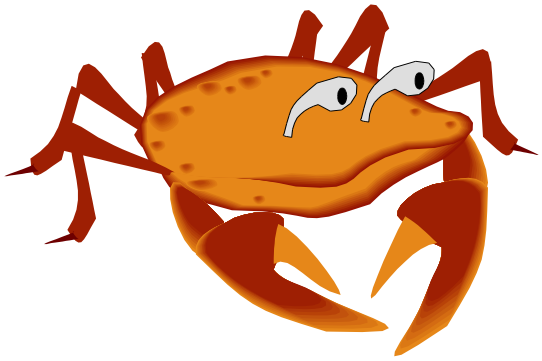
SECOND GRADE
Number and Number Sense



Comparing Numbers with Base-10 Blocks

Reporting Category Number and Number Sense
Topic Place value and compare numbers using symbols and words
Primary SOL 2.1 The student will
a) read, write, and identify the place value of each digit in a three-digit numeral, using numeration models; and
c) compare two whole numbers between 0 and 999, using symbols (>, <, or =) and words (*greater than, less than,* or *equal to*).

Materials

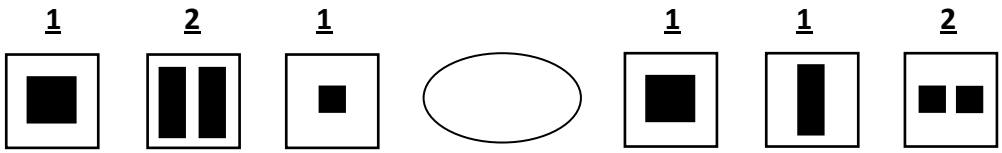
- Base-10 blocks
- Number cards (or number cube) and recording sheet
- Overhead transparency of the recording sheet

Vocabulary

greater than, less than, equal to

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Begin by modeling this activity with a student. As Player One, you will draw a number card and record the number in the hundreds place on the overhead recording sheet. Next, build the number using base-10 blocks. The student (Player Two) will do the same.
2. Play continues with the tens and ones place until two three-digit numbers have been built.



3. Ask, "Which number is greater and how do you know?" Review the symbols for *greater than, less than* and *equal to*. Place the correct symbol in the circle, then, with input from the class, develop a written explanation.
4. Repeat the activity and ask, "Which number is less and how do you know?"
5. Remove the base-10 blocks and number from Player Two's side of the recording sheet, and replace with the same base-10 blocks and number as on Player One's side. Ask, "Which number is greater?" Use student responses to reinforce the concept of equality.
6. Divide the class into groups of two. Give each group a recording sheet, base-10 blocks, and number cards.
7. The students will continue this activity as partners.

8. As a closing activity, write a three-digit number on the overhead projector. Each group will build a number that is *greater than, less than,* or *equal to* the number on the overhead projector.
9. As an additional activity, introduce the "Fill-in-the-Blank" game. Have students draw three blank spaces on a sheet of paper to represent a three-digit number. You will generate numbers by using either number cards or a number cube. The object of the game is to create the largest number. When you announce the number, each student must decide which place to record the number. Once the student places the number in a blank, it cannot be moved. Ask, "Who has the largest number? Does anyone have a number greater than ___? How do you know?"

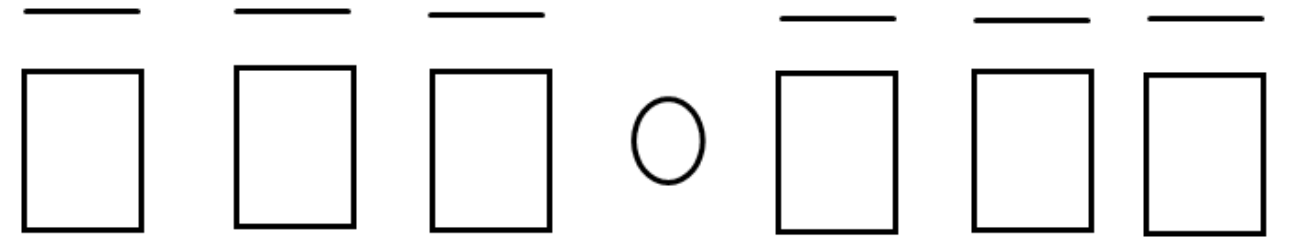
Number Cards

0	1	2	3	4
5	6	7	8	9

0	1	2	3	4
5	6	7	8	9

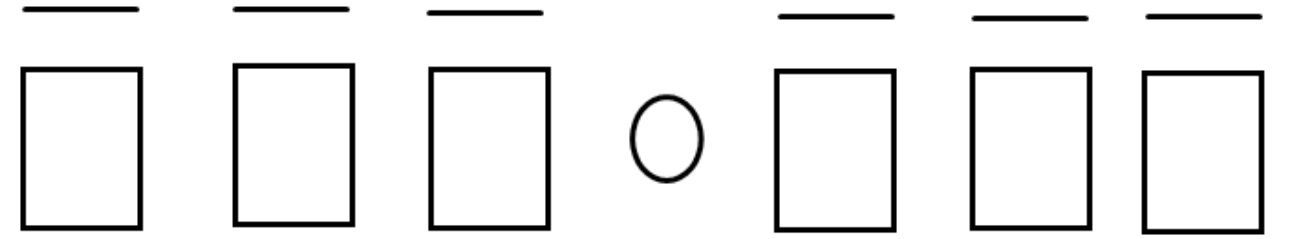
0	1	2	3	4
5	6	7	8	9

Which Number Is Less? How Do You Know?



