

Digital Lesson.com Presents

Marvelous

Middle School

Math

Number Sense Activities

x^2

π

1000%

%

$\sqrt{4}$

By Mark P. Tully

Mark Tully is a mathematics teacher at Oak Middle School in the Los Alamitos Unified School District, Los Alamitos, California. He has been teaching for about 25 years and during that time has served as Mathematics Department Chairman and as a Mathematics Mentor Teacher. He enjoys developing activities that are designed to present the prescribed mathematics curriculum and standards in a way that is active and engaging.

Mark's website, www.DigitalLesson.com, is designed to meet the needs of middle school math teachers. It specializes in providing instant, inexpensive, and engaging math lessons and projects to enhance the middle school math program. Also included on the site are other math resources tailored to the middle school math teacher.

Mark also publishes the *Middle School Math Treasures* newsletter. The newsletter includes resources, ideas, and activities for middle school math teachers. A subscription *to Middle School Math Treasures* is free! Sign up on the home page of Digital Lesson.com. Unsubscribe at any time. We will never rent or sell your e-mail address. Enjoy this great, free resource!

We would love to hear about your experiences using this book, *Number Sense Activities*, in your classroom. Please e-mail us with any comments at digitallesson@yahoo.com.

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Preface

Digital Lesson.com is dedicated to being a valuable resource for middle school math teachers who not only want to excel in the teaching of mathematics, but also want to deliver the mathematical curriculum in a manner that engages and involves students. The collection of lessons and projects in this book strive to place mathematics into an active context that is inherently interesting.

Instant

The lessons and projects at Digital Lesson.com are instantly available. Upon receipt of payment, your lesson or project is automatically sent to you via e-mail. Save your lesson file to your computer for later use. Then, just “Print and Present” your lesson. No more waiting for delivery and no shipping costs.

Engaging

Our math lessons and projects offer students an interesting way to connect to the mathematics prescribed by your required curriculum. Hands-on activities and contextual lessons heighten the sense of usefulness and purpose students find in their mathematics.

Teacher Friendly

All blackline masters for the math lessons and projects are included. We have seen far too many great ideas for lessons on the internet that would take hours of time and effort to format before actually being able to use them. All of our lessons come ready to implement in your classroom immediately. Just make a few copies and get ready to inspire your students!

Teacher Tips are provided with each lesson to eliminate as many of the “Oh, I’ll do that differently next time,” moments as possible. The goal of the *Teacher Tips* is to make you an expert in the lesson BEFORE you teach it, not after. Too many lesson plans and projects that we have seen and received over the years leave it up to teachers to use trial and error before they ever teach the lesson effectively. The tips will immediately empower the teacher to teach the lesson more effectively.

Standards Based

Finally, the math lessons and projects on Digital Lesson.com have been designed to specifically meet the NCTM math standards and state math standards that teachers are expected to teach. Our intent is to provide more engaging activities, while still covering the same mathematical standards as the textbook. The lessons are intended to be served a la carte, to fill in curriculum holes or just to infuse some excitement and activity into your classroom as you teach a familiar math standard.

Wishing you inspiration and motivation to be the best math teacher you can be!

Mark Tully

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The Creative Equations Project is a group math project that requires students to create equations with a variety of solutions from four given numbers. In the process, students manipulate the given numbers using many mathematical symbols. The project helps students to become fluent in the use of Order of Operations. It includes work with square roots, factorials, the proper use of parentheses in equations, and all operational symbols.

7. Math Madness Classroom Mathematics Tournament.....72

Math Madness is a classroom mathematics tournament (that can be run simultaneously with the NCAA Basketball Tournament) that involves problem solving and chance. Students try to become the class champion by solving increasingly more complex math problems.

Students are also assigned one or more teams in the NCAA Basketball Tournament to root for. This part of Math Madness is purely for fun and to create a “buzz” of interest during the tournament.

8. Grade Sheet Fractions, Decimals, and Percents Lesson.....83

The Grade Sheet Lesson is a resource that enables students to track their grade in a class based on total points. Three sets of fictional grades help students transition from points received out of a point total (fractions) to decimals and finally to percents. Whether or not students actually use the Grade Sheet in class, this lesson powerfully demonstrates the effect of each grade on the total class grade of a student. It provides great practice in solidifying the concepts of fractions, decimals, and percents .

9. Who Has Cards Activity.....92

Who Has Cards is an activity that requires students to solve 40 mental math problems in a matter of minutes as they take part in this fun review activity. Each student is given one or more cards with a mental math problem and an answer to another problem. One student starts by reading his “Who Has...?” card and then the student with the answer on his card will say, “I have ___” and then read the problem on his card. The activity continues until all 40 cards have been completed. This activity is perfect for reviewing a concept that has been taught recently or for general review.

Amateur



Architect



Amateur Architect - Ruler Skills 1

Measuring Line Segments

Measure each line segment to the nearest $\frac{1}{16}$ " and write the length in the box under the segment. Use mixed numbers when appropriate and write each number in simplest form.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____





Answer Key

Amateur Architect - Ruler Skills 2

Drawing Line Segments

Place a point at the beginning of each line segment. Then measure the given distance from the starting point and place an endpoint. Finally, shade in the segment between the two points. *(Exchange papers and correct. Segments should be within 1/16".)*

1) $4 \frac{5}{16}$ "

2) $1 \frac{7}{16}$ "

3) $5 \frac{3}{16}$ "

4) $2 \frac{1}{8}$ "

5) $3 \frac{3}{4}$ "

6) $5 \frac{1}{16}$ "

7) $4 \frac{1}{2}$ "

8) $3 \frac{5}{8}$ "

9) $\frac{15}{16}$ "





Amateur Architect

Use the following directions to construct your street, curb, house, and garage.
(NOTE: All dimensions are given as length by width (l x w). Length is measured from left to right. Width is measured from top to bottom.) Use a clean, white sheet of paper turned to landscape mode.

I. Street and Curb

1. The street is $11'' \times 1 \frac{1}{2}''$ and is located at the very bottom of the page.
2. a) A broken median line runs the length of the street. Each median segment is $1'' \times \frac{1}{8}''$ and segments are spaced $1''$ apart.
b) Center these segments between the street line and the bottom edge of the paper.
c) The first median segment begins $1''$ from the left edge of the paper.
3. The curb line rises $\frac{1}{4}''$ above the street line and is parallel to the street line.

II. House

1. The left side of the house is $\frac{1}{2}''$ from the left edge of the paper.
2. The length of the front wall of the house is $\frac{9}{16}$ of the length of the paper.
3. The width of the front wall of the house is $2 \frac{15}{16}''$ less than the length of the house.
4. The distance between the top of the house's front wall and the top of the roof is ten times the width of one broken median segment in the street.
5. The roof angles in at 40° from each top corner of the house. The top of the roof is parallel to the top of the front wall.

III. Garage

1. The distance between the right side of the house and the left side of the garage is $\frac{36}{48}''$.
2. The length of the garage is $1 \frac{7}{8}''$ more than the distance from the top of the house wall to the top of the house roof.
3. The width of the garage is $3 \frac{7}{16}''$ less than the length of the house.
4. The garage roof angles in at 35° from each top corner of the garage and meets at a point.





Amateur Architect - Fraction Calculations

The calculation numbers below correspond to the numbers on the Amateur Architect project. Show all of your work and then place the answer for each calculation in the answer box. Problems without answer boxes can be solved in more than one way. All fractions should be reduced to simplest form.

