

# Building School Readiness with Data(Statistics)

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# Collecting and Representing Data

- Diagrams  
Sorting activities are simple methods for students in the early childhood to work with data
- Tables  
Rows and columns are the first examples of data representations
- Graphs  
More organized representation that follows certain rules



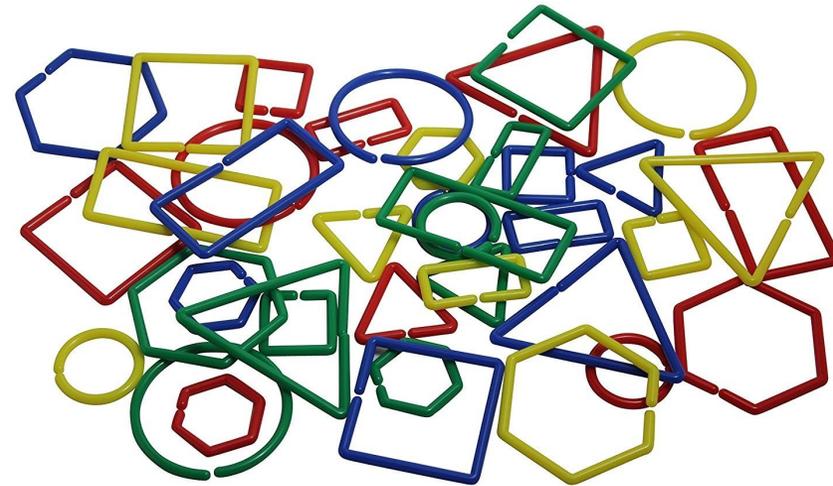
Young children need experiences with **sorting and comparing** before they analyse any representation of data information.

**Sorting is a natural activity for young students.  
It is not necessary to give many directions for the young students to begin sorting.**

Materials from home



Classroom materials



# Sorting

Children must *make connections*:

- ✓ figure out what is the *same or different*
- ✓ figure out how *one thing relates to another*
- ✓ find *unusual connections*- inhibiting an automatic response, reflecting and by selecting something that is connected in a different way.

Activity for your children: concrete or pictorial resources in your environment

## DO THE D'S

- *Decide* the attribute for your sort.
- *Do* the sort.
- *Describe* your sort.



# Sorting in our learning environments

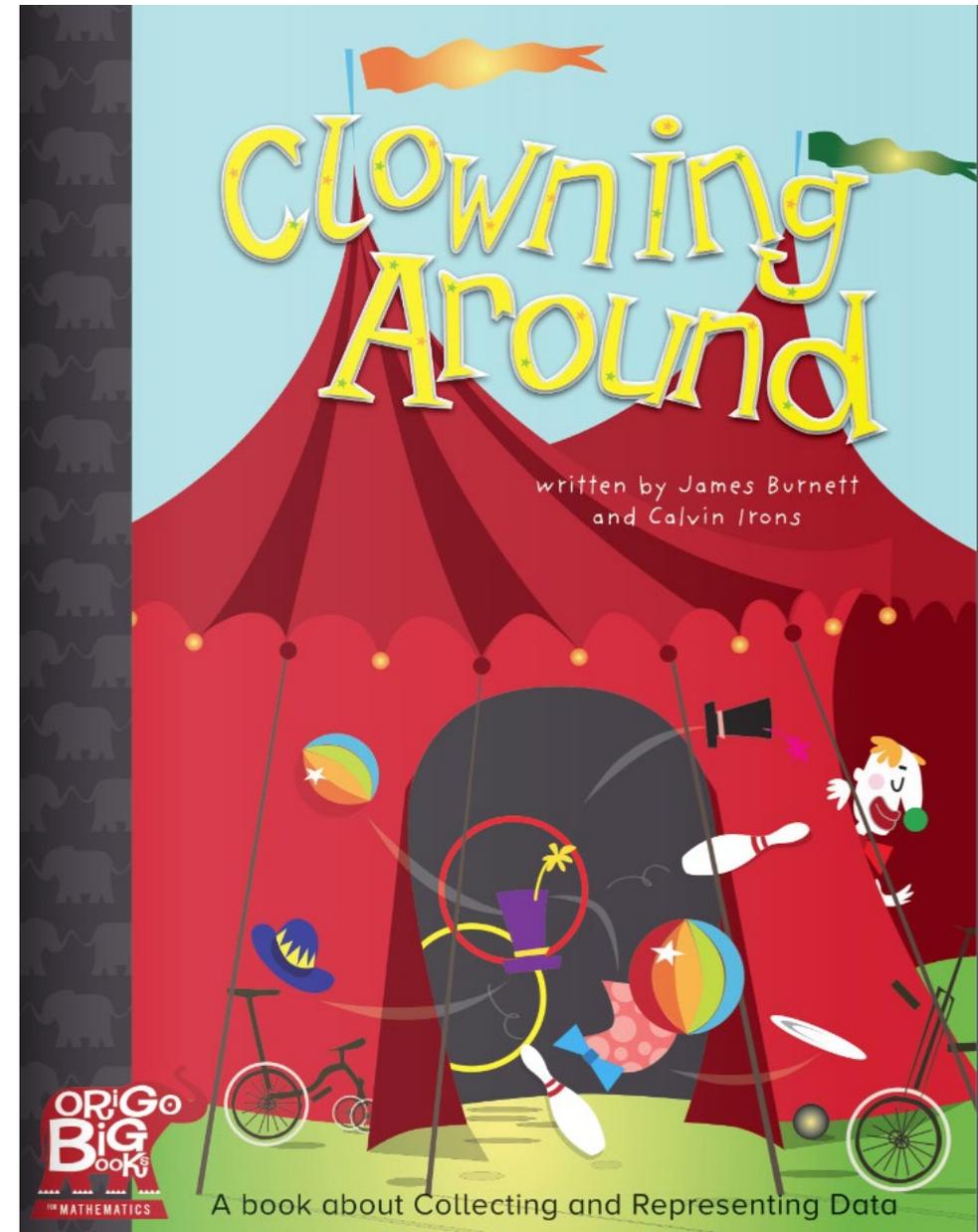




Common sorting resources. Also use your collections of various items- junk box.

