Domain: Operations and Algebraic Thinking

Title: Greater Than, Less Than, Equal To in Range up to 10 (with pictures, symbols, objects, numerals)

Grade: K

Formative Assessment Lesson

Designed and revised by the Kentucky Department of Education
Field-tested by Kentucky Mathematics Leadership Network Teachers

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kdemath@education.ky.gov

Revised 2017

This Formative Assessment Lesson is designed to be part of an instructional unit. This task should be implemented approximately two-thirds of the way through the instructional unit. The results of this task should be used to inform the instruction that will take place for the remainder of your unit.

Mathematical goals:

This lesson is intended to help you assess how well students are able to:

- Using strategies to determine if one group is greater than, less than or equal to in the range up to 10 (using pictures, symbols, objects, and/or numerals).
- Recognize and use the symbols =, -, +

Kentucky Academic Standards:

Critical Area: In Kindergarten, one of the critical focus areas is: (1) representing and comparing whole numbers, initially with sets of objects. More learning time in Kindergarten should be devoted to number than to other topics.

- Students use numbers, including written numerals, to represent quantities and
- to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and
- modeling simple joining and separating situations with sets of objects, or eventually with equations such as 5 + 2 = 7 and 7 – 2 = 5.
- (Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.)
- Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects,
- counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

Kindergarten – Counting and Cardinality

- K.CC.6 Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. (Include groups with up to ten objects)

- K.CC.7 - Compare two numbers between 1 and 10 presented as written numerals

Kindergarten – Operations and Algebraic Thinking

- K.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations

The below 1st Grade Standards are included only to inform the teacher of vertical alignment:

First Grade - Operations and Algebraic Thinking

- 1.0A.2 - Know how to add three whole numbers whose sum is less than or equal to 20. (This is a knowledge target taken from Deconstructed Standards on KDE's website.)
- 1.OA.3 - Understand and apply properties of operations and the relationship between addition and subtraction.
- 1.OA.6 - Add and Subtract within 20 (demonstrating fluency for addition and subtraction within 10
- 1.OA.7 – Understand the meaning of the equal (=) sign
- 1.OA.8 – Determine the unknown whole number in an addition or subtraction equation relating to three whole numbers. (Extension to challenge students.)
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First Grade – Number and Operations

- 1.NBT.3 Know what each symbol represents less than, greater than, equal to. (This is a knowledge target taken from Deconstructed Standards on the Kentucky Department of Education's (KDE's) website.

This lesson involves a range of *Standards for Mathematical Practice (MP),* with emphasis on:

MP2. Reason abstractly and quantitatively
MP3. Construct viable arguments and critique the reasoning of others
MP4. Model with mathematics
MP6. Attend to precision
MP7. Look for and make use of structure

Lesson Vocabulary:

Student Vocabulary	**Teacher Vocabulary** *(These terms are used in middle school and for teacher awareness only at this grade level.)*
Compare/comparison	Inequality (introduced in middle school)
Number sentence	expression (introduced in upper grades)
Greater than, less than, equal, add +, subtract -, unknown	

Introduction:

This lesson is structured in the following way:

- Before the lesson, students work individually on an assessment task that is designed to reveal their current understandings and difficulties. You then review/analyze their responses and create questions for students to consider/answer in order to improve their solutions.
- A whole class introduction provides students with guidance on how to engage with the content of the task.
- Students work with a partner on a collaborative discussion task. Throughout their work, students justify and explain their decisions to their peers.
- In a final whole class discussion, students synthesize and reflect on the learning to make connections within the content of the lesson.
- Finally, students return to their original assessment tasks or a similar task and try to improve their own responses.

Materials Required:

Each individual student will need:

- Two copies of the assessment task ***Greater Than, Less Than, or Equal to in Range up to 10*** per student.
- Each student will need a red, a yellow, and a blue crayon.

Each pair of students will need the following resources: (It is recommended to put sets on different colors of cardstock or construction paper and laminate for durability.)