I-2 Centering Median Segments	II-2 Length of the Front Wall	II-3 Width of the Front Wall
	<input type="text"/>	<input type="text"/>
II-4 Distance Between Top of Wall and Top of Roof	III-2 Length of the Garage	III-3 Width of the Garage
<input type="text"/>	<input type="text"/>	<input type="text"/>
IV-1 Location of Door	IV-2 Width of House Door	V-1 Center Left Window
<input type="text"/>	<input type="text"/>	
V-2 Center Right Window	VI-1 Center Garage Door	VI-3 Five Equal Garage Door Panels
		<input type="text"/>

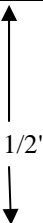
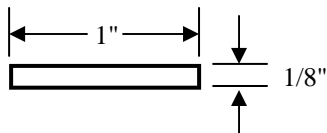
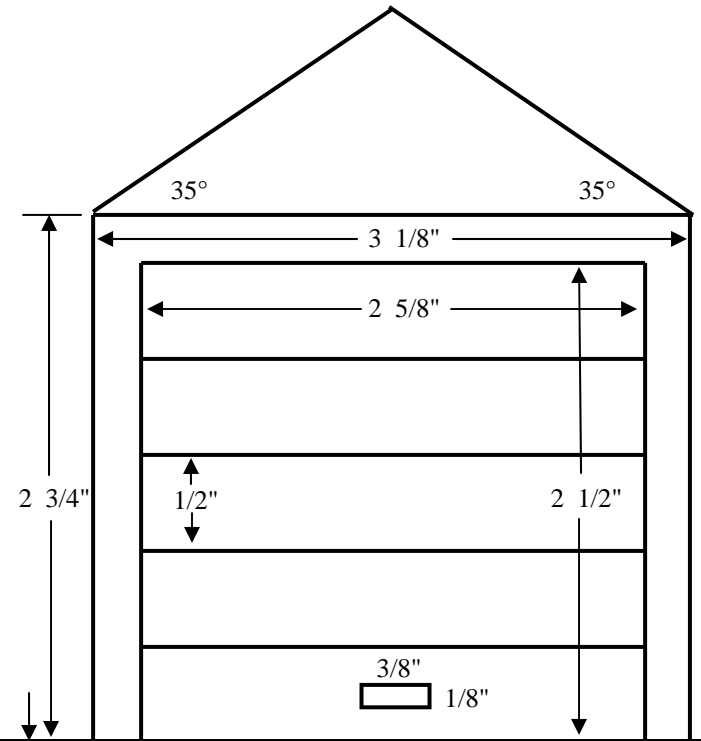
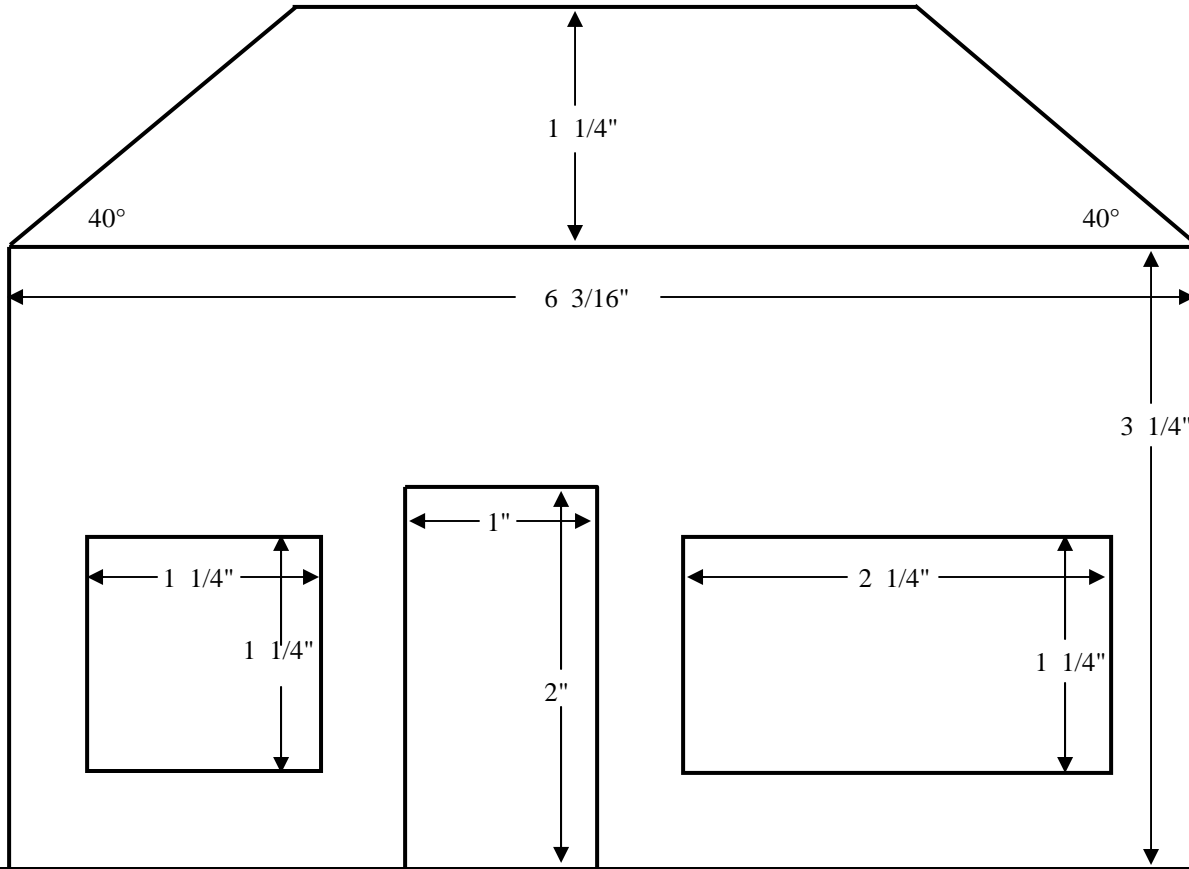


Amateur Architect

Grading Template



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Amateur Architect

Page 1

Lesson Description: Amateur Architect is a hands-on math project that requires students to compute fraction operations problems and use the resulting measurements to construct a house and garage. Students use pencil and ruler to draw and center parts of the house and garage. This project combines the foundational skill of solving fraction operation problems with the practical application of ruler measuring skills.

Math Content: Fraction Operations, Measuring and Constructing Drawings with a Ruler

Time Required: This project usually takes about 4 - 7 class periods, depending on whether or not the Ruler Skills worksheets are used and if you allow any part of the project (such as the final title and drawing) to be done at home.

Amateur Architect includes:

- * 1 Amateur Architect project cover sheet
- * 3 Ruler Skills worksheets (for optional preparation prior to the Amateur Architect project)
- * 3 Ruler Skills answer keys
- * 2 Amateur Architect project pages
- * 1 Amateur Architect project Fraction Calculations worksheet
- * 1 Amateur Architect project Fraction Calculations worksheet answer key
- * 2 Amateur Architect Grading Templates (one with dimensions included)
- * 1 Amateur Architect Project Terms Transparency
- * 2 Amateur Architect Teacher Tips pages
- * 1 Amateur Architect Grading Rubric

17 pages in all!!

Materials Needed: Rulers (class set), two transparencies, construction paper (optional)

Suggested Grade Level: 5th -8th

Teacher Tips:

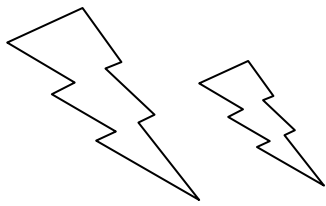
- * **Before printing** make sure “**NONE**” is selected for Page Scaling. Otherwise templates of project and lengths of segments on Ruler Skills pages will not be accurate.
- * Have students calculate and draw simultaneously. Some students want to solve all of the problems first. **Some calculations depend on previous calculations**, so it is important to be able to visualize the reasonableness of math calculations by drawing them.
- * Calculations should be shown, with all work, on the Fraction Calculations worksheet.
- * Teach, and encourage students to use, at least two guide points when constructing lines.
- * Grading for the project is very fast!! Simply check the main calculations using the answer key and then **place a transparency of the project over the student’s work** to check for accuracy. Line up the left side of the house and the curb line as reference points, **not** the edge of the transparency. (Note: Projects will not be perfectly accurate but look at the number and degree of miscalculations or incorrect drawings.) See Grading Rubric.



Proportional

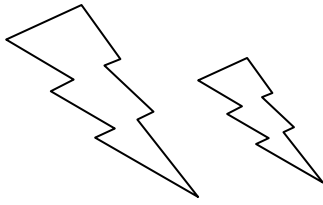


Pictures



Proportional Pictures

7						
6						
5						
4						
3						
2						
1						
	A	B	C	D	E	F



Proportional Pictures

1. Are the two figures that you have drawn similar? Explain.
2. What scale have you used to make your larger drawing?
3. Using your two figures compare their perimeters and areas using the chart below. Use string to help you estimate the perimeter.

