Title: Measurement: Using a Ruler to Measure Sea Creatures to the Nearest Eighth Inch

Brief Overview:

In this lesson students will acquire the skills necessary to understand the markings on a ruler and use it to measure objects to the nearest 1/2, 1/4 and 1/8 of an inch. Students will use snap cubes to understand the lengths of ruler markings. Students will also create oversized "incredible inches" to measure objects to the nearest eighth of an inch. Finally, students will measure, cut and paste certain fish into a paper aquarium.

NCTM Content Standard:

Measurement
Representation
Numbers and Operations

Grade/Level:

Grades 4 and 5

Duration/Length:

Three lessons, 50-60 minutes per day

Student Outcomes:

Students will:

- Identify the markings on a ruler as eighths, fourths and halves.
- Relate ruler marks to equivalent fractions.
- Use a ruler to measure to the nearest 1/2, 1/4, and 1/8 inch in order to determine length of objects.
- Use a ruler to draw straight lines to the nearest 1/2, 1/4, and 1/8 inch.

Materials and Resources:

- Snap Cubes
- Blank Copy Paper
- Sea Creature Cut Outs (See TRS#2, TRS#6, TRS#9)
- Overheads (TRS#4, TRS#5)
- Overhead
- Student Resource Sheets #1-9
- Rulers
- 1 Transparent Ruler (for overhead use)
- Scissors

- Glue
- Math Journals
- Freezer Bags (for sea creature cut outs)
- Sandwich Bags (for rectangle cut outs)
- Crayons or Markers

Development/Procedures:

Lesson 1

Preassessment – (5 minutes)

- Hand out SRS #1 and a ruler to each student. Students will complete "Measurement: What Do You Know?" (SRS #1) on their own so you can assess their skills on measuring with a ruler and their understanding of fractional parts.

Launch – (5 minutes)

- Call time and collect the rulers. Ask the students for the answers to SRS #1 (Answer key is TRS#1). Students may hesitate and probably not know the answers. If so, give the answers and inform the students they will be experts with the rulers by the end of the next few lessons. Explain to the students that they will be using snap cubes today in order to start learning about the ruler.

Teacher Facilitation – (15 minutes)

- Hand out 8 snap cubes to each student and tell them to put the snap cubes together in one straight strand. Model this activity for the students. Ask the students what the snap cubes equal. Discuss that it represents one whole unit or 8/8.
- Ask if they know how many cubes would represent 1/2 of the unit and tell them to show it with their snap cubes. They should be showing 4/8 of the snap cubes. Discuss that this represents 1/2 of the unit and that 1/2 equals 4/8.
- Proceed to ask the students to divide up the cubes again into halves. They will then have 2/8 or 1/4 of the snap cubes.
- Finally the students will divide up the remaining snap cubes and will have 1/8. Slowly put the cubes back together discussing that you have 1/8, then add another snap cube and you have 2/8, which equals 1/4. Add another 1/8 and you have 3/8, which can't be simplified. Add another snap cube to get 4/8, which equals 2/4 or 1/2.
- Keep adding snap cubes and discussing what fraction of the whole unit each part equals and ask if it can be simplified.
- Once the students understand each part of the snap cubes and what they represent, present the four fish objects (TRS #2- Fig. 1-4) to the students. (The teacher needs to tape or magnetize the fish to the board). Model how to measure the fish by placing the snap cubes right below or on the fish and show that the first fish equals three snap cubes, or 3/8. (8 cubes = 1 whole.) Repeat using fish #2.
- For the other two fish, ask the students to tell you how many snap cubes are represented. Make sure the students are using the simplest form of the fraction each time.

Student Application – (10 minutes)

- Hand out a set of labeled fish/sea life (TRS #2- Fig 5-12) to each pair of students and tell the students to work together to find out the length of each fish using the snap cube ruler. The students need to write down the answers in fraction form in their math journals. Allow time for the students to experiment and help one another. Then, call on students for the answers.
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Embedded Assessment – (5 minutes)

- The students will demonstrate their understanding of the snap cube unit by completing "Snap Cube Challenge." (SRS #2) Teacher answer key is TRS#3. The teacher will monitor the students while completing the worksheet to see who needs reteaching and who understands the lesson.

Reteaching/Extension – (10 minutes)

- For those who have not completely understood the lesson, review the parts of the snap cubes and give the students fish to again measure and practice writing the measurements in simplest form.
- For students who have understood the lesson, pair them and give them the task of combining/adding together the fish and sea life (TRS #2- Fig 5-15) to measure 10, 12, 15, 18 and 20 units. Have them write the combinations of the figures they used in their math journals.

Lesson 2

Preassessment – (5 minutes)

- Show overhead TRS#4. Ask for a student volunteer to identify how long fish number 1 is and write the fractional part of the snap cubes on the answer line on the overhead. Discuss with the class the answer. Follow the same directions for fish number 2 and 3. If students argue over who is right make sure they remember and understand the related equivalent fractions.

Launch – (5 minutes)

- Pass out rulers and have students examine them and discuss the lines that break up the space between the inch numbers. Show a blown up inch (TRS#5) on the overhead and discuss how the marking lengths on the blown up inch relate to the rulers in the students' hands. Check for understanding by asking what shape the 1/2, 1/4 and 1/8 markings between the inch marks make. Make sure the students see that ½ is the longest line, ¼ is the next longest line and 1/8 is the shortest line we are learning about. On the overhead draw the triangle from ½ to the 1/8 and 7/8 marks. Compare the lengths of the ruler lines and the fractions they represent once more. They make an isosceles triangle.

Teacher Facilitation – (20 minutes)

- Say, "Today we are going to make our own 'incredible inches.' Then we are going to use them to measure sea creatures of different lengths." Pass out one piece of copy paper and eight snap cubes to each student.
- Have students put snap cubes into one straight line.
- **Model folds first!** Fold paper in half, in book fashion, not the 'hot dog way,' and open paper back up.
- Discuss what fractional part of the whole the line/fold just created represents. (It is half.)
- **Model** breaking the snap cube unit in half and using the half to draw a line the length of the snap cubes from the top of the paper down the fold line.
- Have the students break snap cubes in half and line up four snap cubes to draw a line the same as yours.
- Ask, "What fraction can we write on our 'incredible inch' below the line that splits our paper in half?" Discuss and write 1/2 below the drawn line.
- Show students how to redo the first fold and then do another fold, folding the paper in half again. Students copy what the teacher did.
- Discuss what lines were created and how they might be labeled. Then ask, "How many snap cubes do you think represent the lines we just made? (2 cubes) Hint: Remember that we used four snap cubes to draw the 1/2 line."
- Draw the two new fourths lines. **Model** breaking the snap cube unit in half again and using the two cube section to draw a line the length of the snap cubes from the top of the paper down the fold of the two new lines.
- Label the 1/4 and 3/4 lines accordingly. Also ask, "What fraction besides 1/2 could represent the 1/2 line?" Then write 2/4 below the existing 1/2 label.
- Have students break snap cubes in half and line up two snap cubes to draw two lines the same as yours.
- Show students how to redo the first two folds and then do another fold, folding the paper in half again. Students copy what the teacher did.
- Discuss what lines were created and how they might be labeled. Then ask, "How many snap cubes do you think represent the lines we just made? (1 cube) Remember that we used two snap cubes to draw the 1/4 line."
  - **Model** breaking the snap cube unit in half again and using the single cube to draw a line the length of the snap cube from the top of the paper down the fold of the four new lines.
- Label the 1/8, 3/8, 5/8 and 7/8 lines accordingly. Also ask, "What fraction besides 1/2 and 2/4 could represent the 1/2 line?" Write 4/8 below 2/4. And, "What fraction besides 1/4 could represent the 1/4 line?" Write 2/8 below 1/4. And, "What fraction besides 3/4 could represent the 3/4 line?" Then write 6/8 below the existing 3/4 label.
- Collect snap cubes from students and put them away.
- Discuss with the class what the lengths of the lines represent. "Which one is the longest? Which one is the shortest? Why?"
- Discuss the triangle shape the class discovered during the lesson launch. Make sure they see (or draw if necessary) the same isosceles triangle on their 'Incredible Inch.'

Student Application – (15 minutes)

- At this point the students will begin to use their 'Incredible Inches' to measure fish on their own.
- Tape one fish cutout (3/8 of an incredible inch) on the board and have volunteers come to the board to measure the fish. If necessary, model how to measure it using the 'Incredible Inch.'
- Pass out bags of fish (Cut out from copies of TRS#6) to each table or group so they can use their own 'Incredible Inches' to determine the length of their own fish.
- Have students write their measurements in their math journals and also answer the question 'Using words, pictures or numbers, explain how you know your measurement for fish number three is correct.'
- Collect bags of fish to be used again for lesson extension.