I know that _____, because

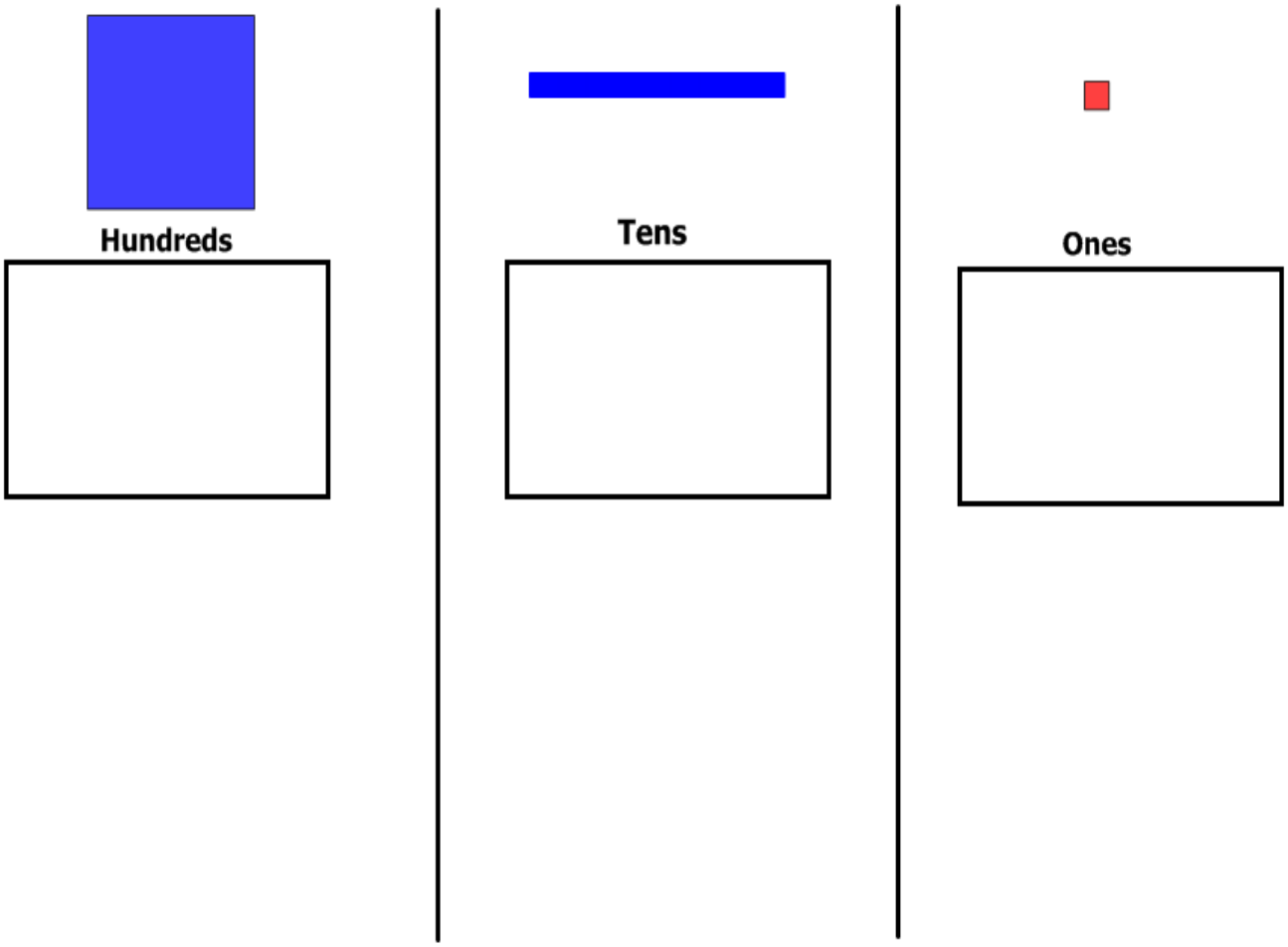
_____.



I know that _____, because

_____.

Base-10 Blocks



Rounding with Base-10 Blocks

Reporting Category Number and Number Sense
Topic Round two-digit numbers
Primary SOL 2.1 The student will
b) round two-digit numbers to the nearest ten.

Materials

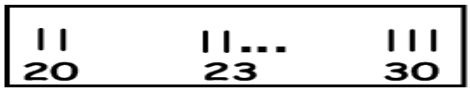
- Base-10 blocks
- T-table
- Overhead projector

Vocabulary

rounding

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Using Base-10 blocks, model the concept of rounding. First, build the number 23. Next, have the students identify the ten that comes before 23, or the smaller ten, and represent it with the Base-10 blocks.
2. Have students identify the ten that comes after 23, or the larger ten. Show students how that ten is represented using the Base-10 blocks.



3. Working with a partner, or in a small group, ask the students to decide if 23 is closer to 20 or 30. Have the groups share their answers and explain the reasoning.
4. Explain why 23 is closer to 20 than to 30. For example, you could compare the difference between 20 and 23, and 23 and 30 to show that 23 is closer to 20.
5. Record 23 on a T-table with the categories “Smaller Ten” and “Larger Ten” labeled.

Smaller Ten	Larger Ten
23	46
51	68

6. Model another example of rounding with Base-10 blocks using the number 46.
7. Choose numbers to be rounded to the nearest ten and have the students use the Base-10 blocks to round the number, following steps one and two above.
8. Continue to record the numbers on the T-table until all digits are represented in the ones place except five.
9. The students will use the numbers on the T-table to look for similarities and differences in order to identify the pattern used to round numbers.

10. Have each group write a response to “How to Round a Number” and share with the class. The class will test each group’s method for accuracy.
11. Ask, “What about a number with a 5 in the ones place?” After student discussion, tell the students that any number with a 5 in the ones place belongs in the larger group.
12. Give each group the opportunity to revise its version of “How to Round a Number.” Post accurate methods in the classroom.

Smaller Ten	Larger Ten

Rounding with Number Lines

Reporting Category Number and Number Sense
Topic Round two-digit numbers
Primary SOL 2.1 The student will
b) round two-digit numbers to the nearest ten.

Materials

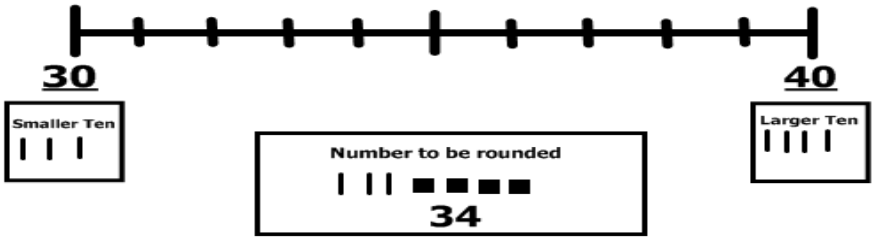
- Base-10 blocks
- Overhead projector
- Blank number lines
- Colored pencils or crayons