- Card set A (MP4)
- Chart A
- Card Set B (MP4)
- Chart B
- Card Set C (MP4)
- Chart C
- Blank Template Chart D. Students will not need Cards for Chart D. They will write their expressions on the chart. (MP4)

Teacher materials needed for this FAL:

- Markers
- Anecdotal Notes on FAL
- A set of Card Set A
- Chart A written on large chart paper for whole group discussion

Time Needed:

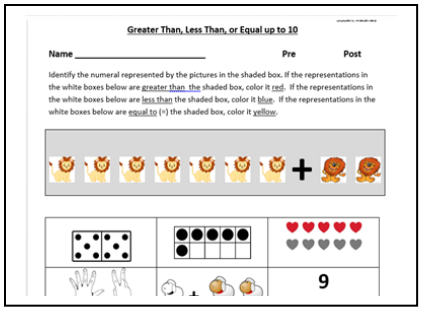
- Approximately 20 minutes for the individual pre-assessment task (at least a day or two before lesson),
- Two 40 - minute lessons (30 minutes for group task and 10 minutes for whole class discussion),
- 20 minutes for the individual post-assessment task.
- Timings given are only approximate. Exact timings will depend on the needs of the class.
- *All students need not complete all sets of card activities*.

Before the Lesson:

Assessment Task: Greater Than, Less Than, or Equal up to 10

- Have students do the initial task, *Greater Than, Less Than, or Equal up to 10* individually in class a day or two before the formative assessment lesson. *REMEMBER: You will give this same assessment again as a post-assessment.)*
- This will give you an opportunity to assess the work, and to find out the kinds of misconceptions students have with it.
- You will be able to target your help more effectively in the follow-up lesson. Depending on your class you can have them do it all at once or in small teacher-led groups (they should still work individually.)

Framing the pre-assessment: (10-15 minutes):


Greater Than, Less Than, or Equal up to 10

Name _____ Pre Post

Identify the numeral represented by the pictures in the shaded box. If the representations in the white boxes below are greater than the shaded box, color it red. If the representations in the white boxes below are less than the shaded box, color it blue. If the representations in the white boxes below are equal to (=) the shaded box, color it yellow.

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Give each student a copy of the assessment task "*Greater Than, Less Than, or Equal to in Range up to 10.*

Display the directions below on the screen.

Identify the numeral represented by the pictures in the shaded box.

If the representations in the white boxes below are <u>greater than</u> the shaded box, color it

. (color the crayon red to display)

If the representations in the white boxes below are <u>less than</u> the shaded box, color it

. (color the crayon blue to display)

If the representations in the white boxes below are <u>equal to</u> (=) the shaded box, color it

. (color the crayon yellow to display)

"Look at the box at the top of the page. Identify the numeral represented by the pictures in the shaded box. If the representations in the white boxes below are <u>greater than</u> the shaded box, color it <u>red</u>. If the representations in the white boxes below are <u>less than</u> the shaded box, color it <u>blue</u>. If the representations in the white boxes below are <u>equal to</u> (=) the shaded box, color it <u>yellow</u>."

It is important that the students are allowed to answer the questions without your assistance, as far as possible. If students struggle to get started ask questions that help them understand what they are being asked to do, but do not do the problem for them. See the *Common Misconceptions Chart* for guiding questions on Page 6.

Students should not worry too much if they do not understand or cannot do everything, because in the next lesson they will engage in a similar task, which should help them. Explain to students that by the end of the next lesson, they should expect to answer questions such as these confidently.

Assessing Students' Responses: *Remind students they should know most of the content and this is a review for the teacher to see what we need to work on.*

- Collect students' responses to the task. We suggest that you do not actually score student's work. The research shows that this will be counterproductive, as it will encourage students to compare their scores, and will distract their attention from what they can do to improve their mathematics.
- Instead, help students to make further progress by summarizing their difficulties as a series of questions. Some questions in the *Common Misconceptions* Chart on page 6 may serve as examples. These questions have been drawn from commonly identified student misconceptions.
- Make notes about what their work reveals about their current levels of understanding and their different problem solving approaches.
- Partner students with others who displayed similar errors/misconceptions on the pre-assessment task.

We recommend you:

- Write one or two questions on each student's work, or
- give each student a printed version of your list of questions and highlight the questions for each individual student or
- display a small list of questions on the board that will be of help to the majority of students.
- For some students, you may need to go over these questions orally, or just use them as you walk around the room and notice mistakes they are making.
- The solution to all these difficulties is not to teach one particular way of solving a problem, but to help students to find a variety of ways that work in different situations and make sense to them.

Below is a list of common misconceptions and questions/prompts that may be written on individual tasks, on the board or asked during the collaborative activity to help students clarify and extend their thinking.

