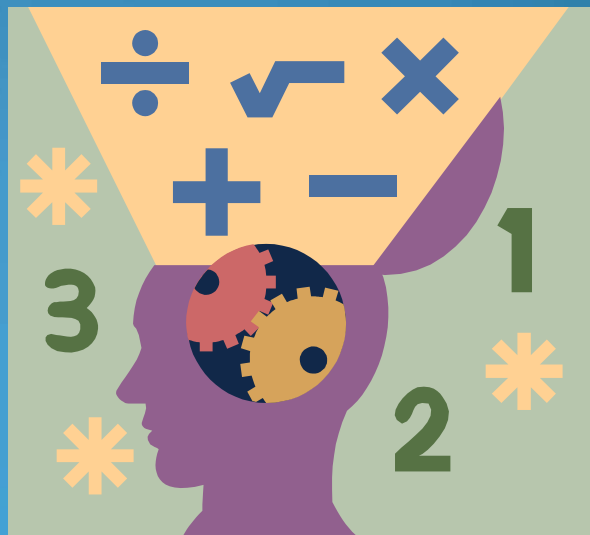
# Problem Solving K-2

Birdville ISD

April 12, 2014



# Think-Puzzle-Explore:

## Problem Solving

**Step 1**

- What do you THINK you know?

**Step 2**

- What PUZZLES you about this topic?

**Step 3**

- How can we EXPLORE these puzzles?

# Challenges students face when solving applications in mathematics

- Brainstorm **5 or more** major challenges students face when solving rigorous problems in mathematics.
- You will share with your **shoulder partner** when **think time** is up and **I say go**.
- Think Time begins now…

# What are the characteristics of good problem solvers?

- Write down as many characteristics that you can think of.
- You have 2 minutes

# An Effective Problem Solver

- Reads the problem carefully
- Defines the type of answer that is required
- Identifies important information and words
- Accesses background knowledge regarding a similar situation
- Eliminates extraneous information
- Uses a graphic organizer
- Sets up the problem correctly
- Uses mental math and estimation
- Checks the answer for reasonableness
- Make mental pictures (Visualize)

# UPS ✓

| | |
|---|---|
| **UNDERSTAND** | **PLAN** |
| **SOLVE** | **CHECK** ✓ |

## Unlock the Problem

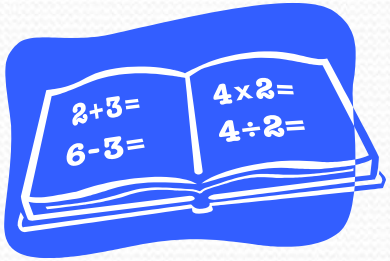
## Soluciona el problema

| Read<br>Lee | Plan<br>Planea |
| --- | --- |
| What information am I given?<br>¿Qué información tengo? | What is my plan or strategy?<br>¿Cuál es mi plan o estrategia? |

**Solve**
**Resuelve**

Show how you solve the problem.
Muestra cómo resuelves el problema.

# Why UPSC?




| | |
|---|---|
| **U**nderstand the problem:<br><br>Mr. Johnson's class 21 total students, but 7 were gone one day. I need to know how many kids were in his class that day. | **P**lan how to solve the problem:<br><br>I think a subtraction problem would help me figure out the answer. |
| **S**olve the problem:<br><br>21 - 7 = 14 | **C**heck your answer:<br><br>14 + 7 = 21 √ |

## Kindergarten UPSC

**U**nderstand the problem.

**P**lan how to solve it.

**S**olve it and show your thinking.

**C**heck your work.

# Process Standards

In grades K-5, the TEKS outline **seven** process standards, which "describe ways in which students are expected to engage in the content."

The process standards were intentionally listed at the **beginning** of the knowledge and skills for each grade level to emphasize the integrated importance of the process standards.

These process standards represent the thinking, habits, and processes through which a student engages with mathematics to acquire and demonstrate mathematical thinking.

# NEW process standards

| Problem-Solving Model | |
|---|---|
| **Current TEKS** | **Revised TEKS (2012)** |
| Understanding the Problem | Analyzing given information |
| Making a plan | Formulating a plan or strategy |
| Carrying out the plan | Determining a solution |
| Evaluating the solution for reasonableness | Justifying the solution<br>Evaluating the problem-solving process and the reasonableness of the solution |

# Problem Solving…Revised TEKS

**K.13B/1.11B/2.12B**
**Solve problems with guidance that incorporate the process of understanding the problem, making a plan, carrying out the plan, and evaluating the solution of reasonableness**

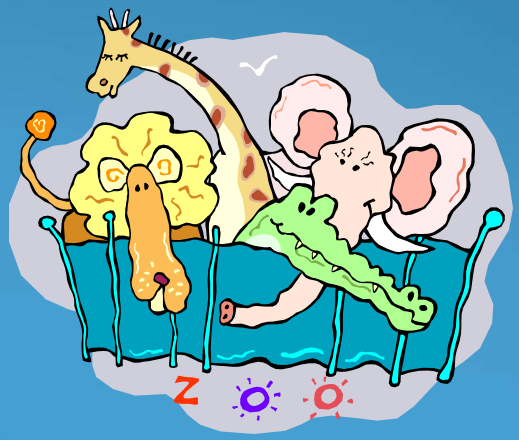
**K.13C/1.11C/2.12C**
**Select or develop and use an appropriate problem-solving plan or strategy including drawing a picture, looking for a pattern, systematic guessing and checking, or acting it out in order to solve a problem**

**K.1B/1.1B/2.1B**
**Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution**

# Today's TEKS Focus

| Kindergarten | First Grade | Second Grade |
|---|---|---|
| **Modeling Addition and Subtraction** | **Modeling Addition and Subtraction** | **Use Equations to Represent Problems** |
| K.3 (A) The student is expected to:<br>model the action of joining to represent addition and the action of separating to represent subtraction. | 1.3 (B) use objects and pictorial models to solve word problems involving joining, separating, and comparing sets within 20 and unknowns as any one of the terms in the problem such as 2 + 4 = [ ]; 3 + [ ] = 7; and 5 = [ ] - 3 | 2.4 (C) solve one-step and multi-step word problems involving addition and subtraction within 1,000 using a variety of strategies based on place value, including algorithms. |
| Use story mats and manipulatives to develop joining and separating up to 20 objects. | Use organizers to bridge the development of addition and subtraction to the abstract of writing number sentences. | Use story mats, UPSC model, and manipulatives to use equations. |

# Modeling Addition and Subtraction



# *5 E Model Addition & Subtraction (Kindergarten)*

| | |
|---|---|
| Engage | Use questions eliciting prior knowledge about experiences going to zoos and being in plays.<br>Read the story. |
| Explore & Explain | Reread the story with students acting it out physically and with manipulatives of a zoo mat and animal cards pointing out separating, joining, and relating to the size of the group (linking cubes are also available). |
| Elaborate 1 | Students will use animal cards or linking cubes. |
| Elaborate 2 | Students will again experience joining and separating of sets with a beach mat and sea shells. |
| Evaluate | Students choose beach mat or zoo mat and are given 3 scenarios to solve with manipulatives; students will create a scenario. |

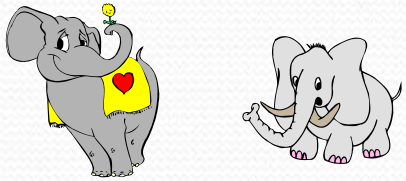
# *5 E Model Addition & Subtraction (Grade 1)*

| | |
|---|---|
| Engage | Use questions eliciting prior knowledge about experiences with zoos and being in plays. Read the story while students physically act it out with manipulatives. |
| Explore 1 | Addition will be modeled with the visual of the part/part whole mat and zoo mat with the poem. |
| Explain 1 | Read the story and experience using the part/part whole mat with the addition portion of the story. |
| Explore 2 | Subtraction will be modeled with the visual of the part/part whole mat and zoo mat with the poem. |
| Explain 2 | Finish the story and experience using the part/part whole mat with the subtraction portion of the story. |
| Elaborate | Students will embellish the zoo story by drawing the new story and writing the matching number sentence. |
| Evaluate | The students will create and write a new scenario, then give the story to a partner and let the partner write the number sentence. |