Vocabulary

rounding

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

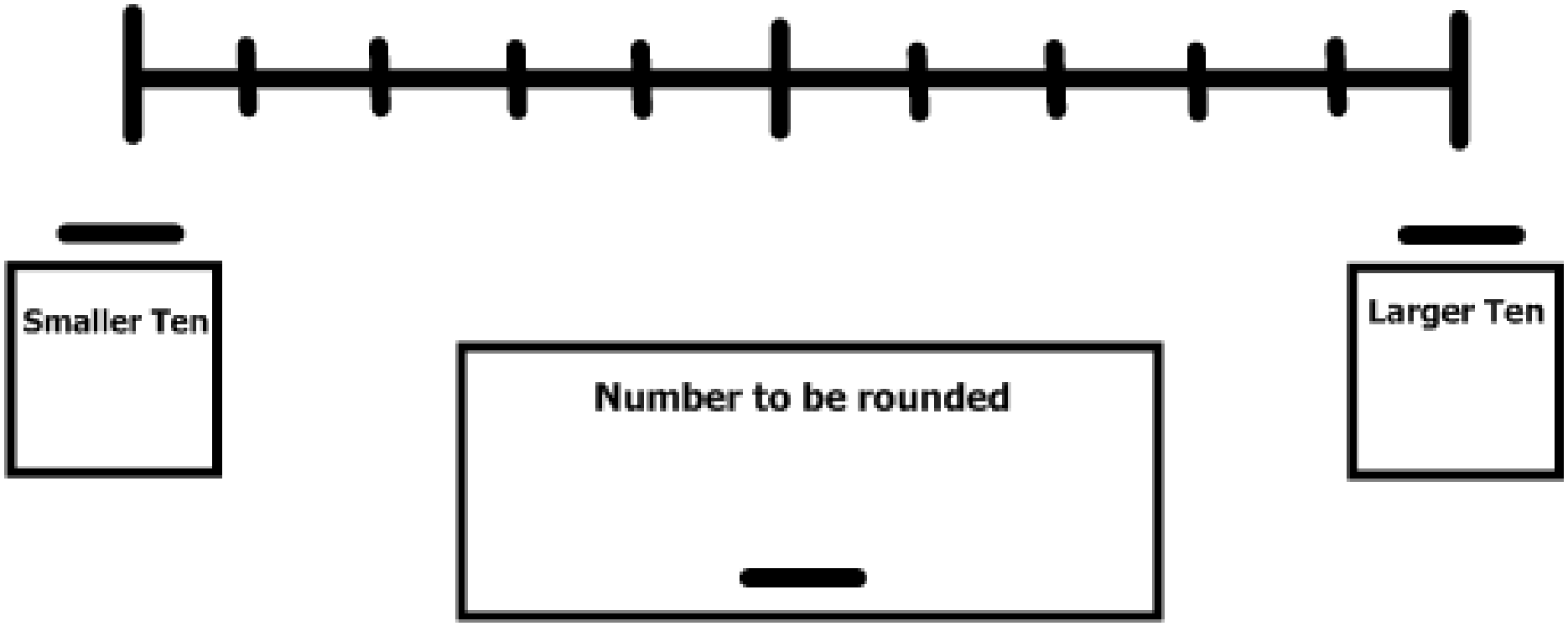
1. To review rounding using Base-10 blocks, you should model an example from the previous lesson.



2. Ask, "What could we do if we did not have Base-10 blocks to help us round numbers?" Have students share their ideas and discuss the advantages and disadvantages of the different strategies.
3. Use the strategy of drawing Base-10 blocks to assist with rounding. For example, demonstrate how to draw Base-10 blocks to illustrate 34. Next, have students identify the smaller ten and larger ten, as you illustrate.
4. Introduce the idea of using a number line to help with rounding numbers.
5. Using the example of "Round 34 to the nearest ten," first, draw Base-10 blocks to represent 34, then write the numeral. Identify the smaller ten and larger ten. Represent those values with Base-10 blocks and write the numbers. Then, locate 34 on the number line. Using a colored pencil or crayon, begin at 34 and draw an arc to 30. Then, using a different colored pencil or crayon, begin at 34 and draw an arc to 40. Have the students compare the difference to understand that 34 is closer to 30 than to 40.
6. Give each student a blank number line and have the students work through several examples as you model the technique on the overhead.
7. Introduce students to the "Heads Together Rounding" activity.

8. Divide the class into groups of four, and assign a letter to each group (e.g., group A, group B).
9. Groups will record their letter on a sheet of paper, then decide who within their group will be number 1, 2, 3, and 4. Have each group post its recording sheet on the wall.
10. Choose a number to be rounded to the nearest ten. The groups should "put their heads together" to reach consensus on the answer. Each group member must understand the correct answer.
11. Randomly pick a number (1–4) and only that member of each group may go to their group's sheet and record the answer.
12. After all answers have been recorded, review the questions with students.

Number Line



Comparing Numbers with Linking Cubes

Reporting Category Number and Number Sense
Topic Compare numbers using symbols and words
Primary SOL 2.1 The student will
c) compare two whole numbers between 0 and 999, using symbols (>, <, or =) and words (*greater than, less than,* or *equal to*).

Materials

- Linking cubes

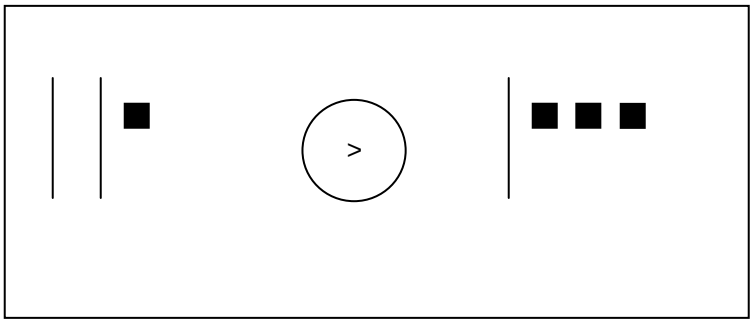
Vocabulary

greater than, less than, equal to

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. To model this activity, place seven linking cubes in one circle and two cubes in another circle. Compare the two sets by asking, "Which set has more? How do you know?"
2. Place six linking cubes in one circle and three cubes in another circle. Compare the two sets by asking, "Which set has less? How do you know?"
3. Place four linking cubes in one circle and four cubes in another circle. Ask questions such as, "Is the number of cubes in circle one greater than the number of cubes in circle two? Is the number of cubes in circle one less than the number of cubes in circle two? How can we compare the two circles?" Discuss the concept of equality.
4. Place nine cubes in one circle and five cubes in circle two. Ask students to think of ways to compare the linking cubes. If no student suggests putting the cubes together to form a tower, then ask, "Could we compare the linking cubes if we put the cubes together to make a tower?" Build the towers, then compare the two numbers using the terms *greater than, less than,* or *equal to.* Build several towers using different numbers.
5. Ask, "What if I had two larger numbers, such as 12 and 18? Is there a better way to stack the cubes so that I do not have two tall towers?" Discuss place value and stacking the cubes into groups of tens and ones.
6. Have the students build 12 and 18 by stacking cubes into groups of tens and ones. Using the place value representation, Ask, "Which number is greater/less than? How do you know?" Repeat several times using different numbers.

7. Model building 21 and 13. Ask the students to compare the two numbers. Show them how to represent these two numbers by drawing a picture of 21 and 13, using sticks and dots to represent the tens and ones place.



8. Give the students examples to build and record.

Ordinal Numbers: Crab House

Reporting Category	Number and Number Sense
Topic	Identify and write ordinal numbers
Primary SOL	2.2 The student will a) identify the ordinal positions first through twentieth, using an ordered set of objects; and b) write the ordinal numbers.
Related SOL	1.5

Materials

- Book about a Hermit crab and his adventures every month
- Drawing paper
- Crayons
- Shell or pattern of a shell to be decorated
- Items to decorate the shell
- Cards with ordinal positions first through fifth
- Hula-Hoop
- Paper cups (20)
- Paper crab to hide under the cup

Vocabulary

ordinal positions first through twentieth

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

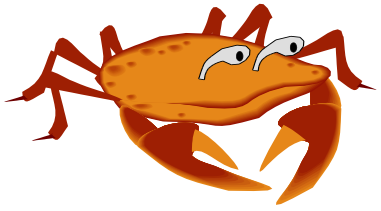
1. Divide the class into 12 groups, giving each group a card with a month of the year listed on it.
2. Before reading the story about a *Hermit Crab*, explain to the students that they will need to listen carefully because they will be drawing and recounting the events that happened to the hermit crab during their group's assigned month.
3. Read the book, taking time to discuss with students the events that occurred during each month.
4. After hearing the book read, each group will draw a picture representing the events that happened during their assigned month.
5. Line up the students in the order of their months by asking questions such as, "Which group has the *first* month of the year?" A member of the group should answer in a complete sentence, "I have January, the first month of the year." Continue in this manner until all 12 months have been represented. Emphasize ordinal numbers in the directions.
6. Beginning with January, have a member of each group tell what happened to the hermit crab during the assigned month.