# Clowning Around

A book about collecting and representing data



5 MINUTES



The clowns dress up in fancy clothes and always put on a funny nose.





Their ties are always  
red, blue, or green.  
They are the brightest  
you have ever seen.



Look at the different  
hats they wear.  
They are bright and shiny,  
just like their hair.

# Sorting experiences- *promote reasoning*

✓ pictures of people

wearing glasses



*not* wearing glasses



✓ own sorting rule

✓ determine someone else's sorting rule

Higher level activity. Encourages learning of new information.

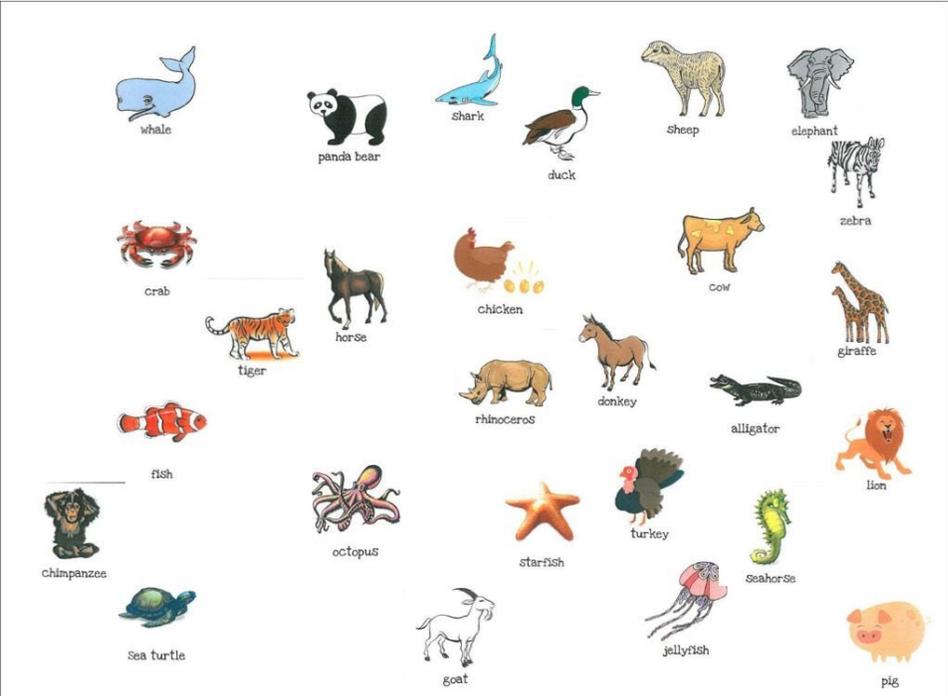
**Animal Detective**  Name: \_\_\_\_\_

Directions: Cut out the picture cards. Glue them under the proper heading.

<u>Wild</u>	<u>Tame</u>

<http://cmmccullough.wixsite.com/digitalboxzoo/pet-vs-wild>



<http://4.bp.blogspot.com/9PFvimG7hxY/T1UVVNADc7I/AAAAAAAAACnE/SfRbDQLGBEw/s1600/Sorting+Animals.jpg>



<https://d4iqe7beda780.cloudfront.net/resources/static/main/image/ec84.jpg>

# Collecting and Representing Data: Sorts

- Focus on same/different or more than two categories of characteristics
- Use physical or pictorial materials
- Encourage children to **decide** the sort, **do** the sort and **describe** the sort—the three d's of sorting

**Leads to higher level data representation**

**\* Venn/Carroll/Tree diagrams are a higher level of sorting**

Use a Venn diagram to show a sort.

What do you see here?

Name some of the animals and describe the groups.

What labels are required?



<https://i.pinimg.com/564x/6d/fd/22/6dfd222d3f62b01a7e21bf3ccbfaebd7.jpg>

Name three animals that fit each category.		Can fly	Cannot fly
	<p><b>Is a bird</b></p>	<p>Pigeon, chicken, parrot, duck,</p>	 <p>penguin, ostrich, emu</p>
 		<p><b>Is not a bird</b></p>	 <p>Butterfly, bee, mosquito, wasp,</p>

A challenge for your afternoon. Think about this data representation.



Cards are easy to make with interesting stickers such as- stars, animals and cars. These are sorting by number.

## Comparing learning experiences:

It is important that you talk about two data representations of information so you encourage the language with 'er' words.

The children selecting **red** have **more** children than those who selected **blue**.

There is a **greater** number of **yellow** than **orange**.

Common language to use is:

more

less

fewer

greater

Important supports for early childhood teachers:

Think about comparing two data information before you talk about the most or greatest number reviewing all the information.

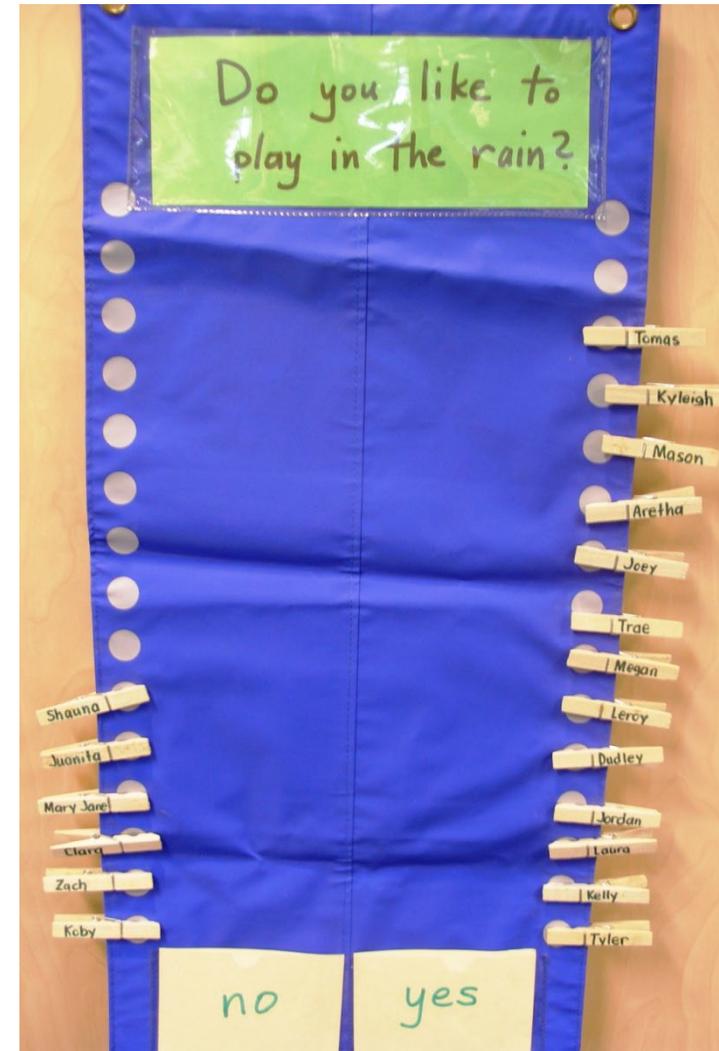
Early Childhood teachers tend to talk about the most or greatest and this does not allow children to have the language for comparing two sets of data.