	SMALL PICTURE	LARGE PICTURE	RATIO: $\frac{\text{LARGE PICTURE}}{\text{SMALL PICTURE}} = \text{x.xx}$
PERIMETER			_____ =
AREA			_____ =

4. About how many times greater is the perimeter of the large figure? Why do you think that the perimeter is this many times greater?
5. About how many times greater is the area of the large figure? Why do you think that the area is this many times greater?
6. If we had made our large picture five times larger than the small picture, how many times larger would the area have been? Explain your reasoning. Can you generalize a rule for this relationship?

Math



Shadows



Math Shadows

Indirect Measurement 2

	<table border="0"> <tr> <td style="text-align: center;">Student</td> <td></td> <td style="text-align: center;">Hoop</td> </tr> <tr> <td style="text-align: center;"><u>height</u> shadow</td> <td style="text-align: center;">=</td> <td style="text-align: center;"><u>height</u> shadow</td> </tr> <tr> <td style="text-align: center;">_____</td> <td style="text-align: center;">=</td> <td style="text-align: center;">_____ X _____</td> </tr> <tr> <td colspan="3" style="text-align: center;">Height of Hoop (x) = _____</td> </tr> </table>	Student		Hoop	<u>height</u> shadow	=	<u>height</u> shadow	_____	=	_____ X _____	Height of Hoop (x) = _____			
Student		Hoop												
<u>height</u> shadow	=	<u>height</u> shadow												
_____	=	_____ X _____												
Height of Hoop (x) = _____														
Name _____ Height _____ Shadow _____		Basketball Hoop Height = x Shadow = _____												

	<table border="0"> <tr> <td style="text-align: center;">Student</td> <td></td> <td style="text-align: center;">Tree</td> </tr> <tr> <td style="text-align: center;"><u>height</u> shadow</td> <td style="text-align: center;">=</td> <td style="text-align: center;"><u>height</u> shadow</td> </tr> <tr> <td style="text-align: center;">_____</td> <td style="text-align: center;">=</td> <td style="text-align: center;">_____ X _____</td> </tr> <tr> <td colspan="3" style="text-align: center;">Height of Tree (x) = _____</td> </tr> </table>	Student		Tree	<u>height</u> shadow	=	<u>height</u> shadow	_____	=	_____ X _____	Height of Tree (x) = _____			
Student		Tree												
<u>height</u> shadow	=	<u>height</u> shadow												
_____	=	_____ X _____												
Height of Tree (x) = _____														
Name _____ Height _____ Shadow _____		Tree Height = x Shadow = _____												

	<table border="0"> <tr> <td style="text-align: center;">Student</td> <td></td> <td style="text-align: center;">Flag</td> </tr> <tr> <td style="text-align: center;"><u>height</u> shadow</td> <td style="text-align: center;">=</td> <td style="text-align: center;"><u>height</u> shadow</td> </tr> <tr> <td style="text-align: center;">_____</td> <td style="text-align: center;">=</td> <td style="text-align: center;">_____ X _____</td> </tr> <tr> <td colspan="3" style="text-align: center;">Height of Flag (x) = _____</td> </tr> </table>	Student		Flag	<u>height</u> shadow	=	<u>height</u> shadow	_____	=	_____ X _____	Height of Flag (x) = _____			
Student		Flag												
<u>height</u> shadow	=	<u>height</u> shadow												
_____	=	_____ X _____												
Height of Flag (x) = _____														
Name _____ Height _____ Shadow _____		Flagpole Height = x Shadow = _____												





Math Shadows

Teacher Tips (1 of 2)

Lesson Description: Math Shadows is a hands-on, outside-the-classroom lesson in which students use shadows, similar triangles, and proportions to indirectly measure the heights of several objects on campus. By measuring the height and shadow of a student and the shadow of an object (basketball hoop, tree, flagpole) the students can create proportions to mathematically discover the height of these objects. This is a fun, active lesson that can be completed in one class period.

Math Content: Indirect Measurement, Similar Triangles, Proportions, and Metric Measurement

Time Required: 1 Class Period

Math Shadows includes:

- * 3 Math Shadows student worksheets
- * 2 Math Shadows Teacher Tips pages
- * 1 Math Shadows Cover Sheet

Materials Needed: Tape Measures (inches or centimeters)

Suggested Grade Level: 5th - 8th

Teacher Testimonial:

Math Shadows is an activity lesson that gives students the opportunity to use some of their mathematical knowledge in the real world. They work in groups and walk around campus applying their math skills in order to find the heights of a tree, a basketball hoop, and a flagpole. A worksheet is included which allows the teacher to personalize the activity for his students by choosing other objects that are found on his own campus. Students enjoy the change of pace and the chance to work together.

Teacher Tips:

- * Be sure to select a **sunny day** to use this activity with your classes. If it is not sunny (and you cannot easily identify shadows) it will be impossible to complete this activity.
- * If you do not have a basketball hoop, tree, and flagpole on your campus that would work well for this activity you may want to create your own worksheet(s) using the template provided.
- * The first page, *Indirect Measurement 1*, is optional. If you have already taught this concept you may want to skip page one and let the students complete *Indirect Measurement 2* and possibly *Indirect Measurement 3*. The first page is intended to help teach the math concept of indirect measurement prior to students completing the rest of the lesson. The **rounded answer to the sample problem on page one is 1068 cm or 420 in.**
- * Decide ahead of time what units of measure (inches or centimeters) you want students to use as they complete the lesson. I prefer using the metric system because the decimals are easier to work with than all of the fractions involved in using feet and inches. At the end of the lesson we often convert the metric answers back to our standard feet and inches so that students have a better understanding of the results.



Amazing



Birthday Cards

1 3 5 7

9 11 13 15

17 19 21 23

25 27 29 31

16 17 18 19

20 21 22 23

24 25 26 27

28 29 30 31



Amazing Birthday Cards

Birthday Cards Number Pattern

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____





Amazing Birthday Cards

Birthday Cards Mathematics

The Base 2 Number System

The Amazing Birthday Card Activity works because the person demonstrating the activity (whether she knows it or not) is using the base 2 number system to identify the unknown number. In our base 10 number system each place value column is worth ten times the previous column and the highest number that can be used in a column in the base 10 system is a nine. In the base 2 system each place value column is worth two times the previous column and the highest number that can be used in a column is a one.

As you complete the chart below pay especially close attention to the way that the first five numbers are made in the base 2 system. Placing a “1” under a column in the base two number chart is the same as saying “yes” on the birthday card that has that place value number in the top left-hand corner of the card. Placing a “0” in a column is the same as saying “no” when that number is in the top left-hand corner of a card.

Base Ten			Number	Base Two						
100	10	1		64	32	16	8	4	2	1
			3							
			5							
			8							
			25							
			31							
			43							
			75							
			100							





Amazing Birthday Cards

Teacher Tips

(1 of 2)

Lesson Description: Amazing Birthday Cards is an activity in which students respond “yes” or “no” to five numbered cards and the teacher uses mathematical patterns to determine the birthdays of these students based on their responses. Students discover the mathematical pattern that enables the teacher to identify the birthdays and they come to understand that this activity is based upon the base 2 number system. Comparing our base 10 number system to the base 2 number system also deepens student understanding of our system. Amazing Birthday Cards never ceases to amaze the students!

Math Content: Number Patterns, Logic, Base 2 Number System, Other Number Systems

Time Required: 1 Class Period (or small parts of several class periods)

Amazing Birthday Cards includes:

- * 1 Amazing Birthday Cards Teacher Notes page
- * 5 Amazing Birthday Cards Numbered Activity Cards
- * 1 Amazing Birthday Cards Number Pattern worksheet
- * 2 Amazing Birthday Cards Mathematics worksheets
- * 2 Amazing Birthday Cards Mathematics worksheet Answer Keys
- * 2 Amazing Birthday Cards Teacher Tips pages
- * 1 Amazing Birthday Cards Cover Sheet

14 pages in all!