7. After retelling their stories, have all students sit down, except for the students holding the drawings. Have those students sit in a row on the floor.
8. Ask students questions related to the story that involve ordinal numbers. The student answering the question should place a Hula-Hoop over the student holding the correct drawing, then orally tell the answer. Examples of questions may include
    - What happened to the hermit crab during the *third* month of the year?
    - Which month is the *tenth* month of the year?
    - During which month did the hermit crab decorate his shell with coral?
    - During which month did the hermit crab and his friends enter the forest of seaweed?
9. When a student answers the question using ordinal numbers, then he/she will take the place of the student holding the drawing. This will ensure that each student will be questioned about ordinal numbers.
10. Either purchase a bag of shells or use the pattern provided as a model for students to decorate their shells. Give each student a card with the ordinal numbers *first* through *fifth* printed on it. Have the students record the order in which each item was attached to the shell. Display the shells and cards.
11. Play the game, "Where's the Crab?" The object of the game is to guess the location of the crab in three or fewer guesses. The person guessing must use an ordinal number in the guess.
    - Have a set of 20 small paper cups or shells turned upside down in a row.
    - A student will hide a paper crab under one of the cups.
    - Choose a student to guess the position of the crab using an ordinal number. If the guess is incorrect, turn the cup upright to help the students narrow the choices.
    - Then the student who hid the crab must give a hint by responding that the crab is either further from the guess or closer to the guess.
    - Play continues until the crab is discovered.
    - Game variations: The set of cups could be presented in lines or rows from left to right, right to left, top to bottom, or bottom to top.

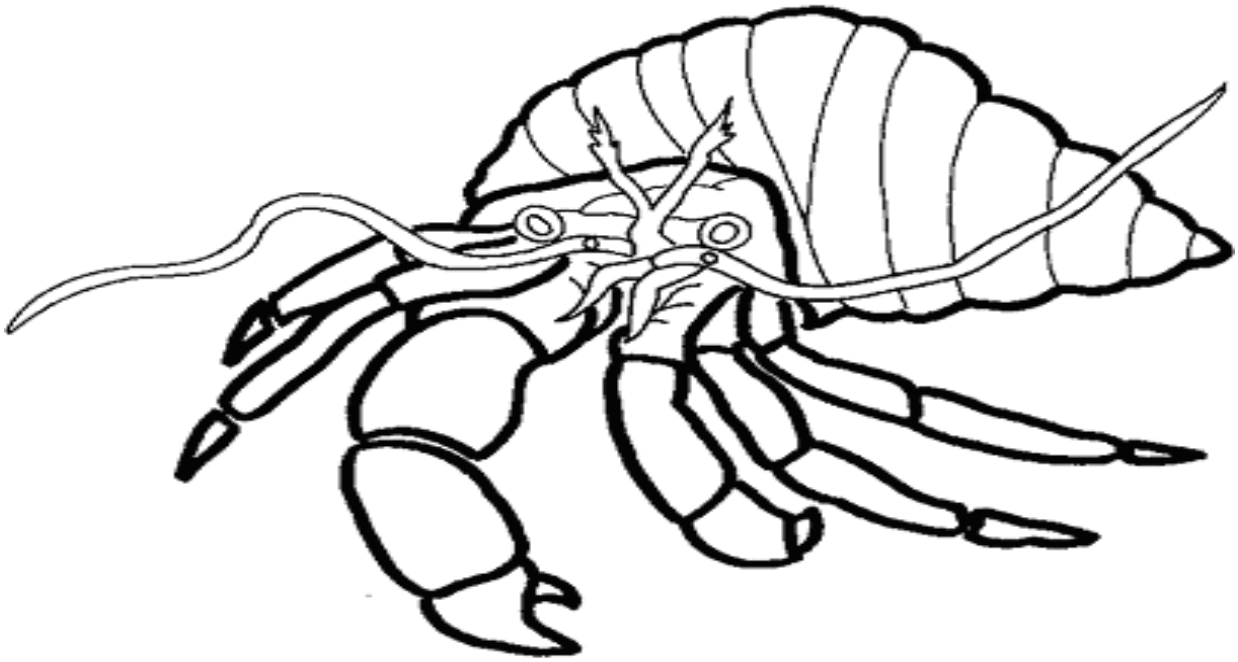
Hermit Crab's House

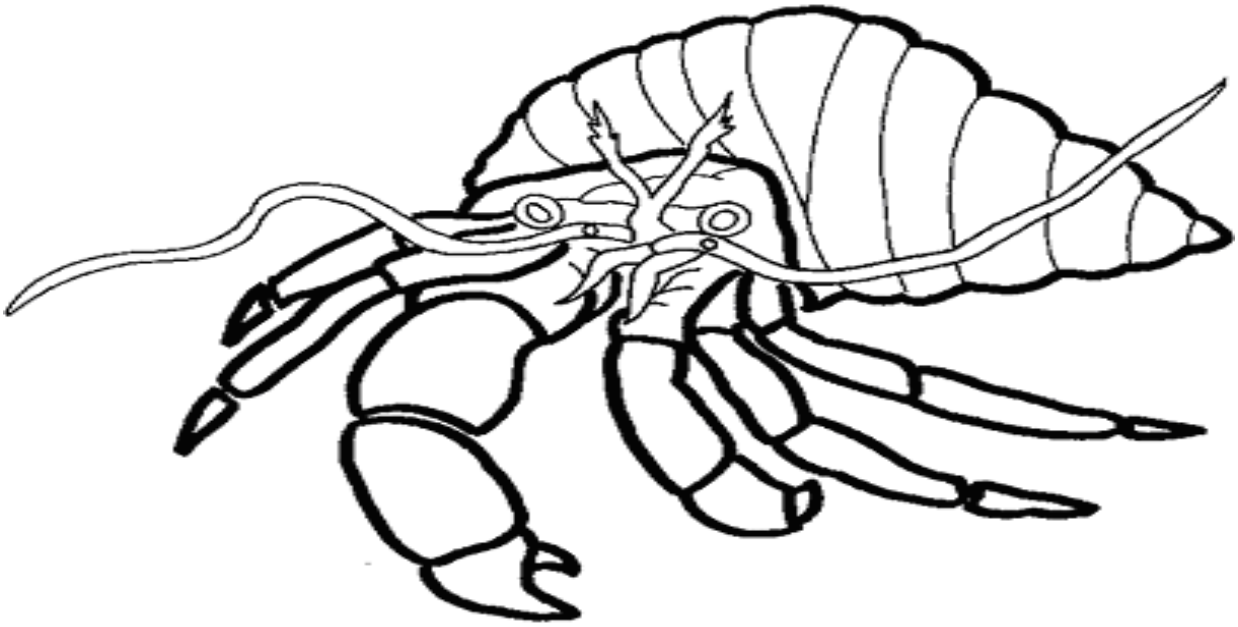
1st	First
2nd	Second
3rd	Third
4th	Fourth
5th	Fifth