# One Gorilla

# Linking Cubes or Cards to Represent Characters

1 gorilla – 1 blue cube

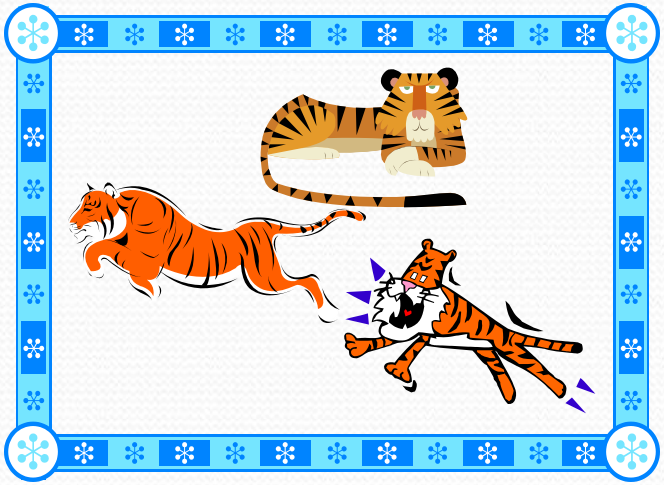


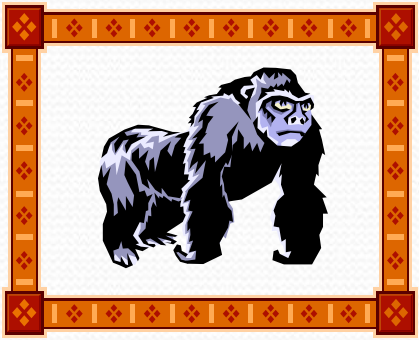
2 elephants – 2 white cubes

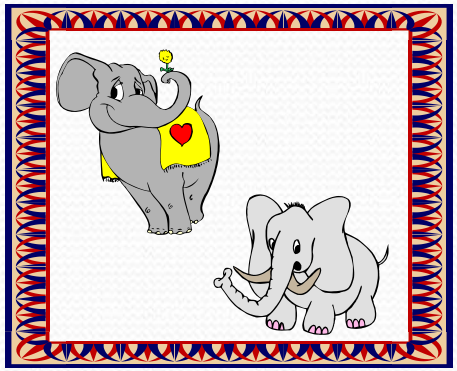
3 tigers – 3 orange cubes

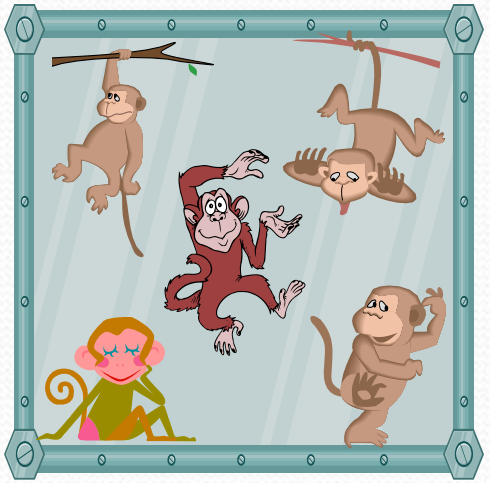
4 parrots – 4 red cubes

5 monkeys – 5 brown cubes



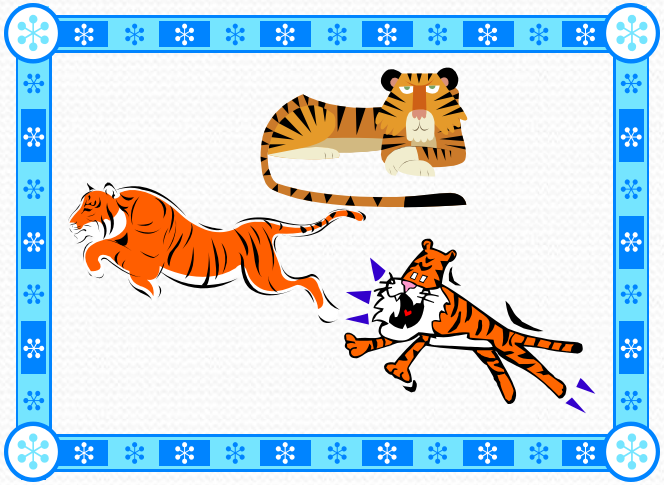


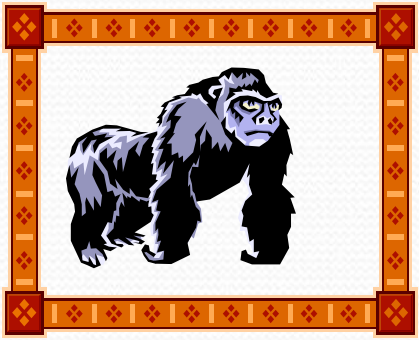


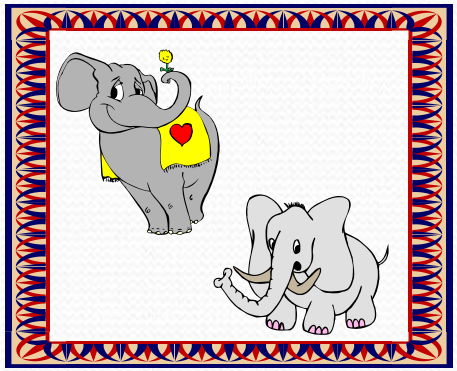


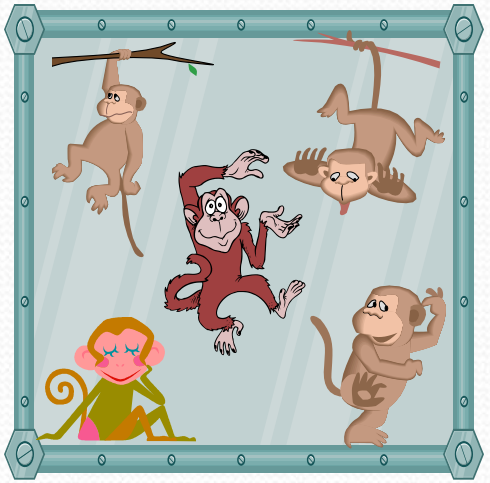
One gorilla is out of his cage,

Oh my, what a rage!

