloween party, the guests voted for the costume they liked the best. The phantom was awarded the grand prize. The dragon received 15% of the votes. The vampire received $\frac{1}{10}$ of the vote, and the mermaid received one vote more than the vampire. The jack-in-the-box received 1 out of 20 votes. With $\frac{4}{20}$ of the votes, the rock star received more than the dragon but less than the phantom.

Place the costumes in order, from the most votes to the fewest votes.

Fractions, Ratios, Decimals, and Percents

Draw four straight lines to divide the rectangle shown below into seven pieces.
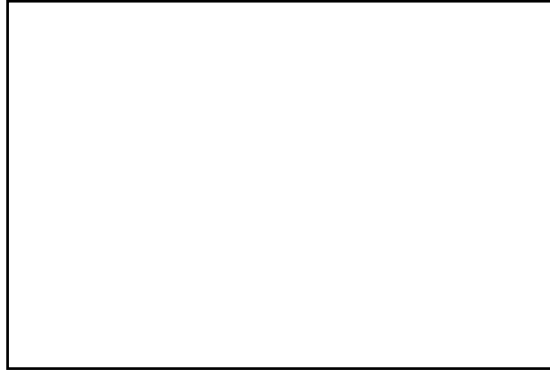
Fractions, Ratios, Decimals, and Percents

If it takes an Amigo Airlines' DC-10 5 hours and 25 minutes to fly from New York to Los Angeles, how long would it take 3 DC-10s to fly from New York to Los Angeles?

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Fractions, Ratios, Decimals, and Percents

The diameter of a smaller wheel on a bicycle is $\frac{7}{22}$ that of the larger wheel. How many times larger is the circumference of the larger wheel than that of the smaller wheel?

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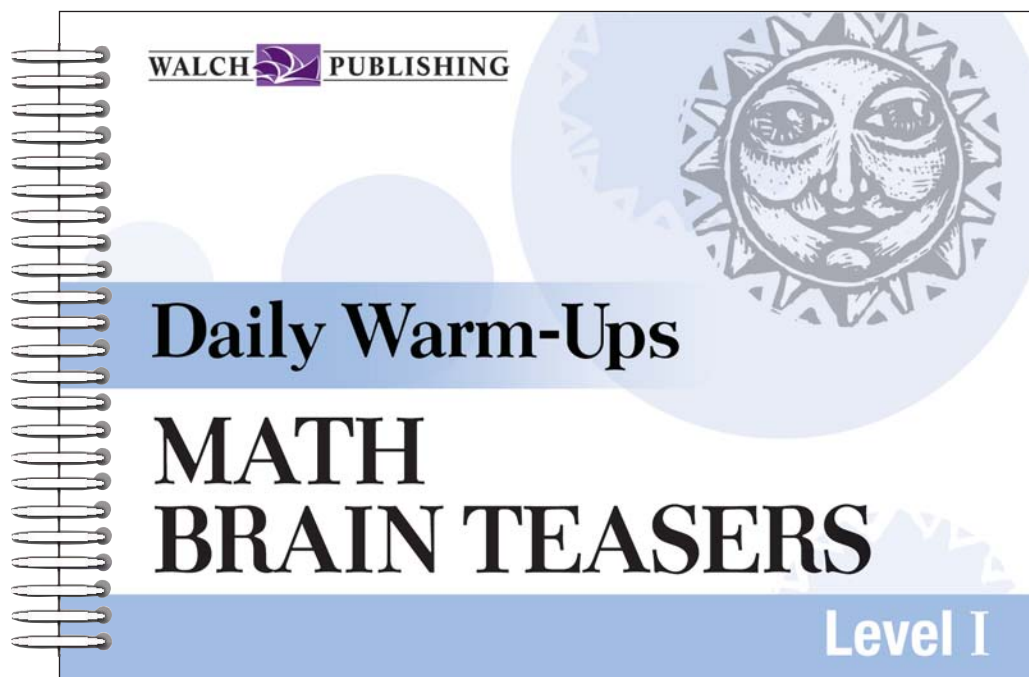
Grades 5–8
MATHEMATICS

Geometry & Measurement

WALCH PUBLISHING
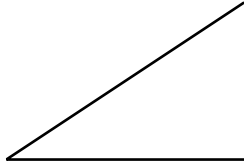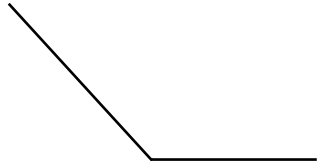
Time to Play Catch-Up

Angles are everywhere. When two straight lines meet, they form an **angle.** The **vertex** is the point at which the two lines intersect.

There are three kinds of angles: right angles, acute angles, and obtuse angles.

Examples:	A right angle is equal to 90°.	An acute angle is less than 90°.	An obtuse angle is more than 90°.

Look at the word *catch-up*. Circle each angle you see in the letters. Label each angle right, acute, or obtuse.

Write a word of your own, then identify its angles.

A View from Every Angle

Study the diagram below. Identify the following as rays, lines, or line segments.

A **line segment** has a beginning and an end.

A **ray** starts at one point and goes on indefinitely in another direction.

A **line** extends in either direction indefinitely.

1.

A   V

2.

V   N

3.

E   V

4.

U   S

5.

B   S

6.

A   I

7.

E   B

8.

I   C

9.

E   N

10.

I   M
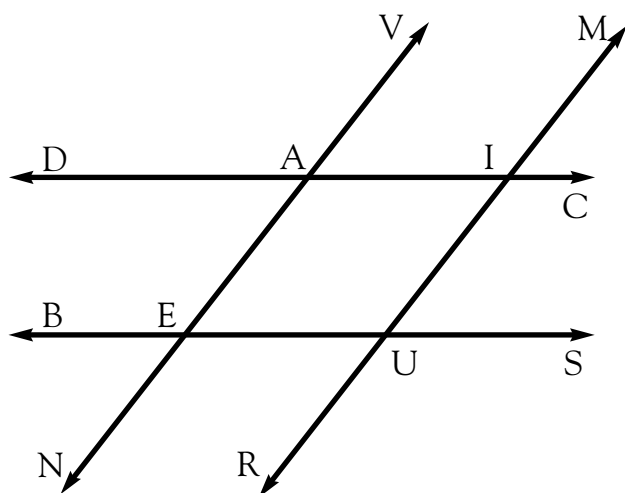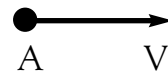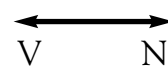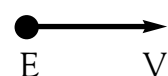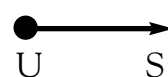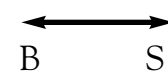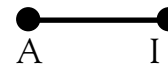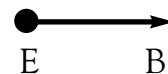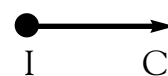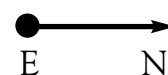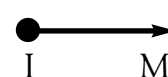
What's Your Angle?

Identify the following angles as acute, right, or obtuse.
Angles 1–11 go with the first diagram; 12–14 go with the
second diagram.

1. ∠ TUM _____

2. ∠ TUN _____

3. ∠ TUL _____

4. ∠ SUM _____

5. ∠ SUN _____

6. ∠ SUP _____

7. ∠ SUR _____

8. ∠ SUQ _____

9. ∠ SUT _____

10. ∠ TUP _____

11. ∠ LUQ _____

12. ∠ OBW _____

13. ∠ BWO _____

14. ∠ BOW _____
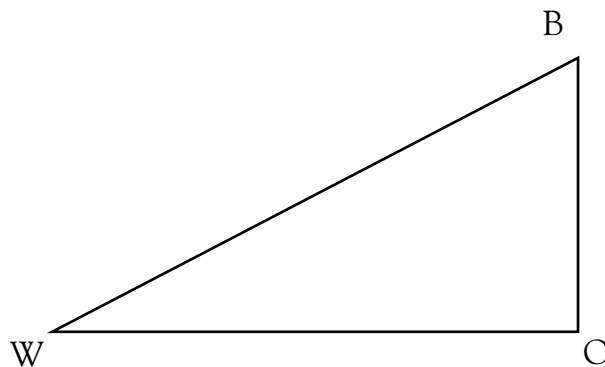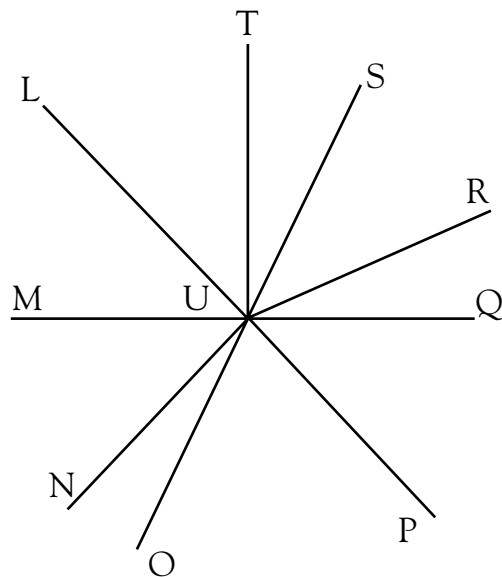
Go Figure!

If you slide a figure along a straight line and it will fit on top of another figure, that is called a **translation.**
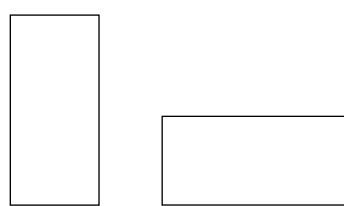
Example:
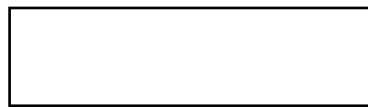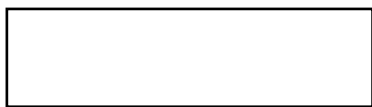
If you can flip a figure over and it covers its identical shape, it is a **reflection.**
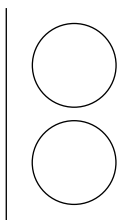
Example:
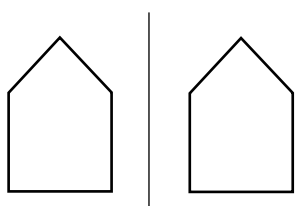
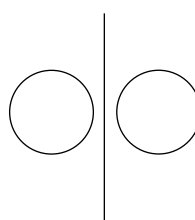A **rotation** is when a shape is turned.

Example:

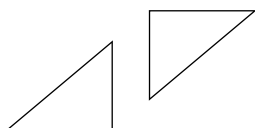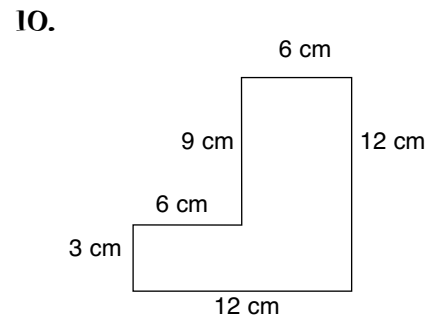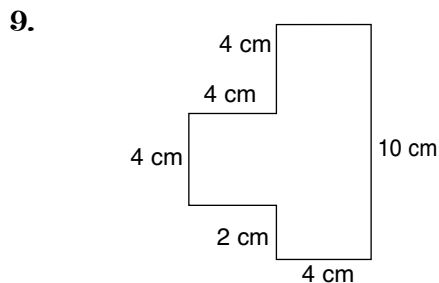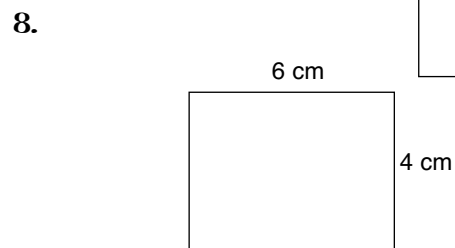Label each figure as a reflection, rotation, or translation.

1.

2.

3.

4. Apart from math class, where would you use reflection, rotation, and translation?

Perfect Perimeters

The **perimeter** is equal to the sum of the sides of a figure.

Find the perimeter of each shape. Write your answer inside the shape.

