

SCOTT FORESMAN
Investigations
IN NUMBER, DATA, AND SPACE®

Information and Ideas for Parents

Investigations in Number, Data, and Space® is a K-5 mathematics curriculum designed to engage students in making sense of mathematical ideas. It has just been revised by the TERC authors through a National Science Foundation Grant. This 2nd edition curriculum is designed to:

- Support students to make sense of mathematics and learn that they can be mathematical thinkers
- Focus on computational fluency with whole numbers as a major goal of the elementary grades
- Provide substantive work in important areas of mathematics – rational numbers, geometry, measurement, data and early algebra – and connections among them
- Emphasize reasoning about mathematical ideas
- Engage the range of learners in understanding mathematics

Underlying these goals is a guiding principle for the Investigations authors as they approached students as agents of their own learning:

- *Students have mathematical ideas.* Students come to school with ideas about numbers, shapes and measurements, patterns, and data. If given the opportunity to learn in an environment that stresses making sense of mathematics, students build on the ideas they already have and learn about new mathematics they have never encountered. Students learn that they are capable of having mathematical ideas, applying what they know to new situations, and thinking and reasoning about unfamiliar problems.

Program

Investigations is based on experience from research and practice, including field testing that involved documentation of thousands of hours in classrooms, observations of students, input from teachers, and analysis of student work. As a result, the curriculum addresses the learning needs of real students in a wide range of classrooms and communities. The investigations are carefully designed to invite all students into mathematics – girls and boys; members of diverse cultural, ethnic, and language groups; and students with a wide variety of strengths, needs, and interests.

Based on this extensive classroom testing, the curriculum takes seriously the time students need to develop a strong conceptual foundation and skills based on that foundation. Each curriculum unit focuses on an area of content in depth, providing time for students to develop and practice ideas across a variety of activities and contexts that build on each other. Daily guidelines for time spent on class sessions, Classroom Routines (K-3), and Ten Minute Math (3-5) reflect the commitment to devoting adequate time to mathematics in each school day.

Things You May Observe in an Investigations Classroom

- ❑ Students are actively involved in all aspects of the lesson
- ❑ Students use concrete mathematical manipulative objects as a natural part of instruction
- ❑ Students solve problems as their primary purpose in math class
- ❑ Students work fewer computations, but more problems that require higher-order thinking
- ❑ Students use calculators as a tool, as called for in the class sessions
- ❑ Students engage in activities that help develop spatial and number sense
- ❑ Students participate in individual, small group and whole class learning experiences
- ❑ Students record and reflect their thinking in math journals/logs/recording papers
- ❑ Students' estimation skills are incorporated in routines and investigations
- ❑ Students learn math facts through repeated work in activities and games
- ❑ Students use Shapes/LogoPaths software for computer work in geometry
- ❑ Students demonstrate and explain their strategies for the teacher to notate and display
- ❑ Students are assessed with formal and informal assessment
- ❑ Students work on extended problems
- ❑ Students study an algorithm to analyze & compare to strategies they know and understand
- ❑ Students reinforce mental mathematics daily
- ❑ Students participate in data collection and analysis
- ❑ Students ask questions of their peers and their teacher
- ❑ Students take home Family Math Letters regularly
- ❑ Students are asked to justify and explain their thinking



Investigations' Student Math Handbook

The *Student Math Handbook* is for students, teachers and parents to use. The Handbook has 2 kinds of pages, Math Words and Ideas, and Games.

The Math Words and Ideas pages highlight the major mathematical words and ideas, skills and concepts of the grade. It is a concise and visual summary of mathematics. Each Daily Page and Homework page has a Note to Parents with a Student Math Handbook reference page when appropriate. At home students can use the Handbook to review or for reference, or to share their mathematical thinking and ideas with parents. Parents can use the Handbook to browse through the mathematics of the grade level, see visual representations their students are using and refresh mathematical terms and ideas they may have forgotten.