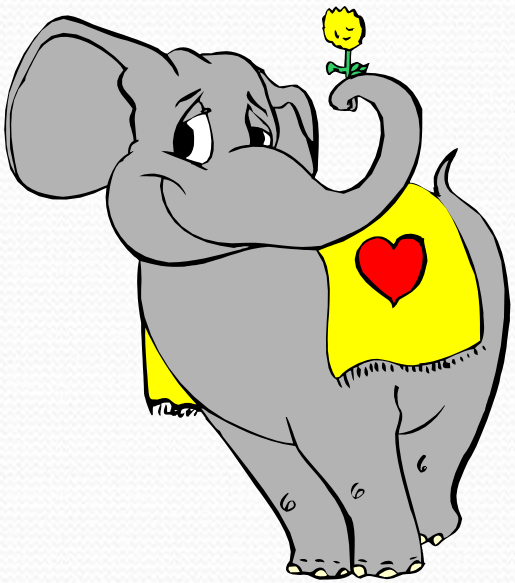


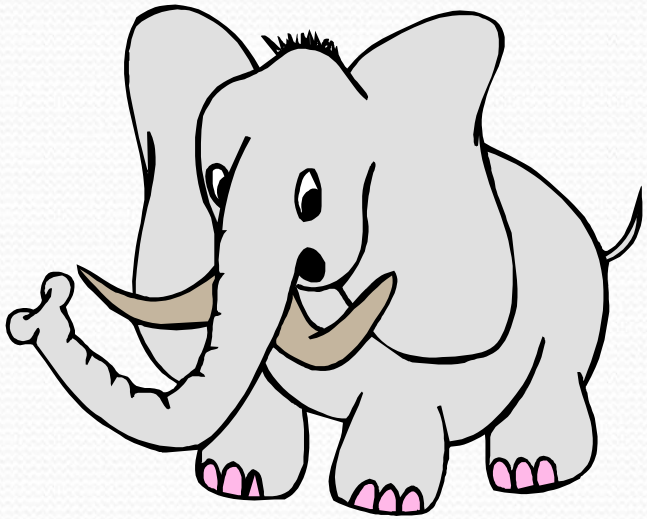


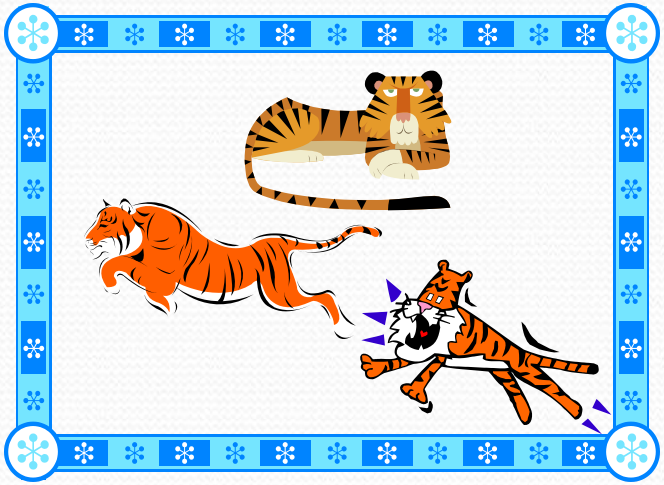


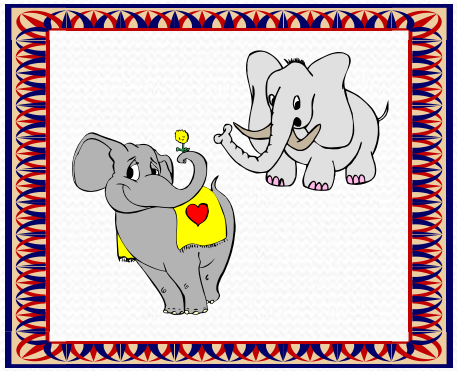


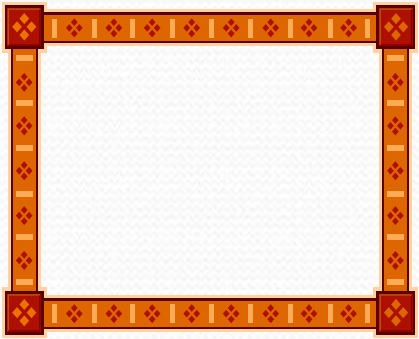
Two elephants followed in line,
Parading, strutting, looking fine!





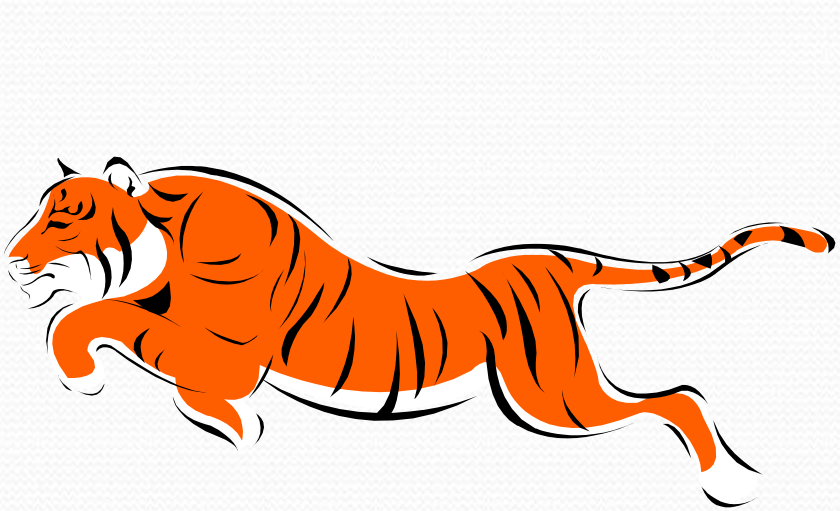


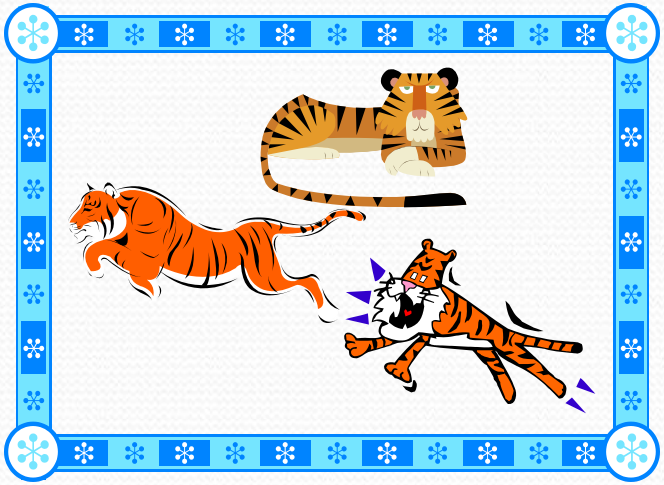


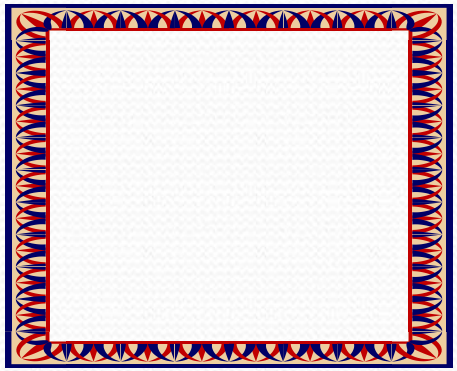


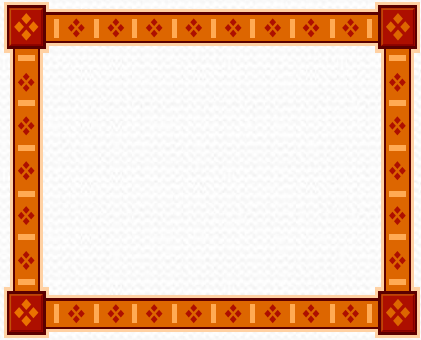
Three tigers let out a roar,

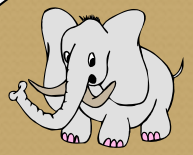
As they join the fun galore.