# Collecting and Representing Data (Early Childhood)

## Yes/No questions

- Good for young students
- Easy to use

Yes/No questions  
involve collecting  
**and** representing.



# There are other ways to represent yes/no graphs



Children need opportunities to count. Make connections!

**Balance 'Graph'**

## Can you ride a bicycle?

**Choices** Yes, No

**Collecting the data**  
Each child places one cube or other item in the appropriate pan of the balance.

**Other examples**  
See pages 13, 17, 18, 24, 32, 33, 67, 70, 76.



The image shows a balance scale on a green mat. At the top of the mat is a white sign with the question "Can you ride a bicycle?" and a small drawing of a bicycle. Below the sign is a blue balance scale. The left pan is lower and contains several colorful blocks (blue, red, yellow, green). The right pan is higher and contains fewer blocks (purple, green, red). Below the scale are two white labels: "Yes" under the left pan and "No" under the right pan.

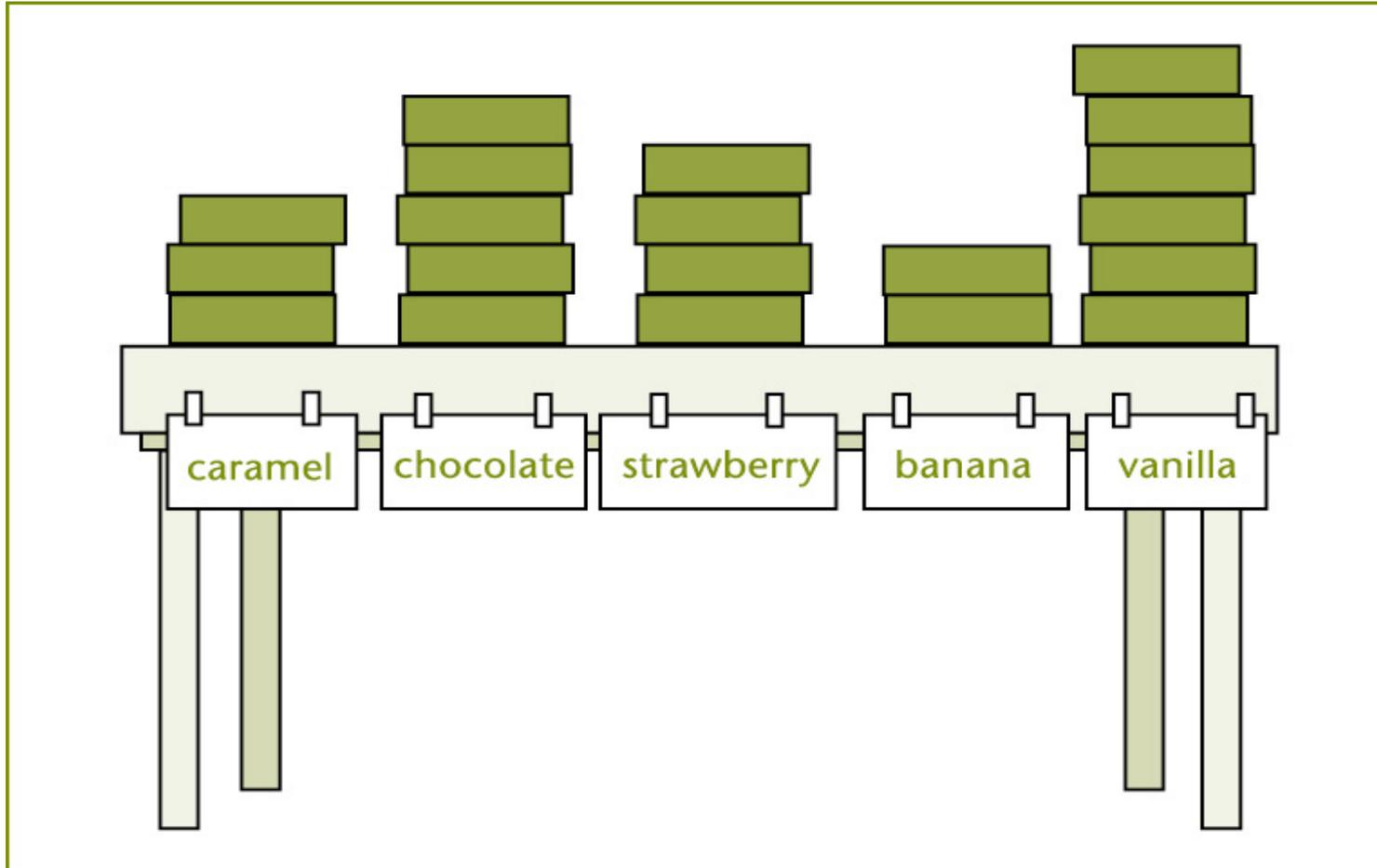
# Object Graphs using Real-life Materials

With young students it is valuable to use them as the data. For example, how many brothers and sisters do you have?