Common Misconceptions:	**Suggested questions and prompts:**
Students will confuse the vocabulary greater than or less than.	• Ask the student to read the card out loud. • Can you build or draw a representation of that math expression (number sentence)? • Why do you think that card goes in that column? • What did you do to decide this card should be greater than, less than, or equal to?
Students will confuse symbols for adding and subtracting (+ -)	• Ask the student to read the problem out loud • Can you build or draw a representation of that math expression (number sentence)? • Why do you think that expression (number sentence) is true? • What did you do to decide if this expression (number sentence) should be addition or subtraction? • What does this symbol mean for you to do?
Students will randomly select cards	• Does the problem make sense? • Can you draw or build a representation to show that card goes in that column?
Students will incorrectly solve for the number sentence or identify the picture representation	• What strategy did you use to solve the problem? • Can you build or draw a representation to show that card goes in that column? • Read the problem to me? • Can you tell me how many altogether? Ok, is that greater than, less than, or equal to the picture representation in the gray box?

Students may guess and not count	• Show me how you got your answer? • What number did you start counting at? • Let me hear you count those objects?
Students may not subitize	• Do you see any groups? • Please count those for me by touching each object.
May not have the 1 to 1 correspondence (cardinality)	• Will you use your finger to point to each object and count out loud?

Recommendation for the teacher: Keep in mind the misconceptions that each student had during the pre-assessment. As you walk around the room monitoring students working, address those areas of misconceptions with the students. You can do this by developing your own anecdotal notes. (An example of Anecdotal Notes on FAL is below on Pages 19 and 20)

Individual Assessment without help

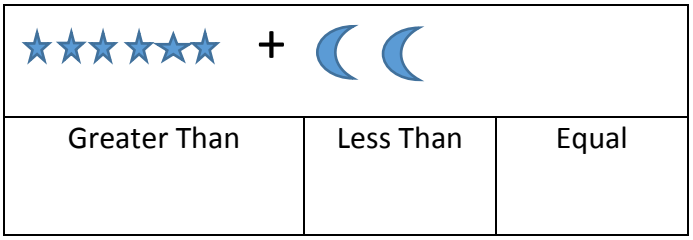
- Give Pre-Assessment
- Make notes about the misconceptions of each student. (Anecdotal Notes on FAL Pages 19 & 20)
  Strategically partner students based on pre assessment data. Partner students with others who display similar errors/misconceptions on the preassessment task. While this may seem counterintuitive, this will allow each student to more confidently share their thinking. This may result in partnering students who were very successful together, those who did fairly well together, and those who did not do very well together.

Part 1: Whole Class Introduction (mini-lesson) (15 minutes)

The student's misconception data from your pre-assessment will drive this whole class mini-lesson (e.g. It could be about the, greater than, less than, equal to.)

Today we are going to do some more work on determining if one group is greater than, less than, or equal to another group.

- Teacher uses chart paper to model Chart A diagram but use a picture representation for 6 + 2.
- Students use their mini whiteboard to solve the picture representation for 6 + 2.



- Teacher would then write the answer on the chart paper out from the picture representation for 6 + 2.
- Teacher will show another picture representation to students for the students to solve on their whiteboards. (Teacher may use Card Set A or teacher can use post cards to make up their own picture representations to use for modeling 6 + 2.) ***(MP 7)***
- After answering, the teacher will facilitate a discussion on comparing (inequality) with the students about whether or not that answer is greater than, less than, or equal to 6 + 2.
- After the discussion, they will place the card under the appropriate column on the chart paper (greater than, less than, or equal to).
- Repeat this process with another picture representation, if need be.
- Refer back to Common Misconceptions Chart on Page 6 for questions to help guide discussion.

Part 2: Collaborative Activity: (20-30 minutes)

Explain to students how they are to work collaboratively. Sample dialogue below:

- *"I want you to work with your partner. There is a lot of work to do today and you may not all finish."*
- *"The important thing is to learn something new, so take your time."*
- *"I just modeled for you how to complete this activity" (mini-lesson from above)*
- *"Look at the box at the top of the chart. It will have picture representation, a number, or a number sentence.* ***(MP 6)***
- *"Take turns choosing a card."*
- *"Look at the card you chose and either solve for the picture representation or number sentence, or say the name of the numeral on the card".* ***(MP 6)***
- *"Explain the strategy you used to get your final answer."* ***(MP 7)***
- *"Decide if the answer to the card is greater than, less than, or equal to the information in the gray box at the top of the chart and place it under the greater than, less than, or equal to column.* ***(MP2)***
- *"Remember each time you solve the number sentence and place it under a column, you need to explain your thinking clearly to your partner".* ***(MP 3)***
- *"If your partner disagrees with your match then challenge him or her to explain why."* ***(MP 3)***
- *"It is important that you both understand why each card is placed where it is."* ***(MP 3)***
- *Hand out Card Set A and Chart A to each group. As groups finish a card set, hand the groups the next card set B and then C. Remember every group may not complete all 3 sets.*

While students are completing the tasks, the teacher's job is to:

- Walk around and monitor/facilitate discussions with students, asking them how they solved the expressions (number sentences) and why they placed the cards under the chosen column trying to determine strategies they are using, reasoning behind their work, and correcting misconceptions as they arise. ***Refer back to Common Misconceptions Chart on Page 6 for questions to help guide discussion.*
- Make a note of whose strategies or thinking you would like to share during Discussion/Reflection time. Inform the student you would like them to be prepared to share their thinking process later. ***(MP 7)***
- Make note of any common misconceptions you observed during the small group work.
- The notes you gather during group work time can guide the whole-class discussion at the end of the lesson.

- Since this is given 2/3 of the way through the unit, you can use the data you gathered to guide instruction in the remaining 1/3 of the unit.

Ways You Can Support Student Problem Solving While Teacher is Monitoring:

- Try not to make suggestions that move students toward a particular approach to the task. Instead, ask questions to help students clarify their thinking. Encourage students to use each other as a resource for learning. Encourage students to explain their reasoning carefully.
- If one student has placed a particular card on the chart, challenge their partner to provide an explanation.
- If you find students have difficulty articulating their decisions, then you may want to use the questions from the *Common Misconceptions* Chart on Page 6 to support your questioning.
- If the whole class is struggling on the same issue, then you may want to write a couple of questions on the board and engineer a quick whole class discussion.

Extension activities -- Individual Student Work for the groups who finish Card Sets A, B, and C quickly.

- Ask students who finish all of the sets ***quickly*** to use Chart D to write their own expression (number sentence) or picture representation or number in the box at the top of the chart.
- Using the expression (number sentence) or picture representation or number they wrote in the box, the students will create and write their own expression (number sentence), picture representation, or number under the appropriate headings *"greater than", "less than", and "equal to"* to show their understanding of greater than, less than, and equal to**.**

Part 3: Whole-class discussion/reflection (10 minutes) Carpet Time

- Focus discussion on strategies used by charting student's strategy used.
- Conclude the lesson by discussing and generalizing what has been learned.
- The generalization involves first extending what has been learned to new examples, and then examining some of the conclusions students came up with.
- Allow groups to bring up some of their work samples and share their thinking.
- The purpose of this discussion is to explore the processes involved in a range of different approaches.
- The aim is to get students to understand and share their reasoning, not just checking that everyone found the correct matches.

Ask students:
Why did you decide to place that card there?
What clues did you use to help you in your decision?
Is there another card that could go there?
What strategy did you use to determine where to place your card?

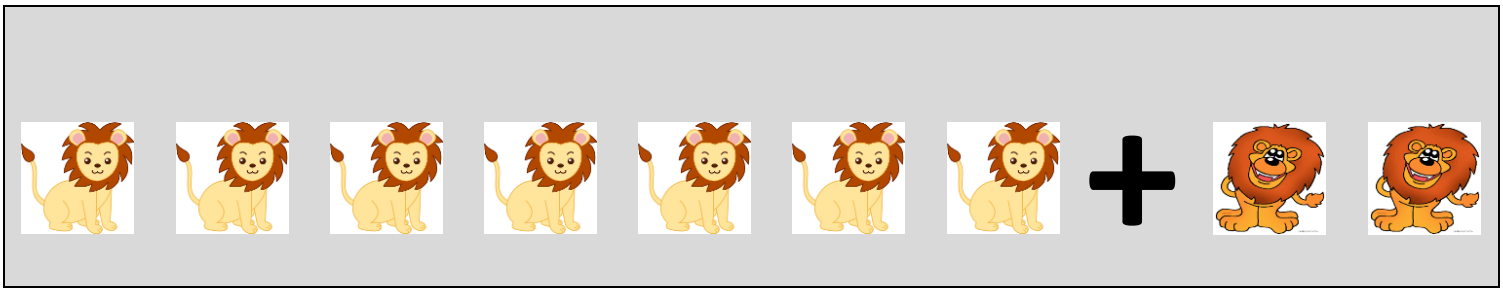
Improving individual solutions to the assessment task (10 minutes)