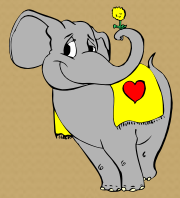


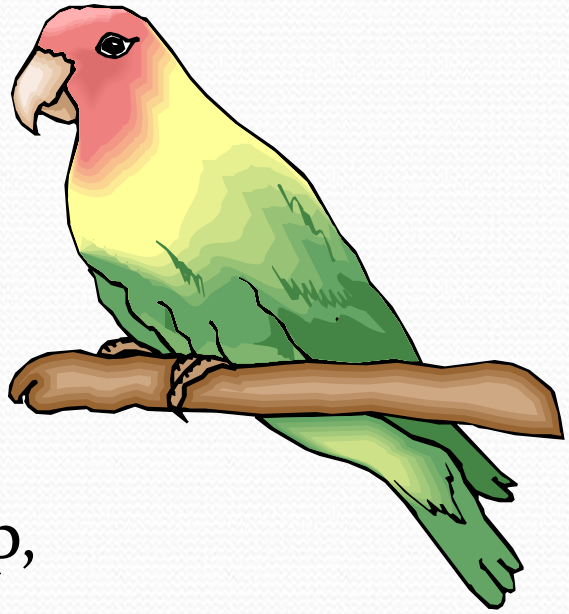






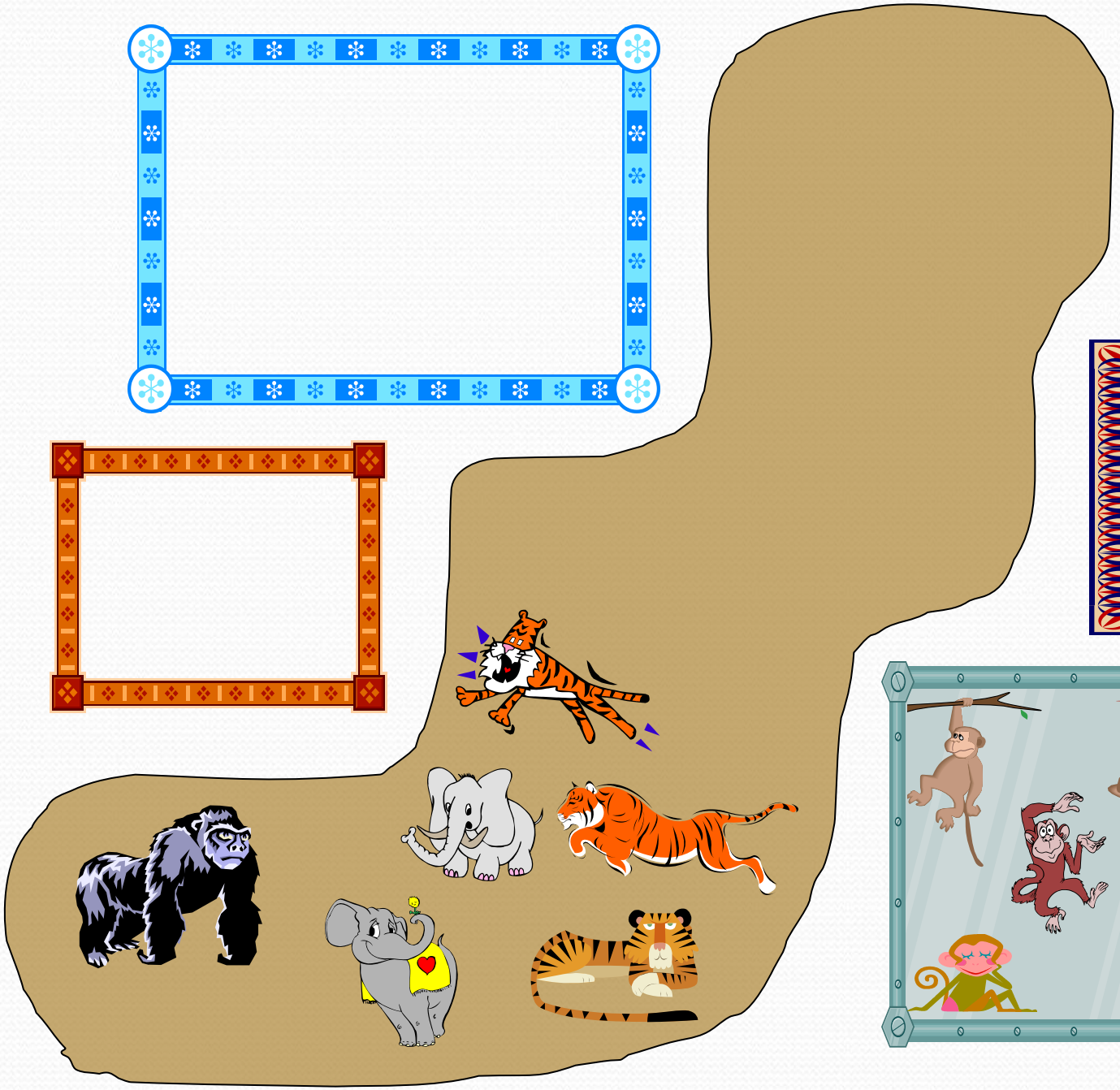




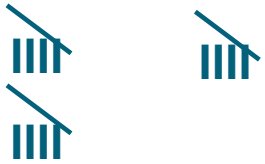


Four parrots flew the coop,

What a crazy looking group.



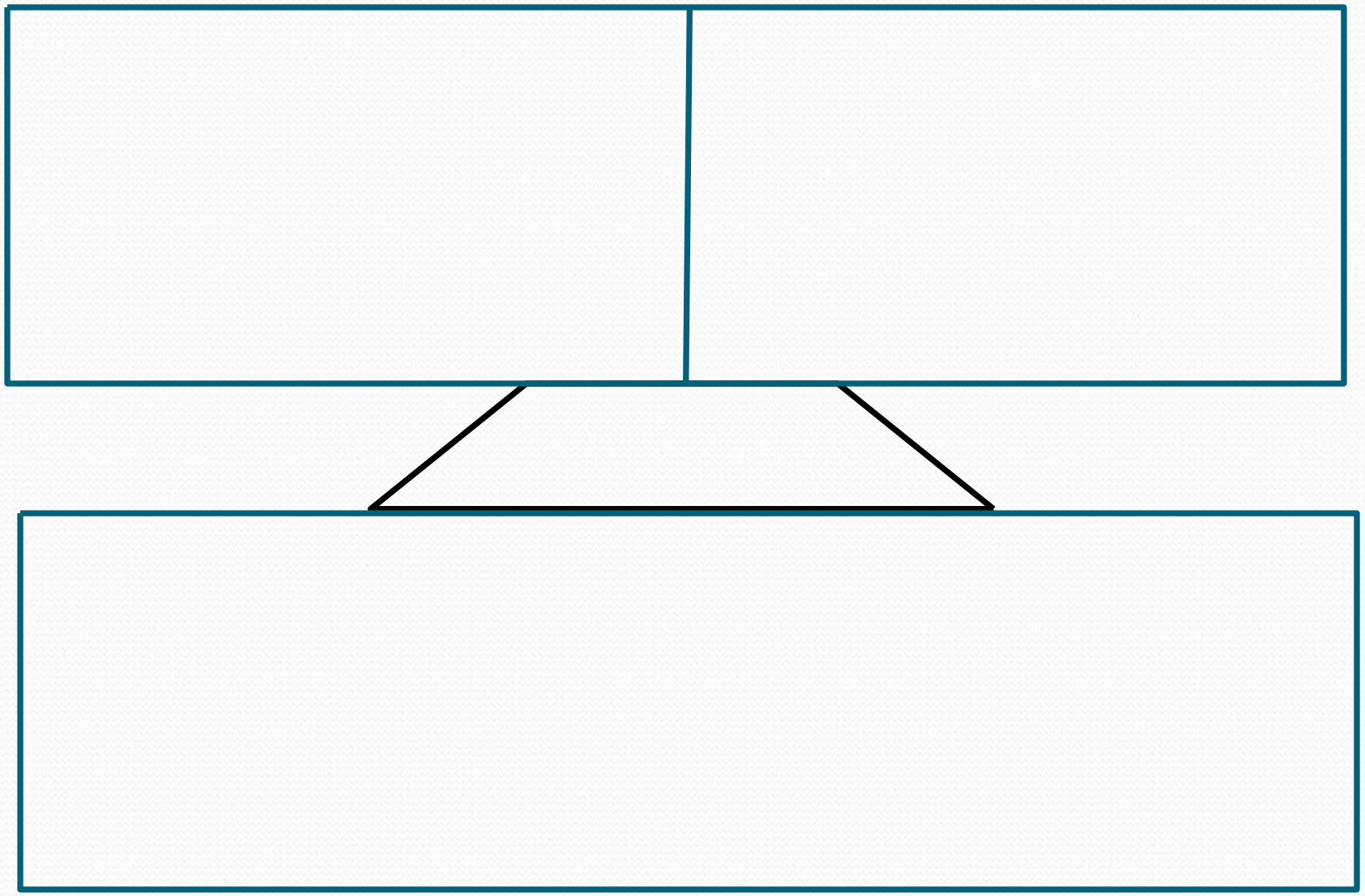
**There are 10 animals out of their cages. If the 5 monkeys join them how many animals will be out of their cage?**

| UNDERSTAND | PLAN |
| --- | --- |
| I need to find…<br><br>How many animals are out of their cage in all | Use my cubes or cards to join the monkeys with the other animals and count them. |
| **SOLVE** | **CHECK** |
| Students use mats to solve. | 15<br>  |

# Time to Reflect

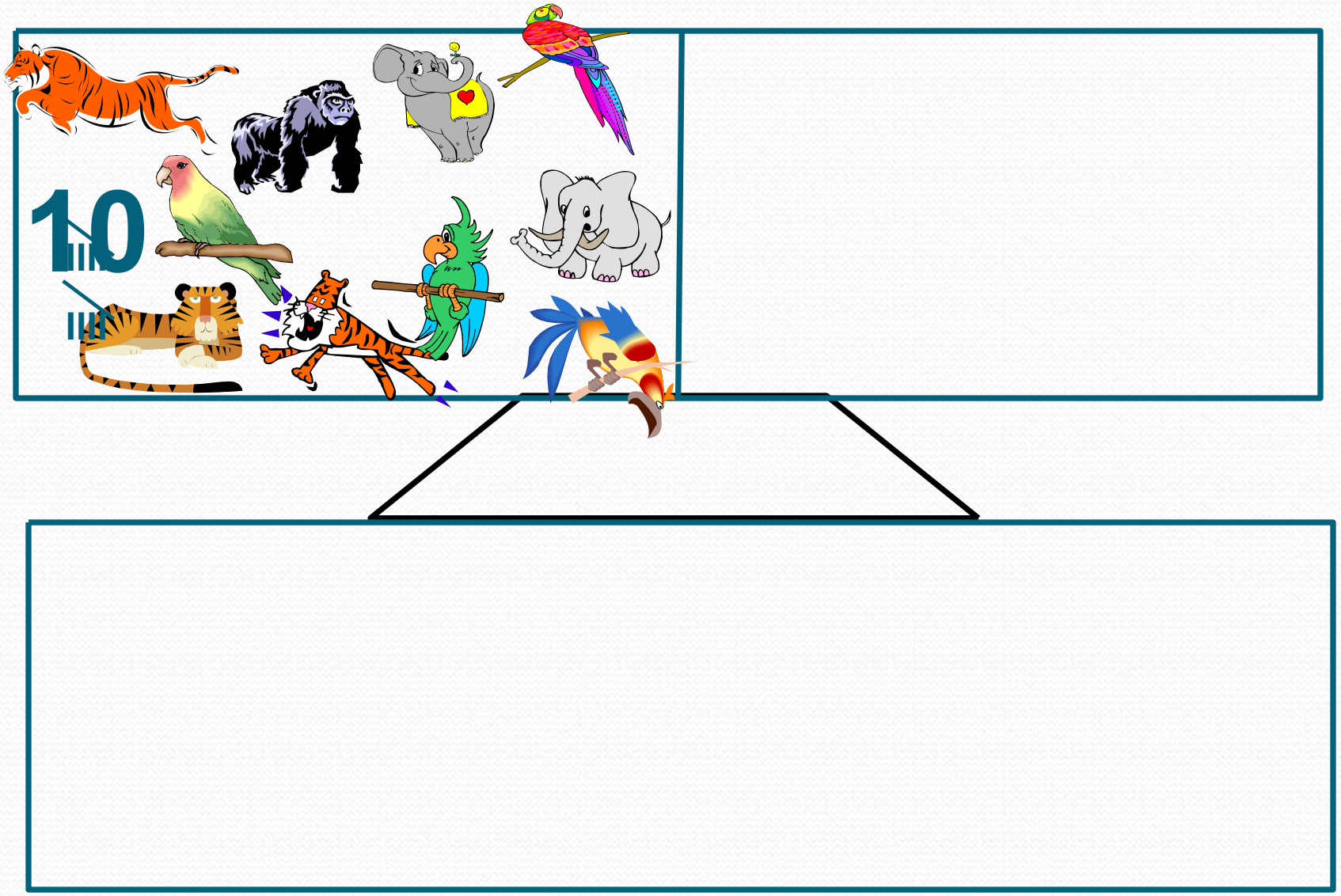
***Which manipulative is easier to use and to understand the concepts for this activity?***