Materials Needed: None

Suggested Grade Level: 5th - 8th

Teacher Testimonial:

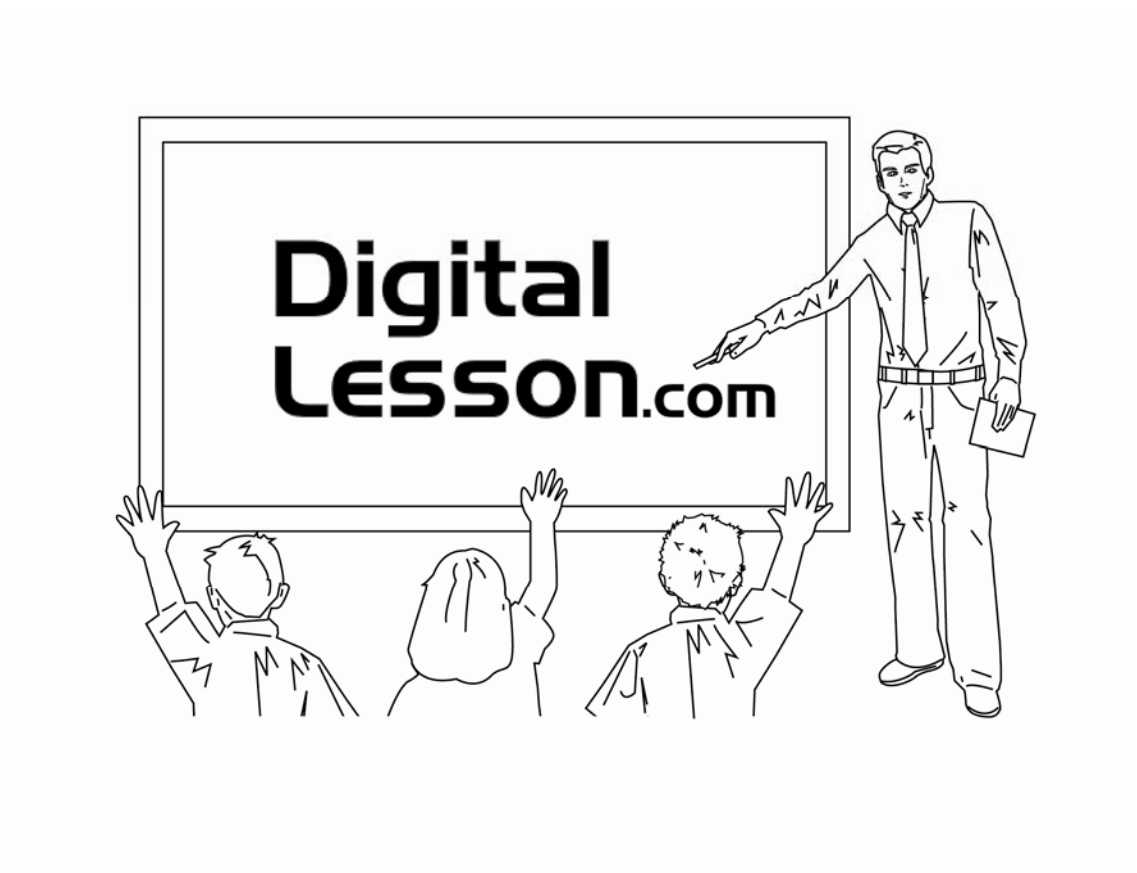
Amazing Birthday Cards is an activity I use every year. The students enjoy participating in this activity and are amazed that by simply saying “yes” or “no” in response to the five cards that I hold up, I can tell them their birthdays. I only take a few of the many volunteers I have each day, thereby building up the suspense before I reveal the mathematical basis for my success in the activity. (Some students think that I actually take my class rosters home and memorize 200+ birthdays each year! As if I had time for that!) The Birthday Cards Number Pattern worksheet allows the students to generate the number pattern themselves and try it out on their friends and family.

Teacher Tips:

- * Amazing Birthday Cards is an activity that can be divided into three parts. The teacher may choose to use one or all of the parts of this activity depending upon the time available and the mathematical objectives of the teacher. As the teacher, you may just want to present the activity to your students without having them delve into the mathematical basis for its success. I always want students to understand the mathematical basis of this activity so I have them complete the Number Pattern worksheet. This takes just a few minutes. As an extension, a quick study of different base systems helps to clarify student thinking about the activity and our own base 10 number system.



Humongous



Hero



Humongous Hero

Project Directions

I. Determine the Height of the Humongous Hero

1. Complete the “Hero’s Height” worksheet to calculate the hero’s height.
2. Select one group member to be the “measurement model” for your hero’s measurements.

II. Find the Scale for Your Drawing of the Humongous Hero

1. Which student is your group going to measure to complete this project? _____
2. What is the hero’s height according to this student’s proportion? _____
3. How tall is the space (in centimeters) that you will draw your hero in? _____
4. Divide the hero’s actual height (see #2) by the space you will draw it in (see #3) and round down to the nearest centimeter to determine the scale factor that you will use to draw the hero. Show your work below.

Scale: 1 cm = _____ cm

III. Determine the Dimensions of the Humongous Hero

1. Complete the “Hero Dimensions” worksheet pages to determine the dimensions of the hero.
2. Calculate the dimensions of the scale model of the hero using the same worksheets.

IV. Draw and Label the Dimensions of the Humongous Hero

1. Draw the hero and label its dimensions on the right side of the poster board.
2. Leave room for the hero’s name at the top and the worksheets to be attached on the left side.

V. Find the Measurements of the Humongous Hero’s Possessions

1. Draw and label the dimensions of four objects that are owned by the hero.
2. Show all work (proportions) used to determine the dimensions of these objects.





Humongous Hero

Hero Dimensions 1

Use the table below to determine the dimensions of the Humongous Hero. All measurements should be rounded to the nearest tenth of a centimeter. Use the hero height that was determined using the height of your group's measurement model (see page 2).

Body Part	Measurements		Scaled Measurements	
			(1 cm = _____ cm)	
Sample: <u>neck to finger tip</u> height (model's hero)	Student Model $\frac{94 \text{ cm}}{189.2 \text{ cm}}$	Hero $= \frac{x}{975 \text{ cm}}$	$x =$ <u>484.4 cm</u>	$484.4 \div 19 =$ (19 is sample scale factor.) <u>25.5 cm</u>
<u>length of face</u> height				
<u>width of face</u> height				
<u>shoulder to shoulder</u> height				
<u>base of neck to waist</u> height				
<u>waist width</u> height				
<u>waist to knee</u> height				
<u>knee to foot</u> height				
<u>length of foot</u> height				





Humongous Hero

Teacher Tips (1 of 3)

Lesson Description: Humongous Hero is a group project that involves proportions and the use of scale. Students use proportions and the handprint of the Humongous Hero to determine its height and body measurements. Then they make a scale model of the superhero that can be drawn on poster board. Finally, students use proportions to determine the dimensions of various items owned by the hero.

Math Content: Writing and Solving Proportions; Using Proportional Reasoning to Create a Scale Model; Metric Measurement; Using Proportions to Solve Problems

Time Required: 3-5 Class Periods

Humongous Hero includes:

- * 5 Humongous Hero assignment sheets
- * 3 Humongous Hero Teacher Tips pages
- * 1 Humongous Hero Cover Page

Materials Needed: Centimeter measuring tapes, poster board, butcher paper, large hand cutouts

Suggested Grade Level: 5th - 8th

Teacher Testimonial:

Humongous Hero is a group project that the students really enjoy. They measure each other to help determine the size of the Humongous Hero and then use a scale to reduce the superhero down to a size that can be drawn on their poster board. When I have used this project before, the students really enjoyed designing the look of the person (superhero) and used mathematics to keep him in proportion.

Teacher Tips:

- * The Humongous Hero project should be completed in groups. I have always used groups of four, but a group of three would also be acceptable. Larger groups allow too many spectators.
- * Using an overhead projector and sheets of white butcher paper, create a “Humongous Hero hand” for each group. Tape the butcher paper to the wall and then use a tracing of your hand to draw the “humongous hands”. Simply move the overhead further away from the butcher paper to make the hand bigger. (**Note: I have always used hands that are about 102 centimeters from the base of the palm to the tip of the longest finger. This is A little more than 5 times the length of my hand and so creates a Humongous Hero that is about 900 centimeters, nearly 30 feet, tall.**)
- * Of course you may use a different “humongous hand” size if you want students to calculate the size of a larger or smaller Humongous Hero.