Stand here if you have no brothers or sisters; stand here if you have one...



# Transition from Real Objects to Blocks



Make smiley faces to help  
make a data display.  
Children can make their  
own smiley face

Glue eyes on a bottle top  
and draw the other face  
features.



# Reading the Data

- What does the graph tell you?
- This is a literal reading of the facts shown in the display.
- This includes the title and all labels.
- There is no interpretation at this stage.

Favorite animal

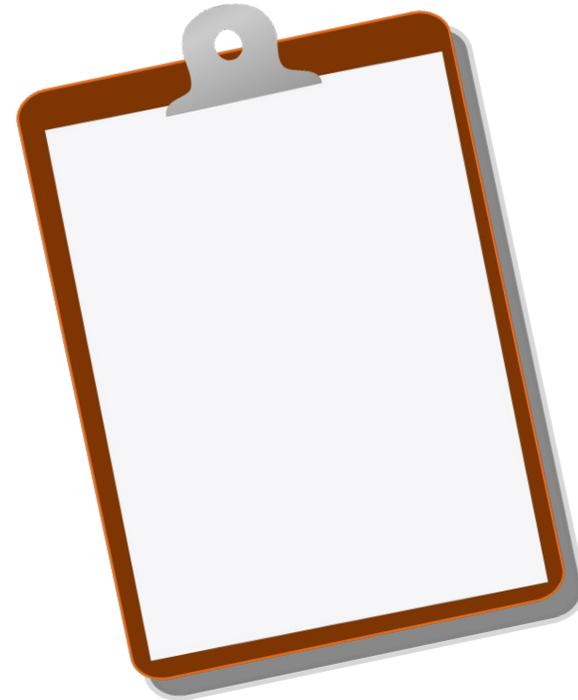


Best resource for Data for your early childhood environment:

**clip boards, markers and blank paper**

Children can initiate their own questions. Then ask others in the group. Let them record their results any way they wish.

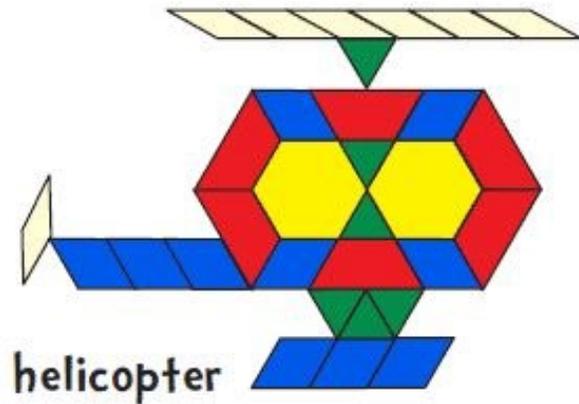
What is your favourite colour?  
Do you have a pet at home?



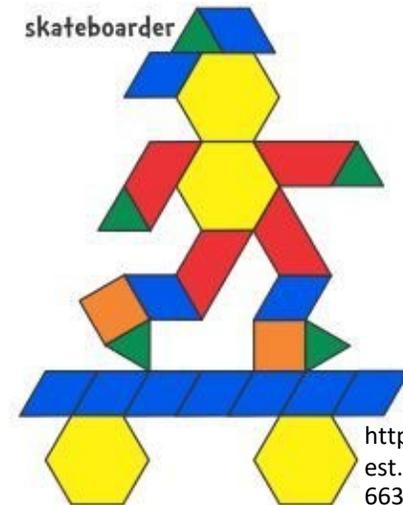
# Pattern block picture

## Graph your picture blocks

- Draw and label the axis for a graph of the blocks you used
- Place your blocks on the graph