- Give the students a new copy of the assessment *"Greater Than, Less Than, or Equal up to 10".*
- You could say to the students: *"Think about what you have learned during this lesson. Using what you have learned, try to improve your work on this assessment compared to the pre-assessment that you took a few days ago."*
- Remember to use the data from this assessment to guide the remaining instruction of the unit.

Greater Than, Less Than, or Equal up to 10

Student Materials

Name _____ **Pre** **Post**



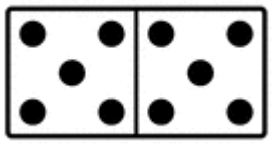
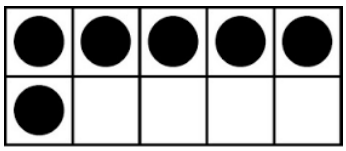
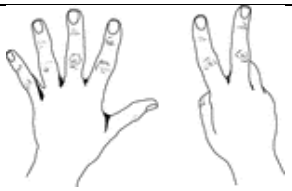
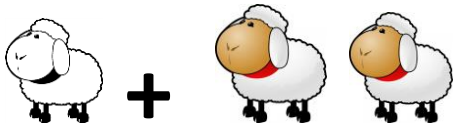
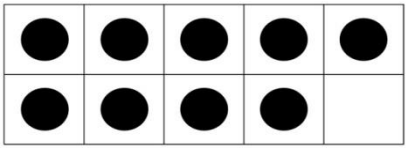
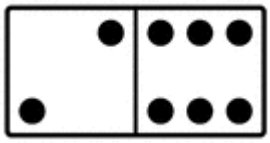
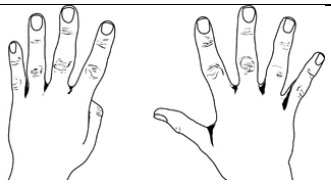
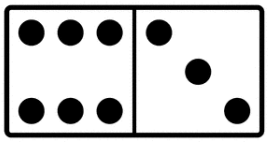
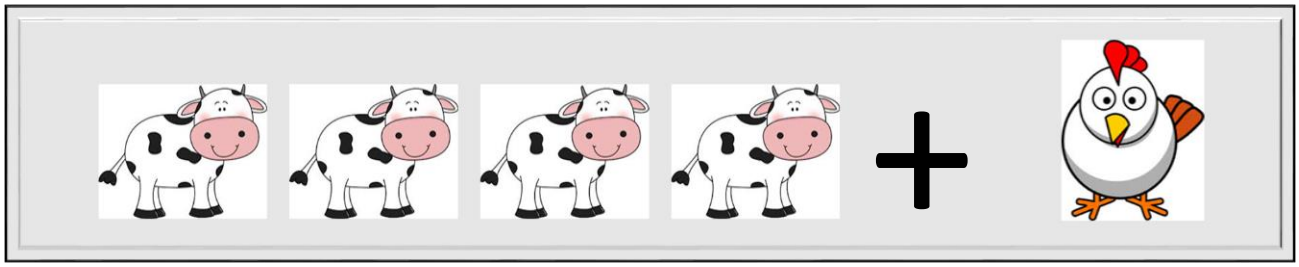
		
		9
		
5 + 0		11
		3 + 2

Chart A



Greater Than	Less Than	Equal

Card Set A
(Cut apart)