All of the games of Investigations for that grade are in the back of the Student Math Handbook! If the game has a recording sheet, it is pictured as a mini-page so everyone knows what needs to be recorded.

The Handbook may be a Big Book used in the classroom in grades K-2. The Handbooks K-5 are also accessible online.

Game Directions

Multiple Turn Over


You need:


- Deck of Multiple Cards
- Calculators (optional)
- Multiple Turn Over Recording Sheet

Basic Game: Numbers 2–50
Intermediate Game: Numbers 2–80
Advanced Game: Numbers 2–113

Play with a partner or in a small group.

- Deal out 10 Multiple Cards to each player.
- Players arrange the Multiple Cards faceup in front of them. Each player should be able to see everyone's Multiple Cards.
- The player with the smallest multiple begins. This player calls out any whole number (except 1). Each player records that factor on the *Multiple Turn Over Recording Sheet*.
- All the players (including the player who called out the number) search for cards that are multiples of that number. Write those multiples on the recording sheet and turn the cards facedown.
- Players take turns calling out numbers. The game is over when one player turns over all 10 Multiple Cards.





Grade 4

Math Words and Ideas


Factors of 24

Math Words

- factor
- rectangular array


These are all the possible rectangular arrays that we can make with 24 square tiles:

4




6 × 4 or 4 × 6

12



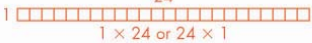
2 × 12 or 12 × 2

8



3 × 8 or 8 × 3

24

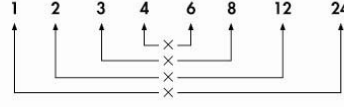


1 × 24 or 24 × 1

Each dimension of these rectangles is a factor of 24.


Listed in order, the factors of 24 are:

1 2 3 4 6 8 12 24




Pairs of factors can be multiplied to get a product of 24:

$1 \times 24 = 24$	$2 \times 12 = 24$	$3 \times 8 = 24$	$4 \times 6 = 24$
$24 \times 1 = 24$	$12 \times 2 = 24$	$8 \times 3 = 24$	$6 \times 4 = 24$



What are some other factors of 32?



Grade 4

The Importance of Playing Games More Than Once

Game Directions

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- 4 All the players (including the player who called out the number) search for cards that are multiples of that number. Write those multiples on the recording sheet and turn the cards facedown.
- 5 Players take turns calling out numbers. The game is over when one player turns over all 10 Multiple Cards.

10 ten



Grade 4

Games are used throughout the Investigations program as a way to engage students in important mathematical ideas. The game format is one that students enjoy, so the potential for repeated experiences with a concept or skill is great. Because most games involve at least one other player, students are likely to learn strategies from each other whether they are playing cooperatively or competitively.

The more times students play a mathematical game, the more opportunities they have to practice important skills and to think and reason mathematically. The first time or two that students play, they focus on learning the rules. Once they have mastered the rules, their real work with the mathematical content begins.

Students need many opportunities to play mathematical games, not just during math time, but other times as well. Games played as homework can be a wonderful way of communicating with parents.

The game directions may come home as homework, or as a student sheet used in class. The game directions may also be accessed online.

Games | Read Together

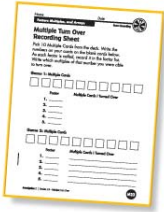
How Many Am I Hiding?

You need

- cubes
- recording sheet

Play with a partner.

- 1 Make a tower with some cubes and show your partner.
- 2 Each of you should count the cubes and write the number at the top of your recording sheet.
- 3 Now tell your partner not to look. Break off some of the cubes and hide them behind your back.
- 4 See if your partner can figure out how many cubes are hidden.
- 5 If your partner is right, you should each record the combination on the recording sheet.
- 6 Use the same total number of cubes and play again. This time your partner hides some of the cubes.