1.
9 cm
4 cm
12 cm
8 cm
4 cm

2.
6 cm
6 cm
6 cm
6 cm

3.
8 cm
8 cm

4.
4 cm
4 cm
4 cm
4 cm

5.
7 cm
3 1/2 cm
9 cm

6.
4 cm
15 cm

7.
11 cm
5 cm

8.
6 cm
4 cm

9.
4 cm
4 cm
4 cm
10 cm
2 cm
4 cm

10.
6 cm
9 cm
12 cm
6 cm
3 cm
12 cm
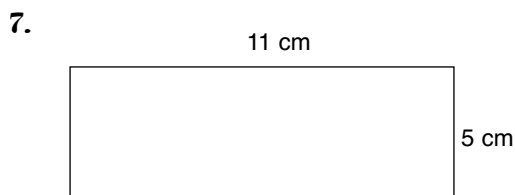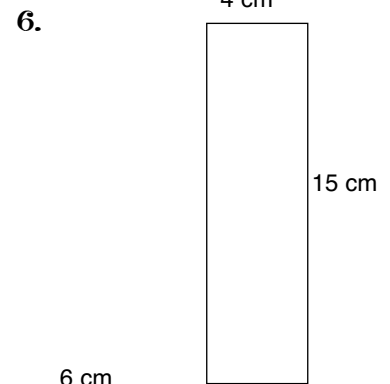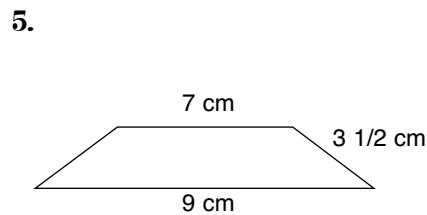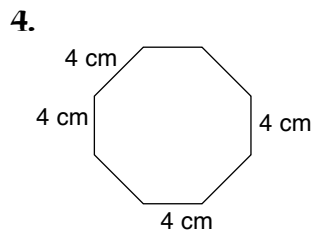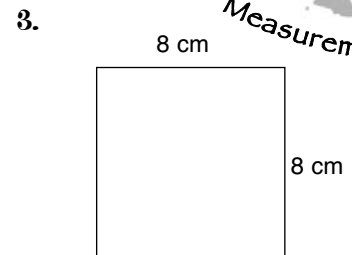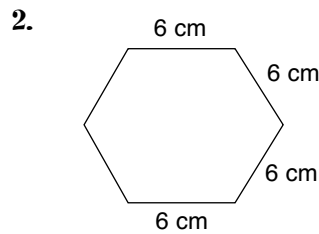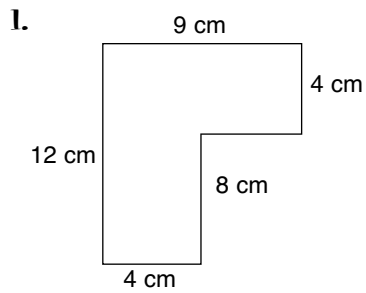
On the back of this worksheet, create three shapes of your own. Label the measurement of each side. Write the perimeter in the center of each shape.

Round and Round We Go

The **area** tells you the number of square units in a figure. Find the total number of square units in each figure. Some squares may be split.

1.
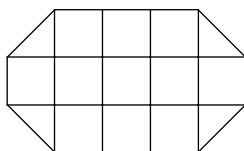
_____ Square Units

2.
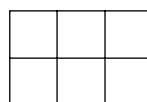
_____ Square Units

3.
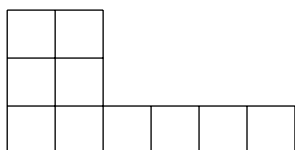
_____ Square Units

4.
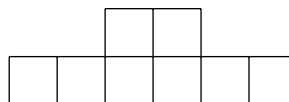
_____ Square Units

In problems 5–9, the area can be found by multiplying the length by the width: $A = lw$

5.
8 ft
1 ft
Area = _____ ft^2

6.
2 ft
11 ft
Area = _____ ft^2

7.
4 ft
3 ft
Area = _____ ft^2

8.
11 ft
11 ft
Area = _____ ft^2

9.
4 ft
4 ft
Area = _____ ft^2
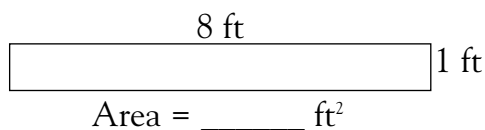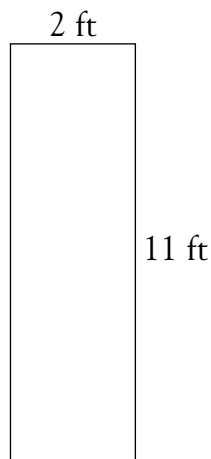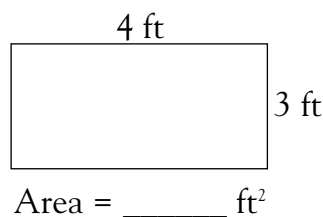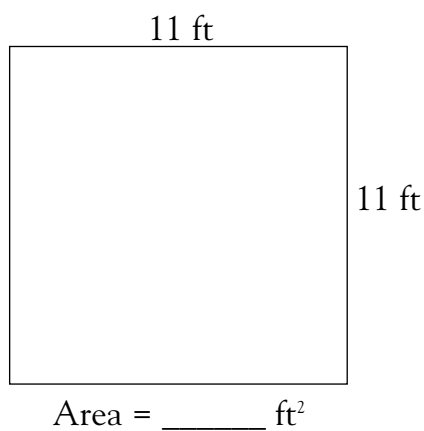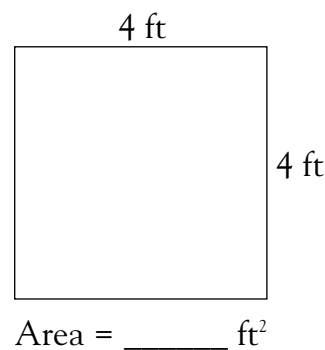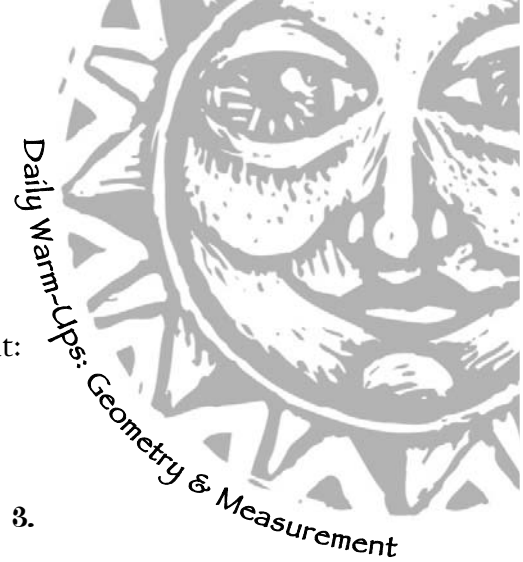
Formula for Success

The area of a triangle is equal to $\frac{1}{2}$ the base times the height: $A = \frac{1}{2}(b \times h)$.

Find the area of the following triangles.

1.

6 cm

3 cm

A = _____

2.

13 cm

4 cm

A = _____

3.

4 cm

9 cm

A = _____

4.

7"

← 4" →

A = _____

5.

8"

5"

A = _____
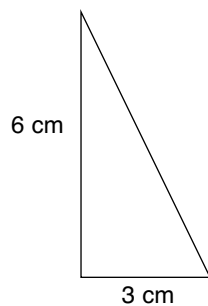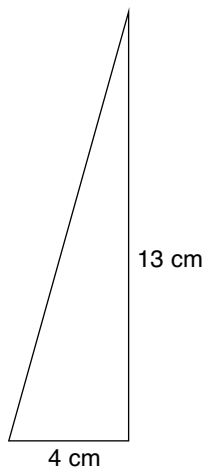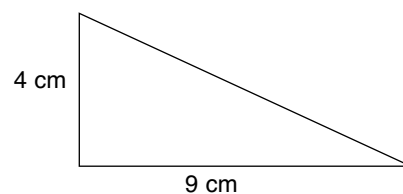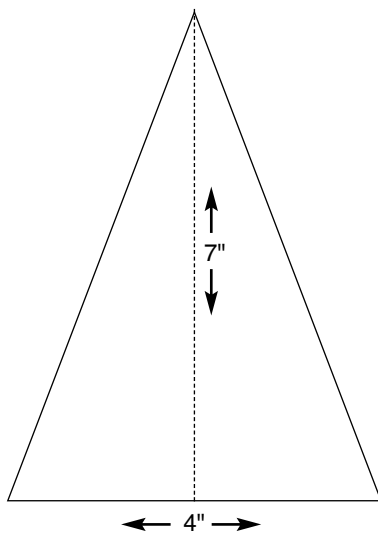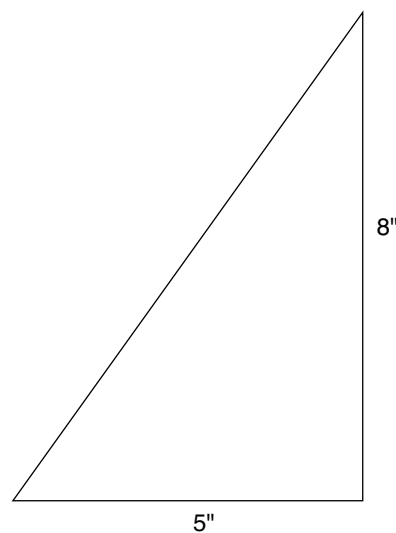
Are You Up for It?

When you are faced with an unusual shape, find the areas of familiar shapes within the object. Look for triangles, squares, and rectangles. Add the areas together for the total area of the unusual shape.

1.

3 ft

9 ft

4 ft

A = _____

2.

5 in

2 in

3 in

A = _____

3.

4 in

4 in

3 in

3 in

3 in

3 in

4 in

4 in

A = _____

4.

6 in

5 in

3 in

2 in
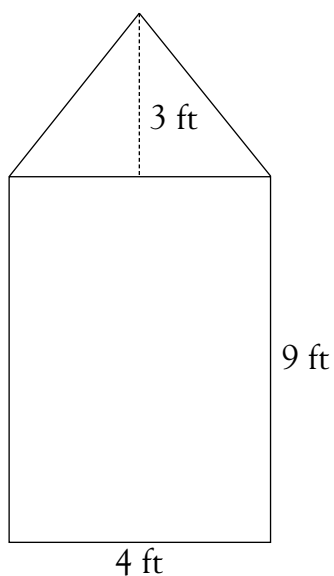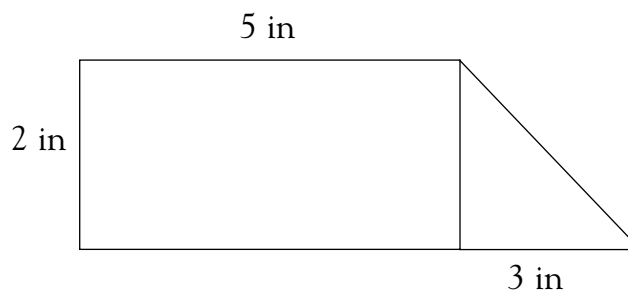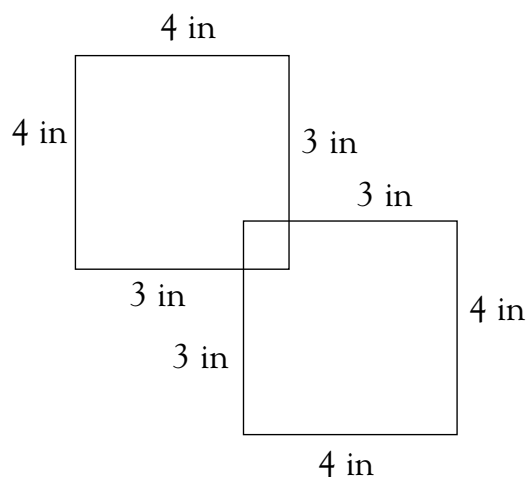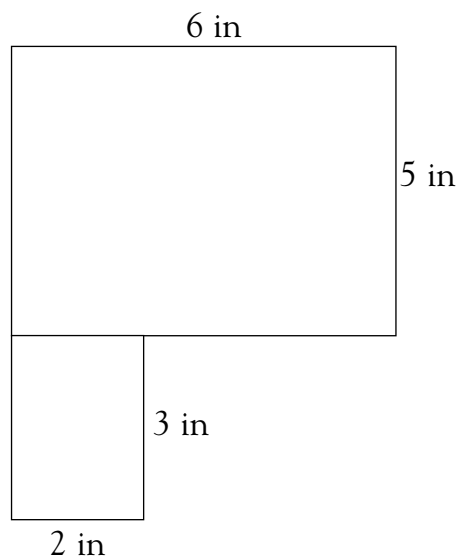
A = _____

Amazing Areas

What do you call a song about a car? To answer this riddle, start at number 1 and go in order. On each line below the table at the bottom of the page, write the letter that corresponds to each correct answer.
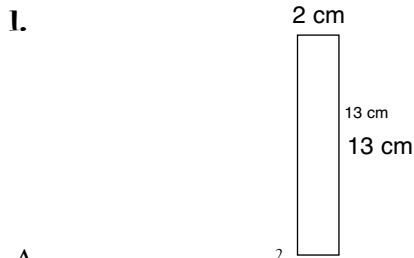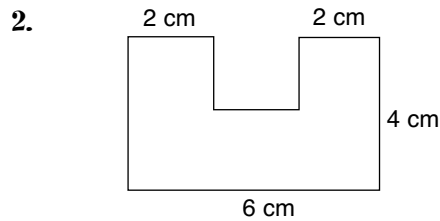
1. 2 cm
13 cm
13 cm
Answer: _____ cm^2

2. 2 cm   2 cm
4 cm
6 cm
Answer: _____ cm^2

3. 6 cm
15 cm
Answer: _____ cm^2

4. 14 cm
6 cm
4 cm
6 cm
Answer: _____ cm^2

5. 6 cm
4 cm
Answer: _____ cm^2

6. 5 cm
9 cm
5 cm
10 cm
Answer: _____ cm^2

7. 3 cm
7 cm
Answer: _____ cm^2

8. 5 cm
10 cm
Answer: _____ cm^2
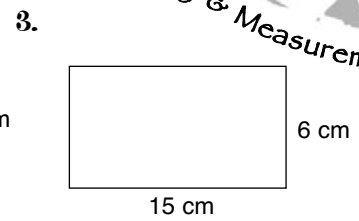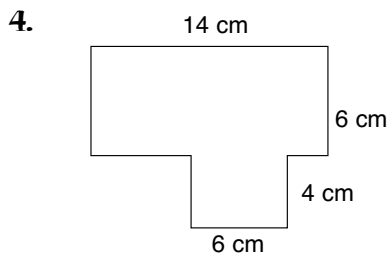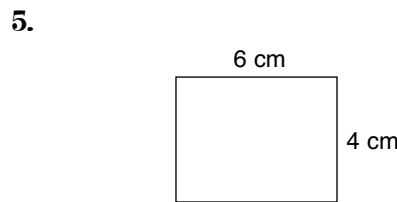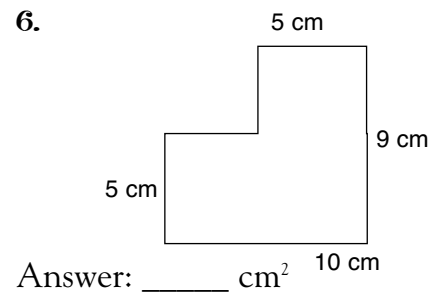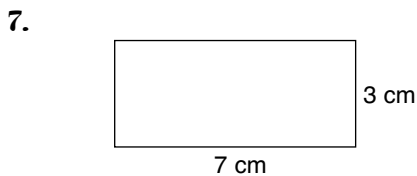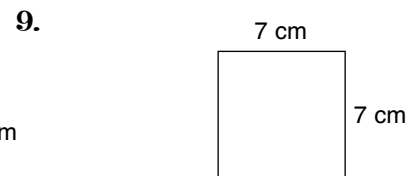
9. 7 cm
7 cm
Answer: _____ cm^2

A 26	M 82	! 49	R 108
P 27	R 53	T 24	O 70
E 77	O 21	S 14	Z 40
A 90	N 50	L 44	C 20

____ ____ ____ ____ ____ ____ ____ ____

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The Tangram Turn

A **tangram** is an ancient Chinese puzzle made up of seven polygons. People use the seven polygons to create geometric shapes, animals, and flowers. After a design is created, an outline is drawn around the shape.