Creative



Equations



Creative Equations Project

Teacher Project Directions

Administering the Creative Equations Project:

- 1. Choose which four numbers the students will use to create their equations.**
 - * Although using four fours or four nines allow many possible answers to be generated, the answers for these puzzles can be found on the internet.
 - * Some teachers like to choose the numbers of the calendar year. For instance, in 1998 some teachers used a 1, 9, 9, and 8. This will not work well in years that have several zeros.
 - * You may want to choose the four numbers yourself or allow the students to choose them.
 - * Each class should use the same four numbers. Using different numbers for different classes will encourage more individual work.
- 2. Select the number of equations that each individual or group will find.**
 - * I have used the sheets for all 100 equations with motivated students.
 - * Some students may have more success becoming involved in the project if only the equations with solutions from 1-25 or 1-50 are used. Other equations might count toward extra credit. Weigh the level (and ability to persevere) of your students.
 - * The number of equation solutions selected should also be partially determined by the amount of time, in class and at home, that you want students to spend on the project.
- 3. Distribute the Creative Equations packet to your students.**
 - * Each student should have a Student Project Directions sheet, one or two Creative Equations Recording Sheets, and a copy of the Creative Equations Scavenger Hunt.
- 4. Give students time to start the project in class.**
 - * Students should work in groups or teams with 2 to 4 students in each group.
 - * All students in a group **must have the exact same equations** on their respective papers. This promotes cooperation, increases the mathematics done, and helps students to teach each other regarding misunderstandings in the use of Order of Operations.
 - * Calculators should be discouraged except in cases where exponents, factorial, etc. cause the numbers to be temporarily very large.
- 5. Post the Creative Equations Class Chart with Student Signature Lines sheet.**
 - * I require students to check with me before posting equations and signing their names.
 - * Make it a class goal to find equations for as many of the solution numbers as possible.
- 6. Conclude the Project by Finding Scavenger Hunt Winners and Scoring Papers.**
 - * Have students share their Scavenger Hunt results and reward winners for each problem.
 - * Facilitate the switching of papers and scoring of one group by another.
 - * I have the top two teams switch papers, the third and fourth teams, and so on.
 - * In a fixed amount of time, have correcting groups start with the number of successful equations reported and then deduct a point for each incorrect equation found.





Creative Equations Project

Creative Equations Recording Sheet 1

Equation Numbers: _____

_____	= 1	_____	= 26
_____	= 2	_____	= 27
_____	= 3	_____	= 28
_____	= 4	_____	= 29
_____	= 5	_____	= 30
_____	= 6	_____	= 31
_____	= 7	_____	= 32
_____	= 8	_____	= 33
_____	= 9	_____	= 34
_____	= 10	_____	= 35
_____	= 11	_____	= 36
_____	= 12	_____	= 37
_____	= 13	_____	= 38
_____	= 14	_____	= 39
_____	= 15	_____	= 40
_____	= 16	_____	= 41
_____	= 17	_____	= 42
_____	= 18	_____	= 43
_____	= 19	_____	= 44
_____	= 20	_____	= 45
_____	= 21	_____	= 46
_____	= 22	_____	= 47
_____	= 23	_____	= 48
_____	= 24	_____	= 49
_____	= 25	_____	= 50





Creative Equations Project

Class Chart with Student Signature Lines

Equation Numbers: _____

_____	= 1	_____
_____	= 2	_____
_____	= 3	_____
_____	= 4	_____
_____	= 5	_____
_____	= 6	_____
_____	= 7	_____
_____	= 8	_____
_____	= 9	_____
_____	= 10	_____
_____	= 11	_____
_____	= 12	_____
_____	= 13	_____
_____	= 14	_____
_____	= 15	_____
_____	= 16	_____
_____	= 17	_____
_____	= 18	_____
_____	= 19	_____
_____	= 20	_____
_____	= 21	_____
_____	= 22	_____
_____	= 23	_____
_____	= 24	_____
_____	= 25	_____





Creative Equations Project

Teacher Tips (1 of 2)

Lesson Description: Creative Equations is a group math project that requires students to create equations with a variety of solutions from four given numbers. In the process students manipulate the given numbers using many mathematical symbols. The project helps students to become fluent in the use of Order of Operations. It includes work with square roots, factorials, the proper use of parentheses in equations, and all operational symbols.

Math Content: Order of Operations, Equations, Square Roots, Factorials, Number Operations (Addition, Subtraction, Multiplication, and Division), Exponents, and Using Parentheses

Time Required: 2-3 Class Periods

Creative Equations Project includes:

- * 1 Creative Equations Teacher Project Directions Sheet
- * 1 Creative Equations Student Project Directions Sheet
- * 2 Creative Equations Project student worksheets
- * 1 Creative Equations Project Four Fours sample Answer Key for Equations 1-50
- * 4 Creative Equations Project Classroom Charts for posting equations in class.
- * 1 Creative Equations Scavenger Hunt Sheet
- * 2 Creative Equations Project Teacher Tips pages
- * 1 Creative Equations Project Cover Sheet

13 pages in all!

Materials Needed: None

Suggested Grade Level: 5th - 8th

Teacher Testimonial:

Creative Equations Project is a fun group activity that focuses on Order of Operations and manipulating numbers using many mathematical symbols. It encourages working with numbers in unique ways and allows students many “aha!” moments.

Teacher Tips:

- * Students must have a clear understanding of Order of Operations in order to complete this project successfully. This project would be a perfect follow-up to student instruction of this important math topic.
- * Have students use only **one** equal sign at the end of the equation. In other words, if your equation is $4 + 4 + 4 + 4 = 16$ it should not be written as $4 + 4 = 8 + 4 = 12 + 4 = 16$. You want one clean-looking equation for each possible answer.
- * Four fours and four nines are numbers number puzzles that have been done before by others and there are **solutions on the internet** for these puzzles. I have included a sample answer key for the first fifty equations using four fours. Some numbers have many solutions. This page will give you an idea for the types of equations that are possible, regardless of the numbers chosen.





Creative Equations Project

Teacher Tips

(2 of 2)

Teacher Tips: (continued)

- * You may want to pick another combination of numbers that students will not be able to find on the internet. Including at least one nine or one four allows for more equations to be found as you can find the square root for each number, effectively giving you one more number choice to use in your equations.
- * Depending on the numbers selected by the teacher for this project, it may or may not be possible to write equations with solutions for every number.
- * Some students may become confused regarding the proper order of operations if they are using a calculator. Some inexpensive calculators do not automatically perform order of operations. More complex calculators do perform equations using order of operations. Have students do the equation $3 + 8 \times 4$ on their calculators. Type in the numbers without using an equal sign until the end. If a student gets a solution of 44 his calculator is not using order of operations. An answer of 35 clarifies that the calculator is automatically performing order of operations.
- * I spend about 30 minutes in class the first day introducing the project and letting the students choose groups to begin working on the project. A few times before the final project due date make sure that students have the opportunity to share their equations with their group. Have students write the equations on a separate paper until it is officially approved by the group. Then spend about another 15 to 30 minutes on the due date to exchange papers (by group) and correct.
- * As you get down to just a handful of creative equations remaining to complete the assignment, write these numbers on the board. Students will enthusiastically seek solutions for the remaining numbers. You may even want to offer prizes for the last few solution numbers.
- * **Important:** Give students a selected amount of time per night to work on the project. Without guidelines, some students will spend hours each day trying to find the often elusive (or perhaps impossible given our rules) equation solution. I suggest about 10 minutes per day for the length of the project.

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Enjoy your lesson!!

Mark



Math



Madness





Math Madness

Tournament Problem Set 1

Tournament Entry Problem: Triple the Square

If you triple the length of the sides of a square, by how many times does the area of the square increase? Include an example.