Embedded Assessment – (10 minutes)

- Students will receive an unlabeled 'Incredible Inch' (SRS#3) and the worksheet, 'Incredible Inch Investigation' (SRS#4). Pass out both sheets and have students fill in the labels on the 'Incredible Inch' and the correct measurements of the sea creatures on SRS#4. Collect both worksheets. Answer sheet to SRS#4 is TRS#7

Reteaching/Extension – (10 minutes)

- Gather those who have not completely understood the lesson into a small group to review creating the 'Incredible Inch' and using it to measure objects.
- Allow successful students to pair up and complete 'Combine-a-Fish,' (SRS#5) which requires students to combine two fish and measure their total length. The answer sheet to SRS#5 is TRS#8.

Lesson 3

Preassessment – (5 minutes)

- Show overhead of 'Incredible Inch' (TRS #5). Have students come up and label each line on the inch. Pass out rulers and discuss the relationship between the 'Incredible Inch' and an actual inch on a ruler.

Launch – (5 minutes)

- Tell students that they will be able to identify EVERY MARK ON THE ENTIRE RULER. Begin by having students point to the 1-inch line. Then have them point to the 2-inch line. During this time the teacher should be circulating around the room to assess student understanding of each mark. Continue this exercise into the Teacher Facilitation part of the lesson.

Teacher Facilitation – (20 minutes)

- Ask students to then point to the 1 1/2 inch mark. Repeat with 2 and 2 1/2 inches. Continue to skip count as a class by 1/2 all the way to 12 while the students point to the appropriate ruler mark.
- Tell students to put their fingers on the 1 and 1 1/2 inch marks. Then have them identify 1 1/4 inch. Hint: It is the biggest mark between 1 and 1 1/2 inch. As needed teacher should refer back to the 'Incredible Inch' overhead.
- Tell students to put their fingers on the 1 1/2 and 2-inch marks. Then have them identify 1 3/4 inch. Hint: It is the biggest mark between 1 1/2 and 2 inches.
- Distribute (TRS#9), already cut and placed in bags, to each group of students. Make sure each student has one rectangle from the bag. Student will measure their rectangle and switch rectangles with the other members of their group. During this time monitor their ability to measure to the nearest 1/4 inch.
- Tell students to put their fingers on the 1 and 1 1/4 inch marks. Then have them identify 1 1/8 inch. Hint: It is the biggest mark between 1 and 1 1/4 inches. Teacher should refer back to the 'Incredible Inch' overhead if necessary.
- Tell students to put their fingers on the 1 3/4 and 2-inch marks. Then have them identify 1 7/8 inch. Hint: It is the biggest mark between 1 3/4 and 2 inches.
- At this point ask students what they think the other smaller marks on the ruler are. They will know, or you tell them, that they are 1/16-inch marks. Tell students that we will not be using the 1/16-inch marks.
- Display transparent ruler on overhead. Place marks on any 1/8, 1/4 or 1/2-inch mark and have students identify the point. Let student who correctly identifies mark come up and make the next mark. Repeat as needed.
- Model how to draw a line of a given length (5 1/2 inches) using the overhead and transparent ruler. Volunteers come up to draw a few more given lengths on the overhead.

Student Application – (15 minutes)

- Distribute one copy of 'Measurement Hunt,' (SRS#6) and have students follow instructions. There is no key provided because answers to questions will vary by student

Embedded Assessment – (15 minutes)

- Distribute 'Aquarium Fun,' (SRS#7), crayons, scissors and glue and have students complete the worksheet/art project. Answers to SRS#7 are provided on TRS#10.

Reteaching/Extension –

- Gather those who have not completely understood the lesson into a small group to review markings of a ruler and practice measuring objects and drawing given lengths.
- For those who have understood the lesson, provide a copy of 'Measurement Connections,' (SRS#8). No answer key is provided since answers can vary.

Summative Assessment:

The final assessment (SRS#9) tests the students' ability to use a ruler to measure given objects and to draw straight lines of a given length. Each exercise tests their ability to measure to the nearest whole, half, quarter or eighth inch. The test consists of measuring four objects, drawing four lines to given measurements and answering one Brief Constructed Response (BCR). Answers to the summative assessment are provided on TRS#11.

Authors:

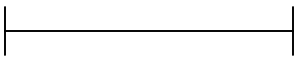
Sean Berg
Lakeland Elementary School
Baltimore City Public Schools

Corinne Reed
McCormick Elementary School
Baltimore County Public Schools

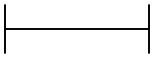
Student Resource Sheet #1

Measurement: What Do You Know?

Directions: Use your ruler in order to measure each line in inches. Write your answer in the space provided.

1. 

_____ inch(es)

2. 

_____ inch(es)

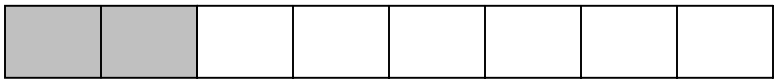
3. 

_____ inch(es)

Directions: Write the fraction that is represented by the shaded part. Write your answer in the space provided.

4. 

_____

5. 

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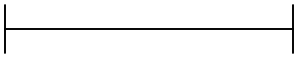
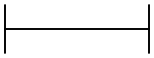
Teacher Resource Sheet #1 (SRS#1-key)

Measurement: What do you know?

Directions: Use your ruler in order to measure each line in inches. Write your answer in the space provided.

6. 

1 ½ inches

7. 

¾ inch

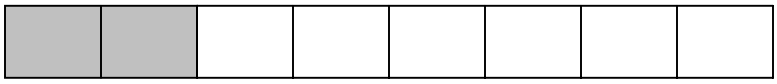
8. 

¼ inch

Directions: Write the fraction that is represented by the shaded part. Write your answer in the space provided.

9. 

5/8

10. 