Cut out the tangram shapes below and create as many designs as you can. Trace an outline of each design. After you have created 10 pictures, try to put the pieces back together to form the original tangram. It's not as easy as it seems, but it can be done!
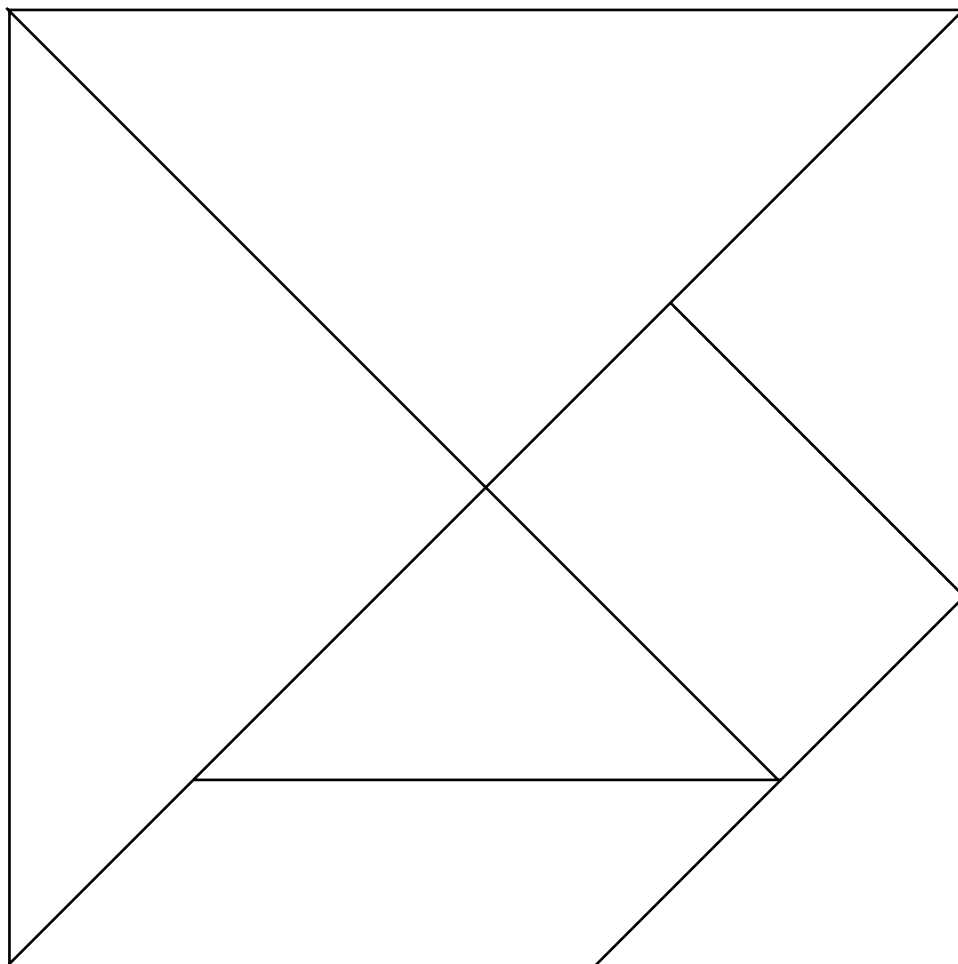
Here, There, and Everywhere

1. What is the best shape name to describe a dollar bill? What facts about its sides and angles make you think this is the best name?

2. Look at the barn. Name all the polygons you see.
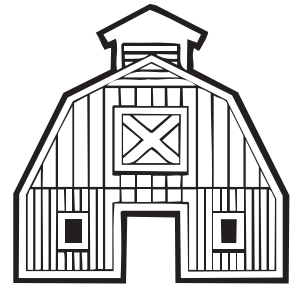
3. Name all of the quadrilaterals (four-sided figures) in the barn. What facts about these shapes made you choose each name?

4. On the back of this worksheet, create an interesting building. Use as many polygons as possible. Label each part. Be specific for triangles; state if they are equilateral. Use a ruler—and have fun!

Running Around in Circles

The **circumference** of a circle is the distance around the outside of the circle. The **diameter** is the distance of the line through the center of a circle that divides it in half. The **radius** is one half the diameter. **Pi (π)** is a constant number equal to approximately 3.14. It is the ratio of the circumference of the circle to the diameter.

$$\text{Circumference} = \pi \times d$$
$$c = \pi \times d$$
$$r = \frac{1}{2}\,d$$

Answer these questions and find the circumference.

1. What is the circumference of a pizza with a diameter of 10 inches?

2. What is the circumference of a chocolate cake with a diameter of 14 inches?

3. What is the circumference of a cherry pie with a diameter of 9 inches?

4. What is the circumference of a table with a diameter of 36 inches?

5. What would the circumference of a plate be if the radius was 4 inches?

It's in the Can

To calculate the surface area of a cylinder:
$S = (2 \times \pi \times r^2) + (2 \times \pi \times r \times h)$.

Example:
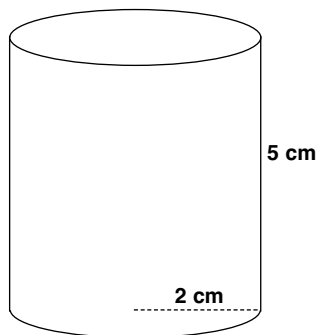
Radius of base = 2 cm

Height = 5 cm

5 cm

π = 3.14

2 cm

$(2 \times \pi \times 2 \text{ cm} \times 2 \text{ cm}) + (2 \times \pi \times 2 \text{ cm} \times 5 \text{ cm}) =$

$(\pi \times 8 \text{ cm}^2) + (4 \text{ cm} \times 3.14) \times 5 \text{ cm} =$

$(3.14 \times 8 \text{ cm}^2) + 12.56 \text{ cm} \times 5 \text{ cm} =$

$25.12 \text{ cm}^2 + 62.8 \text{ cm}^2 =$

87.92 cm^2

Find the surface area of these cylinders.

2.

1.

$h = 2$ cm

$h = 4$ cm

$r = 3$ cm

3.

$r = 4$ cm

$h = 6$ cm

$r = 4$ cm
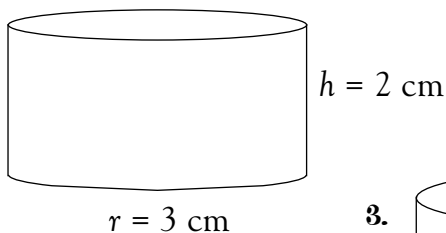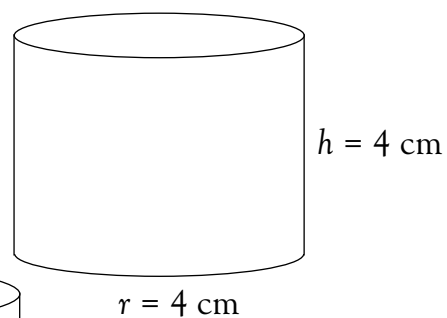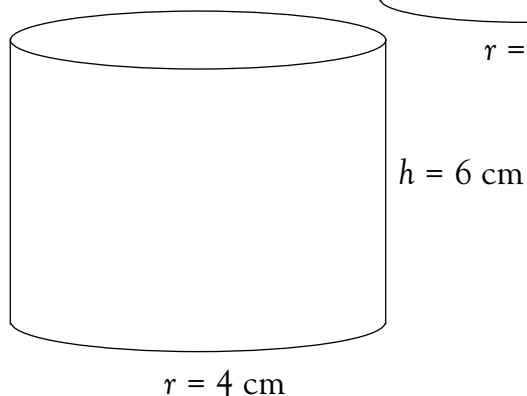
All on the Surface

To calculate the surface area of a rectangular prism: $S = 2 \times ((l \times w) + (l \times h) + (w \times h))$. **Remember:** l = length, w = width, h = height.

Find the surface area of each rectangle.

Example:

3 cm

2 cm

4 cm
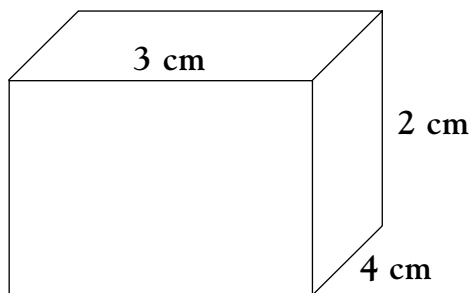
l = 4 cm

w = 3 cm

h = 2 cm

$2 \times ((4 \text{ cm} \times 3 \text{ cm}) + (4 \text{ cm} \times 2 \text{ cm}) + (3 \text{ cm} \times 2 \text{ cm})) =$

$2 \times ((12 \text{ cm}^2 + 8 \text{ cm}^2 + 6 \text{ cm}^2) =$

$2 \times 26 \text{ cm}^2 =$

52 cm^2

1.

5 cm

8 cm

8 cm

2.

4 cm

6 cm

4 cm

3.

3 cm

5 cm

10 cm

4.

6 cm

6 cm

6 cm
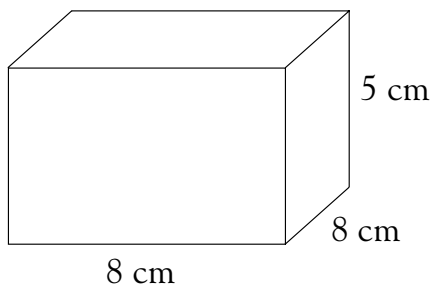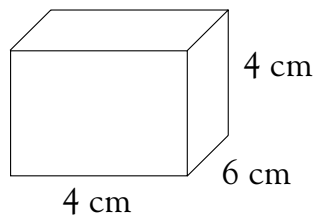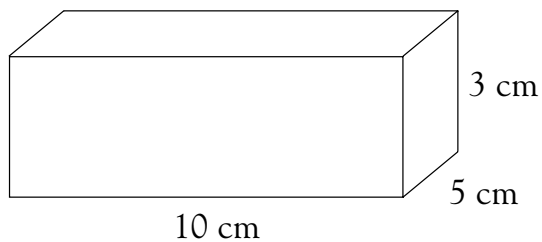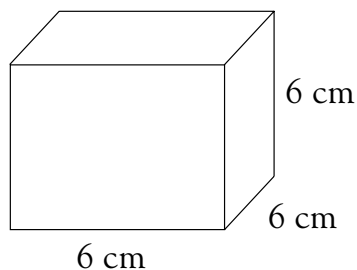
Cool Cubes

Volume is the number of cubic units that fills a space. When we speak about volume, we are speaking about a three-dimensional object.

> Volume = length × width × height

Solve the word problems below.

1. Maureen has a box that is 8 feet wide, 4 feet tall, and 10 feet long. How many cubic feet will her box hold?

2. Carla had loam delivered. The man at the landscaping company said he would send 5 cubic yards of loam. What are the dimensions of a dump truck if it holds exactly 5 cubic yards?

3. Bella has to fill all the flower boxes. They are 30 inches long, 6 inches wide, and 6 inches high. How many cubic inches of soil will she be able to fit in 1 box? She has 6 boxes to fill. How many cubic inches will it take to fill all the boxes?