First Round Problem: Large Cookie

Sandra baked a very large cookie which weighed 10 pounds. Each day she and her friends ate one half of the remaining portion of the cookie. How long will the cookie last?

Second Round Problem: Lightning Laura

Laura ran 100 yards in 14 seconds. To the nearest hundredth, what was her speed in miles per hour?

Quarterfinal Problem: More Money

Jose started a new job with a salary of \$45,000 per year. If he gets a 6% raise each year, what will his salary be at the beginning of the 8th year?

Semifinal Problem: Winning Streak

When a baseball team won 5 games in a row its winning percentage increased from 40% to 50%. How many games had the team lost?

Final Problem: Stop Sign Angles

What is the measure of each exterior angle of a stop sign?





Math Madness

Answer Key

Tournament Problem Set 3

Tournament Entry Problem: Handshake Problem

There are 66 handshakes. Twelve people each shake hands with eleven other people. Twelve times eleven is 132 handshakes. However, half of these handshakes would be repeats so you divide 132 by 2 and end up with 66. The mathematical formula for this type of handshake problem is $n \times (n-1)/2$ where n represents the number of people.

First Round Problem: Count the Squares

There are 30 squares in the figure. If you consider this large square to be a 4×4 square with four smaller squares making up each side then you can breakdown the problem in the following manner. There are 16 small squares (1×1). There are 9 squares (2×2) made up of four small squares. There are 4 squares (3×3) made up of nine smaller squares. Finally, there is 1 large square (4×4) made up of all 16 small squares. The pattern for solving this type of problem is $4^2 + 3^2 + 2^2 + 1^2$.

Second Round Problem: Four or Less

The probability that the sum of the numbers will be less than or equal to four is $1/54$. When rolling three number cubes there are 216 total possible combinations ($6 \times 6 \times 6$). Only four of these combinations (1-1-1, 1-1-2, 1-2-1, and 2-1-1) have a sum that is less than or equal to four. The fraction $4/216$ can be reduced to $1/54$.

Quarterfinal Problem: Free Throw Shooting

Skeeter would have to make 38 free throws in a row. So far he has made about 40.9 percent of 208 free throws or 85 free throws. He has missed $208 - 85$ or 123 free throws. If he makes 38 more free throws in a row he will have made 123 and missed 123 free throws and his free throw percentage will be 50 percent.

Semifinal Problem: Long Addition

The sum of the numbers is 500,500. If you look at the set of numbers (1, 2, 3,998, 999, 1000) you can see that adding the first and last numbers will give you a sum of 1,001. The second and the second to last numbers can be added together to equal 1,001 and so on. There will be 500 pairs of numbers whose sum is 1,001. ($500 \times 1,001 = 500,500$)

Final Problem: Greek Travels

Marti first visited Greece in 1993. Let x be the first year Marti visited Greece. The next visit would be $x + 5$, then $x + 10$ and so on. The equation is $7x + 105 = 14,056$ and $x = 1993$.

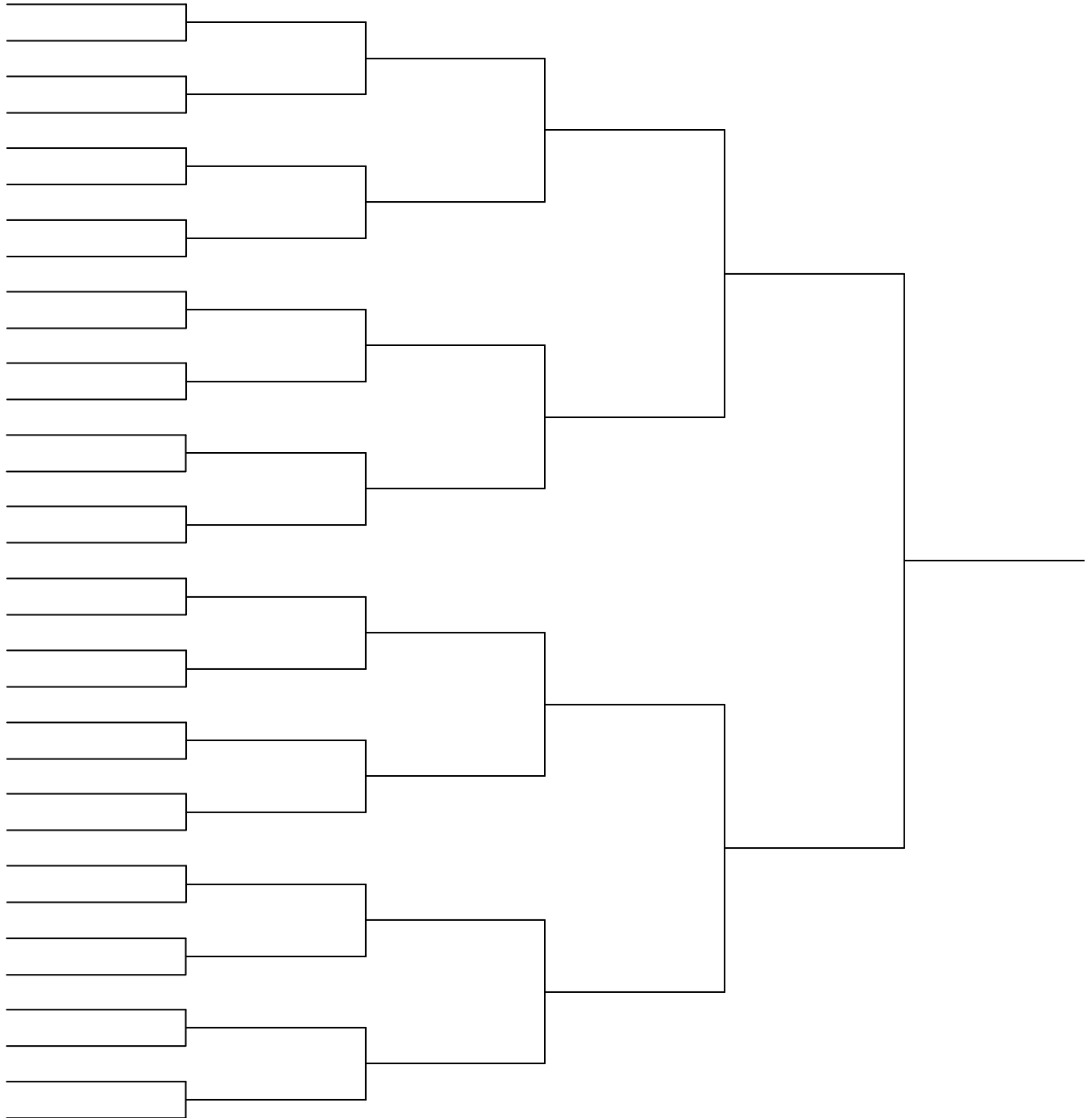




Math Madness

Math Tournament Bracket

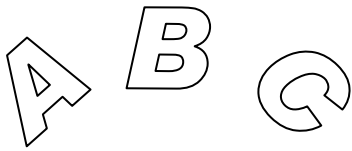
FIRST ROUND SECOND ROUND QUARTERFINALS SEMIFINALS FINALS CHAMPION



Grade Sheet

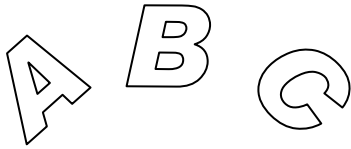


Lesson



GRADE SHEET

No.	Date	Assignment	Score	Decimal	Percent	Grade	Class Total	Decimal	Percent	Class Grade	Parent Signature
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											



GRADE SHEET ASSIGNMENTS

Basketball Star's Grades:

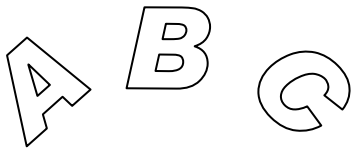
<u>Number</u>	<u>Date</u>	<u>Assignment</u>	<u>Score</u>
1.	9/12	Practicing Hard	49/50
2.	9/16	Signing Autographs	18/20
3.	9/19	Free Throws	32/35
4.	9/22	Commercials	10/10
5.	9/26	Acrobatic Dunks	53/50
6.	10/1	3-point Shooting	25/30
7.	10/3	Defense	44/45
8.	10/7	Layup Drills	9/10
9.	10/10	Team Leadership	39/40
10.	10/14	NBA Finals	97/100