¼ or 2/8

Teacher Resource Sheet #2

Snap Cube Fish Cut Outs

Figure 1

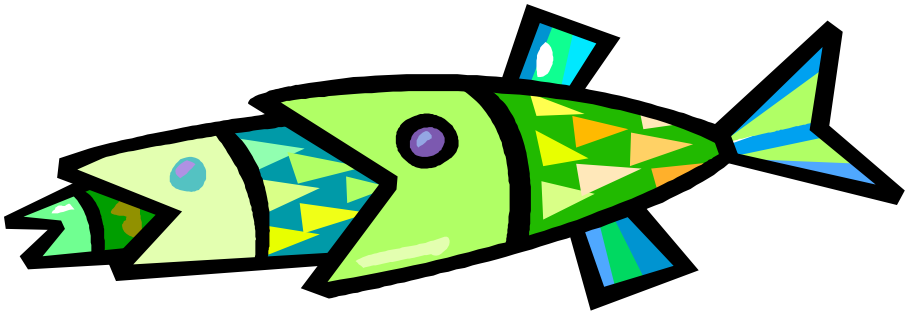


Figure 2

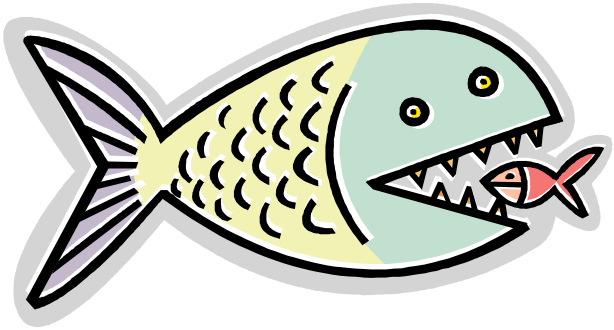


Figure 3

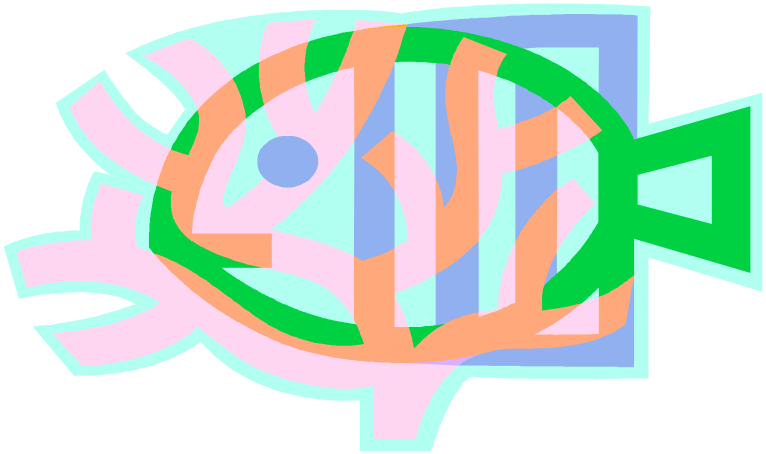


Figure 4

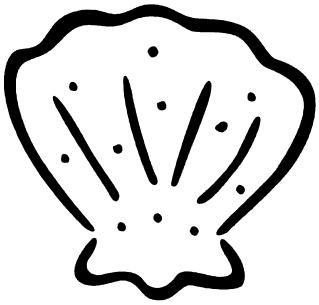


Figure 5

Figure 6

Figure 7

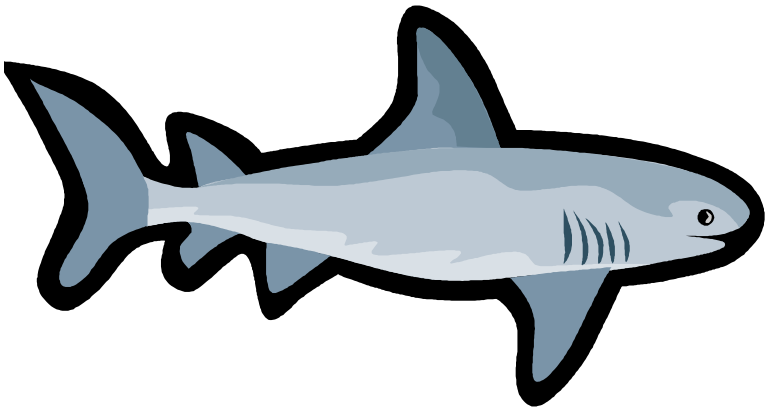


Figure 8

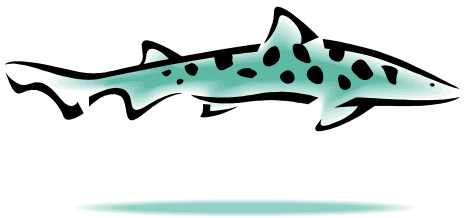


Figure 9

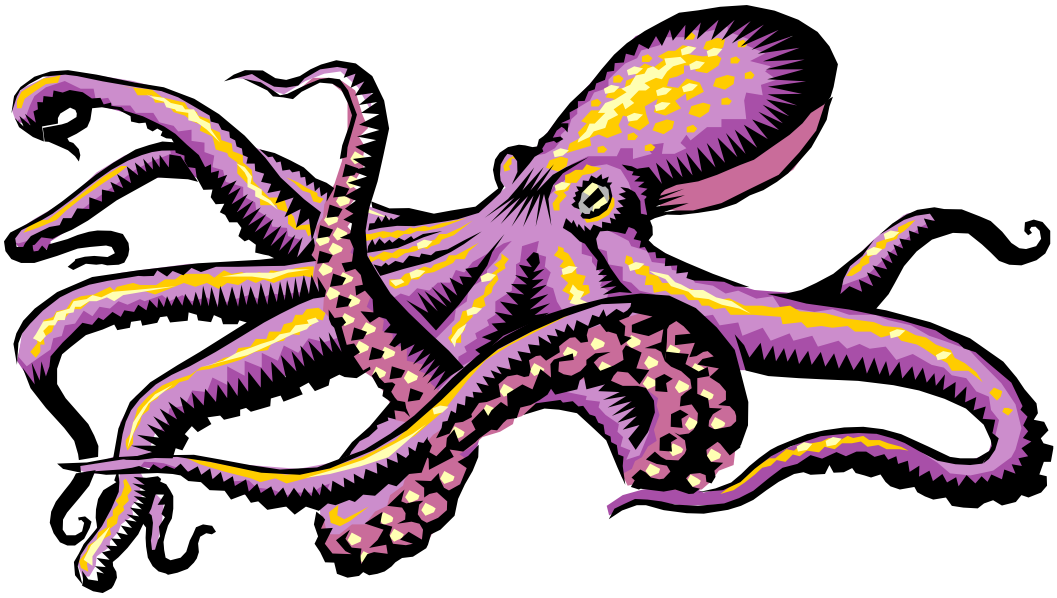


Figure 10

Figure 11

Figure 12

Figure 13

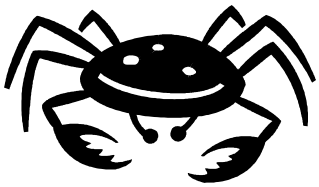


Figure 14

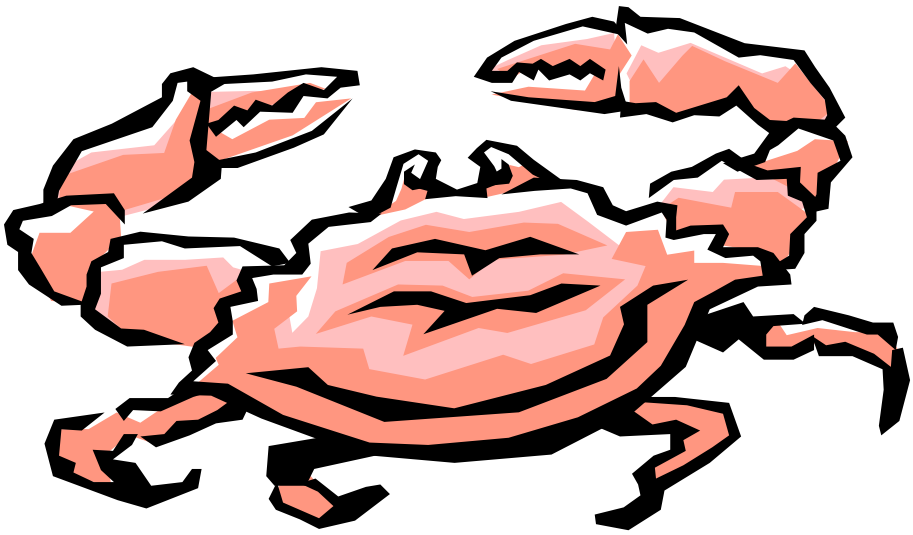
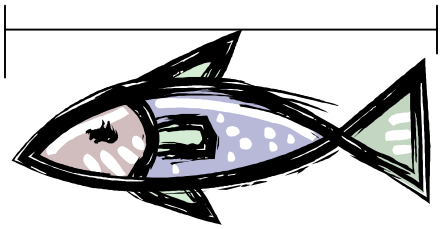


Figure 15

Student Resource Sheet #2

Snap Cube Challenge: How Long Are The Fish?

Directions: Using your whole snap cube unit (8/8), measure each fish and write how long it is using fractions. Make sure your fraction is in simplest form.

1. 

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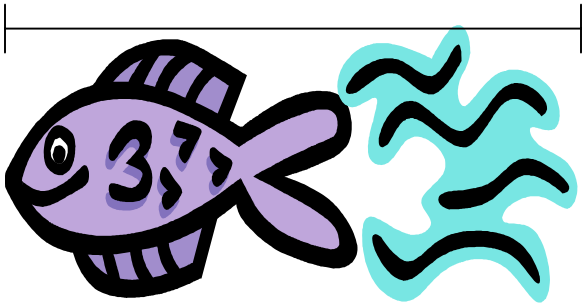
2. 

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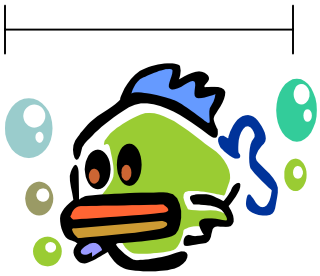
3. 

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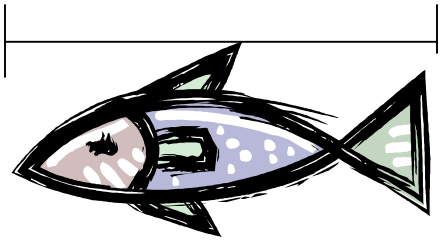
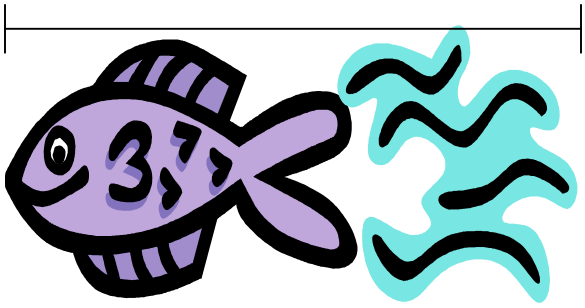
Teacher Resource Sheet #3- SRS #2 key

Snap Cube Challenge: How long are the fish?

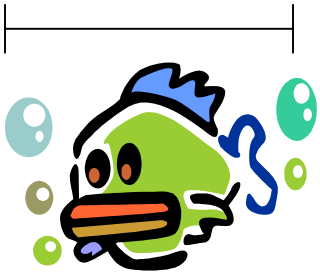
Directions: Using your whole snap cube unit (8/8), measure each fish and write how long it is using fractions. Make sure your fraction is in simplest form.

4. 

3/8

5. 

1/2

6. 