Volumes and Volumes

1. Find the volume of this cone. Use the formula $v = \frac{1}{3} \pi r^2 h$.

$r = 4''$ $10''$
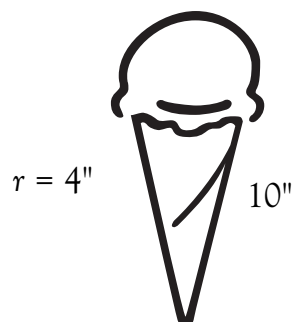
2. Find the volume of this sphere. Use the formula $v = \frac{4}{3} \pi r^3$.

$r = 4''$
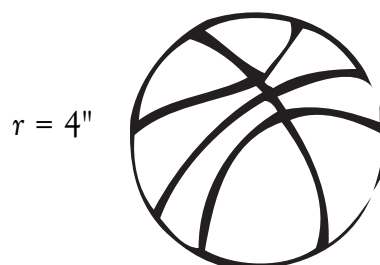
3. Find the volume of this cylinder. Use the formula $v = \pi r^2 h$.

$r = 1.5''$ $6''$
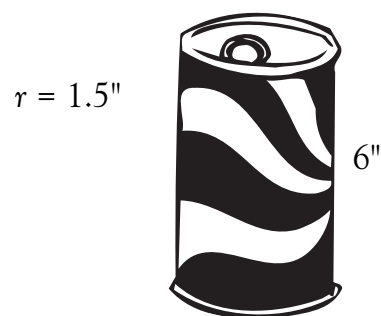
4. Find the volume of this gift box. Use the formula $v = lwh$.

6 cm

10 cm

8 cm
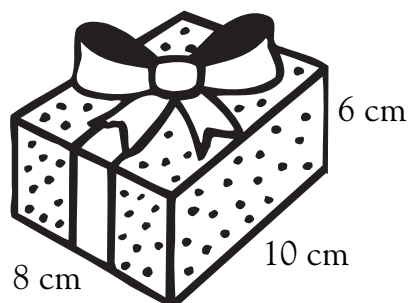
Hiking a National Park

Use this map and a metric ruler to measure the distance from place to place. Help these hikers find their destination.

River Point   Pine Trail

Lookout
Point

River Trail

Mountainview Trail

Slide Trail

Lonely Man's Trail

Smooth Sailing Trail

Trail Begins

Legend
10 cm = 1 km
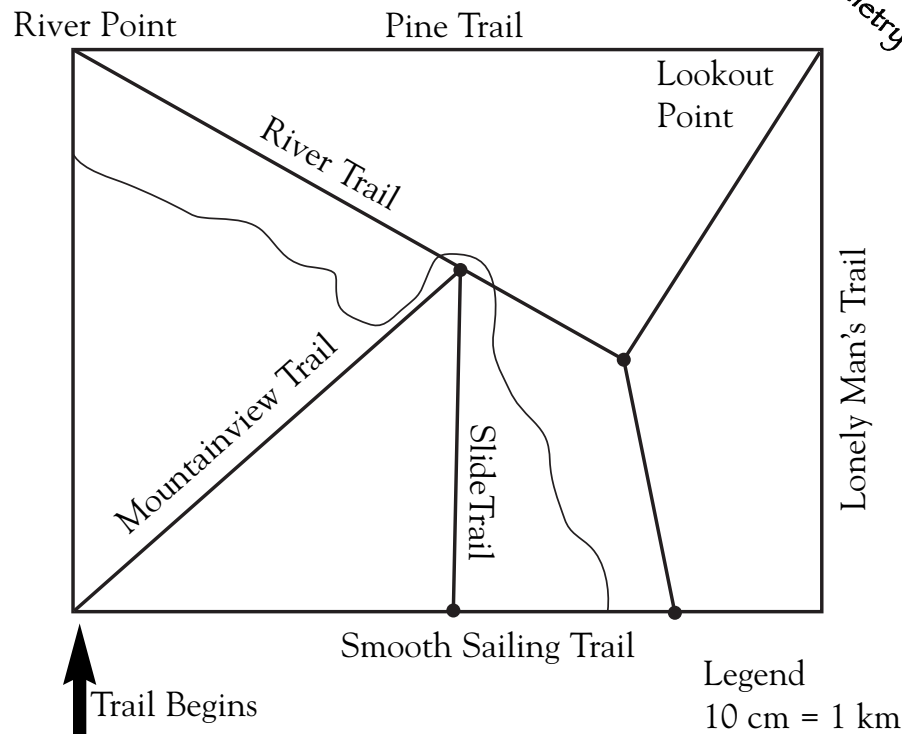
1. If the hikers walk down Mountainview Trail, turn left on River Trail, and stop at River Point, how many kilometers did they hike?

2. From River Point, they head along Pine Trail to Lookout Point. How far is it from River Point to Lookout Point?

3. If the hikers head down Lonely Man's Trail and turn right onto Smooth Sailing Trail to return to their starting point, how far will they have traveled from Lookout Point to their original starting point?

     96   www.walch.com
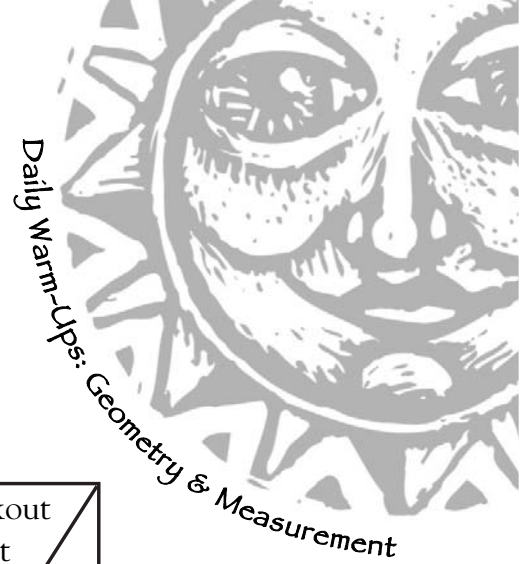
Tomāto, Tomăto, It's All the Same

Sometimes you need to convert measurements from one unit to another.

1 cm = 10 mm	1 m = 1,000 mm	1 m = 100 cm	1 km = 1,000 m
1 mm = $\frac{1}{10}$ cm	1 mm = $\frac{1}{1,000}$ m	1 cm = $\frac{1}{100}$ m	1 m = $\frac{1}{1,000}$ km

Use the information in the table above to rewrite each length using a different unit of measure.

> **Example:** 50 cm = 500 mm

1. 50 cm = _____ m
2. 10 km = _____ m
3. 8.1 km = _____ m
4. 9.2 m = _____ cm
5. 18 cm = _____ m

1 ft = 12 in	1 yd = 36 in	1 yd = 3 ft
1 in = $\frac{1}{12}$ ft	1 in = $\frac{1}{36}$ yd	1 ft = $\frac{1}{3}$ yd

Use the information in the table above to rewrite each length using a different form of measurement.

6. 7 ft = _____ in
7. 27 ft = _____ yd
8. 36 in = _____ ft
9. 156 in = _____ yd _____ ft
10. 100 ft = _____ in

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We'll Make It Fit!

Complete the following.

$$1 \text{ liter} = 1,000 \text{ ml}$$

1. 5 liters   = _____ ml

2. 4 liters   = _____ ml

3. 8 liters   = _____ ml

4. 6 liters   = _____ ml

5. 10 liters = _____ ml

6. 14 liters = _____ ml

7. 12 liters = _____ ml

8. 16 liters = _____ ml

9. 24 liters = _____ ml

10. 30 liters = _____ ml

11. If a bottle of water holds 1.5 liters, how many milliliters does it hold?

12. How many milliliters are in 2 two-liter bottles of ginger ale?

13. During the day, Mrs. King filled her water bottle 3 times. Her water bottle holds $1\frac{1}{2}$ liters. If the bottle was empty each time she filled it, and she drank $2\frac{1}{2}$ bottles of water, how many milliliters of water did she drink?

14. Which holds more—a 4,000-ml bottle or 2 two-liter bottles?

15. If the cream cartons at the grocery store each hold 946 milliliters of cream, how many milliliters of cream are in 4 cartons?
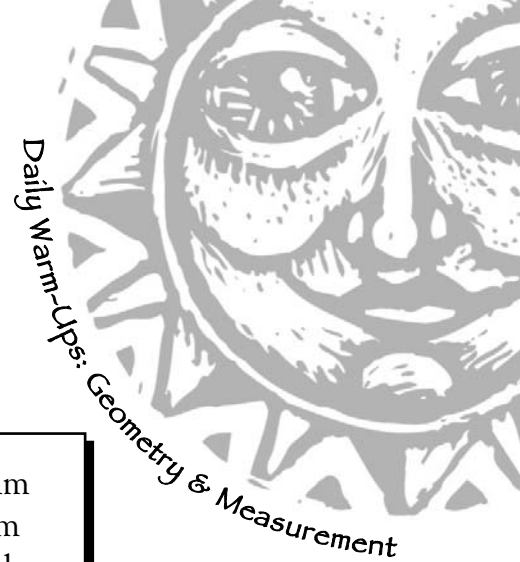
It All Measures Up

Convert the following measurements using the information in the box below.

1 centimeter = 10 millimeters	1 cm = 10 mm
100 centimeters = 1 meter	100 cm = 1 m
1,000 meters = 1 kilometer	1,000 m = 1 km
1 meter = 1,000 millimeters	1 m = 1,000 mm

1.
   30 cm = __300__ mm

   1 cm = 10 mm

   × 30   × 30
   ‾‾‾‾‾   ‾‾‾‾‾‾
   30 cm   300 mm

2.
   29 cm = _____ mm

3. 7 cm = _____ mm

4. 27 cm = _____ mm

5. 4 km = _____ m

6. _____ km = 8,000 m

7. 215 cm = _____ mm

8. 39 cm = _____ mm

9. _____ km = 5,000 m

10. 10 km = _____ m

11. 11 m = _____ cm

12. 18 m = _____ cm

13. 1 cm = _____ mm

14. _____ km = 7,000 m

15. 7 m = _____ mm

16. 15 cm = _____ mm

17. 20 m = _____ mm

18. 20 m = _____ cm

19. 22 cm = _____ mm

20. 48 m = _____ mm

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Grades 5–8
MATHEMATICS

Logic

Choosing the Correct Twin

Sally's boyfriend had an identical twin whom she did not like. Her boyfriend always told the truth, and his twin always lied. One evening, one of the twins came to visit her. Since the twins looked exactly alike, she couldn't tell whether he was her truth-telling boyfriend or the liar. Sally thought for a moment, then asked the visitor one question. From the reply, she knew which twin was visiting her. What was the question that Sally asked?

Daily Warm-Ups: Logic

School Faculty

Ms. Chang, Mr. Pejcek, and Ms. Taylor are members of a high-school faculty. Their titles are counselor, principal, and teacher, but not necessarily in the order of their names above. The following additional facts are known about these people:

1. No person's name begins with the same first letter as that of his or her title.

2. Mr. Pejcek is not the counselor.

What is the title of each of the three faculty members?

The Walkathon

Four couples, who are high-school seniors, will be participating in a walkathon for charity. The names of the young women are Cara, Michelle, Keisha, and Maddie. The names of the young men are Ben, Ramon, Mark, and Ahmed. The following facts are known about the couples:

1. Michelle is not walking with Mark or Ben.

2. Maddie isn't walking with Ben or Ahmed.

3. Keisha isn't walking with Mark or Ben.

4. Ramon isn't walking with Michelle.

Match the couples who will be in the walkathon.

Three Doubles

Chris, a bookkeeper who doesn't do much spelling, would like to know a word in which there are three double letters in succession. What is the word?

Daily Warm-Ups: Logic

The Perfume Bottle

A bottle of perfume costs $10. The perfume is worth $9 more than the bottle. What is the value of the bottle?

Pounds of Gold

Which is worth more: two pounds of $10 gold pieces or one pound of $20 gold pieces?

Talking Back

Many have heard it, but nobody has ever seen it, and it will not speak back until spoken to. What is it?

Forming Triangles

The arrangement of lines below forms two squares. Move two lines (by striking out and redrawing) so that the arrangement forms three triangles of equal size.

Dividing a Figure

The arrangement of lines below forms a six-sided polygon. Add eight lines to divide it into four equal parts, all of which are the same shape.
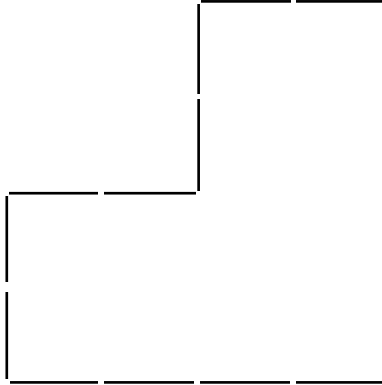
How Many Children?

Philip and Danae were talking about their families. Danae said, "Each boy in my family has as many brothers as he has sisters. But each girl in my family has twice as many brothers as sisters."

How many boys and girls are in Danae's family?

An Old Photograph

A young man and his sister were looking at an old photo album.
The young man pointed to a photograph of a woman and
explained, "This woman's father was my father's brother-in-law."
What relation was the young man's sister to the subject in the
photograph?

Accomplishing the Impossible

A teacher entered his classroom wearing a very flashy hat. When he was sure that he had the attention of the entire class, he removed the hat. Then, holding it up for all to see, he announced, "You really don't know how unusual this hat is!"

He put the hat on his desk, picked up a sheet of paper, and cut a small hole in the center of the paper. "I can actually fold the hat," he continued, "and push it through the hole in this piece of paper." Thereupon he put the sheet of paper on the desk, picked up the hat, and carefully folded it one time before returning it to the desk.