Hermit Crab's House



Crab Pattern





Ordinal Numbers

Reporting Category Number and Number Sense
Topic Identify and write ordinal numbers
Primary SOL 2.2 The student will
a) identify the ordinal positions first through twentieth, using an ordered set of objects; and
b) write the ordinal numbers.

Materials

- Overhead projector
- Transparency
- Dry-erase marker
- Colored counters (at least six)
- Sets of 20 objects
- Ordinal numbers written on self-adhesive notes

Vocabulary

ordinal positions first through twentieth

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Have students do some activities in which there will be a first, second, and third place. For example, have the entire class line up and count off using ordinal terminology. It may be necessary for you to begin by saying, "I am first," so that students understand the process. Have a group of six students run a short race, and have the others say who finished first, second, and third. Using small toy cars and a predetermined raceway, allow six students to race the cars and determine which one finished first, second, and third. Take an ordinal field trip: Take your class into the hall and send an individual or pair of students to the third door on the right. Send two others to the second door to the left. Be sure that each student participates in at least one of the activities.
2. Ask students what all of these activities have in common. Explain that today they will be talking about numbers that indicate a position in a series or order. Ask the students to explain how ordinals were used in each activity earlier.
3. Select 20 items from around the room and place them in a row. Pass out self-adhesive notes with ordinal numbers written on them. Select students to come up and label the items by placing the notes on the actual items so that the entire class can see. Once one direction has been started (e.g., left to right), make sure students follow that same order. Then remove the ordinal notes, pass them out again, and have students label the positions of the items but in the opposite direction (right to left).
4. Place six colored counters on an overhead transparency. Arrange the counters horizontally. Have students come up and label the ordinal positions from left to right using a dry-erase marker. Ask them to predict what would happen if you turned the transparency from horizontal to vertical. Then turn the transparency clockwise and have

students discuss what has changed and what has not changed. Students should realize that the ordinal position has not changed as long as you are going from bottom to top. Erase the ordinal positions. Ask other students to come up to the overhead and label the six counters with ordinals from top to bottom. Ask them to predict what will happen when you change it back to a horizontal orientation (counter-clockwise). Change it back to a horizontal orientation and have them discuss what has changed or what has not changed.

5. Place students in groups of four to six. Have one student from each group select 20 items from around the room to bring back to the group. Each student in the group will draw a pictorial representation of those 20 items and label the pictured objects with ordinal numbers. They will then add a written explanation of what will happen if the orientation changes from horizontal to vertical. Allow the students to physically change their vantage point (get up and move so that the row becomes a column) and then write their explanations. If students need further guidance, refer to the rotation of the counters on the overhead transparency.
6. When the class period is almost over, regroup as a whole class and review what students did that day. Have students share their pictorial representations and written explanations.

Variations:

- Have students draw all students in class in a line going from the classroom door to the teacher desk. Have them choose and denote their place in line using an ordinal number. Have them explain their rationale for picking that location. Ask if their preferred place would change depending on the activity (e.g., getting ready to go outside or having the teacher check your work before going to learning centers). Ask, "Would you choose to be in a different spot if the order was always going to be the same?"
- Have students write in their journals about real-life applications of ordinals.
- Have students explain how sports would be different in a world without ordinals.
- Have students try to write directions for how to make an art project or how to solve a problem that requires sequencing—without using ordinals. Then have the students write the directions using ordinals. Discuss the impact, and have students explain why ordinals were invented.
- Have students ask an adult family member for directions to his or her house and tally the number of ordinals that are used in the explanation.
- Have students create a collage of pictures (using their own drawings or images cut from magazines and newspapers) of instances where ordinals are used (e.g., calendar, sports, floors of buildings, rooms in long hallways).

Don't Answer the Door

Reporting Category	Number and Number Sense
Topic	Identify and write halves, thirds, fourths, sixths, eighths, and tenths Compare unit fractions for halves, thirds, fourths, sixths, eighths, and tenths
Primary SOL	2.3 The student will a) identify the parts of a set and/or region that represent fractions for halves, thirds, fourths, sixths, eighths, and tenths; b) write the fractions c) compare the unit fractions for halves, thirds, fourths, sixths, eighths, and tenths.
Related SOL	1.3

Materials

- Book about a doorbell ringing and sharing cookies
- Four copies of the large cookies (cut-out images)
- Student page
- Cookies (optional)
- Paper
- Scissors
- Fraction pieces for projecting

Vocabulary

one-half, one-third, one-fourth, one-eighth, one-tenth, equal-sized parts, halves, thirds, fourths, sixths, eighths, and tenths

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Divide the class into groups of four. Give each student a copy of the student page, and have students cut out each box. Ask for two volunteers to role-play the fraction story as you read it.
2. Tape the large cookies on the board. Read the first page and discuss how many cookies are in the whole set (12) and how the two students will share them equally (halves). Ask one student in each group to show this with his or her cookies. Then use the large cookies to model it on the board, and write the fractional notation below it. Have the student find that fraction and place it with his or her cookies.
3. Read the next two pages, then stop and have students predict how the characters will solve the dilemma. Ask, "What should they do if more people arrive to share?"
4. Read the next section to see if their predictions were correct. Have students use role-play to mimic what characters do in the story. Continue reading the story, adding more volunteers as needed. Have a different student in each group show the fraction with his

or her cookies and then find the correct fraction card. Discuss what is happening to the whole set (i.e., first the cookies get divided into halves, then thirds, and so forth).

5. After finishing the story, discuss what happened to the set of cookies being shared in the story. (The set was divided again and again as more people came.) Discuss the fair shares (equal-sized portions) that each person received. Explain that fractions are shares of a whole or a set. Relate it to how the students would feel if their parents gave them a treat and they had to share it with a brother or sister. The parent would expect them to be fair and divide it equally (fair shares).
6. Ask the students, "What do you notice happening to the fair shares that each person receives as the number on the bottom of the fraction gets larger?" When the set of 12 cookies was divided in half, each child got $\frac{1}{2}$ of 12 cookies or a total of 6 cookies. When the set of 12 cookies was divided in sixths, each child got $\frac{1}{6}$ of the 12 cookies or a total of two cookies. Have students look for the pattern and ask them to think about the patterns they see, talk with their group, and then share as a whole class what they have discovered: the larger the denominator, the smaller the fair share. Compare this with what they know about the region/area model (fraction circles) of fractions. Ask, "Does the conclusion still fit?" Ask students to use the fraction pieces projected on the overhead to justify their conclusions and explain their rationale.
7. As a review and summary of the activity, have students complete a written and pictorial retelling of the fraction story that was shared at the beginning of class. Key components that should be included are the title, author, correct sequence of events, pictorial representations with the fractional notations of what happens each time new people join the original characters, and at least one sentence telling about each picture. Encourage students to use correct capitalization and punctuation.