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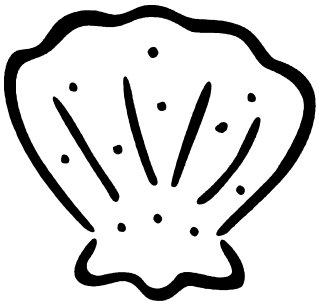
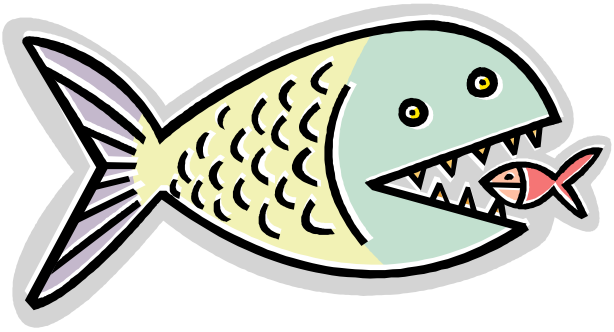
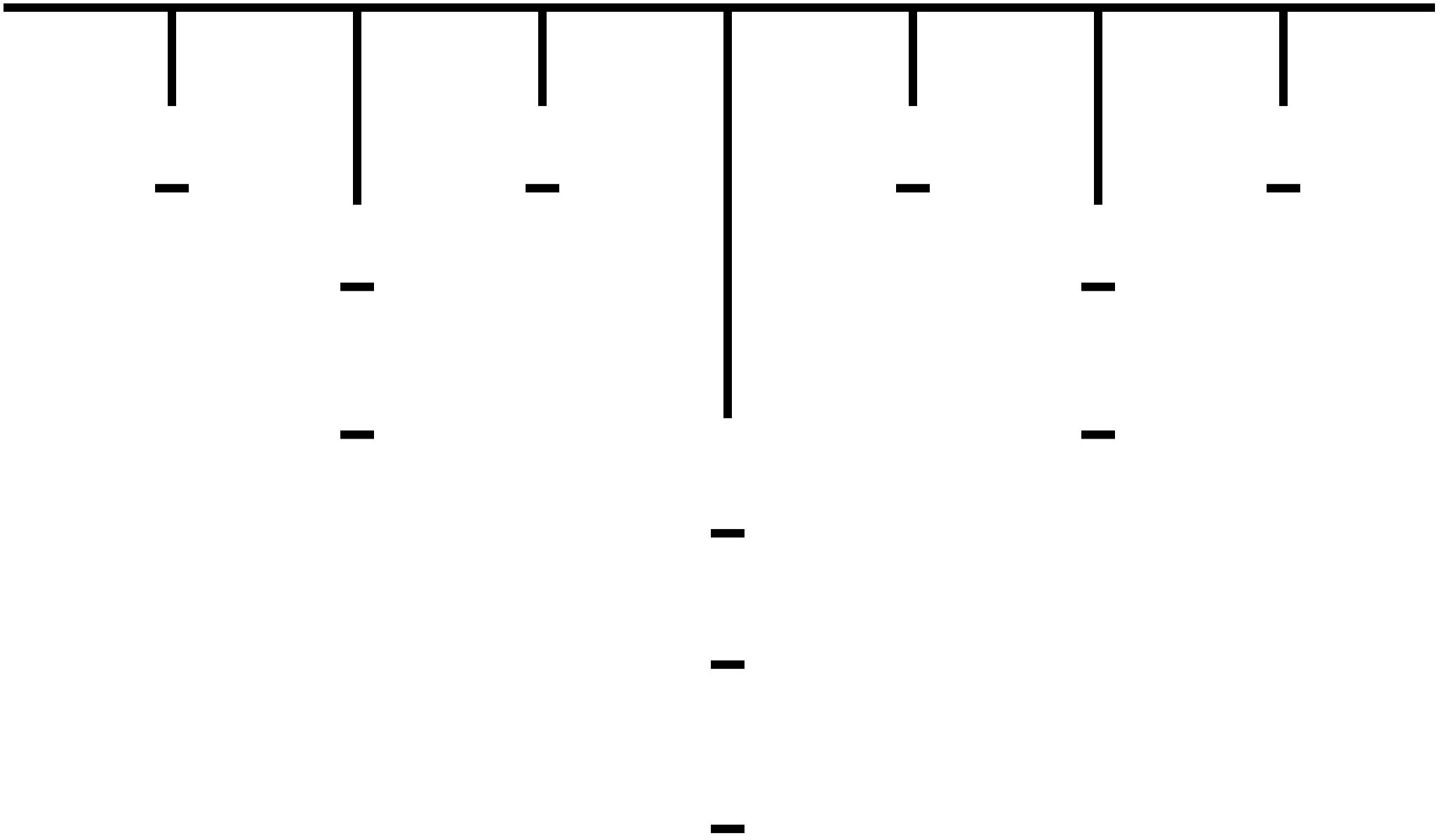
Teacher Resource Sheet #4
Overhead for Preassessment
Lesson 2- Use Snap Cubes