Surf Dude's Grades:

<u>Number</u>	<u>Date</u>	<u>Assignment</u>	<u>Score</u>
1.	9/3	Wave Theory Quiz	19/20
2.	9/5	Surf Slang	42/50
3.	9/10	Weather Knowledge	24/25
4.	9/12	Wave Tricks	25/30
5.	9/17	Surf Competition	83/100
6.	9/22	Respect for Others	42/40
7.	9/26	Swimming Skills	46/50
8.	9/30	Mini Surf Competition	40/50
9.	10/2	Extra Credit: Rescue Swimmer	10/0
10.	10/7	Final Surf Competition	95/100

Baddy Siszhon's Grades:

<u>Number</u>	<u>Date</u>	<u>Assignment</u>	<u>Score</u>
1.	9/5	Basic Facts Quiz	15/20
2.	9/9	Chapter 1 Test	83/100
3.	9/15	Chapter 1 Homework	20/44
4.	9/16	Fraction Project	29/30
5.	9/19	Chapter 2 Quiz	18/20
6.	9/23	Chapter 2 Test (cheated)	0/100
7.	9/26	Chapter 2 Homework	40/50
8.	9/30	Adding Decimals Quiz	30/30
9.	10/3	Decimal Project (not turned in)	0/30
10.	10/8	Chapter 3 Quiz	19/20



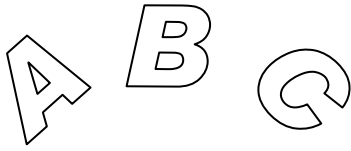
GRADE SHEET QUIZ

No.	Date	Assignment	Score	Decimal	Percent	Grade	Class Total	Decimal	Percent	Class Grade	Parent Signature
1											
2											
3											
4											
5											

Using the grade sheet above, determine this student's final grade based on his individual scores.

Student's Grades

<u>Number</u>	<u>Date</u>	<u>Assignment</u>	<u>Score</u>
1.	9/5	Basic Facts Quiz	21/25
2.	9/7	Chapter 1 Test	92/100
3.	9/9	Chapter 1 Homework	48/52
4.	9/16	Class Project	41/50
5.	9/19	Chapter 2 Quiz	29/35



Grade Sheet Lesson Teacher Tips

Lesson Description: The Grade Sheet Lesson is a resource that enables students to track their grade in a class. It is also a tool used to communicate student progress to the home. Finally, it provides content practice in fractions, decimals, and percents.

Math Content: Fractions, Decimals, and Percents

The Grade Sheet Lesson includes:

- * 2 Grade Sheet forms to track up to 30 grades in any grading period
- * 1 assignment sheet with 3 sets of fictitious grades that can be used to learn the Grade Sheet
- * 2 quizzes that can be administered to your class in order to assess understanding
- * 2 answer keys for the Grade Sheet assignments and the Grade Sheet quizzes
- * 1 Grade Sheet Teacher Tips sheet

Materials Needed: None

Suggested Grade Level: 5th - 12th

Teacher Tips:

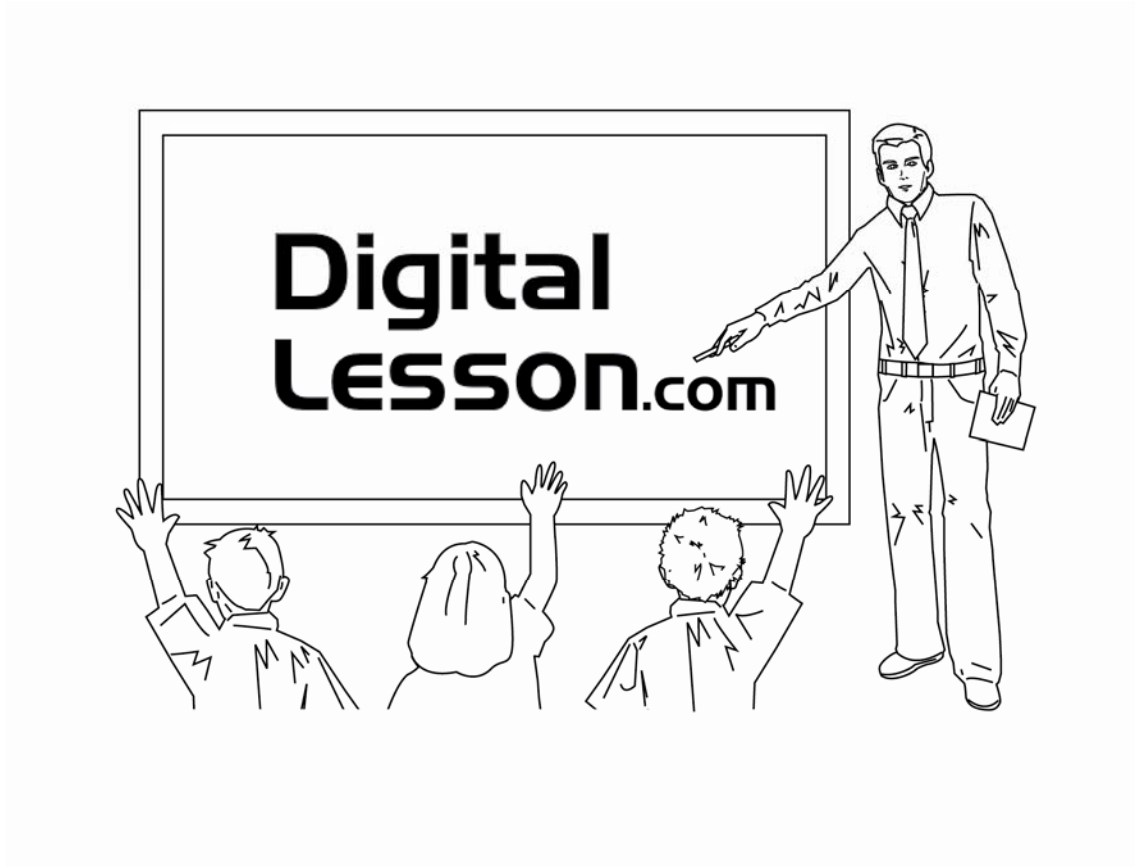
- * The most common error made by students is not rounding decimals to the nearest hundredth.
- * You may need to alter the letter grade on the practice sheets or quizzes if your grading scale is different from the one used here.
- * The parent signature box is optional, but I require it as proof that parents know class grades.
- * I subtotal ten homework scores before students enter a homework score on their Grade Sheet. This keeps the amount of entries to a reasonable number while still providing the relevant information.
- * For the Grade Sheet to be most effective, make it a part of the culture of your class. Share it with parents at Back-to-School Night, allow class time to enter grades, check frequently for parent signatures, and collect at times. I collect mine at mid-quarter and at the end of the quarter and grade them, comparing them to my own computer gradebook.

Testimonial:

One of the first things I do each year with my students is teach them how to use my Grade Sheet. The students complete two or three practice Grade Sheets and then take a quiz to prove their ability to use this tool. For the remainder of the year, each time I give the students a grade they must enter it onto their Grade Sheet, calculate their new cumulative grade in my class, and then have their parent sign it. After a few assignments they will fill out their Grade Sheets with little prompting. I rarely hear parents say that they weren't aware of their child's grades!!

Most parents see and sign their child's Grade Sheet 10-15 times per quarter and are continually updated with their child's progress. The Grade Sheet also brings ownership of their grades to the students. As a math teacher I love to see the students learning the effect of each assignment on their cumulative grade. "I only need 5 more points for a B." or "This assignment really brought up my grade." are common types of comments I hear as students earnestly enter each grade to see its effect. In the past, students have often had trouble making the connection between their individual efforts and their final grade.