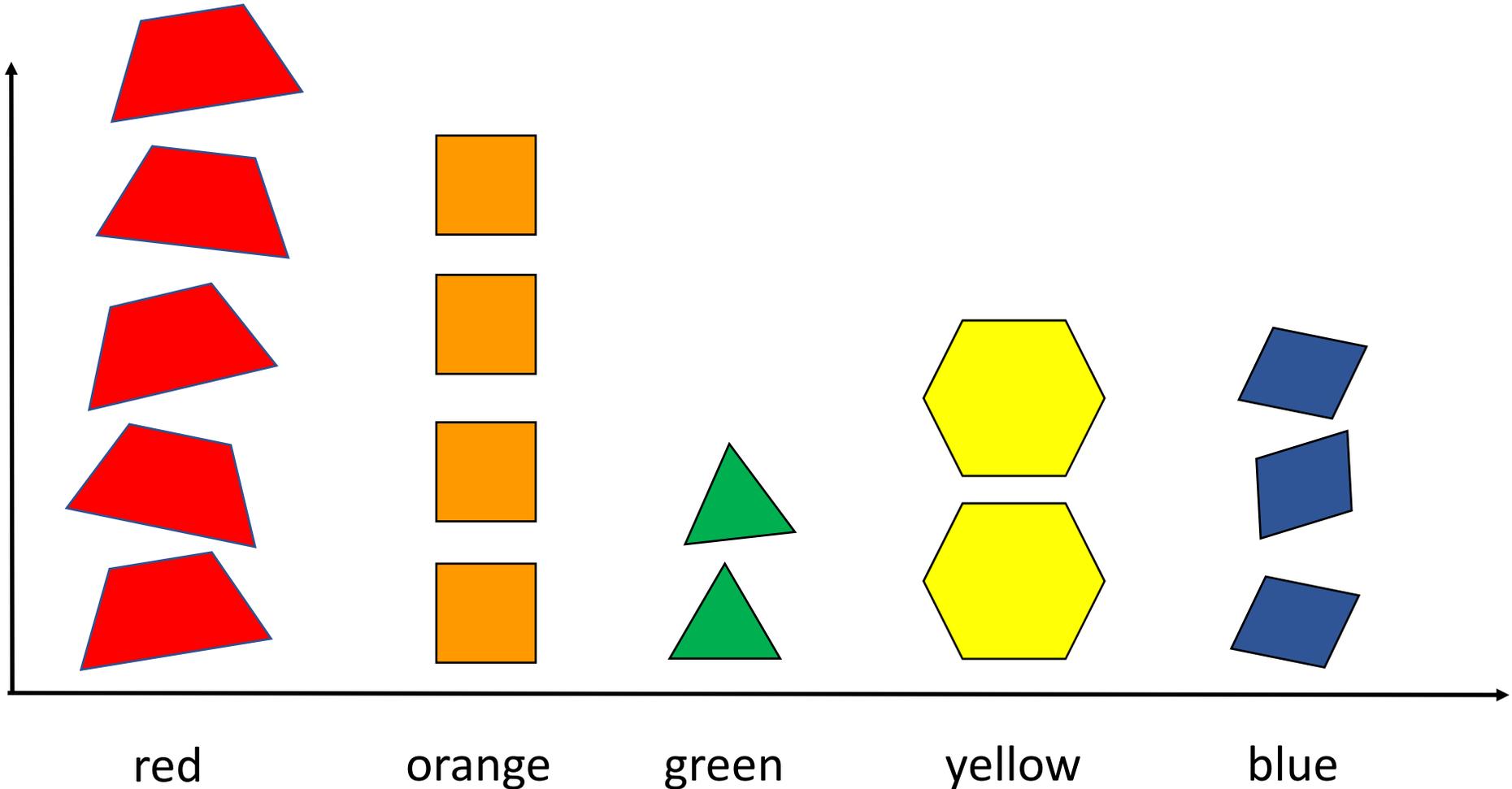


<https://www.pinterest.com/11.jpg>

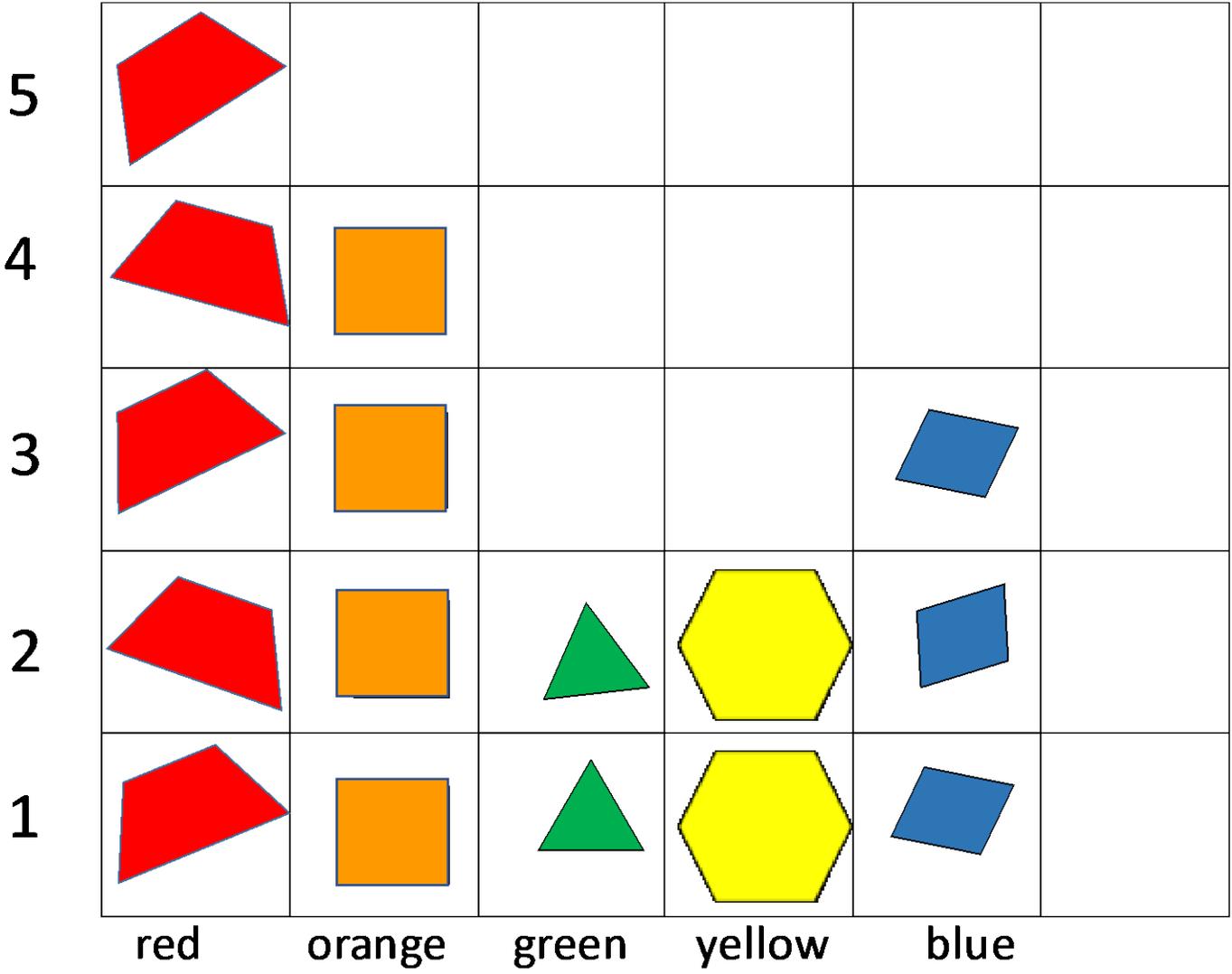