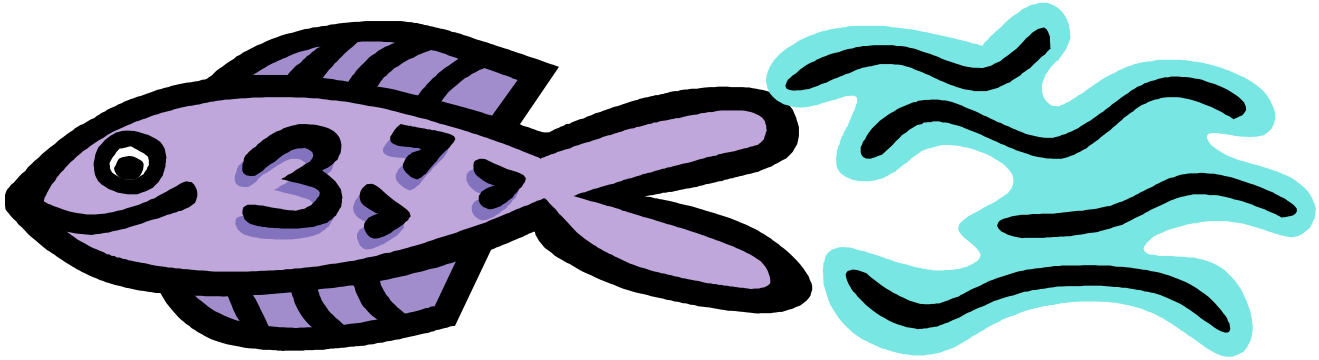


Teacher Resource Sheet #5-Overhead

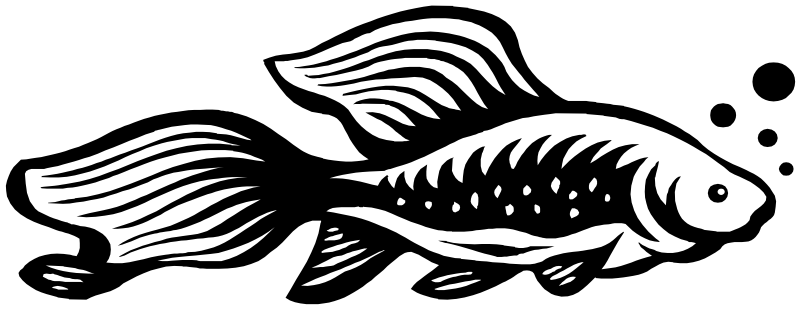
INCREDIBLE INCH



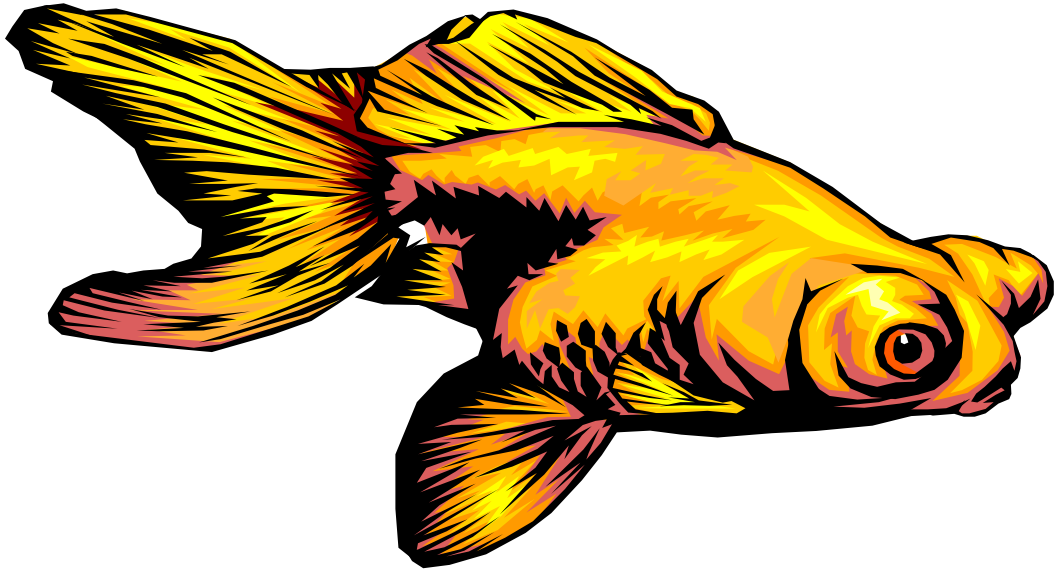
Fish 1



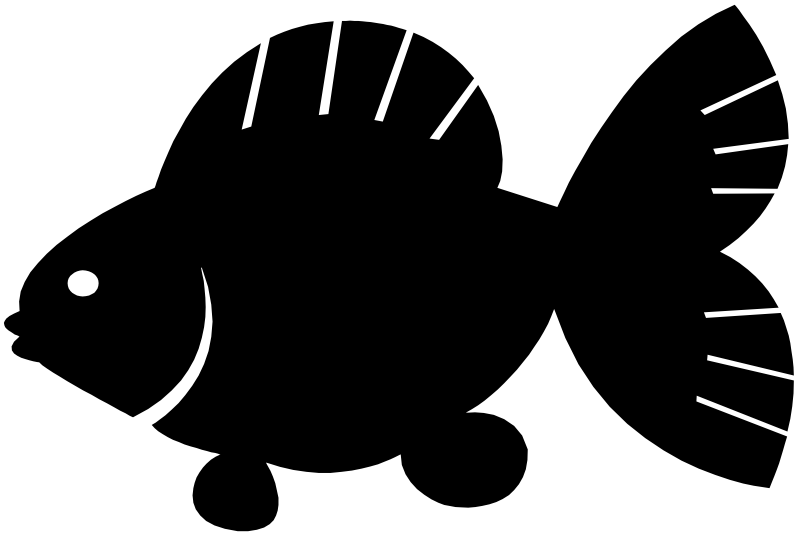
Fish 2



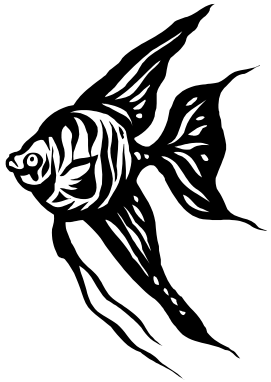
Fish 3



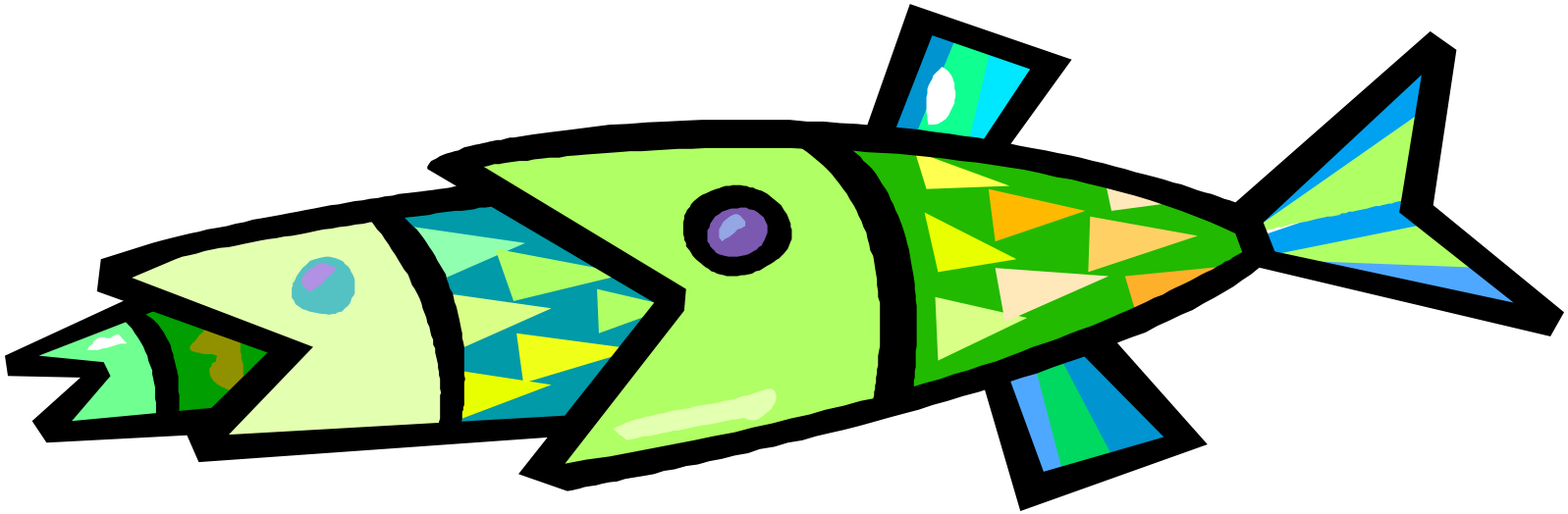
Fish 4



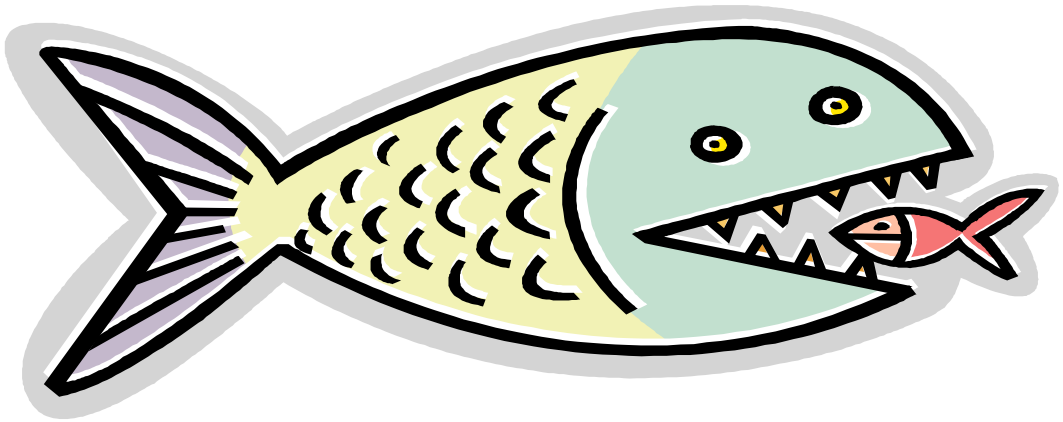
Fish 5



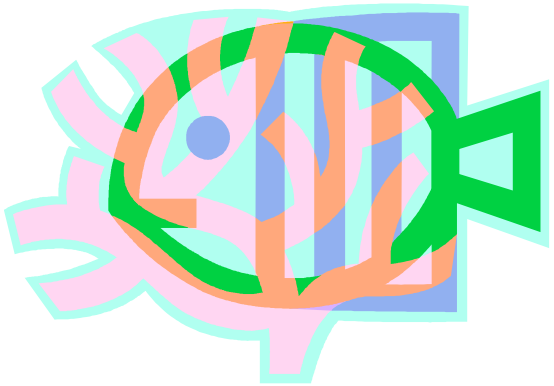
Fish 6



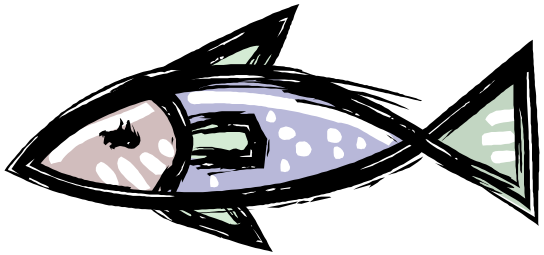