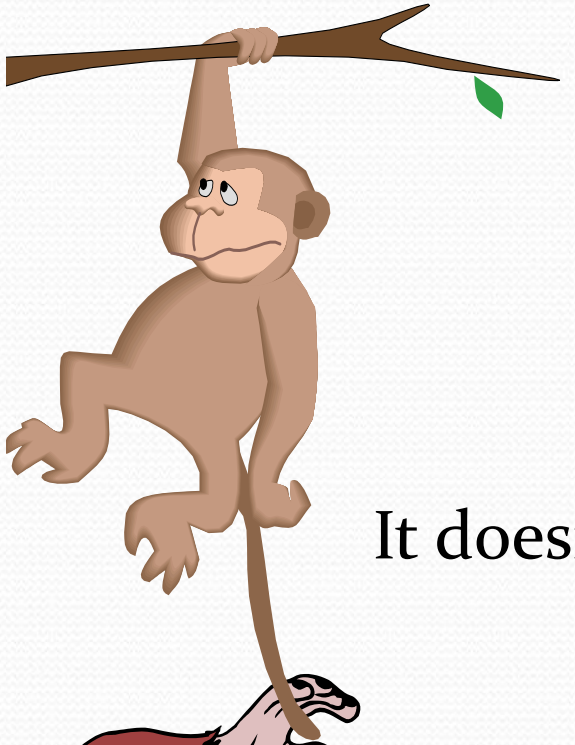
# Part-Part-Whole Mat for Addition

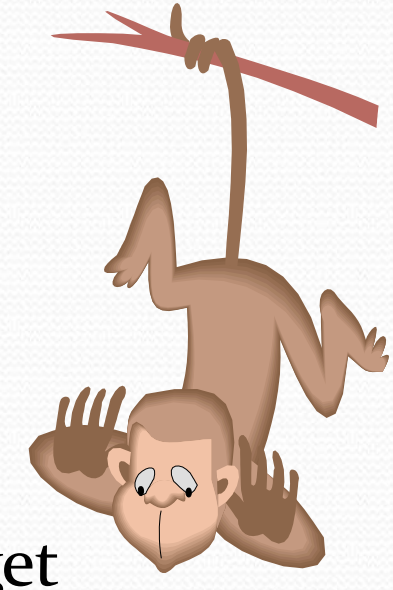


**Explore**

# Part-Part-Whole Mat



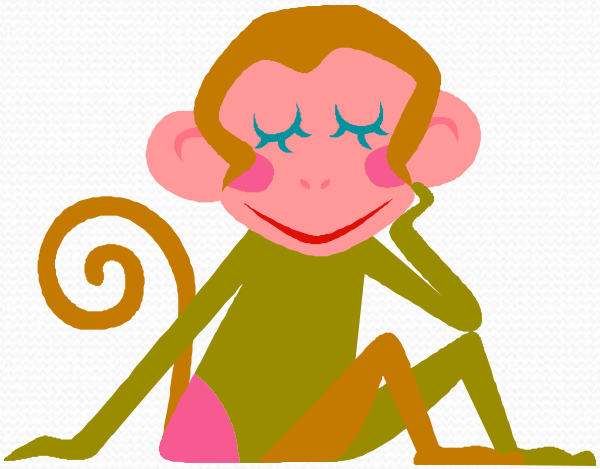




Five monkeys

scream and shout.

It doesn't take long for them to get out!



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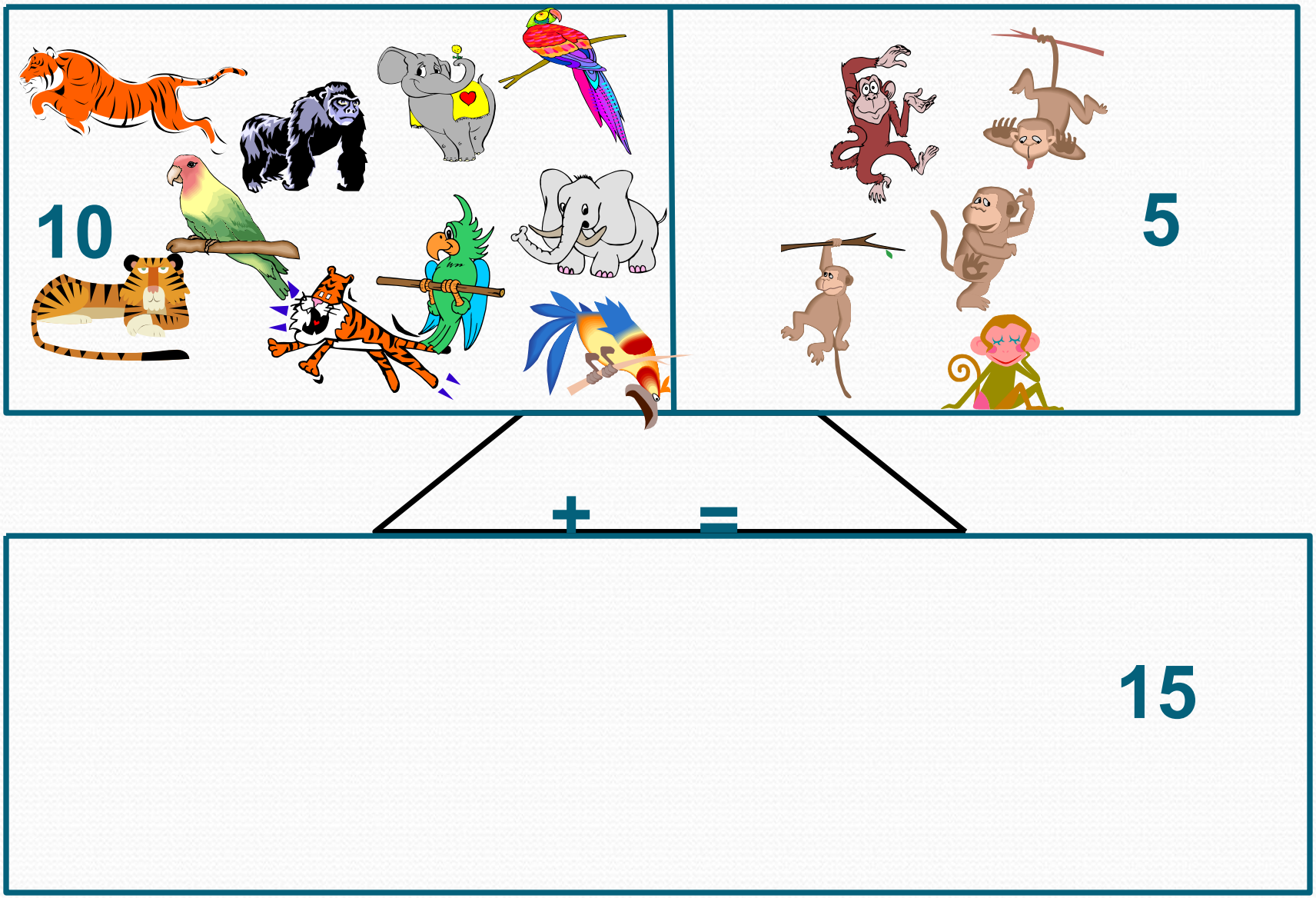
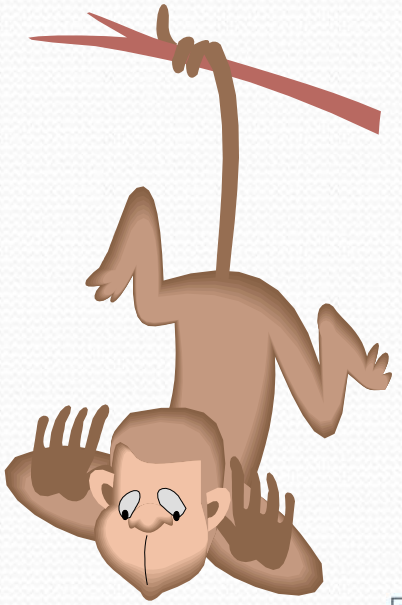