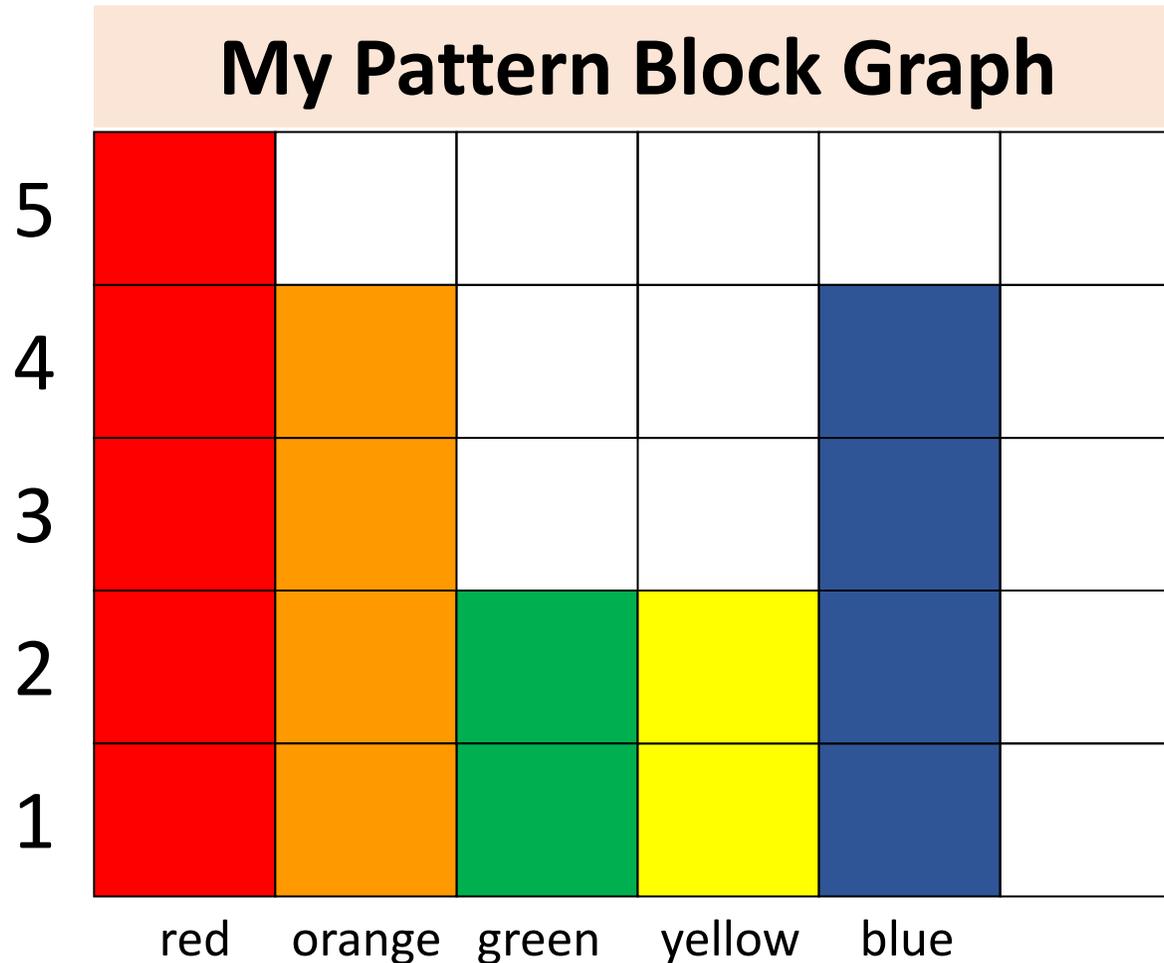
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# My Pattern Block Graph