Fish 7



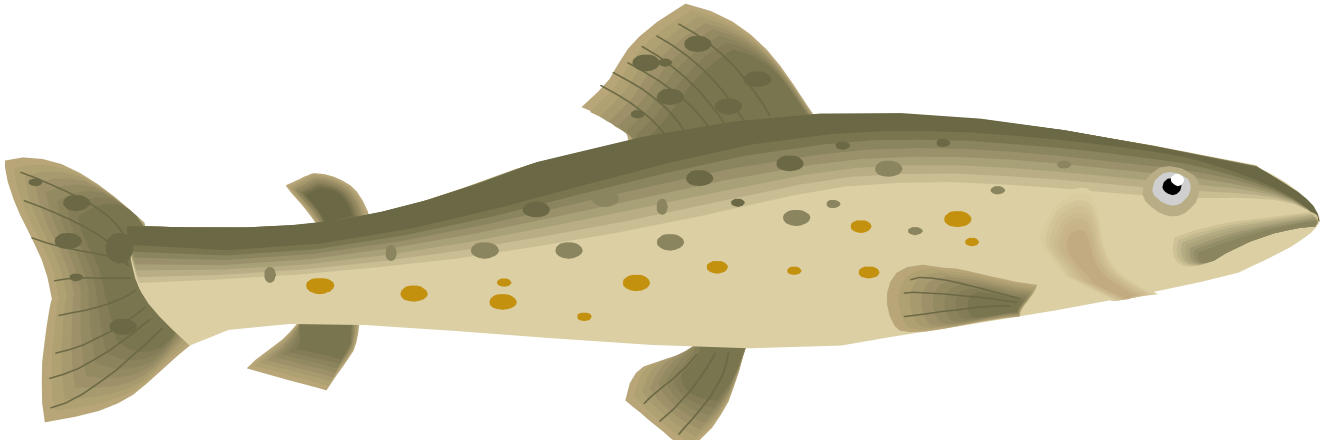
Fish 8



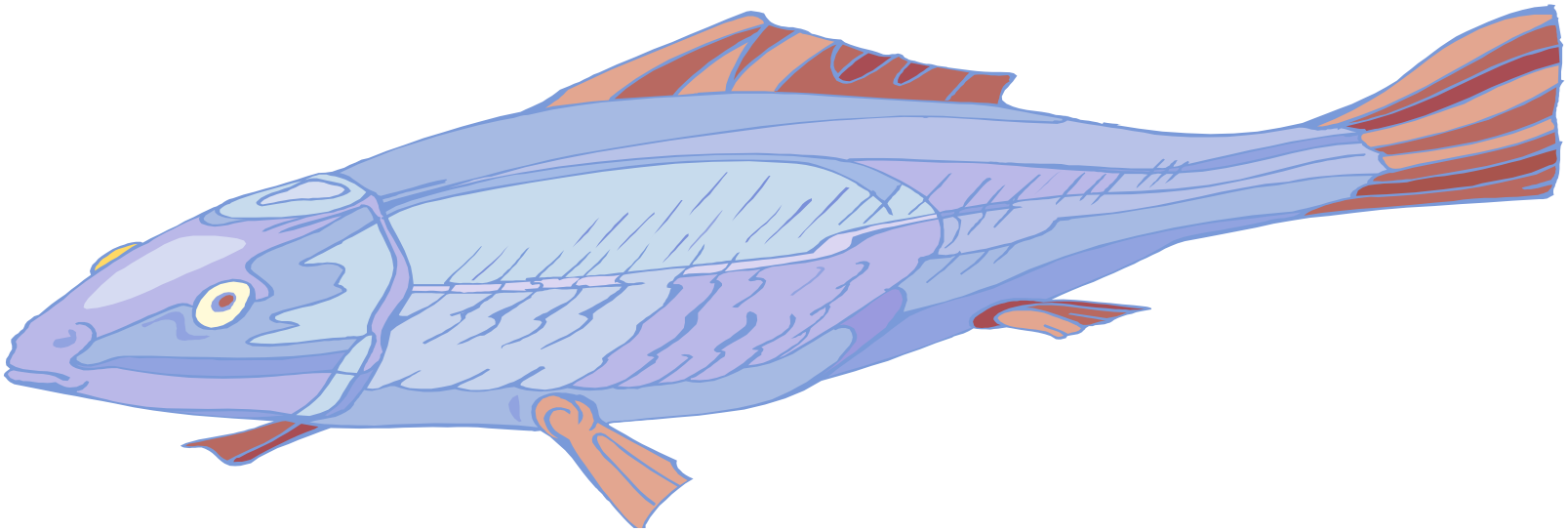
Fish 9



Fish 10



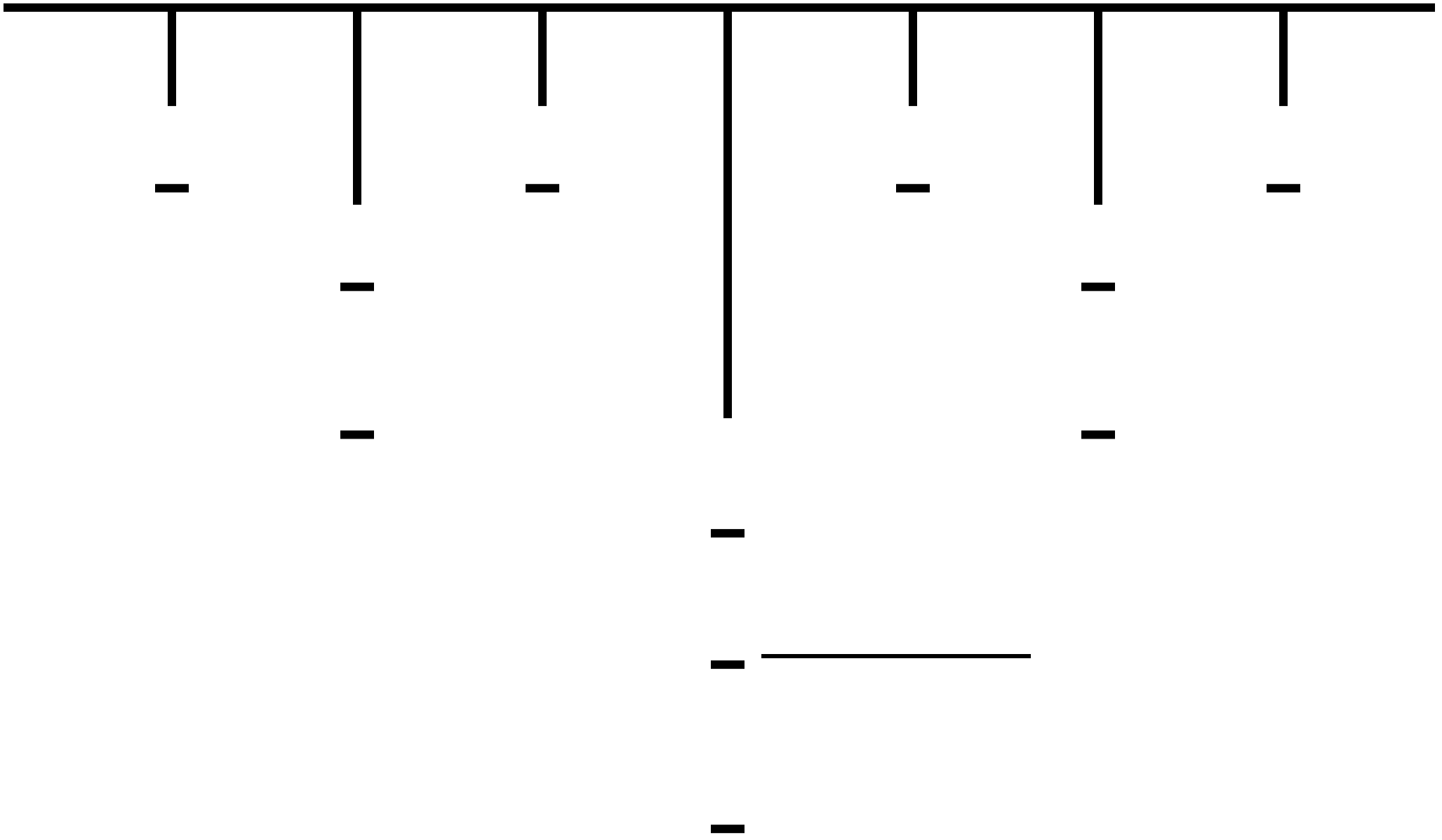
Fish 11



Fish 12

Student Resource Sheet #3

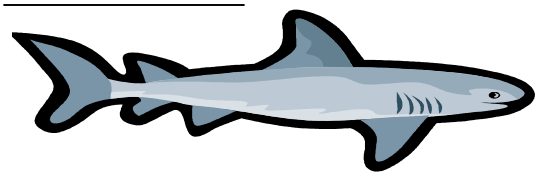
INCREDIBLE INCH



‘Incredible Inch’ Investigation

Directions – Use your ‘Incredible Inch’ to measure each sea creature. Write the length on the answer line provided. Make sure your fraction is in simplest form.