How did the teacher manage to push the hat through the small hole in the piece of paper?

A Trick of Digit Addition

| 111 | 999 | 777 |

The three sets of digits above (three 1s, three 9s, and three 7s) make a total of nine digits. The object is to cross out six of the digits and leave three digits whose sum is eighteen. Can you manage this?

Daily Warm-Ups: Logic

The Fake Explorer

A man billed as a famous explorer was telling his audience how he once shot a polar bear as it was chasing penguins across an ice floe. Suddenly an audience member stood up and shouted, "You're a fake!" What led this audience member to conclude that the speaker was a fake?

Seeing Is Believing?

If someone told you that the top line on the left of the figure below is the one extended on the right, would you believe it? How could you find out whether it were true?
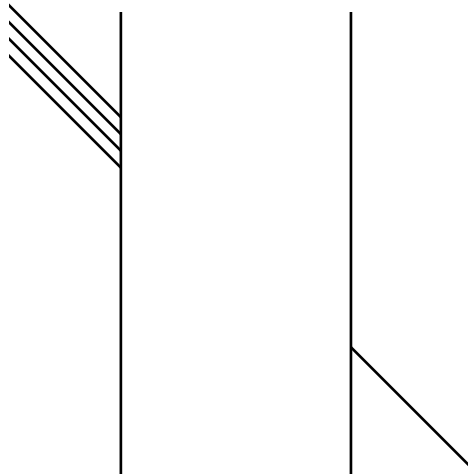
Getting the Traveler Across the River

A mountain man is making his annual trip to town to buy supplies and visit with friends. He comes to a river, which he must cross. His possessions include a pet wolf, a goat, and a sack of carrots. The only available boat with which to cross the river is very small; it can carry no more than the traveler and one of his possessions at a time.

The man realizes that if left together, the goat will eat the carrots and the wolf will dine on the goat. How can he transport his belongings to the other side of the river and still keep them intact?

Dividing the Juice

Two friends have an 8-liter jug full of juice which they wish to share equally. They have two empty jars; one has a capacity of 5 liters, and the other has a capacity of 3 liters. They plan to divide the juice between them without spilling a drop. Can you explain how the friends plan to divide the juice?

The Missing Dollars

Three journalists, arriving late one night at a motel, were charged $80 each for a room, or $240 in all. Later, the motel manager, thinking that she had overcharged, decided to refund $40 of the money to the guests. She sent the money by her son, who was alert enough to observe that $40 could not be divided equally among three people. Thus, the boy kept $16 for himself and returned $24 to the journalists. Each journalist happily received $8 back, making the rooms cost $72 each, or a total of $216 collectively.

Since together the journalists paid a sum of $216 for the rooms and the boy kept $16, for a total of $232, what happened to the other $8?

High School Classes

Josh, Chelsea, Luisa, and Hamdi are students at the same high school. They are in the freshman, sophomore, junior, and senior classes, but not necessarily in the order of their names above. The following statements are true about these students:

1. Chelsea is in a class below Luisa and above Hamdi.

2. Luisa is in a class above Hamdi and below Josh.

In which class is each of the students?

The Favorite Sports

There are four students named Becca, Felipe, Hilary, and Steven. Each has a favorite sport. These sports are basketball, fishing, hiking, and soccer, but not necessarily in the order of their names above. The following information is known about these students and their favorite sports:

1. No student's name begins with the same first letter as his or her favorite sport.

2. Felipe and Hilary like team sports.

3. Becca spent last summer vacationing at a lake, where she avoided hiking.

4. If Steven likes hiking, Felipe doesn't like basketball.

What is the favorite sport of each student?

The Theft

One day at noon, as the vice principal of the high school was getting ready to go to lunch, she discovered that her bag was missing from her desk. Only four students had been in her office that morning, so she called them in for questioning. She knew that three of these students always told the truth, but one of them consistently lied. When questioned, the students made the following statements:

Ray: "Denise did it."

Denise: "Abby did it."

Zack: "I didn't do it."

Abby: "Denise lied when she said I did it."

How did the vice principal know which student was guilty?

Naming the Ships

A passenger ship, a tanker, and a cargo ship are named S. S. *Adams,* S. S. *Kennedy,* and S. S. *Monroe,* but not respectively. Their ports of departure and destinations are Boston, Charleston, London, Miami, New York, and Philadelphia, listed alphabetically. The following facts are known about the ships:

1. The S. S. *Kennedy* arrived in Boston on the same day the passenger ship left London.

2. The S. S. *Adams* left Philadelphia with a cargo of steel and did not go to New York, although one of the others did.

3. The tanker met the ship going to Miami.

What are the names of the cargo ship, the passenger ship, and the tanker, and what are their respective ports of departure and destination?

The Poisoned Coffee

After a business meeting at a restaurant, four executives finished their lunch with some coffee. One of them, who had just finished her coffee, suddenly struggled to her feet and cried out, "I've been poisoned!" She then fell over, dead.

All the companions of the dead woman were arrested. When questioned by the police, each suspect made three statements, two of which were true and one of which was false. The statements were as follows:

Ms. Mason: "I was sitting next to Ms. Berg." "We had our usual waiter today." "I didn't do it."

Ms. Hernandez: "The waiter didn't do it." "I was sitting across the table from Ms. Wright." "We had a new waiter today."

Ms. Berg: "Ms. Mason lied when she said we had our usual waiter." "Ms. Hernandez didn't do it." "The waiter poisoned Ms. Wright."

If only these three businesswomen and the waiter were involved in the crime, who poisoned Ms. Wright?

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Grades 5–8
MATHEMATICS

Pre-Algebra

On March 4 of this year, Vermont became the 14th state to join the Union. To learn the year that Vermont became a state, just solve this puzzle.

- My hundreds and tens digits are odd numbers whose sum is 16 and product is 63.

- My hundreds digit is a prime number.

- The sum of all of my digits is the same as the number of months in $1\frac{1}{2}$ years.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

Louisiana became the 18th state of the Union on April 30 of this year. To learn the year that Louisiana became a state, just solve this puzzle.

- The two-digit number formed by tens and units digits could be the perimeter of this rectangle:
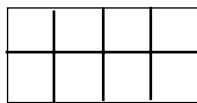
- My hundreds digit is 4 times my units digit.

- The three-digit number formed by my thousands, hundreds, and tens digits is a palindrome.

What year am I?

_____   _____   _____   _____
 Thousands   Hundreds   Tens   Units

Alabama became the 22nd state of the Union on December 14 of this year. To learn the year that Alabama became a state, just solve this puzzle.

- The two-digit number formed by my tens and units digits is the largest prime number less than 20.

- The two-digit number formed by my thousands and hundreds digits could be the area of this triangle:

- The sum of all of my digits is 19.

What year am I?

4

9
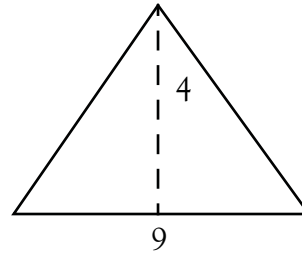
_____ _____ _____ _____
Thousands   Hundreds   Tens   Units

Michigan became the 26th state of the United States on January 26 of this year. Solve this puzzle to learn the year.

- The two-digit number formed by my tens and units digits is the largest prime number between 30 and 40.

- The sum of my thousands and hundreds digits is 1 less than the sum of my tens and units digits.

- The sum of all of my digits is the largest prime number less than 20.

What year am I?

_____   _____   _____   _____
 Thousands   Hundreds   Tens   Units

On September 9 of this year, California became the 31st state of the United States. Solve this puzzle to learn the year.

- My date is a multiple of 10.
- My hundreds digit is a cubic number.
- My tens digit is 3 less than my hundreds digit.
- The sum of all of my digits could be the perimeter of a square with sides of length 3.5.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

West Virginia became the 35th state of the United States on June 20 of this year. To learn the year of this event, just solve this puzzle.

- My prime units digit is 50% of my tens digit.

- My tens digit is equal to 3!.

- The sum of all of my digits is equal to $\dfrac{16 + 5(2) + \sqrt{100}}{2}$.

What year am I?

_____   _____   _____   _____

Thousands   Hundreds   Tens   Units

In this year, four more states were added to the Union—North Dakota, South Dakota, Montana, and Washington. North and South Dakota were admitted on the same day, November 2; Montana followed on November 8; and Washington was admitted three days later. Solve this puzzle to learn the year.

- My hundreds and tens digits are the same; they are the sixth number in the Fibonacci sequence.

- My units digit is equal to the sum of the first three odd numbers.

- The sum of all of my digits is the same as the number of letters in the English alphabet.

What year am I?

_____   _____   _____   _____

Thousands   Hundreds   Tens   Units

In this year, New Mexico and Arizona became the 47th and 48th states admitted to the Union. New Mexico became a state on January 6 and Arizona on February 14. To learn the year, just solve this puzzle.

- The two-digit number formed by my tens and units digits is the number of faces on a dodecahedron.

- The two-digit number formed by my hundreds and tens digits is equal to $1 + 2 + 3 + 4 + \ldots + 13$.

- The sum of all of my digits is the number of cards in each suit in a standard deck of playing cards.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

Nellie Tayloe Ross became the first woman to be elected a governor in the United States. She took the oath of office on January 5 of this year. The state was Wyoming.

- The product of my tens and units digits is equal to the sum of my hundreds and thousands digits.

- My tens and units digits are prime numbers, although the tens digit is even and the units digit is odd.

- The two-digit number formed by my tens and units digits could be the area of a square with a perimeter of 20.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

On January 21 of this year, the first law requiring that drivers of automobiles have licenses went into effect. To learn the year, solve this puzzle.

- The two-digit number formed by my tens and units digits is the 12th prime number and is considered normal body temperature when measured in degrees Celsius.

- My tens digit is $33\frac{1}{3}\%$ of my hundreds digit.

- The sum of all of my digits is the same as the number of triangles that make up an icosahedron.

What year am I?

_____   _____   _____   _____
   Thousands   Hundreds   Tens   Units

Maggie Walker became the first African-American woman to establish and manage a bank in this year. Solve this puzzle to learn the date.

- My units digit is the square root of my hundreds digit.

- The two-digit number formed by my hundreds and tens digits is equal to the sum of the first ten even numbers.

- The sum of all of my digits is equal to the number of doughnuts in a baker's dozen.

What year am I?

_____ _____ _____ _____
Thousands   Hundreds   Tens   Units

On March 2 of this year, the first school for the blind in America was established in Massachusetts. Solve this puzzle to learn the year.

- My hundreds digit is equal to 2^3 while my units digits is equal to 3^2.

- The digit in my tens place is equal to $2!$.

- The sum of all of my digits is equal to the number of equilateral triangles in an icosahedron.

What year am I?

_____ _____ _____ _____

Thousands   Hundreds   Tens   Units

On March 19 of this year, the swallows first returned to the old mission of San Juan Capistrano, California. To learn the year, solve this puzzle.

- The two-digit number formed by my hundreds and tens digits is equal to the product of the 4th and 5th prime numbers.

- My units digit is a perfect number.

- The sum of all of my digits is the same as the sum of the first six counting numbers.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

On April 19 of this year, the Battle of Lexington began the Revolutionary War. The first gunfire was called "the shot heard 'round the world." To learn the year, solve this puzzle.

- The two-digit number formed by my tens and units digits is the sum of the integers greater than or equal to 3 and less than or equal to 12.

- My hundreds digit is equal to $3^2 - 2^1$.

- The sum of all of my digits is equal to $\dfrac{7 + (6 \times 4) + 9}{2}$.

What year am I?

_____ _____ _____ _____
Thousands   Hundreds   Tens   Units

The first ocean-to-ocean railroad was

completed on May 10 of this year. The Union Pacific and Central Pacific railways were linked at Promontory Point, Utah, by a golden spike. Learn the year by solving this puzzle.

- My tens digit is 75% of my hundreds digit.

- My tens digit is $66\frac{2}{3}\%$ of my units digit.

- The sum of all of my digits is equal to 4!.

What year am I?

_____ _____ _____ _____
Thousands   Hundreds   Tens   Units

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On August 17 of this year, three Americans—Max Anderson, Ben Abruzzo, and Larry Newman—became the first to cross the Atlantic in a hot-air balloon. They traveled 3,200 miles in a little over 137 hours. Learn the year by solving this puzzle.

- My hundreds, tens, and units digits are consecutive integers that are out of order; their mean is 8.

- My hundreds digit is a square number, my tens digit is prime, and my units digit is cubic.

- The sum of all of my digits is equal to $\sqrt{625}$.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

Daily Warm-Ups: Pre-Algebra

On January 5 of this year, German physicist Wilhelm Roentgen announced the discovery of the X ray. Solve this puzzle to learn the year.

- The two-digit number formed by my thousands and hundreds digits is equal to $2 \times \sqrt{81}$.

- The two-digit number formed by my tens and units digits is the product of the third and eighth prime numbers.

- The sum of all of my digits is 2 less than 5^2.

What year am I?

_____   _____   _____   _____

Thousands   Hundreds   Tens   Units

On January 24 of this year, a gold nugget was found at the site of a sawmill owned by John Sutter near Colona, California. This discovery started the California Gold Rush. Learn the year by solving this puzzle.

- My even hundreds, tens, and units digits form a palindrome whose sum is 20.