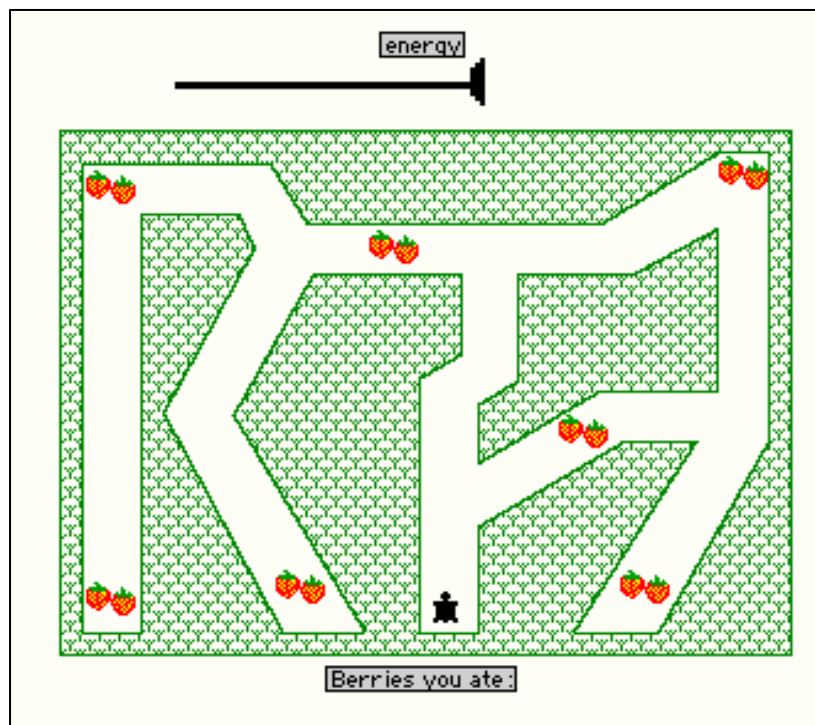
Grade 1

Technology in Investigations

The Investigations curriculum incorporates two forms of technology in the classroom: calculators and computers.

Calculators are assumed to be standard mathematical tools, available for student use as appropriate. Students need to learn how to use the calculator effectively and appropriately as a tool, just as they need to learn to read a clock, interpret a map, measure with a ruler, or use coins. They might use calculators at home for sensible purposes – just as you do – not as a replacement for mental calculations or for paper and pencil calculations they are learning to do. Calculators are recommended for only a few specific activities in the units.

Computers are explicitly linked to one or more curriculum units at each grade level. Shapes software is for grades K-2. LogoPaths software is for grades 3-5. Students' activities on the computers allow them to approach and visualize mathematical situations in new ways. With Shapes students have free exploration and structured activities. They can compose and decompose shapes, pattern a quilt, or tile a plane, and print copies of the entire workspace for you to see. explore the properties of geometric figures by drawing and manipulating them. LogoPaths provides an interactive environment where students can learn about math and computer programming through exploration activities. They can explore distance and angles, supplementary angles and regular polygons, symmetry and similarity.



LogoPaths

Encouraging Students to Think, Reason and Share Ideas

In the Investigations program students need to take an active role in mathematics. They must do more than get the correct answers; they must think critically about their ideas, give reasons for their answers, and communicate their ideas.

You can help your student develop their thinking and reasoning by asking questions such as:

Does this remind you of other problems you've worked?

What have you come up with so far?

Where do you think you should start?

What is the problem asking you to do?

Would drawing a picture help?

How can I help you?

How did you find your answer?

Why does that work?



Is there another way?

How do you know it solves the problem?

Over time, students become more comfortable thinking about their solution, recording it, and explaining it to others. Your interest in their thinking is a great motivator!

Who Is Closer to 100?

Two students are playing Close to 100.

Student 1 has  Student 2 has 

Find the 4 cards that will get each player as close as possible to 100.


Student 1 $10 + 6 + 3 + 5 = 101$ Student 2 $7 + 9 + 2 + 3 = 98$

Who got closer to 100? Student 1

Choose one student's hand. Explain why this is as close as you can get to 100 with those six cards.