1. _____

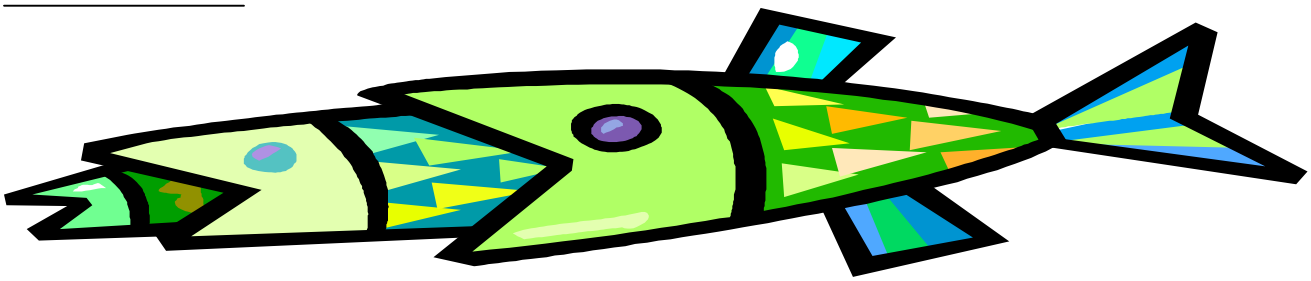


_____

2. _____

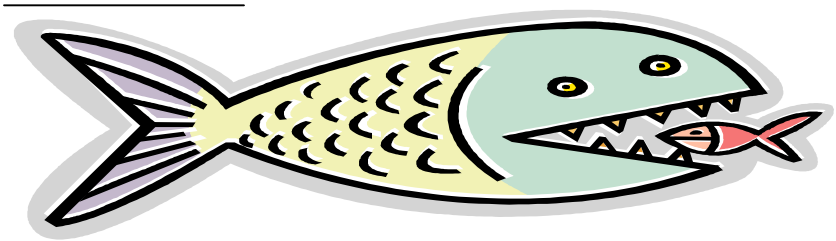
_____

3. _____



_____

4. _____



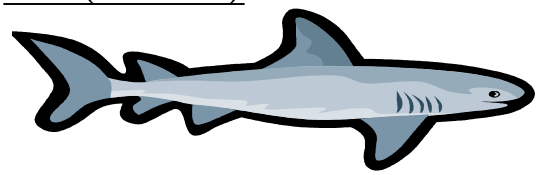
_____

Teacher Resource Sheet #7-
SRS#4 Key

‘Incredible Inch’ Worksheet

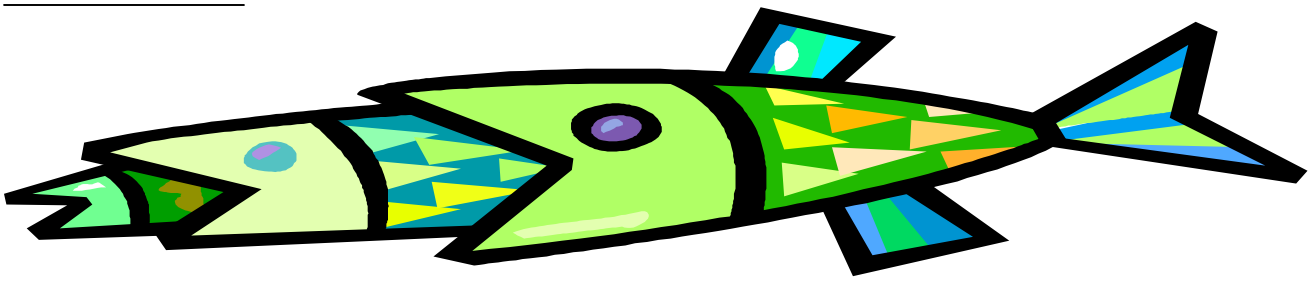
Directions – Use your ‘Incredible Inch’ to measure each sea creature. Write the length on the answer line provided. Make sure your fraction is in simplest form.

1. 1/4 (one fourth)

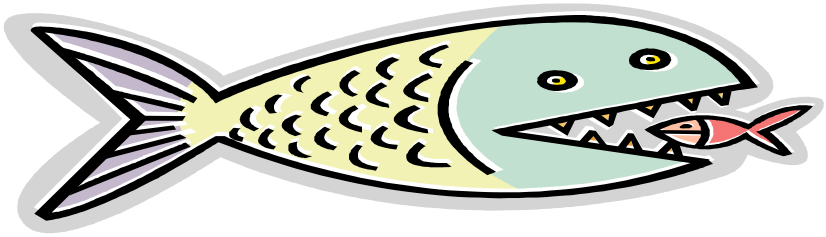


2. 1/2 (one half)

3. 5/8 (five eighths)



4. 3/8 (three eighths)



Combine-a-Fish

Directions:

1. Find a partner.
2. One person gets two bags of fish from the supply area.
3. Place your partner's and your 'Incredible Inches' side by side.
4. Place the fish listed in each problem next to each other so you can measure them with your 'Incredible Inches.'
5. Measure the total length of the two fish given in each problem.
6. Write your answer on the line next to each problem in simplest form.

1. fish 1 and fish 2 _____

2. fish 2 and fish 5 _____

3. fish 3 and fish 4 _____

4. fish 4 and fish 2 _____

5. fish 8 and fish 12 _____

6. fish 2 and fish 7 _____

7. fish 8 and fish 11 _____

8. fish 12 and fish 7 _____

9. fish 9 and fish 2 _____

Combine-a-Fish

Directions:

1. Find a partner.
2. One person gets two bags of fish from the supply area.
3. Place your partner's and your 'Incredible Inches' side by side.
4. Place the fish listed in each problem next to each other so you can measure them with your 'Incredible Inches.'
5. Measure the total length of the two fish given in each problem.
6. Write your answer on the line next to each problem in simplest form.

1. fish 1 and fish 2 _____3/4_____

2. fish 2 and fish 5 _____1_____

3. fish 3 and fish 4 _____7/8_____

4. fish 4 and fish 2 _____1 and 1/8_____

5. fish 8 and fish 12 _____1 and 1/4_____

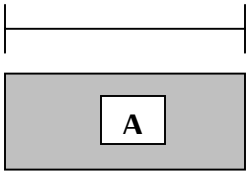
6. fish 2 and fish 7 _____1 and 3/8_____

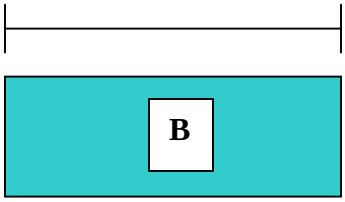
7. fish 8 and fish 11 _____1 and 1/8_____

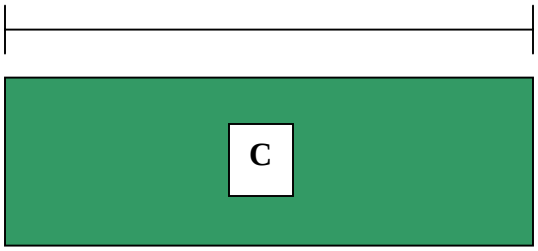
8. fish 12 and fish 7 _____1 and 1/2_____

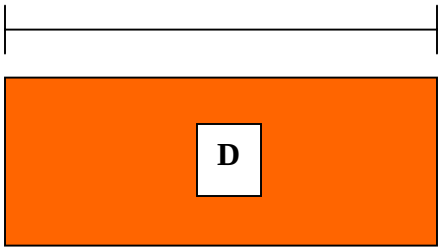
9. fish 9 and fish 2 _____7/8_____

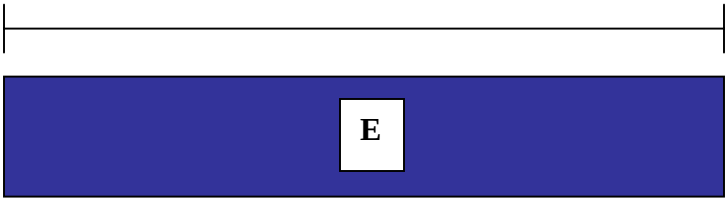
Teacher Resource Sheet #9
Print, cut out and put in bags
for groups of students











Student Resource Sheet #6

Measurement Hunt

Directions: Using your ruler, write the exact length of the following items found throughout the classroom.

1. chalkboard eraser _____
2. your index/pointy finger _____
3. math book _____
4. pencil box _____
5. one snap cube _____
6. paper clip _____
7. scissors _____
8. foot _____

Directions: Use your ruler to draw a straight line using the measurement and the space below it.