# My Pattern Block Graph

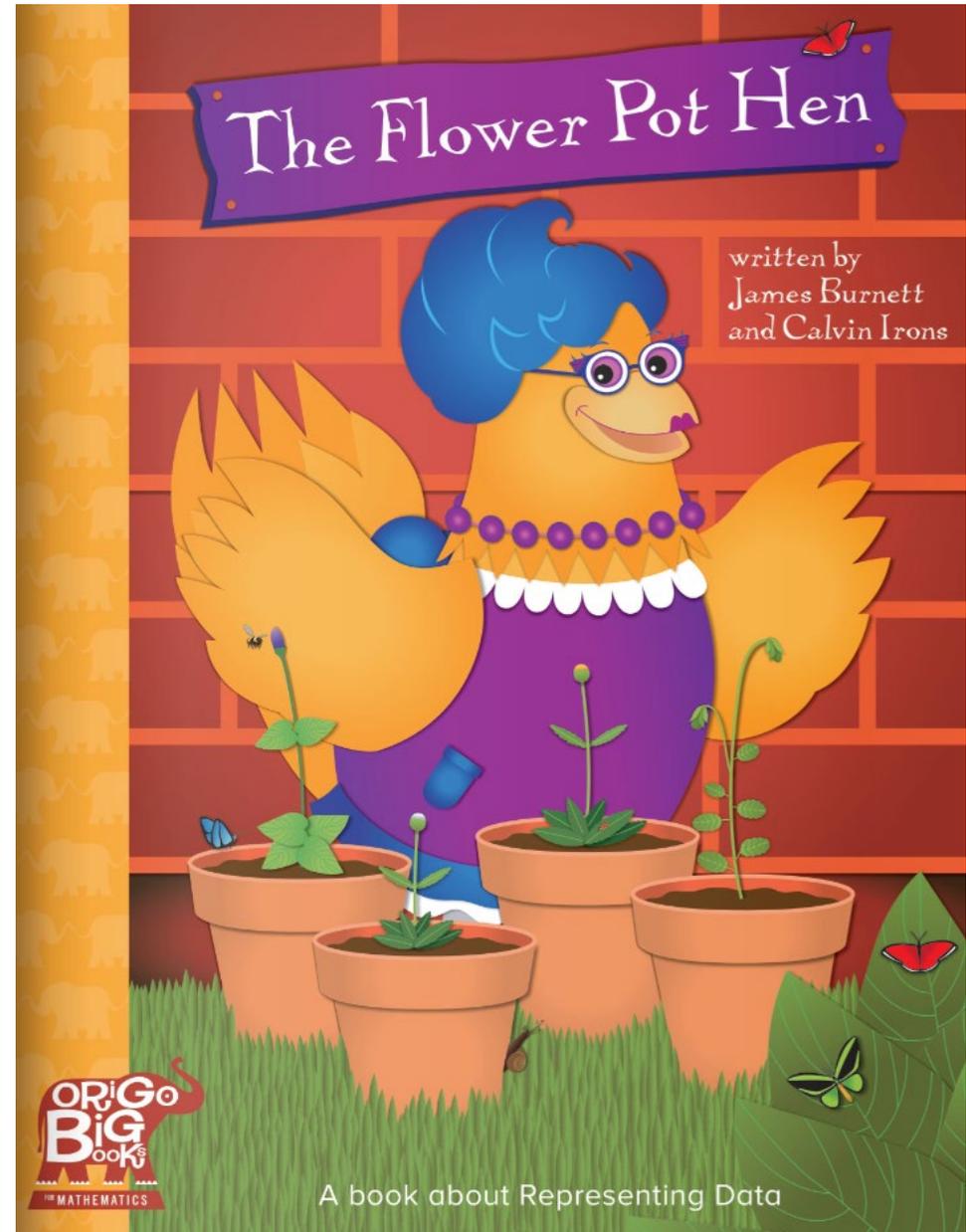




- Data is represented by individual squares that form a vertical bar
- The height of the bar is becoming the data focus
- There is no need for a scale on the y-axis, but it could be introduced here

# The Flower Pot Hen

A book about representing data





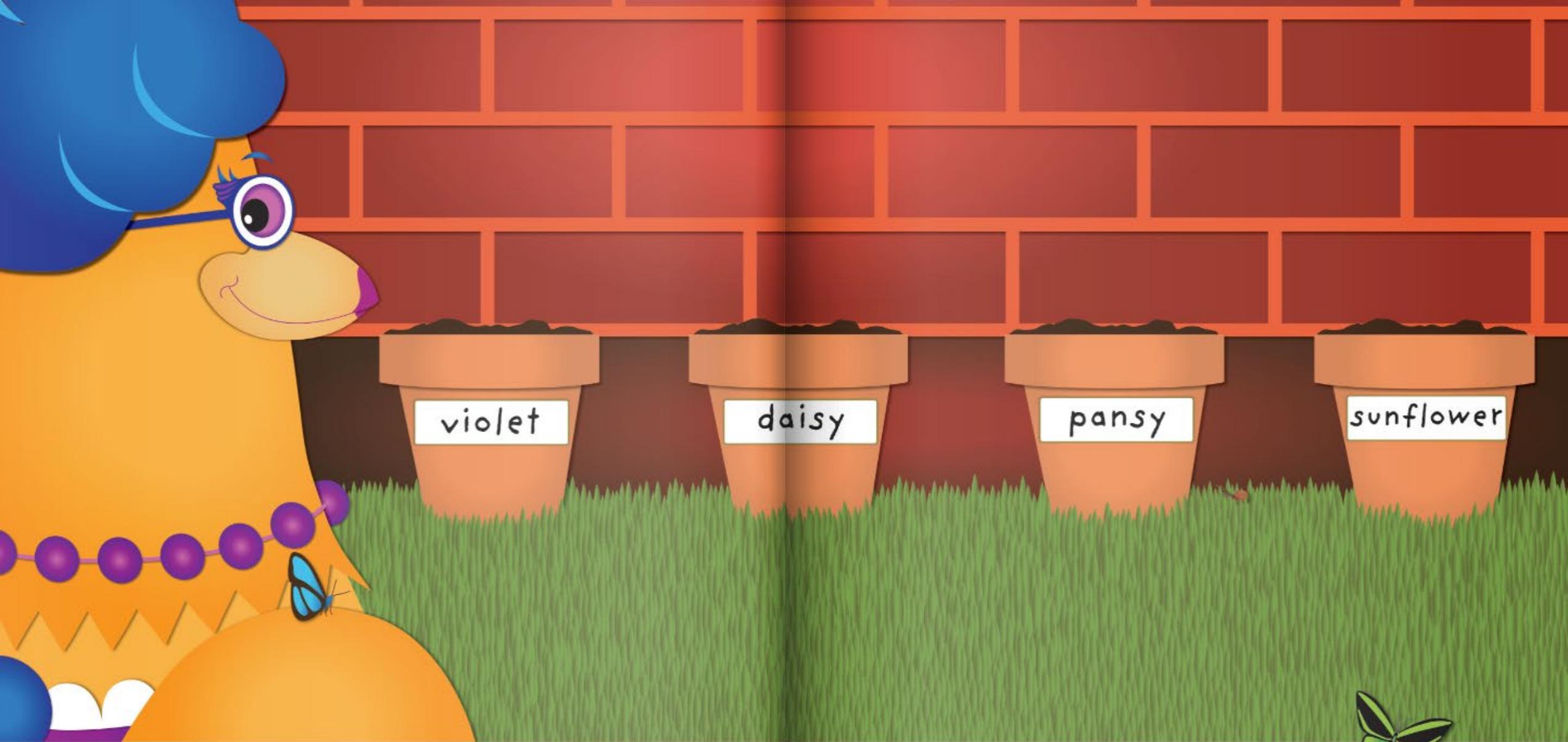
There was an old lady who lived in a pen.

She was called the Flower Pot Hen.



Each year she sowed seeds for the show,

and watched and waited  
for the flowers to grow.