- My hundreds digit is 200% of my tens digit.

- The sum of all of my digits is equal to the number of days in three weeks.

What year am I?

_____ _____ _____ _____
Thousands   Hundreds   Tens   Units

On March 18 of this year, Schick marketed the first electric razor. Learn the year by solving this puzzle.

- My hundreds digit is 300% of my tens digit.

- My units digit is the multiplicative identity element.

- The sum of all of my digits is equal to $-4 + 6 + 3 \times 2^2$.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

On April 20 of this year, Marie and Pierre Curie isolated the element radium. This husband-and-wife team was awarded the Nobel Prize for their work. Later, Marie Curie won a second Nobel Prize for her work in chemistry, making her the first person to win this prize twice. Even more amazing, Marie Curie's daughter, Irène Joliot-Curie, was also awarded a Nobel Prize for Chemistry. Solve this puzzle to learn the year radium was isolated.

- My units digit raised to the 3rd power would be 1 less than my hundreds digit.
- My tens digit is the additive identity element.
- The sum of all of my digits is equal to $2^2 \times 3$.

What year am I?

_____	_____	_____	_____
Thousands	Hundreds	Tens	Units

On April 26 of this year, Sarah Boone, one of the first African-American women to receive a patent, invented an improved ironing board. To learn the year of this invention, solve this puzzle.

- My hundreds and tens digits are consecutive integers with a sum of 17 and a product of 72.

- My units digit is 25% of my hundreds digit.

- The sum of all of my digits is the same as the number of triangular faces in an icosahedron.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

On May 24 of this year, the Brooklyn Bridge opened in New York City. It took 14 years to construct and cost over $16 million; it crosses the East River, connecting Brooklyn and Manhattan. This steel suspension bridge was designed by John Roebling and has a span of 1,595 feet. Solve this puzzle to learn the year.

- My hundreds and tens digits could be the sides of a square with a perimeter of 32 units.

- My units digit is the smallest odd prime number.

- The sum of all of my digits is equal to $2^2 \times 5$.

What year am I?

_____   _____   _____   _____
   Thousands   Hundreds   Tens   Units

On June 8 of this year, John McGaffrey patented the first suction-type vacuum cleaner. To learn the year, solve this puzzle.

- My hundreds and tens digits are even; my tens digit is $\frac{3}{4}$ of my hundreds digit.

- My units digit is odd; it is 150% of my tens digit.

- The sum of all of my digits is equal to two dozen.

What year am I?

_____ _____ _____ _____
Thousands   Hundreds   Tens   Units

Joseph Woodland and Bernard Silver received a patent for their invention, the bar code, in this year. A bar code is used for automatic identification and data collection. It eventually became what we now call a UPC symbol (Universal Product Code). Twenty-four years after it was invented, the first UPC scanner was used in a store. Solve this puzzle to learn the year of this invention.

- The two-digit number formed by my tens and units digits is equal to $3 + 4 + \ldots + 9 + 10$.

- My hundreds digit is equal to the sum of the first three odd integers.

- The sum of all of my digits is the seventh prime number.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

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Daily Warm-Ups: Pre-Algebra

On December 4 of this year, a painting in the Metropolitan Museum of Art in New York City was found to have been hung upside down. It had been in this embarrassing position for 47 days. Solve this puzzle to learn the year.

- My tens digit is $\frac{2}{3}$ of my hundreds digit.

- Both my thousands and units digits are the multiplicative identity.

- The sum of all of my digits is equal to the seventh prime number.

What year am I?

_____   _____   _____   _____

Thousands   Hundreds   Tens   Units

On January 15 of this year, Dr. Martin Luther King, Jr., was born. Dr. King was America's most famous civil rights leader, and he received the Nobel Peace Prize for his important work. To learn the year of his birth, just solve this problem.

- The two-digit number formed by my tens and units digits is a prime number and is 10 greater than the two-digit number formed by my thousands and hundreds digits.

- The sum of all of my digits is equal to the product of the second and fourth prime numbers.

What year am I?

_____ _____ _____ _____
   Thousands   Hundreds   Tens   Units

On February 5 of this year, African-American baseball player Hank Aaron was born in Mobile, Alabama. Aaron topped Babe Ruth's batting average and had a career total of 755 home runs. Solve this puzzle to learn the year this baseball great was born.

- My tens digit is $33\frac{1}{3}\%$ of my hundreds digit.

- The sum of my tens and units digits is 7.

- The sum of all of my digits is equal to $2 + \sqrt{4} + 3^2 + 2^2$.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

On February 15 of this year, Susan B. Anthony was born. A leader of the women's suffrage movement, she was arrested and fined for voting, which at the time was illegal for women. She was the first woman to appear on a United States coin. To learn the year she was born, solve this puzzle.

- My date is divisible by 2, 5, and 10.

- If my tens and hundreds digits were the sides of a rectangle, its area would be 16 square units and its perimeter would be 20 units.

- The sum of all of my digits is the fifth prime number.

What year am I?

_____   _____   _____   _____
  Thousands   Hundreds   Tens   Units

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On March 2 of this year, author and illustrator Dr. Seuss (Theodor Seuss Geisel) was born in Springfield, Massachusetts. (Can you name some of his popular books?)

- Both my hundreds and units digits are square numbers, but my hundreds digit is odd and my units digit is even.

- My tens digit is 1 less than my thousands digit.

- The sum of all of my digits is equal to the number of pints in 7 quarts.

What year am I?

_____   _____   _____   _____
Thousands   Hundreds   Tens   Units

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Word Problems

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Customary Measurement

A helium balloon rose to 500 ft and was blown sideways for about a mile. Then it went up 350 ft, came down 100 ft, and went up 400 ft. What is the highest altitude the balloon reached?

Customary Measurement

Melosa had 2 lb of raisins. She ate 4 oz of them. What fraction of the raisins did she eat?

Customary Measurement

By tradition, horse races are measured in furlongs. A furlong is $\frac{1}{8}$ of a mile. How long is a 5-furlong race in miles?

Customary Measurement

A rectangle is 4 ft by 9 ft. What is the perimeter of a square that has the same area as the rectangle?

Customary Measurement

By tradition, the height of a horse is measured in hands and inches. A hand is 4 in, which is roughly the width of a grown man's hand. Horses are measured from the ground to the highest point of the withers, the ridge between the shoulder bones at the base of the neck. If a horse is 15 hands 2 in tall, how tall is the horse in feet and inches?

Customary Measurement

Hayley wants to cover the floor of her room with tiles that are 1 ft square. The floor is 12 ft by 20 ft, including a closet that is 3 ft by 3 ft. The floor of the closet will not be covered with tile. How many squares of tile does she need?

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Customary Measurement

Typesetters measure lines of type in picas. A pica is about 4 mm or $\frac{1}{6}$ of an inch. A story that you wrote has 1,581 characters (letters, punctuation marks, and spaces between words) in it. It is going to be printed in a book in type that averages 2.45 characters per pica. Each line of type in the book will be 30 picas long. There will be 28 lines of type on each page. How many pages of the book will it take to print your story?

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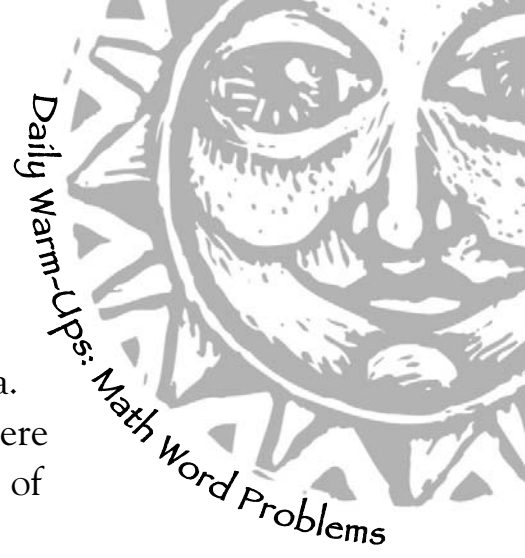
Customary Measurement

An airplane flew from Asmara, Ethiopia, where the latitude is 15° North, to Tananarive, Madagascar, where the latitude is 19° South. What is the difference in latitude between the two cities?

Metric Measurement

A group of mountaineers climbed to the summit of Mount Everest, which is 8,850 m above sea level. How far did they have to climb down to return to the base camp at 5,300 m?

Metric Measurement

Heike Drechsler of Germany won the gold medal in the women's long jump at the 2000 Olympics in Sydney, Australia. She jumped 6.99 m. Four years earlier, Chioma Ajunwa of Nigeria won by jumping 7.12 m in the same event. How much farther in centimeters did Ajunwa jump than Drechsler?

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Metric Measurement

The paper size commonly used in Europe for business letters, documents, and books is 210 mm by 297 mm. What is the area of a sheet of paper of that size?

Metric Measurement

In May 2001, the Ukraine produced 1.468 Gm^3 of natural gas. In May 2002, the Ukraine produced 1.534 Gm^3. How much more natural gas did they produce in May 2002 than in May 2001?

168

Metric Measurement

The speed limit on major highways in Germany is
130 km/hr. How fast is that in miles per hour?
(1 km = 0.6 miles)

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Metric Measurement

The white keys on Lesley's piano are 2 cm wide. The black keys are 1 cm wide. If an octave has 7 white keys and 5 black keys, how wide is an octave? (Imagine that the keys are side by side.)

Time Measurement

Amy, Barbara, Charlie, David, and Everett all play the drums. Amy beats her drum once every second; Barbara, every other second; Charlie, every third second; David, every fourth second; and Everett, every fifth second. If they all start by beating their drums together at the first second, how long will it take before they all beat their drums together again?

Time Measurement

The school bus comes to pick up Bailey at 7:30 A.M. It takes him 10 min to get up and get dressed, 20 min to have breakfast, and 15 min to walk to the bus stop. What time does he have to get up?

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Time Measurement

Darcy's band's new CD has 13 songs on it. The playing times of the songs are 5:23, 5:48, 5:51, 5:27, 5:52, 5:56, 4:33, 3:45, 5:25, 5:30, 5:27, 6:14, and 5:59. (5:23 means 5 min 23 sec.) What is the total playing time of all the songs on the CD?

Money

Mr. Morgan wanted Oswald to do some work for him. Oswald made the following agreement with him. "I'll work for you for 10 days," Oswald said. "You only have to pay me $1 for the first day, $2 for the second day, $4 for the third day, and so on." How much did Mr. Morgan have to pay Oswald for the 10 days?

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Money

Ryan owns a clothing store. He bought two jackets in the same style. The list price was $80 each. He bought them at 45% off list price. He sold one for full list price right away, but the other one didn't sell for a long time. He marked it down and ended up selling it for $5 more than he paid for it. How much profit did he make on the two jackets combined?

Money

According to her October 5 statement, Felicia owes $500 on her credit card account. She sends in the minimum payment, which is $10. It arrives just before the November 5 statement is printed. The credit card company charges 18% per year ($1\frac{1}{2}$% per month) for a finance charge. What will the balance be on her November 5 statement? As a percentage, what part of the $10 payment went to pay interest rather than reduce Felicia's balance?

Money

One bottle of a certain soft drink costs $1.25. A case of 24 costs $25. As a percentage, how much do you save by buying by the case?

Money

Ray rented a car for 5 days. The charge was $55 per day plus a 10% surcharge for not returning the car to the same place where he originally got it. How much did he have to pay to rent the car?

Money

Darcy's band played in a concert. Her agreement with the theater was that the band would get 50% of gross ticket sales with $300 guaranteed. (Gross sales means total sales before any expenses are deducted.) The theater sold 98 tickets at $12 each. How much was the band paid?

Money

Martin put $123 in a savings account and left it there for 3 years. It earned interest at 2% per year compounded annually. What was the balance after 3 years?

Money

Ling has 81 dimes and 29 quarters. How much money does she have?

Money

Taylor had a balance in her checking account of $857.11. She wrote a check for $89.23 and a check for $29.92. What was her new balance?

Counting

There are 895 students at the King School. There are 33 more girls than there are boys. How many girls are there?

Counting

Agnes's father is 6 times as old as she is. In 4 years, he will be 4 times as old. How old are they now?

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Counting

Gertrude has a fruit store. She likes to display oranges by stacking them up in a pyramid with 1 orange on top supported by 4 oranges underneath it, which are supported by 9 oranges underneath them, and so on. She stacks the oranges up 7 layers high. How many oranges are there in the display?

Counting

In an election, Ms. Duval got 534 votes, Mr. Smith got 507, and Mr. Fennig got 88. What percent of the vote did the winner get?

Counting

In a box of 36 chocolates, $\frac{1}{3}$ of them are white; the rest are brown. If 1 white chocolate and 3 brown chocolates are eaten, what fraction of the remaining chocolates will be white?

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Counting

Eggs are usually sold to consumers by the dozen in cartons that hold a rectangular array of two rows of six eggs in each row.

An egg company wants to sell eggs to restaurants in rectangular cartons that hold 90 eggs. A carton that holds one row of 90 eggs would be too difficult to handle. What other rectangular arrays of 90 eggs are possible?

Counting

If you have 13 blocks, you can stack up 12 of them to make a 2-by-2-by-3 rectangular solid with more than one block on every side. But you cannot make a rectangular solid with more than one block on every side using all 13 blocks. If you have 19 blocks, what is the greatest number of blocks you can stack up to make a rectangular solid with more than one block on every side?