Cling! Clang! It's dinner time!
Five monkeys swing home in
rhyme.



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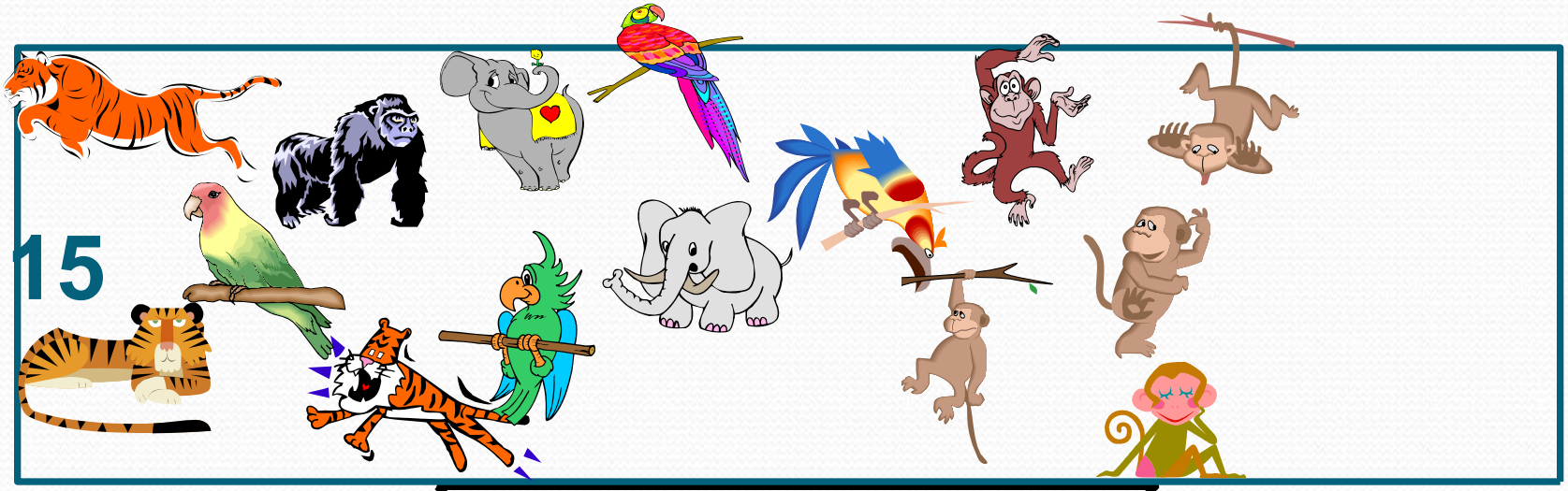
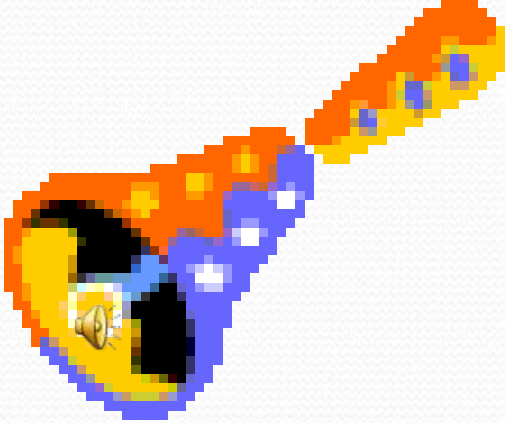