Variations:

- Students can create their own variations of the fraction story as a dramatic presentation activity. The plays can then be presented to the class, with the fractional parts and fractional notation being drawn on the board, or by having group members present them on posters as props during the presentations.
- Model and create fractions using different set models (e.g., counters, cubes, fruit, six-packs of juice boxes, snack-sized packages of raisins). Set up learning centers so students can rotate and model the fractions, then trace or draw the representations (e.g., if 10 chips is the whole, show $\frac{1}{2}$ by dividing the chips into two equal piles encircling each group with yarn). A pictorial representation of the set model can be made by drawing or by stamping with Bingo markers and then circling the fractional parts.

Large Cookies

			
			
			
$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{12}$

Fractions with Pattern Blocks

Reporting Category	Number and Number Sense
Topic	Identify and write halves, thirds, fourths, sixths, eighths, and tenths and compare unit fractions for halves, thirds, fourths, sixths, eighths, and tenths
Primary SOL	2.3 The student will a) identify the parts of a set and/or region that represent fractions for halves, thirds, fourths, sixths, eighths, and tenths; b) write the fractions; and c) compare the unit fractions for halves, thirds, fourths, sixths, eighths, and tenths.

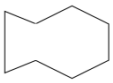
Materials

- Paper
- Scissors
- Glue
- Pattern blocks for teacher and each group
- Fraction fish and peanut outlines for each student. *(Before the lesson begins, use pattern blocks to create the outline of the fraction fish and peanut on a projector.)*

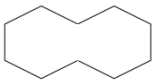
Vocabulary

one-half, one-third, one-fourth, one-eighth, one-tenth, equal-sized parts, halves, thirds, fourths, sixths, eighths, and tenths

Fraction Fish



Peanut



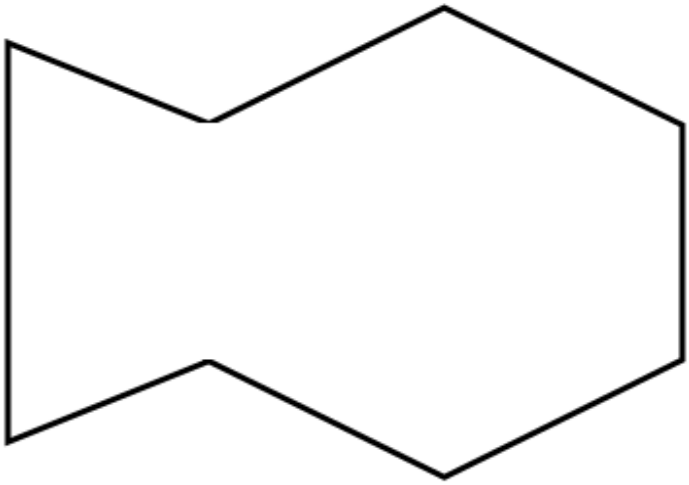
Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Group students in fours, placing a set of pattern blocks in the middle of each group.
2. Tell students that you found a picture of a fish (place outline on overhead), and you're curious as to how it was made. Ask them to help you determine how to make the fish using the pattern blocks. Give students a few minutes to come up with different solutions, using whatever strategies they choose.
3. As a class, discuss several of the students' strategies. Have students come up to the overhead and model the different solutions. As each solution is modeled, stick tape to the back of the pattern blocks to recreate the solution on the board, thereby keeping a record of the different solutions. If students use more than one type of pattern block (e.g., two trapezoids and three triangles), accept the answer, but ask if they can now make the fish using only one type of pattern block (e.g., all trapezoids or all triangles).

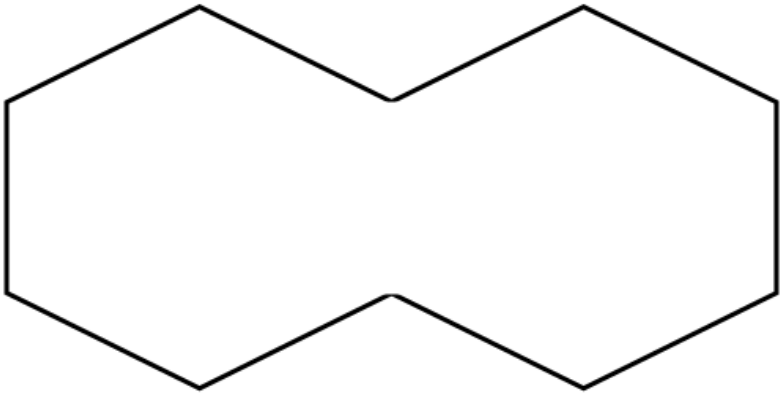
Students will be trading in/making equivalent fractions to achieve this. Only record those solutions that use one type of pattern block (e.g., three trapezoids or nine triangles).

4. Using the patterns stuck on the board, discuss the fractional parts of the fish. Discuss the importance of fair shares, or equal-sized parts, of a whole. Model the fractional notation for each piece. On the overhead, trace the trapezoids inside the fish shape. As you remove each piece, write $\frac{1}{3}$, explaining that the fraction represents one of three equal-sized pieces that make up the fish.
5. Repeat step four using nine triangles.
6. Model the strategy and steps again, as you have the students make the peanut outline shape. Repeat steps two through four.
7. Pass out blank white paper. Have students fold the sheet in half, open it, and draw a line on the fold. Discuss how they started out with one whole sheet of paper and now they have folded it to create two halves. Draw a pictorial representation on the board and write the fractional notation: one-half and $\frac{1}{2}$ on each half of the paper.
8. Explain to students that they will now create their own picture shapes using two blue rhombuses. They must follow one guideline: the rhombuses must touch on at least one side. Review the geometry terminology of sides. (The step is important to keep the activity a region/area model; otherwise, it could become the set model.) Students should trace the outline of the completed shape, then use the provided sheet of pattern blocks to cut and color the two rhombuses. On the opposite side of their papers, the students should recreate the picture with the paper pattern blocks, writing the fractional notation as they glue each block. Each student will then pass the paper to his or her partner, who will fill in the outline with other equal-sized pattern blocks. The partners will cut, color, and glue their paper pattern blocks on the outline, writing the fractional notation as they remove each piece. (Four green triangles will fit in the shape, so each traced piece should be marked as $\frac{1}{4}$.) When the puzzle is solved, have students pass back their pictures and explain what they did. Allow students to discuss, explain, and verify their solutions.
9. Have students create another shape on the back of their papers using four blue rhombuses. Repeat step eight.
10. Have students share their creations, solutions, and fractional notations.
11. Summarize the lesson by having students explain that the whole can be made up of more than one piece. It does not need to be one hexagon or one fraction circle. Fractions are equal-sized pieces of a whole. Have students quickly identify and write the fractional parts of a whole for $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{1}{10}$.