Student 1 has 101. I could not get any closer to 100. It was only 1 away from 100. If there were another 5 I would have got an 100. But I have did not have the 5.

Grade 3



First I folded the paper to find my line of symmetry. I had half of a butterfly then I cut it out then I had a butterfly

Grade 2

More Children's Literature

Investigations uses children's literature to support the mathematical ideas the students investigate. The second Family Letter in each unit will give you suggestions for related literature. Below are some more suggestions to look for at the local public library.

K-1	2-3	4-5
Allen, Pamela. <u>Who Sank the Boat?</u>	Carle, Eric. <u>The Very Hungry Caterpillar</u>	Anno, Mitsumasa. <u>Anno's Magic Seeds</u>
Burns, Marilyn. <u>The Greedy Triangle</u>	Dee, Ruby. <u>Two Ways to Count to Ten</u>	Birch, David. <u>The King's Chessboard</u>
Crews, Donald. <u>Ten Black Dots</u>	Emberley, Ed. <u>Ed Emberley's Picture Pie</u>	Clement, Rod. <u>Counting on Frank</u>
Henkes, Kevin. <u>Chrysanthemum</u>	Giganti, Paul, Donald Crews. <u>Each Orange Had 8 Slices</u>	Leedy, Loreen. <u>Fraction Action</u>
Grossman, Virginia <u>Ten Little Rabbits</u>	Hong, Lily Toy. <u>Two of Everything</u>	Mathis, Sharon Bell. <u>The Hundred Penny Box</u>
Lankford, Mary. <u>Hopscotch Around the World</u>	Hutchins, Pat. <u>The Doorbell Rang</u>	Pittman, Helena Clare. <u>A Grain of Rice</u>
Reid, Margarette. <u>The Button Box</u>	Merriam, Eve. <u>12 Ways to Get to 11</u>	Schwartz, David. <u>If You Made a Million</u>
Sturges, Philemon. <u>Ten Flashing Fireflies</u>	Pinczes, Elinor J. <u>One Hundred Hungry Ants</u>	Tompert, Ann. <u>Grandfather Tang's Sto</u>



Try-Me Activities

	K-1	2-3	4-5
Money:	Recognize, name, know the value and count coins	Make change, make 25 and 50 cents multiple ways, manage an allowance	Help grocery shop, compare prices, budget allowance for saving/spending short/long term
Counting:	Count things around the home, past 10 Identify numbers on signs and in an elevator; set the table for your family size	Count by 2, 5, 10, count past 100, look for patterns, practice skip counting	Practice skip counting – starting at 2, 3, 7, 9, count past 1000 counting by 25, 50, 250
Math Facts:	Learn single digit facts, start with doubles 1+1, 2+2, 3+3, 5-5, 4-4, 3-3	Know addition and subtraction facts to 20, begin learning multiplication and division fact families (3x4=12, 4x3=12, 12/3=4, 12/4=3)	Know multiplication and division facts to 12, fluently and accurately
Time:	Read clocks on the hour and half hour; name days of week, months of the year, seasons	Know minutes in an hour, hours in a day, days in a week; read an analog clock	Practice scheduling, time management; determine elapsed time
Measurement:	Compare household items in length, weight, mass	Using measurement tools: ruler, tape measure, scale, etc.	Participate in cooking, building, measuring; rearrange your bedroom
Data:	Count and compare: cars vs trucks; record and compare: sunny/cloudy days	Survey and graph family members “favorites”, describe the data, and ask “why” and “how” questions	Discuss newspaper graphs or charts, discuss the probability of likely and unlikely events
Geometry:	Name shapes (circle, square, rectangle) and find representations in the home and outside	Name and describe differences of 2- and 3-D objects in the home, explore area and volume of cereal boxes	Draw up a proposal for new carpet and paint for your bedroom; determine the cost