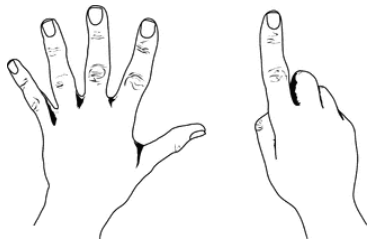
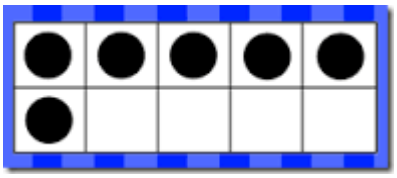
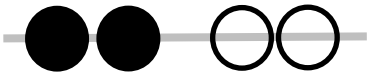
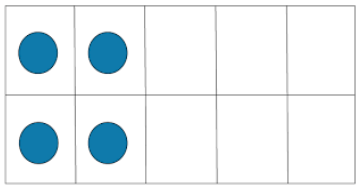
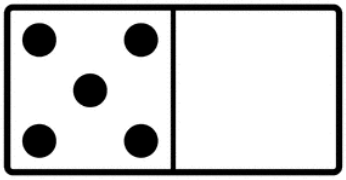
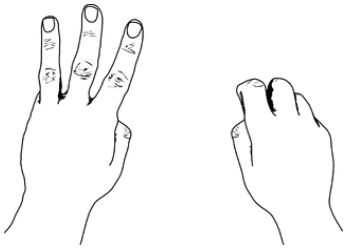
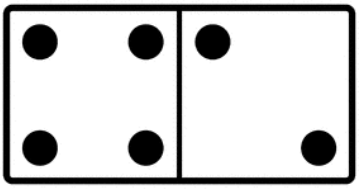
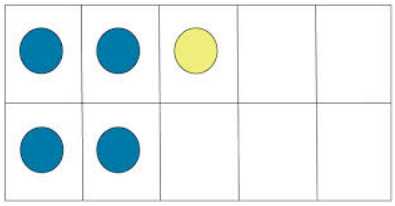
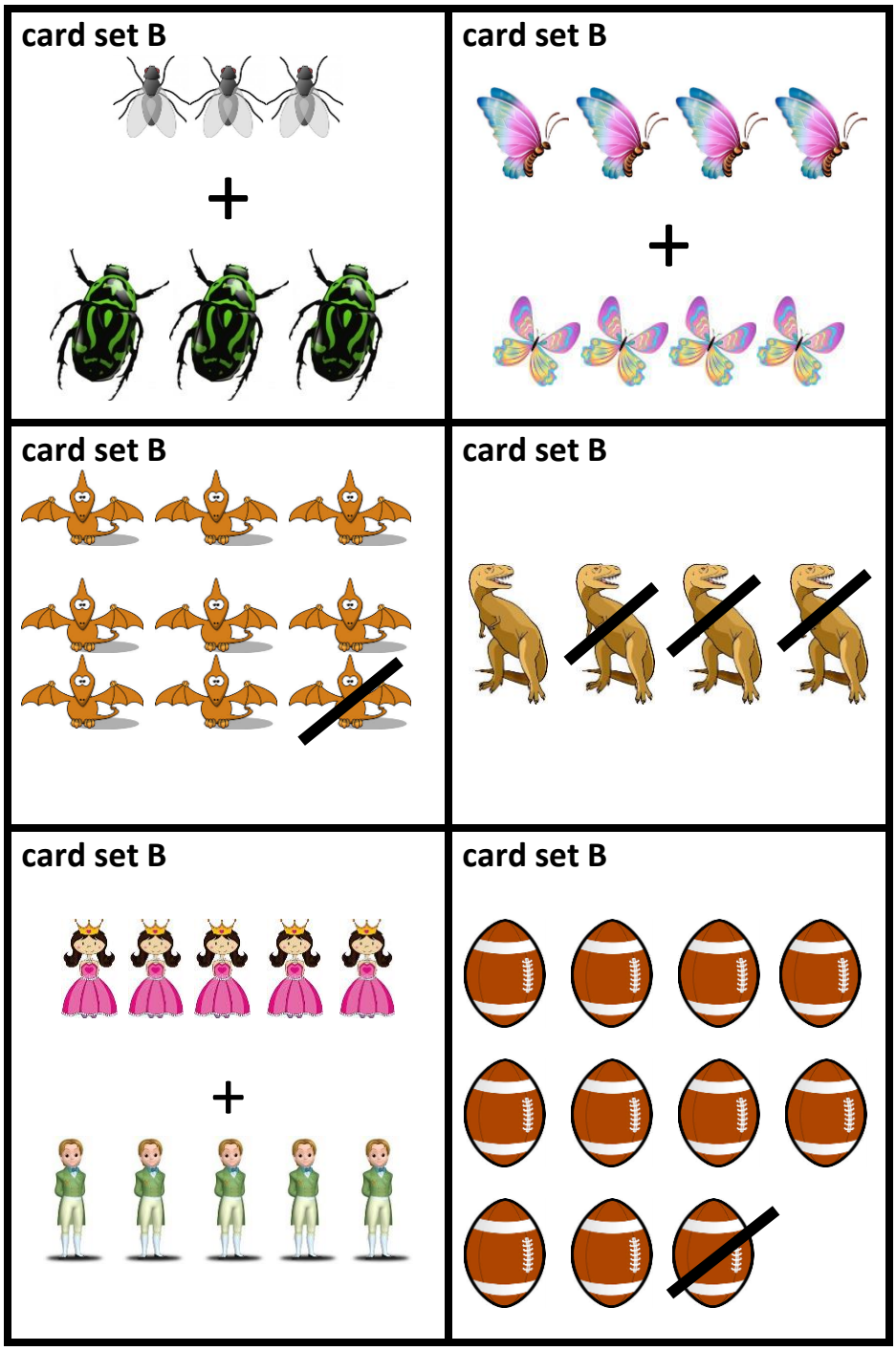
card set A 	card set A	card set A 1
card set A 	card set A 	card set A 
card set A 5	card set A 	card set A 
card set A 	card set A 7	card set A 