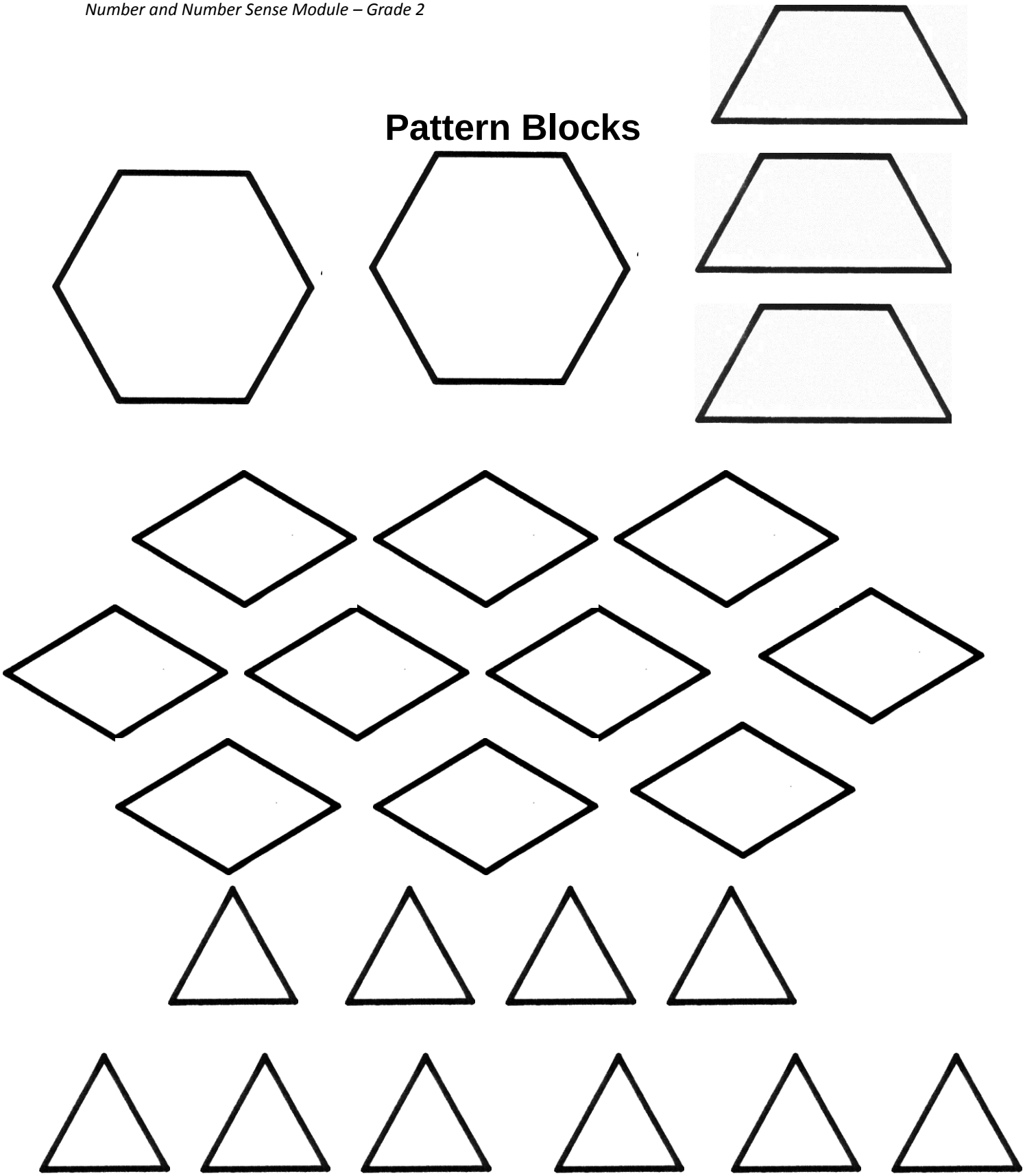
Fraction Fish



Fraction Peanut



Pattern Blocks



Magic Number Machine

Reporting Category	Number and Number Sense
Topic	Count by twos, fives, tens, count backwards, and recognize even and odd numbers
Primary SOL	2.4 The student will a) count forward by twos, fives, and tens to 100, starting at various multiples of 2, 5, or 10; b) count backward by tens from 100; and c) recognize even and odd numbers.
Related SOL	2.20, 2.21

Materials

- Magic Number Machine (see explanation)
- Square inch tiles or linking cubes
- Paper and pencil for each student

Vocabulary

input, output, pattern, skip count, even, odd

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Show students the Magic Number Machine and explain that we will be using it to discover some patterns. Explain how it works. Some cubes will be put in the "In" flap, the machine will do its magic, and then some cubes will come out of the "Out" flap. Our job is to figure out how the machine works (what pattern it is following). The teacher will be the machine operator at first, but as the students get accustomed to the activity they will become the operators and recorders of the data.
2. Draw a T-table and label it with "In" and "Out." Compare with the "In" and "Out" flaps on the Magic Number Machine.

In	Out

3. Select a student to come up and place three cubes in the top flap of the machine. Record the three on the "In" section of the T-table. Go behind the box, make whirring noises, and then make five cubes come out from the bottom flap. Record the five on the "Out" section of the T-table. Ask students to think about what has happened.

In	Out
3	5

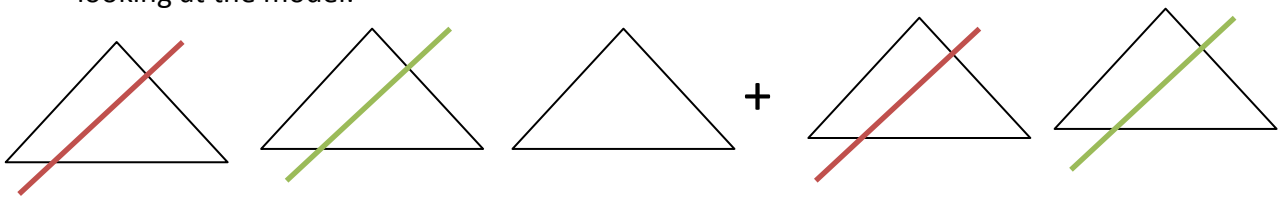
4. Select another student to come up and place five cubes in the top flap of the machine. Record the 5 on the "In" section of the T-table. Go behind the box, make whirring noises, and then make seven cubes come out from the bottom flap. Record the 7 on the "Out" section of the T-table. Ask students to think independently and then discuss with a partner what happened.