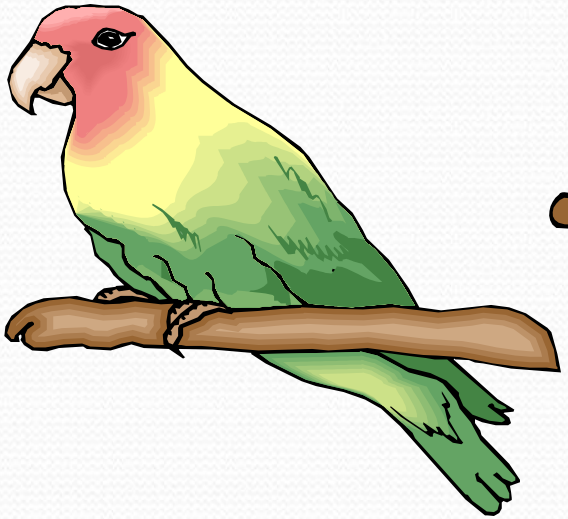

- = 10

5



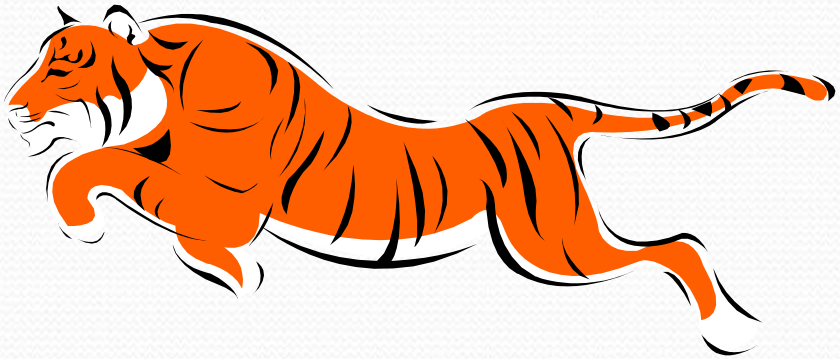
Four parrots hungry for seed

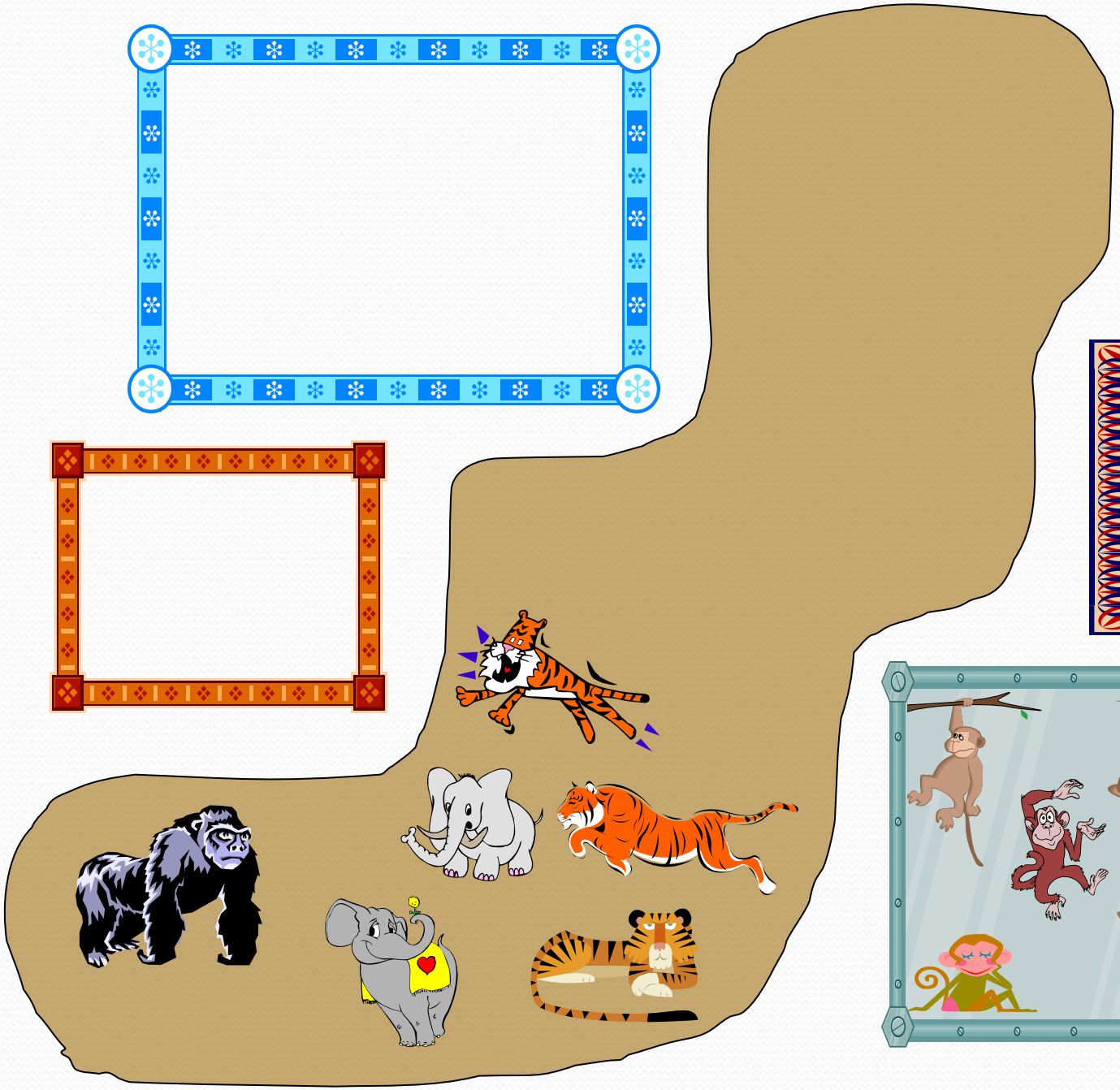
Quickly fly back to feed.



Three tigers smell red meat,

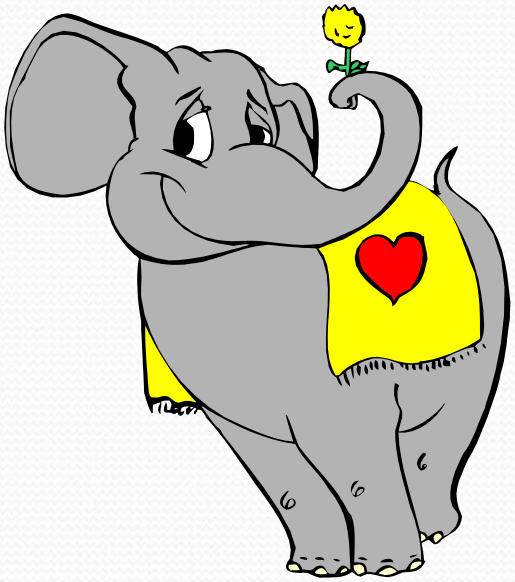
As they swiftly spring to their feet.

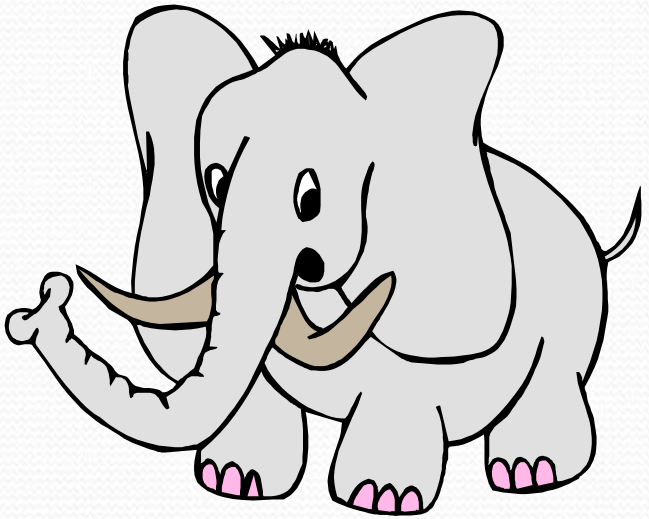


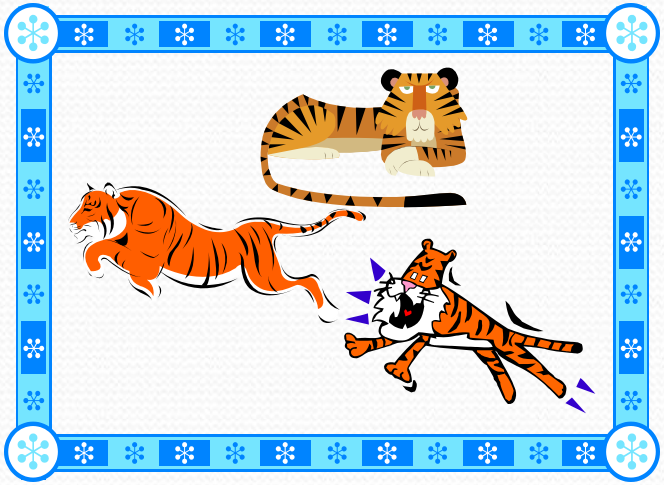


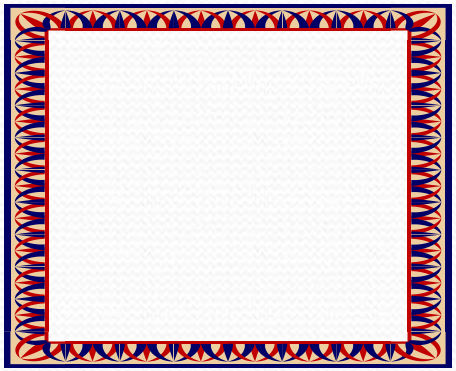
Two elephants run for food.

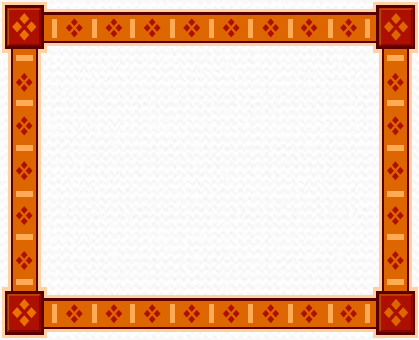
They must eat not to be rude!