Counting

Kendra had 24 worms. She used 3 as bait. She gave away 5 to a friend. Some of them fell into the water when she accidentally knocked the bait can over. She had 10 left. How many fell into the water?

Probability

There are 75 gumballs in a bag. There are 30 red gumballs, 20 green, 15 yellow, 5 blue, and 5 orange. If you reach into the bag without looking and take out 2 gumballs, what is the probability that one of them will be green?

Probability

There are 75 gumballs in a bag. There are 30 red gumballs, 20 green, 15 yellow, 5 blue, and 5 orange. If you reach into the bag without looking, what is the probability that you will get a gumball that is not green?

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Probability

A standard deck of playing cards has 52 cards. No two cards are alike. Each card has both a value and a suit. There are 4 suits: hearts, diamonds, clubs, and spades. Each suit has 13 cards in it with values of 2, 3, 4, 5, 6, 7, 8, 9, 10, jack, queen, king, and ace. If you choose a card at random, what are the chances that you will choose a heart?

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Probability

A standard deck of playing cards has 52 cards. No two cards are alike. Each card has both a value and a suit. There are 4 suits: hearts, diamonds, clubs, and spades. Each suit has 13 cards in it with values of 2, 3, 4, 5, 6, 7, 8, 9, 10, jack, queen, king, and ace. If you choose 2 cards at random, what are the chances that you will choose 2 kings?

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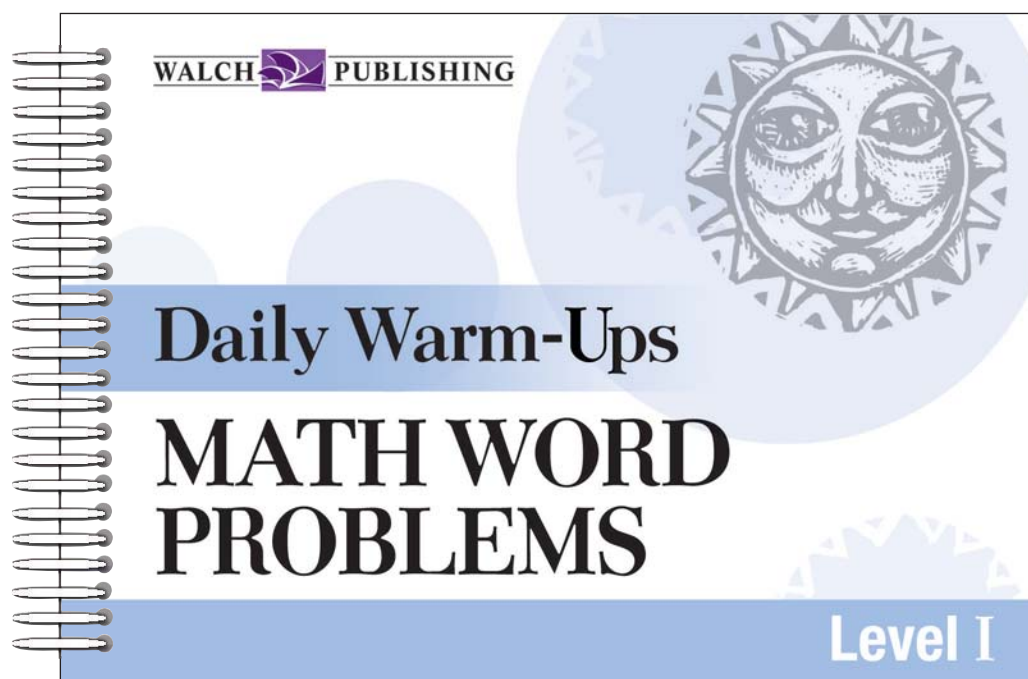To purchase the entire Daily Warm-Ups book on this topic
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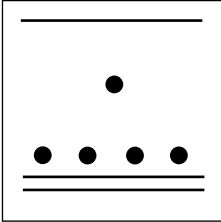
Answer Key

Algebra

6. Tennessee became a state in 1796.
7. Mississippi became a state in 1817.
8. Missouri became a state in 1821.
9. Iowa became a state in 1846.
10. Oregon became a state in 1859.
11. Nebraska became a state in 1867.
12. Utah became a state in 1896.
13. The women became FBI agents in 1972.
14. Hattie Caraway became the first woman United States Senator in 1932.
15. Justice Brandeis was appointed in 1916.
16. *American Magazine* was published in 1747.
17. The parachute jump was made in 1912.
18. Hank Aaron hit the home run in 1974.
19. Gwendolyn Brooks won the Pulitzer Prize in 1950.
20. Sally Ride's mission was in 1983.
21. The newspaper was published in 1690.
22. The accordion was patented in 1854.
23. The tomb was opened in 1923.
24. Jonas Salk introduced the polio vaccine in 1953.
25. The disposable diaper was invented in 1950.
26. The Simplon Tunnel opened in 1906.
27. The Dionne quintuplets were born in 1934.
28. The wheat reaper was patented in 1834.
29. The *Spruce Goose* made its flight in 1947.
30. Paul Revere was born in 1735.
31. Maria Tallchief was born in 1925.
32. Grant Wood was born in 1892.
33. Copernicus was born in 1473.
34. Luther Burbank was born in 1849.
35. North Carolina became a state in 1789.

Brain Teasers

38. 1,055,555 (first swipe—10, second swipe—100 + 5, third swipe,—1,000 + 50 + 5, fourth swipe—10,000 + 500 + 50 + 5, fifth swipe—100,000 + 5,000 + 500 + 50 + 5, sixth swipe—1,000,000 + 50,000 + 5,000 + 500 + 50 + 5)

39.

(5 years)

(1 month)

($5 \times 2 + 4 = 14$ days)

40. Great-aunt (The only choices are an aunt or a grandmother. Since chick 602 is not in a vertical line with chick 2, chick 2 must be an aunt. From the number of generations between the chicks, chick 2 is a great-aunt.)
41. Two palindromic combinations of the digits 1 through 4 added together will make a palindrome. Sample answer: 1441 + 2332 = 3773
42. A shoe (Mallard has completed 5 cycles of chewing on the items and has begun the sixth cycle. He is chewing on the second item, which is a shoe.)
43. The greatest number possible is 10.
44. 10 turns (additional rocks on the beach after each turn: 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10; number of rocks on the beach: 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 55)
45. 2 (Each horizontal row adds up to 1 more than the row above. So, the last row must add up to 12.)
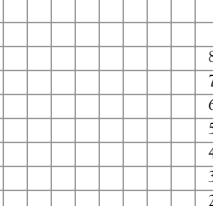
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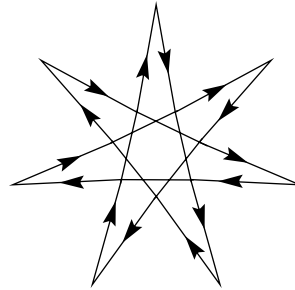
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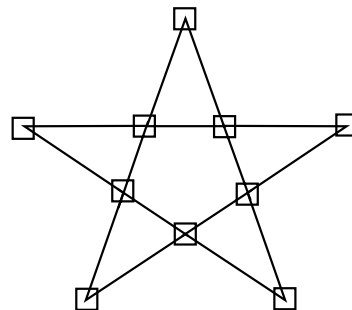
48. 32 (The 9th person is opposite the 25th. Since 25 – 9 = 16, there are 16 people in half the circle, so there are 32 people in the whole circle.)
49. Rectangular covers could fall through the holes. (Because the diagonal of a rectangle is always longer

Answer Key, continued

than either of its sides, a rectangular cover could be dropped through the hole if it was dropped at an angle, despite the protruding lip. However, because a circle is the same width all around, a circular cover cannot fall through the hole, because the lip makes the hole smaller than any part of the circle.)

50. 7

51. 17 feet (The angle between the telephone pole and the ground is 90°, and if one of the angles is 45°, the other angle must also be 45°. This is an isosceles right triangle. Thus, two of the sides are equivalent in length. Use the Pythagorean theorem to find the length of the third side.)

52. 44 sq units

(Break the irregular form into recognizable geometric shapes, and use the appropriate formulas to find the area of each shape. For triangles, $A = \frac{1}{2}bh$, and for squares, $A = s^2$. Adding the areas gives 6 + 8 + 6 + 8 + 16 = 44 square units.)

53.

54.

55.

56. 6 (One solution: move 1: np_pnpn; move 2: npppn_n; move 3: npp_npn; move 4: ppnnpn_; move 5: pp_nnpn; move 6: pppnnn)

57. 8 (1 half-dollar, 1 quarter, 2 dimes, 4 pennies)

58. Yes (The table shows all the possible combinations. If the 15-cent shell includes a dime and a penny, then the last combination in the table must be the actual one.)

5¢	15¢	20¢
5 pennies	3 nickels	2 dimes
5 pennies	1 dime and 1 nickel	1 dime and 2 nickels
1 nickel	2 nickels and 5 pennies	2 dimes
1 nickel	1 nickel and 1 dime	1 dime, 1 nickel, and 5 pennies
1 nickel	1 dime and 5 pennies	1 dime and 2 nickels

Answer Key, continued

59. $885 (Starting with .05 per week in January and doubling the weekly amount every month, Eva will receive (.05 × 4) + (.10 × 4) +(.20 × 4) + (.40 × 5) + (.80 × 4) + (1.60 × 5) + (3.20 × 4) + (6.40 × 4) + (12.80 × 5) + (25.60 × 4) + (51.20 × 5) + (102.40 × 4) = .20 + .40 + .80 + 2.00 + 3.20 + 8.00 + 12.80 + 25.60 + 64.00 + 102.40 + 256.00 + 409.60 = 885.00)

60. 13 (1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13 = 91)

61. 9, 6, and 2 quarters (The total of the quarters plus the token is used. 18 quarters × $\frac{1}{2}$ = 9 quarters, 9 go into the college savings account. 18 × $\frac{1}{3}$ = 6 quarters, 3 quarters go toward a CD player. Finally, 18 × $\frac{1}{9}$ = 2 quarters, 2 quarters are spent on something fun. The remaining coin is the token.)

62. 4 days with no rental and 5 days with a rental

Day	1	2	3	4	5	6	7	8	9
No Rental	+$10	+$10	+$10	+$10					
Rental					–$8	–$8	–$8	–$8	–$8

63. No (He will cover the same terrain, just in reverse order.)

64. On a clock (11$\frac{1}{2}$ hours added to 1:30 is 1:00.)

65. 750 miles (Since the four wheels of the three-wheeled cart share the journey equally, each wheel covers three fourths of the total distance. 1000 × .75 = 750.)

66. 2 gallons + 1 quart, 6 gallons + 1 quart (The number of the bucket is squared to give the number of quarts, and then the number of quarts is simplified to find the number of gallons.)

Bucket	1	2	3	4	5	6
Number of quarts	1	4	9	16	25	36
Sizes	1 quart	1 gallon	2 gallons + 1 quart	4 gallons	6 gallons + 1 quart	9 gallons

67. The weight that was dropped into the container at 45° C would hit the bottom first. (The water in the second container would be frozen solid.)

68. Phillip was traveling toward the South Pole in a straight line. He traveled 1 mile south to the South Pole, crossed over the Pole, and then, still maintaining his straight line, began going north.

69. 1:50 P.M. (The malfunctioning clock loses 10 seconds per minute, and there are 60 minutes in one hour, so the clock has lost 10 × 60 = 600 seconds, or 10 minutes.)

70. If she places all the quarters in one bag and all the dimes in the other, the probability of the teacher drawing a dime is 1/2.

71. All the even numbers, with the same number for both items.
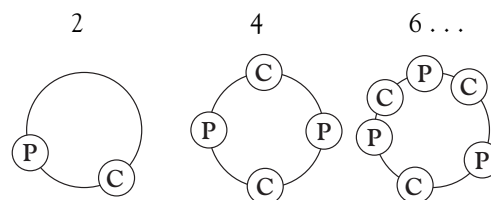
72. 9 combinations (3 single cones, 6 double cones when repeated combinations are subtracted)

73. 4 mittens (There are 3 colors. Even if the first 3 mittens are all of different colors, the fourth mitten must match one of the first 3.)

74. Phantom, rock star, dragon, mermaid, vampire, jack-in-the-box

75. Answers will vary. Here is one solution:

76. 5 hours and 25 minutes (The amount of time it takes to fly from New York to Los Angeles has not changed.)
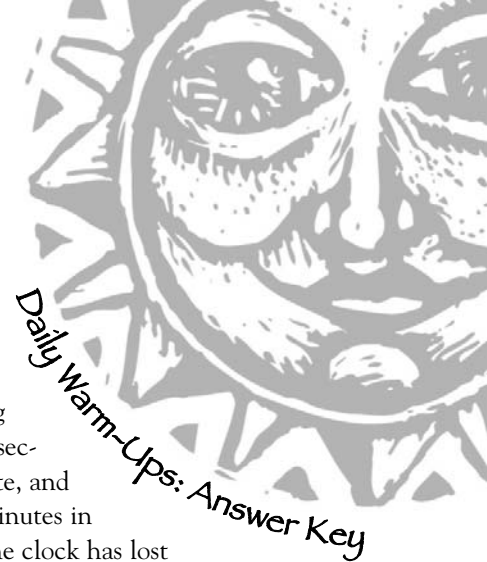
Answer Key, continued

77. π (The circumference of the smaller wheel is

$C = \pi \left(\frac{7}{22} d \right) = \frac{22}{7} \times \frac{7}{22} \times d = d$. The circumfer-

ence of the larger wheel is $C = \pi d$. So, the larger

wheel circumference is larger by a factor of π.)