In	Out
3	5
5	7

5. Ask students what is happening to the "In" number? (It's getting bigger so we know the machine is adding cubes each time.) Is there a pattern to how many cubes the machine is adding each time? What do you think that pattern is?
6. Select a student to come up and place one cube in the top flap of the machine. Record the 1 on the "In" section of the T-table. Ask students to predict what will come out. Go behind the box, make whirring noises, and then make three cubes come out from the bottom flap. Record the 3 on the "Out" section of the T-table. Ask students to think about what has happened and compare with their predictions. Discuss. Write the following:

In	Out	
3	5	3 + __ = 5
5	7	5 + __ = 7
1	3	1 + __ = 3

7. Select another student to come up. Allow them to place any number they want, record it in the T-table, and place them in the top flap. Students are to predict what will come out. The machine will do its thing, and then the output needs to be recorded on the T-table. Add the missing addend equation to the T-table as well. Students should be able to verbalize and explain the +2 pattern. They can model the pattern with manipulatives and determine which number is even and which number is odd by looking at the model:

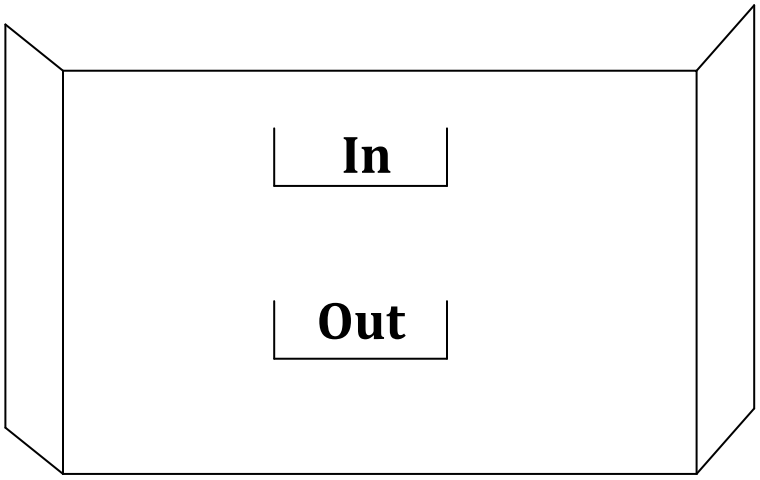


Students will observe that there is a triangle that does not have a match, so that makes the sum of 5 an odd number. They may also notice that the set of 3 is odd and the set of 2 is even and infer that an odd number plus an even number results in an odd number.

8. Repeat this sequence with other patterns on new T-tables. (e.g., +3, +4). Change this lesson from being teacher-led to being student-led. Students should be able to take charge of creating and recording in the T-tables, creating and implementing the pattern behind the Magic Number Machine, and writing and solving the missing addend/subtrahend problems.
9. Stop the activity when the class period is almost over, regroup as a whole class, and review what they did that day.

Magic Number Machine

A Magic Number Machine can be made by using a science project board or an empty box. A flap needs to be cut in the top third of the box and labeled “In.” A flap needs to be cut in the bottom third of the box and labeled “Out.” Decorate as “magically” as you would like.



Magic Number Machine

Rule +3	
In	**Out**
3	
6	
15	

Explain how your last two numbers fit the pattern.

Rule –10	
In	**Out**
100	
90	
80	
40	

Explain how your last two numbers fit the pattern.

Rule +2	
In	**Out**
1	
3	
5	
13	

Explain how your last two numbers fit the pattern.

Rule ____	
In	**Out**
0	**5**
5	**10**
10	
15	

Write the equation showing how you determined the missing number.
0 + ____ = 5

Recreate the pattern above by coloring in the same numbers on the hundred chart below. Continue the pattern.

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**	**26**	**27**	**28**	**29**	**30**
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
71	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
81	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
91	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**

Describe what you have discovered.

Estimation Jar

Reporting Category Number and Number Sense
Topic Count by twos, fives, tens and recognize even and odd numbers
Primary SOL 2.4 The student will
a) count forward by twos, fives, and tens to 100, starting at various multiples of 2, 5, or 10;
c) recognize even and odd numbers.

Materials

- A jar filled with 100 or fewer items of the same size and shape (e.g., wrapped candy, pencil erasers)
- One small piece of paper (approximately 3" by 3") for each student

Vocabulary

estimate, even, odd

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Have students gather in a circle. Place the Estimation Jar in the center. Explain that they will be writing down an estimate of the number of items in the jar. The person that comes the closest will win half the contents in the jar. The rest of the class will share the remaining half. Allow students a few minutes to write their names and estimates on the slips of paper. When finished, students will place folded estimates in the circle next to the jar.
2. Allow one person to select an estimate. This person will read the name and the estimate aloud. That student will then select the next estimate, read the name and estimate and then place it on the floor in the correct sequence using an appropriate distance from the first one. This will continue until all estimates have been read and placed accordingly. A sample is shown.

3. Ask students to determine what the smallest estimate was. Ask students to determine what the largest estimate was. Ask students to determine what the most popular and least popular estimates were. Always have the students explain how they determined their answers. Ask students to compare the estimates, e.g., “How many more people picked 54 than 65? How many more people picked 44 than 42? How many more people picked 36 than 17? How do you know?”
4. Empty the contents of the jar. Allow students to discuss and model several ways of sorting/classifying the items. Select one way and have students count the items

together. Practice having students group and count by twos, threes, fours, fives, and tens. Leave the items in groups of tens and ones.

5. Have a student write the actual number of items on the board. Have another label the place value and compare it to the piles of tens and ones on the floor.
6. Have another student write the actual number on a slip of paper and then sequence it in the row of estimates. Have students select the two estimates on either side of the actual number. Have students discuss the process to find the difference. Have students estimate and then actually determine the difference between the estimate and the actual number. Have students determine who the winner is.
7. Have students look at the actual number again. Have them discuss if the number is even or odd and their rationale.
8. Divide the items in half. Ask for strategies about how to make it fair. (For example, give one pile of ten to the winner and one pile to the class until you have run out of piles of tens. Then figure out what would be a fair way to divide up the ones.) Discuss if the number is even or odd by determining if there is anything left over after dividing the items into two equal piles.
9. Have the winner take home his/her goodies, while the rest of the class divides the remaining half equally.

Variations:

- Have students write in a journal about how to determine if a number is even or odd.
- This activity can be redone the following week. The items can be the same size or smaller/larger. Students should be reminded to take that factor into consideration when making their estimates.
- This activity might also be done as a learning center activity in the room using other objects. However, you may not want the students to "win" these items. The students could keep a record in their journals naming the item of the week, their estimate, the actual number, and the difference. Over time their estimation skills should improve if they look back at their previous data and use that to guide them in making their new estimates. See the recording chart attached.
- Have students write their numbers, counting by twos, threes, fours, fives, and tens to 100.

Estimation Jar Recording Sheet

Date	Item	My Estimate	Actual Number	Difference