9. 2 1/4 inches

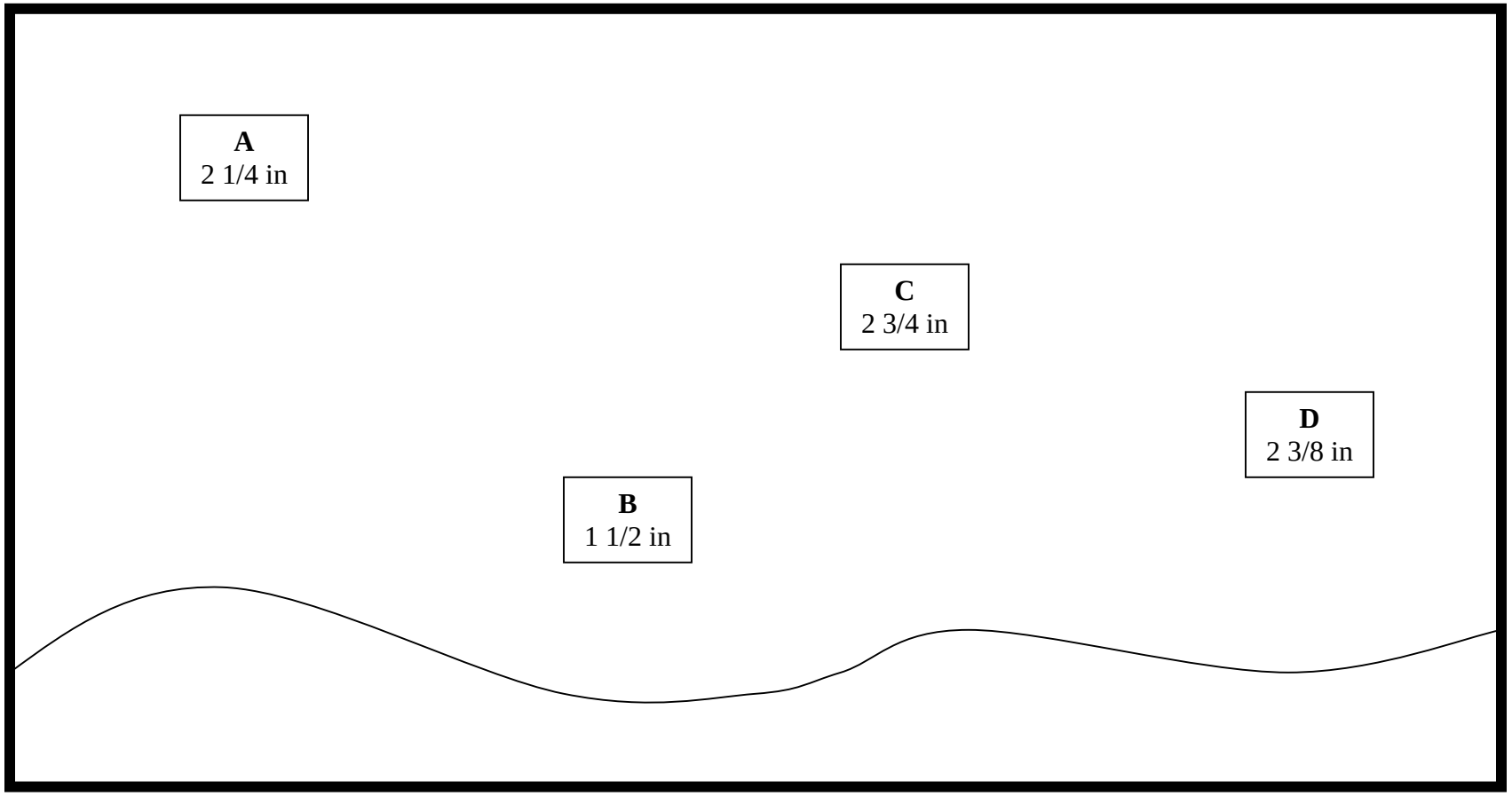
10. 1 5/8 inches

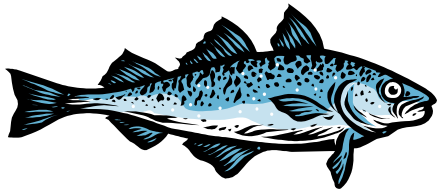
11. 3 3/4 inches

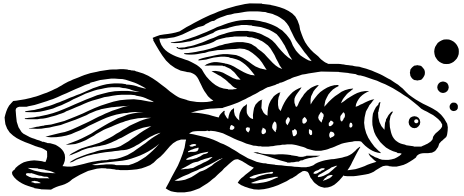
Student Resource Sheet # 7

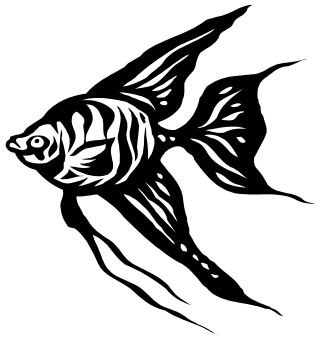
Aquarium Fun- Where do the Fish Belong?

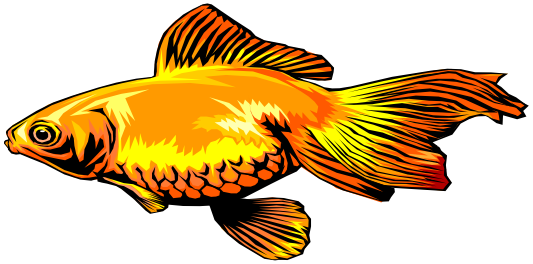
Directions: 1) Measure each fish on the next page. Then cut out the fish and paste them on top of the correct letter and length in the aquarium.
2) Draw a straight line that is 1 5/8 inches long going from fish A to a new fish that you draw inside the aquarium. Hint: Draw the line first and then your new fish.







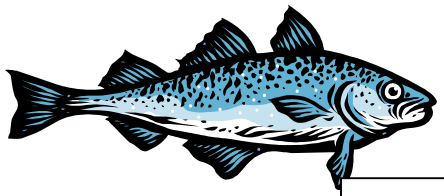




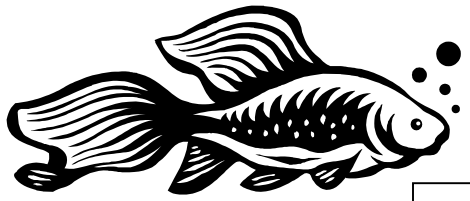
Teacher Resource Sheet #10
SRS #7 Key

Aquarium Fun- Where do the Fish Belong?

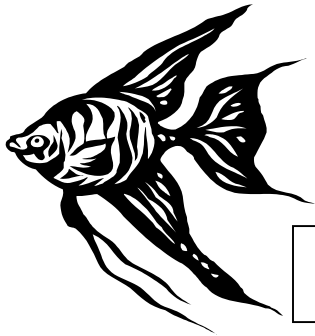
The boxes next to the fish indicate the correct placement of the fish in the aquarium.



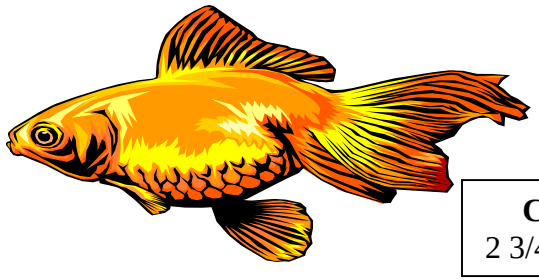
A
2 1/4 in



D
2 3/8 in



B
1 1/2 in



C
2 3/4 in

Student Resource Sheet # 8

Measurement Connections

Directions: Read carefully through each step to make a snake-like line.

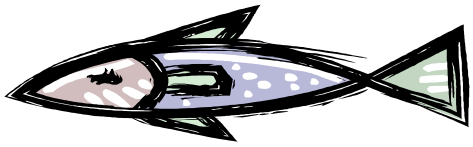
1. Start at Point A and draw a straight line in any direction that is 2 1/4 inches. Write Point B at the end of your line.
2. From Point B draw a straight line connecting it to Point C. How long is the line from Point B to Point C? _____ inch(es)
3. From Point D draw a straight line in any direction that is 1 7/8 inches. Write Point E at the end of your line.
4. From Point E draw a straight line connecting it to Point F. How long is the line from Point E to Point F? _____ inch(es)
5. At Point G draw a circle and make a head of an animal of your choice.
6. Color the rest of your new animal. Be creative!

Student Resource Sheet # 9

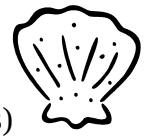
Measurement Test

Directions: Use a ruler to measure the lines/objects. Write your answer in the space provided.

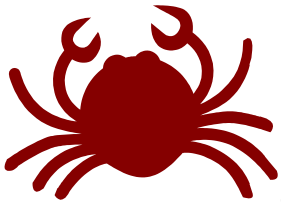
1. _____ inch(es)



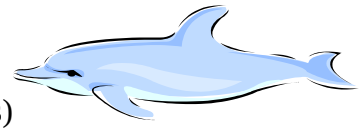
2. ___inch(es)



3._____ inch(es)



4. _____inch(es)



Directions: Use a ruler to draw a straight line of the given length in the space below.

5. 2 3/4 inches

6. 1 1/8 inches

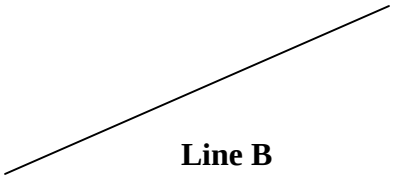
7. 3 1/2 inches

8. 2 5/8 inches

Brief Constructed Response

Line A

2 2/8 inches



Line B

Part A

What is the length of Line B in simplest form? _____ inch(es)

Are Line A and Line B the same lengths? _____

Part B

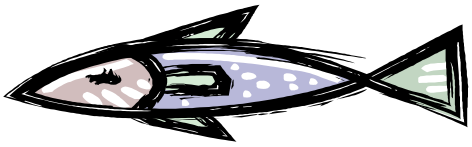
Use what you know about measurement and simplest forms to explain why your answer is correct. Use number and/or words in your explanation.

Teacher Resource Sheet #11

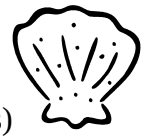
Measurement Test

Directions: Use a ruler to measure the lines/objects. Write your answer in the space provided.

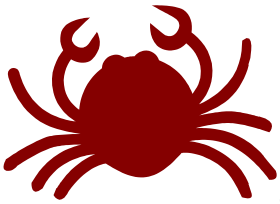
1. _2 3/8 inch(es)



2. 5/8_inch(es)



3._1 1/2 inch(es)



4. _1 7/8 inch(es)

Directions: Use a ruler to draw a straight line of the given length in the space below.

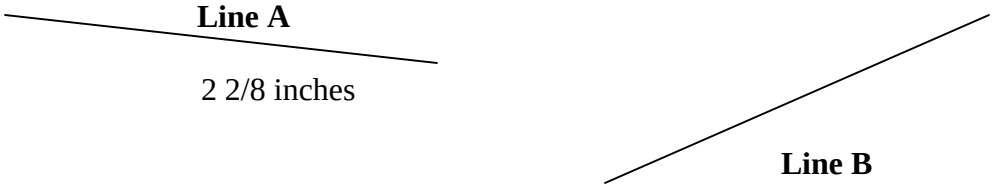
5. 2 3/4 inches

6. 1 1/8 inches

7. 3 1/2 inches

8. 2 5/8 inches

Brief Constructed Response



Part A

What is the length of Line B in simplest form? 2 1/4 inch(es)

Are Line A and Line B the same lengths? Yes

Part B

Use what you know about measurement and simplest forms to explain why your answer is correct. Use number and/or words in your explanation.

My answer is correct because I measured line B and it was 2 1/4 inches long. That is the same as 2 2/8 inches because if you look on a ruler they are both the same mark, but 2 1/4 is the simplest form. 2 2/8 is simplified to equal 2 ¼ by dividing the numerator and denominator by 2. Note: Key point is that the student mentions the two lines are equal when simplified.