Geometry & Measurement

80. Students will circle and label right, obtuse, and
    acute angles. All letters are made up of right angles,
    except for A, which includes obtuse and acute.

81.
1. ray   6. line segment
2. line   7. ray
3. ray   8. ray
4. ray   9. ray
5. line   10. ray

82.
1. right   8. acute
2. obtuse   9. acute
3. acute   10. obtuse
4. obtuse   11. obtuse
5. obtuse   12. acute
6. obtuse   13. acute
7. acute   14. right

83.
1. translation
2. reflection
3. rotation
4. Answers will vary. Sample answer: on the comput-
   er, decorating, creating symmetry

84.
1. 37 cm   7. 32 cm
2. 36 cm   8. 20 cm
3. 32 cm   9. 36 cm
4. 32 cm   10. 48 cm
5. 23 cm   11. Answers will vary.
6. 38 cm

85.
1. 13   6. 22
2. 6   7. 12
3. 10   8. 121
4. 8   9. 16
5. 8

86.
1. 9   4. 14
2. 26   5. 20
3. 18

87.
1. 42 ft2
2. 13 in2
3. 31 in2
4. 36 in2

88.
1. 26 cm2
2. 20 cm2
3. 90 cm2
4. 108 cm2
5. 24 cm2
6. 70 cm2
7. 21 cm2
8. 50 cm2
9. 49 cm2
   Riddle answer: A cartoon!

89.
   Answers will vary.

90.
1. rectangle
2. triangle, rectangle, square, trapezoid
3. rectangle, square, trapezoid
4. Answers will vary.

91.
1. 31.4   4. 113.04
2. 43.96   5. 25.12
3. 28.26

92.
1. 94.2 cm2
2. 200.96 cm2
3. 251.20 cm2

93.
1. 288 cm2   3. 190 cm2
2. 128 cm2   4. 216 cm2

94.
1. 320 cubic feet
2. 15'33'33'
3. 1,080 cubic inches, 6,480 cubic inches

95.
1. 167 cubic inches
2. 268 cubic inches
3. 42.39 cubic inches
4. 480 cubic cm

96.
1. 1.3 km
2. 1 km
3. 1.75 km

Answer Key, continued

97.

1. .5	6. 84
2. 10,000	7. 9
3. 8,100	8. 3
4. 920	9. 4 yd 1 ft
5. .18	10. 1,200

98.

1. 5,000	9. 24,000
2. 4,000	10. 30,000
3. 8,000	11. 1,500 ml
4. 6,000	12. 4,000 ml
5. 10,000	13. 3,750 ml of water
6. 14,000	14. They are equal.
7. 12,000	15. 3,784 ml
8. 16,000	

99.

1. 300	11. 1,100
2. 290	12. 1,800
3. 70	13. 10
4. 270	14. 7
5. 4,000	15. 7,000
6. 8	16. 150
7. 2,150	17. 20,000
8. 390	18. 2,000
9. 5	19. 220
10. 10,000	20. 48,000

Logic

101. Sally asked, "Did your twin come with you this evening?" If the response was *yes*, she would know that the visitor was not telling the truth; if the response was *no*, she would know that the visitor was her boyfriend.

102. Ms. Chang is not the counselor, Mr. Pejcek is not the principal, and Ms. Taylor is not the teacher. Mr. Pejcek is also not the counselor, so he must be the teacher. Since Ms. Chang is not the teacher, she must be the principal. By elimination, Ms. Taylor is the counselor.
    Summary: Ms. Chang—principal, Mr. Pejcek—teacher; Ms. Taylor—counselor

103. Michelle doesn't walk with Ben, Mark, or Ramon (1, 4); therefore, she must walk with Ahmed. Keisha doesn't walk with Ben, Mark, or Ahmed (3); (who's walking with Michelle), so she walks with Ramon. Maddie doesn't go with Ben (2), Ahmed, or Ramon, so she walks with Mark. Thus, Cara walks with Ben.
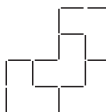   **Summary:** Cara goes with Ben; Keisha goes with Ramon; Michelle goes with Ahmed; Maddie goes with Mark.

104. *bookkeeper*

105. The bottle is worth 50¢.

106 . Since two pounds of $10 gold pieces contain twice as much gold as a pound of $20 gold pieces, they are worth twice as much.

107. an echo

108.

109.

110. four boys and three girls

111. The mother of the young man and his sister has a brother, who is the father of the woman in the picture. The woman in the picture is, therefore, a first cousin of the brother and sister.

112. He removed a pencil from his coat pocket, extended part of it *through the small hole* in the paper, and with the pencil gently pushed the hat.

113. Cross out all three 9s, one of the ls, and two of the 7s. This leaves 11 and 7; their sum is 18.

114. Polar bears are native to the Arctic regions; penguins are native to the Antarctic regions.

115. Perhaps the first thing to do is to get a straight edge (the edge of a sheet of paper will do) and determine which line is extended. Measuring is the only accurate way to verify distances and the positions of the lines. Sometimes we can't believe what we see.

116. The man first takes the goat across, leaving the wolf and the carrots. He then comes back and gets the wolf, which he takes to the other side, returning with the goat. Next, he leaves the goat and takes the carrots to the other side. Finally he comes back and gets the goat.

117. They will first fill the five-liter jar, then fill the three-liter jar from it. This will leave two liters in the five-liter jar. Next, they will empty the three-liter jar back into the juice jug. Then they will pour the two liters from the five-liter jar into the three-liter jar. After filling the five-liter jar again from the jug, they will finish filling the three-liter jar from the five-liter jar. This will leave four liters in the

five-liter jar, or half the juice.

118. The "missing" $8 is a matter of faulty bookkeeping presented in the puzzle. The hotel manager received $240 from the three journalists. She kept $200; her son kept $16, and the guests were returned a total of $24; this accounts for all of the money.

119. According to statement 1, Hamdi is in a class below Chelsea, and Chelsea is in a class below Luisa. According to statement 2, Luisa is in a class below Josh. Thus, Hamdi is a freshman, Chelsea is a sophomore, Luisa is a junior, and Josh is a senior.

120. Statement 1 means that Becca's favorite sport is not basketball; Felipe's is not fishing, Hilary's is not hiking, and Steven's is not soccer. If Felipe and Hilary like team sports (2), then Becca and Steven must like fishing and hiking. Becca's favorite sport must be fishing (3) since she avoids hiking, so Steven's favorite sport is hiking. Since Steven does like hiking, then Felipe must not like basketball (4) and therefore must like soccer. By elimination, Hilary's favorite sport is basketball.
Summary: Becca—fishing, Felipe—soccer, Hilary—basketball, Steven—hiking.

121. Since only one of the four is guilty, than either Ray or Denise is lying. Since Zack and Abby must be telling the truth, then Denise is lying and is guilty.

122. Since the S. S. *Kennedy* is neither the passenger ship that leaves London nor the cargo ship (which is the S. S. *Adams*), the S. S. *Kennedy* must be the tanker. The name of the passenger ship is therefore S. S. *Monroe*. If the tanker (S. S. *Kennedy*) met the ship going to Miami, and if the *Kennedy's* destination was Boston, then its port of departure must have been Charleston. This means that the S. S. *Monroe* goes to New York from London, and that the S. S. *Adams* is the ship heading to Miami (from Philadelphia).
Summary: S. S. *Adams*—cargo ship, Philadelphia to Miami; S. S. *Kennedy*—tanker, Charleston to Boston; S. S. *Monroe*—passenger ship, London to New York

123. The waiter can't be guilty, since all of Ms. Berg's statements would be true. Ms. Hernandez is not guilty, since Ms. Berg's second and third statements would be false. Ms. Mason is not guilty, since either she or Ms. Hernandez would have two false statements. Ms. Berg is the guilty person.

Pre-Algebra

126. Vermont became a state in 1791.
127. Louisiana became a state in 1812.
128. Alabama became a state in 1819.
129. Michigan became a state in 1837.
130. California became a state in 1850.
131. West Virginia became a state in 1863.
132. North Dakota, South Dakota, Montana, and Washington became states in 1889.
133. New Mexico and Arizona became states in 1912.
134. Nellie Tayloe Ross became the first woman governor in 1925.
135. Driver's licenses were required in 1937.
136. Maggie Walker became a bank manager in 1903.
137. The school for the blind was opened in 1829.
138. The swallows first returned in 1776.
139. The Battle of Lexington took place in 1775.
140. The railroad was completed in 1869.
141. The balloon crossing occurred in 1978.
142. The X ray was discovered in 1895.
143. Gold was discovered in 1848.
144. The electric razor was patented in 1931.
145. Radium was isolated in 1902.
146. Sarah Boone invented her ironing board in 1892.
147. The Brooklyn Bridge was opened in 1883.
148. The vacuum cleaner was patented in 1869.
149. The bar code was patented in 1952.
150. The painting was hung in 1961.
151. Dr. Martin Luther King, Jr., was born in 1929.
152. Hank Aaron was born in 1934.
153. Susan B. Anthony was born in 1820.
154. Dr. Seuss was born in 1904.

Word Problems

157. 500 ft + 350 ft – 100 ft + 400 ft = 1,150 ft
158. 2 lb × (16 oz/lb) = 32 oz. 4 oz/32 oz = 1/8
159. 5 furlongs × ($\frac{1}{8}$ mile/furlong) = $\frac{5}{8}$ mile
160. Area = 4 ft × 9 ft = 36 ft^2 = 6 ft × 6 ft
Perimeter of square = 4 × 6 ft = 24 ft
161. 15 hands × (4 in/hand) × (1 ft/12 in) + 2 in = 5 ft 2 in
162. (12 ft × 20 ft) – (3 ft × 3 ft) = 240 ft^2 – 9 ft^2 = 231 ft^2 = 231 tiles

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Answer Key, continued

163. (1,581 cc)/(2.45 cc/pica) = 645 picas. 645 picas/(30 picas/line) = 21.5 lines. The whole story will fit on one 28-line page.

164. 15° − (−19°) = 34°

165. 8,850 m − 5,300 m = 3,550 m

166. 7.12 m − 6.99 m = 0.13 m = 13 cm

167. 210 mm × 297 mm = 62,370 mm²

168. 1.534 Gm³ − 1.468 Gm³ = 0.066 Gm³

169. 1 km = 0.6 miles. 130 km/hr × (0.6 km/mile) = 78 miles/hr

170. 7 × 2 cm + 5 × 1 cm = 14 cm + 5 cm = 19 cm

171. 59 seconds. They will all beat together on the 60th beat. (60 is the least common multiple of 1, 2, 3, 4, and 5.)

172. 7:30 A.M. − 10 min − 20 min − 15 min = 7:30 A.M. − 45 min = 6:45 A.M.

173. 5:23 + 5:48 + 5:51 + 5:27 + 5:52 + 5:56 + 4:33 + 3:45 + 5:25 + 5:30 + 5:27 + 6:14 + 5:59 = 63:490 = 71:10

174.
Day	Pay (in $)
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128
9	256
10	512
Total	$1,023

175. $80 + [$80 × (1 − 0.45) + $5] − 2 × $80 × (1 − 0.45) = $41

176. $500 × 1.015 − $10 = $497.50. $7.50 or 75% went to pay interest.

177. (24 × $1.25 − $25)/(24 × $1.25) = $16\frac{2}{3}$ %

178. 5 × $55 × 1.10 = $302.50

179. 98 × $12 × 0.50 = $588

180. $123 × (1.02)³ = $130.53

181. 81 × $0.10 + 29 × 0.25 = $15.35

182. $857.11 + −$89.23 + −$29.92 = $737.96

183. g = number of girls. g + (g − 33) = 895. 2g − 33 = 895. 2g = 928. g = 464. There are 464 girls.

184. f = father's age. a = Agnes's age. f = 6a. f + 4 = 4(a + 4) = 4a + 16. Substituting, 6a + 4 = 4a + 16. 2a = 12. a = 6. f = 36. Agnes's father is 36. Agnes is 6.

185. 1 + 2² + 3² + 4² + 5² + 6² + 7² = 140 oranges

186. 534/(534 + 507 + 88) = 47%

187. ($\frac{1}{3}$ × 36 − 1)/(36 − 4) = $\frac{11}{32}$

188. 2 by 45, 3 by 30, 5 by 18, 6 by 15, 9 by 10

189. 18 or 2 by 3 by 3

190. 24 − 3 − 5 − 10 = 6 worms

191. (20 greens/75 gumballs) + (19 greens/74 gumballs) = $\frac{581}{1,110}$, or about 52%

192. (75 gumballs − 20 greens)/75 gumballs = $\frac{11}{15}$, or about 73%

193. 13 hearts/52 cards = $\frac{13}{52}$ = $\frac{1}{4}$ = 25%

194. The probability that the first card you pick will be a king is $\frac{4}{52}$. If you get a king on your first pick, the probability of getting a king on your second pick is $\frac{3}{51}$. The probability of picking a king both times is $\frac{4}{52}$ × ($\frac{3}{51}$) = $\frac{12}{2,652}$ = $\frac{1}{221}$, or about 0.45%.

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