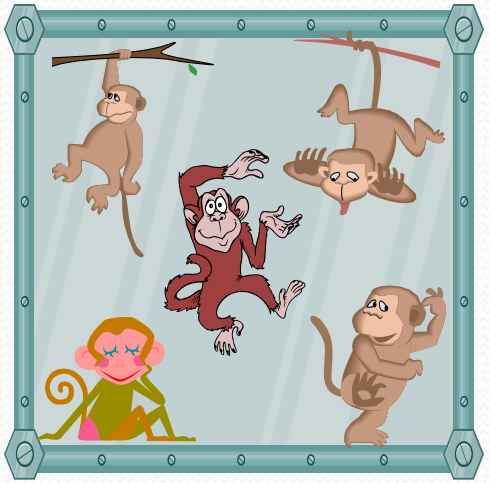


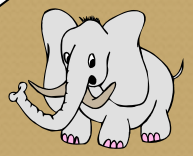


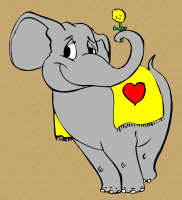








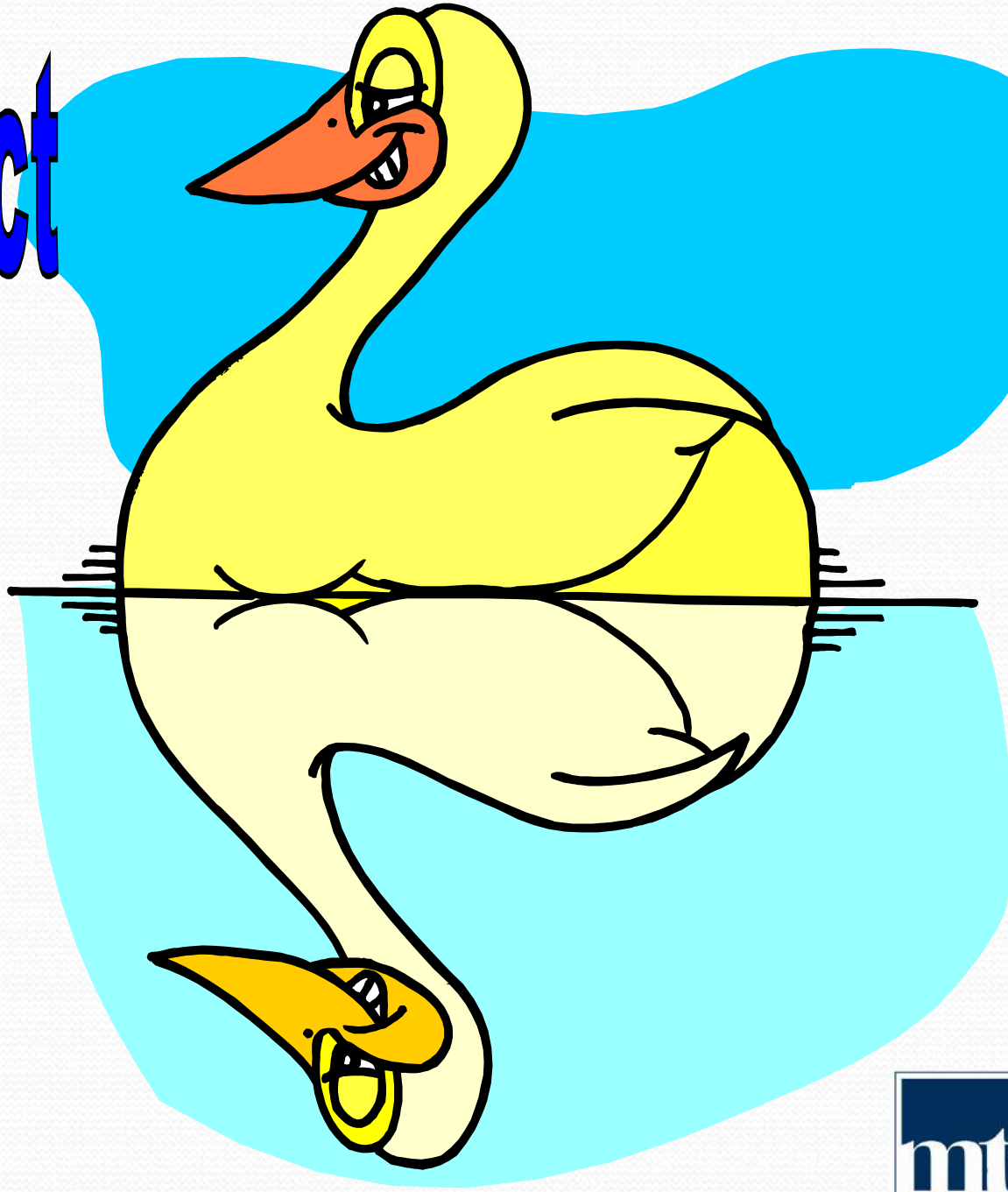




One gorilla, sad and blue,

What do ***you*** think he should do?

# Time to Reflect



***How did we use visuals to move the students from the concrete to the abstract level of learning?***

| Activity | Concrete | Pictorial | Abstract/ Generalization |
|---|---|---|---|
| **Zoo story – Acting it out as in a play** | •Kids are experiencing a tactile and kinesthetic activity.<br><br>•Kids see a physical representation and interaction with the story.<br><br>•The purpose of acting it out is to allow all students to create a common experience on which they can draw.<br><br>•Acting it out provides students an opportunity to connect language with action. | **Act It Out Animal Card Placards**<br>• Students model the poem wearing pictures of animals around their neck. | • Students begin to generalize that joining means that the group is getting larger.<br><br>• Students begin to generalize that separates means the group is getting smaller.<br><br>• Students can also generalize that if no animals join, then the group stays the same.<br><br>• Students begin to generalize what happens to the group size and the reasonableness to their answers. |

# Time for a brain break…

- http://www.youtube.com/watch?v=kLTKlwNZGjw

# Use Equations to Represent Problems

Second Grade Lesson

| ***Use Equations to Represent Problems (Grade 2)*** | |
|---|---|
| Engage | Use questions eliciting prior knowledge about addition and subtraction. Show video to excite students. |
| Explore | Have the students choral read the problem given in the video. Students will use a story mat, manipulatives and the UPSC model. |
| Explain | Addition and subtraction will be modeled with the visual of the part/part whole mat and story mat with the poem. |
| Elaborate | Students will use their UPSC model to work through the problem and write corresponding equations. |
| Evaluate | Students can create their own story problem and ask a partner to create the equation. |

# Use equations to represent problems.

http://www-k6.thinkcentral.com/content/hsp/math/texas_math_2015/tx/gr2/video_based_projects_se_9780544103672_/mediaPlayerWindow.html?url=http://link.brightcove.com/services/player/bcpid1861182355001?bckey=AQ~~,AAAA2fV0xfE~,Tmydk9UFFWVJKhSHBEdCMdi5yCXNIT1G&bctid=ref:En_317

**There were some ducks in a pond. Four more ducks joined them. Then there were 13 ducks in the pond. How many ducks were in the pond at first?**

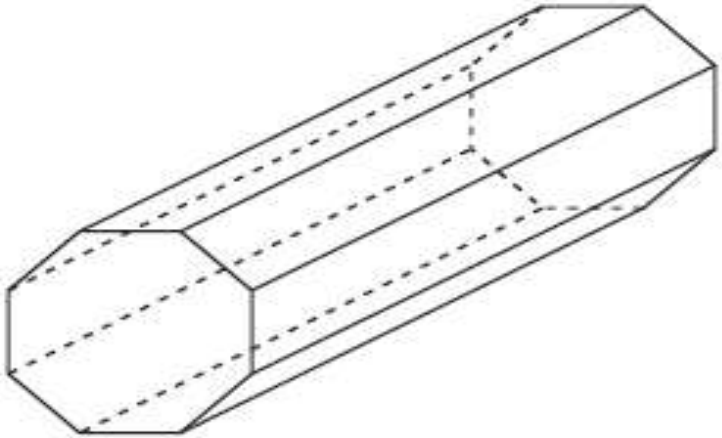
| | |
|---|---|
| **UNDERSTAND**<br>**I need to find…**<br>How many ducks were in the pond before 4 more came.<br>? + 4 = 13<br>I am missing a part. | **PLAN**<br>Use my part-part-whole mat and cubes because I have the whole and I am missing a part. |
| **SOLVE**<br>**Students use mats to solve.**<br>**Students can draw a picture.** | **CHECK** 9 + 4 = 13<br>13 - 4 = 9<br>There were 9 ducks in the pond at first.<br>**Students can also draw a picture here.** |

# Emphasis on Questioning

- Plan questions while preparing lessons
- Increase wait time
- Ask for paraphrases
- Record your lessons to monitor levels of questioning

# Content Vocabulary

3 A three-dimensional figure is shown below.



How many vertices does this figure have?

**A** 10

**B** 16

**C** 24

**D** 8

# Content Vocabulary

**18** Mr. Neufeld grew a vegetable garden last year. The list below shows the number of three vegetables he grew.

- 718 onions
- 374 potatoes
- 187 cucumbers

Which expression shows the best way to estimate the difference between the number of potatoes and the number of cucumbers Mr. Neufeld grew in his garden?

**F** $370 + 190$

**G** $400 + 100$

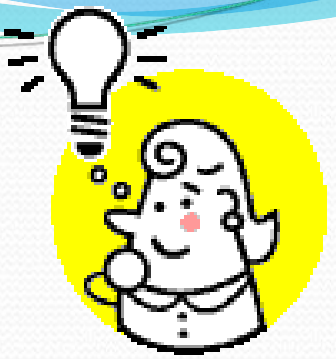
**H** $400 - 100$

**J** $370 - 190$

# Focal Areas

| | |
|---|---|
| K | • Understanding counting and cardinality.<br>• Understanding addition as joining and subtraction as separating.<br>• Comparing objects by measurable attributes. |
| 1 | • Understanding and applying place value.<br>• Solving problems involving addition and subtraction.<br>• Composing and decomposing two-dimensional shapes and three-dimensional solids. |
| 2 | • Making comparisons within the base-10 place value system.<br>• Solving problems with addition and subtraction within 1,000.<br>• Building foundations for multiplication. |

# We need your input.



**Professional Learning Surveys:**

We have created some surveys so that we can elicit feedback from all of the participants about the trainings they attend. Visit the website below and complete the appropriate survey(s).

**http://schools.birdvilleschools.net/surveys**

The surveys will be open until April 18 and reminders will go out through Mark Thomas next week, but we would like for you to complete your survey today if possible.