Chart B

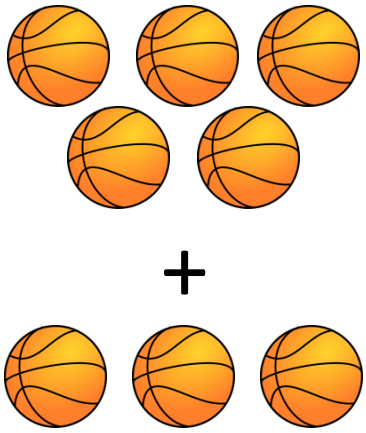
8

Greater Than	Less Than	Equal

Card Set B
(cut apart)



card set B



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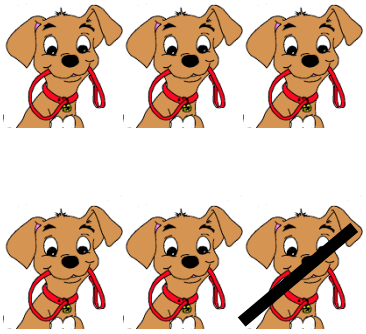

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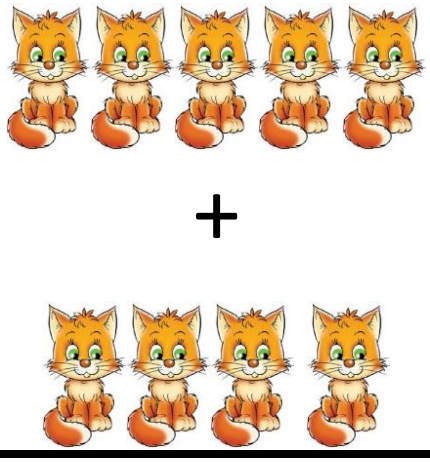

card set B

Chart C (Extension Activity)

5 + 2

Greater Than	Less Than	Equal

Card Set C
(cut apart)

4 + 5 **card set C**	**8 - 2** **card set C**	**5 + 3** **card set C**
3 + 4 **card set C**	**1 + 6** **card set C**	**5 - 2** **card set C**
2 + 0 **card set C**	**1 + 6 + 1** **card set C**	**7 + 0** **card set C**
7 + 1 **card set C**	**3 + 3** **card set C**	**7 - 0** **card set C**

Chart D – Extension Activity for early finishers

Greater Than	Less Than	Equal

Anecdotal notes on FAL Lesson on Greater Than, Less Than, Equal To in Range up to 10 (with pictures, symbols, objects, numerals)

EXAMPLE

Miriam	**Tabetha**	**Tristan**	**Taylor**	**Hunter**
Cheyanne **<u>pre-assess data</u>:** **Could not subitize.**	**Andrew**	**Dylan**	**Autumn**	**Angel** **<u>pre-assess data:</u>** **confused the greater than and less than symbols**
Tristan	**Jonathan**	**Cayden**	**Athena**	**Carson**
Luke	**Alexander** **<u>pre-assess data:</u>** **was not able to count 1 to 1 – no cardinality**	**Braylee**	**Owen**	**Natalia**
Aaron	**Chloe**	**Savannah**	**Haley**	**Ayrionna**