Who Has



Cards



Who Has Cards

Card Set 1 - Integers

Integer Cards Master Problem List

- | | | | |
|---------------------------------------|-----------|---|-----------|
| I have -3. Who has $12 - (-7)$? | | I have 48. Who has $62 \div 2$? | |
| I have 19. Who has $32 \times (-3)$? | | I have 31. Who has $-80 + 60$? | |
| I have -96. Who has $-12 - 20$? | | I have -20. Who has $17 - (-12)$? | |
| I have -32. Who has $-8 + (-15)$? | | I have 29. Who has $-19 \div 1$? | |
| I have -23. Who has $42 \div (-6)$? | 5 | I have -19. Who has $32 + (-16)$? | 25 |
| I have -7. Who has $-50 \div (-10)$? | | I have 16. Who has -3×13 ? | |
| I have 5. Who has $20 + (-18)$? | | I have -39. Who has $22 \div (-11)$? | |
| I have 2. Who has $25 \times (-2)$? | | I have -2. Who has -7×5 ? | |
| I have -50. Who has $15 + 18$? | | I have -35. Who has $-15 - 3$? | |
| I have 33. Who has $-81 \div 9$? | 10 | I have -18. Who has $9 \times (-4)$? | 30 |
| I have -9. Who has $100 - (-20)$? | | I have -36. Who has $17 - 5$? | |
| I have 120. Who has $-20 - (-5)$? | | I have 12. Who has $-30 + (-22)$? | |
| I have -15. Who has $12 + (-16)$? | | I have -52. Who has $100 - 30$? | |
| I have -4. Who has $-10 - (-11)$? | | I have 70. Who has $-24 \div (-6)$? | |
| I have 1. Who has $120 \div 3$? | 15 | I have 4. Who has $15 + (-25)$? | 35 |
| I have 40. Who has -12×5 ? | | I have -10. Who has $90 \div (-2)$? | |
| I have -60. Who has $62 + 30$? | | I have -45. Who has 8×9 ? | |
| I have 92. Who has $-6 \times (-3)$? | | I have 72. Who has $-16 + (-40)$? | |
| I have 18. Who has $5 - (-9)$? | | I have -56. Who has $-11 \times (-4)$? | |
| I have 14. Who has 12×4 ? | 20 | I have 44. Who has $24 \div (-8)$? | 40 |



Who Has Cards - Integers (Page 1 of 5)

I have -3.

Who has $12 - (-7)$?

Integers

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I have -23.

Who has $42 \div (-6)$?

Integers

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I have 19.

Who has $32 \times (-3)$?

Integers

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I have -7.

Who has $-50 \div (-10)$?

Integers

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I have -96.

Who has $-12 - 20$?

Integers

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I have 5.

Who has $20 + (-18)$?

Integers

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I have -32.

Who has $-8 + (-15)$?

Integers

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I have 2.

Who has $25 \times (-2)$?

Integers

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Who Has Cards - Integers (Page 2 of 5)

I have -50.

Who has $15 + 18$?

Integers

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I have -15.

Who has $12 + (-16)$?

Integers

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I have 33.

Who has $-81 \div 9$?

Integers

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I have -4.

Who has $-10 - (-11)$?

Integers

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I have -9.

Who has $100 - (-20)$?

Integers

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I have 1.

Who has $120 \div 3$?

Integers

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I have 120.

Who has $-20 - (-5)$?

Integers

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I have 40.

Who has -12×5 ?

Integers

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Who Has Cards - Integers (Page 3 of 5)

I have -60.

Who has $62 + 30$?

Integers

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I have 48.

Who has $62 \div 2$?

Integers

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I have 92.

Who has $-6 \times (-3)$?

Integers

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I have 31.

Who has $-80 + 60$?

Integers

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I have 18.

Who has $5 - (-9)$?

Integers

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I have -20.

Who has $17 - (-12)$?

Integers

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I have 14.

Who has 12×4 ?

Integers

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I have 29.

Who has $-19 \div 1$?

Integers

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Who Has Cards - Integers (Page 4 of 5)

I have -19.

Who has $32 + (-16)$?

Integers

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I have -35.

Who has $-15 - 3$?

Integers

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I have 16.

Who has -3×13 ?

Integers

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I have -18.

Who has $9 \times (-4)$?

Integers

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I have -39.

Who has $22 \div (-11)$?

Integers

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I have -36.

Who has $17 - 5$?

Integers

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I have -2.

Who has -7×5 ?

Integers

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I have 12.

Who has $-30 + (-22)$?

Integers

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Who Has Cards - Integers (Page 5 of 5)

I have -52.

Who has $100 - 30$?

Integers

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I have -45.

Who has 8×9 ?

Integers

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I have 70.

Who has $-24 \div (-6)$?

Integers

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I have 72.

Who has $-16 + (-40)$?

Integers

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I have 4.

Who has $15 + (-25)$?

Integers

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I have -56.

Who has $-11 \times (-4)$?

Integers

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I have -10.

Who has $90 \div (-2)$?

Integers

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I have 44.

Who has $24 \div (-8)$?

Integers

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Who Has Cards

Teacher Tips

(1 of 2)

Lesson Description: Who Has Cards is an activity that requires students to solve 40 mental math problems in a matter of minutes as they take part in this fun review activity. Each student is given one or more cards with a mental math problem and an answer to another problem. One student starts by reading his “Who Has...?” card and then the student with the answer on his card will say, “I have ____.” and then read the problem on his card. The activity continues until all 40 cards have been completed. This activity is perfect for reviewing a concept that has been taught recently.

Math Content: Integer Operations, Percent of a Number, Fractions, and Create Your Own

Time Required: 10 minutes as a review during any class period

Who Has Cards includes:

- * 4 Who Has Cards Master Problem List pages
- * 20 Who Has Cards Card pages
- * 2 Who Has Cards Teacher Tips pages
- * 1 Who Has Cards Cover Sheet

27 pages in all!

Materials Needed: None

Suggested Grade Level: 5th - 8th

Teacher Testimonial:

Who Has Cards is a quick, fun activity that reinforces mathematical learning and strengthens the mental math skills of students. My students enjoyed competing to see which class could complete the card set in the shortest amount of time. Who Has Cards is a terrific filler activity and a great change to the everyday routine of the math classroom.

Teacher Tips:

- * Who Has Cards can be printed on regular copy paper or card stock. You may want to use colored paper and some teachers may choose to laminate the cards to make them last longer. Of course the other option is to just copy off the five sheets each time you want to use the Who Has Cards and just consider it a disposable activity.
- * I recently played with three classes using the same set of Who Has Cards copied on regular copy paper. At the end of the day I still had all 40 cards. They were a little crumpled, but that actually makes them easier to count and distribute.
- * If you plan on playing with multiple classes during one school day, plan to keep an extra set or two of each Who Has Cards activity on hand. That way you are covered in case a card from the set ends up missing.
- * When you cut the individual cards from the card sheets you can line up all five sheets and cut them all at once.





Who Has Cards

Teacher Tips

(2 of 2)

Teacher Tips (continued):

- * **Most importantly**, students should know the math skills covered in each card set very well before they use the activity. Otherwise the activity will get bogged down and students will lose interest.
- * It is helpful to review a few key ideas before using each card set in order to facilitate student success. For example, prior to using the Integers card set I reminded students of a few key ideas including the fact that subtracting a negative number is the same as adding a positive number. That way, when they heard subtracting a negative they were able to process it faster.
- * I look at the card of a student nearby and choose that student to begin the activity. He reads **ONLY** his math question to begin the activity. The activity is over when this same student answers the last question.
- * After choosing the student to begin the Who Has Cards activity, I locate that problem on the master problem list so that I can follow the progress of the activity and keep it from going off course if someone speaks up with an incorrect answer. At times I have to redirect the course of the activity by calling on a student with the correct answer.
- * I ask all students (even if their card or cards have been played) to do the math for every problem. If a student has not answered a problem within about 10 or 15 seconds after it is read, I allow a student with his hand in the air to answer that question. Then the student with the correct answer card will still have to read their card, which includes the next Who Has question.
- * I prefer students to do the math work for this activity mentally, but you may choose to allow your students to have paper and pencil in front of them to help as needed.
- * Using the templates provided, it is easy to create your own set of Who Has Cards. All you need is 40 math facts or vocabulary words that you would like students to review. The blank card sheets and a blank problem list are included in this activity.

Remember to keep a master copy so that you can reuse it later!

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