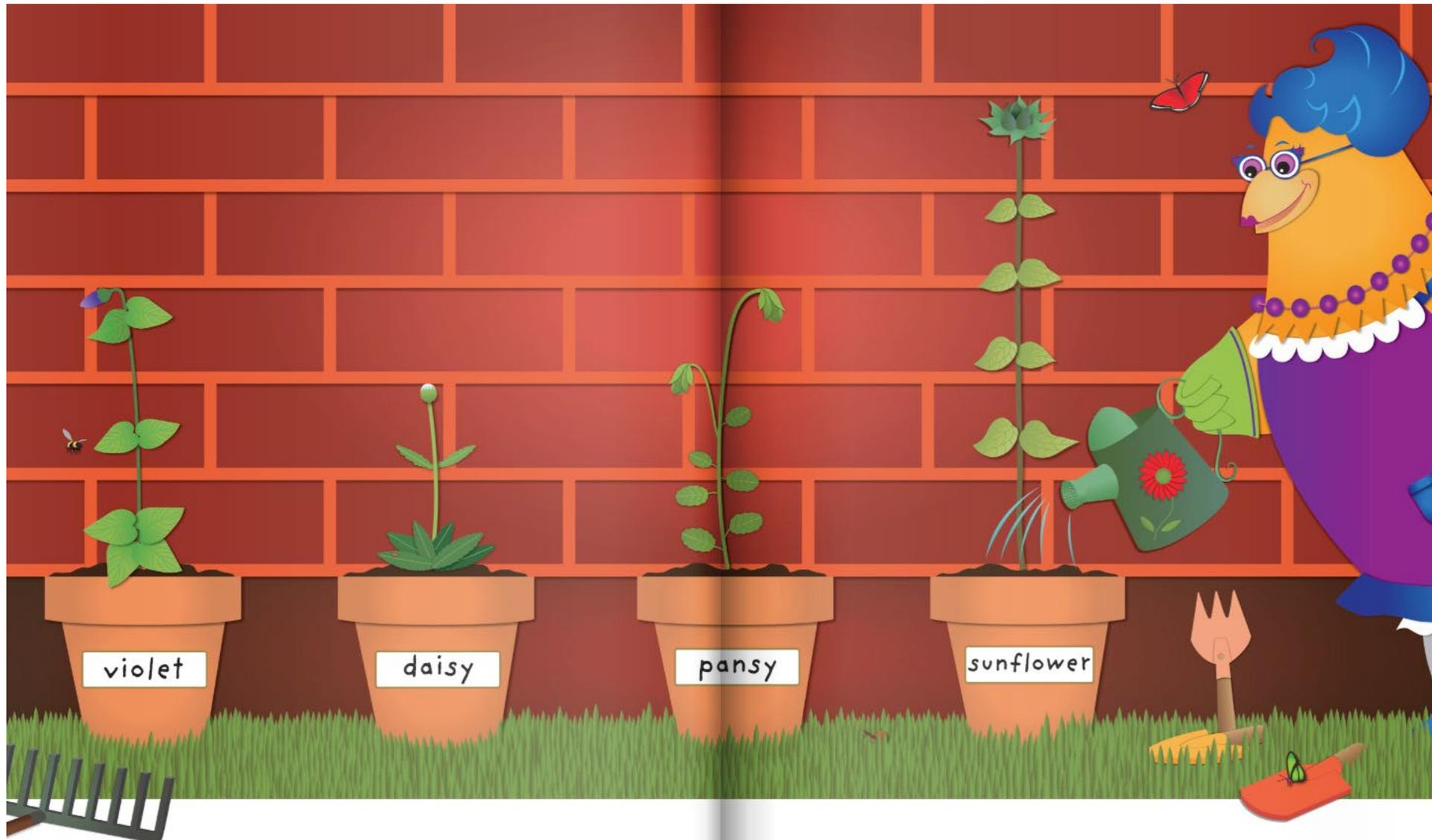
She placed the pots against the wall

and hoped her plants grew nice and tall.



Some grew high and some grew low.

Some grew fast and some grew slow.



The Flower Pot Hen did not rest.

She wanted her flowers to be the best.

# Collecting and Representing Data

## Closed questions

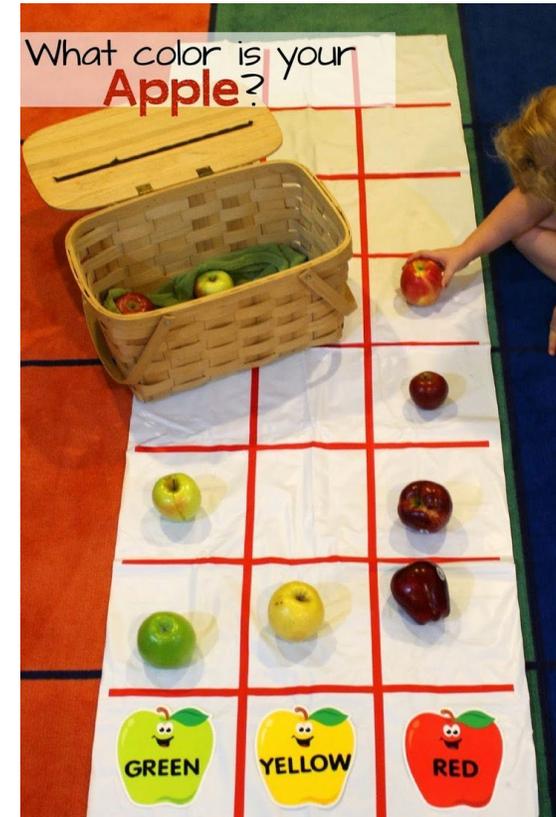
What color is your apple?

Which of these animals do you like the best?

- Represents each item of data once as a category
- May or may not have headings
- Check mark and later tallies can be used

We could also draw tally marks.

Cat	✓✓✓✓
Dog	✓✓✓✓✓
Bird	✓✓
Fish	✓



[https://playtolearnpreschool.us/wp-content/uploads/2014/09/IMG\\_3856-625x1024.jpg](https://playtolearnpreschool.us/wp-content/uploads/2014/09/IMG_3856-625x1024.jpg)

# Collecting Data

Open questions

What fruit did you eat yesterday?

What is your favourite animal?



[http://krabi-magazine.com/wp-content/uploads/2015/08/fruit\\_bg.jpg](http://krabi-magazine.com/wp-content/uploads/2015/08/fruit_bg.jpg)

- Represents each item of data as it is collected
- The data still needs to be summarized
- May have too great a range to be useful

cat	cat
dog	dog
bird	dog
cat	cat
dog	dog
bird	fish

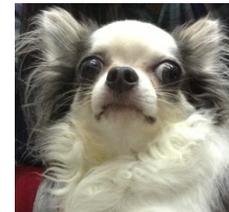
# Reading the Data:

## Tables as a Summary of Data

- Categories are listed along with totals
- Categories form headings
- What does this table tell you?



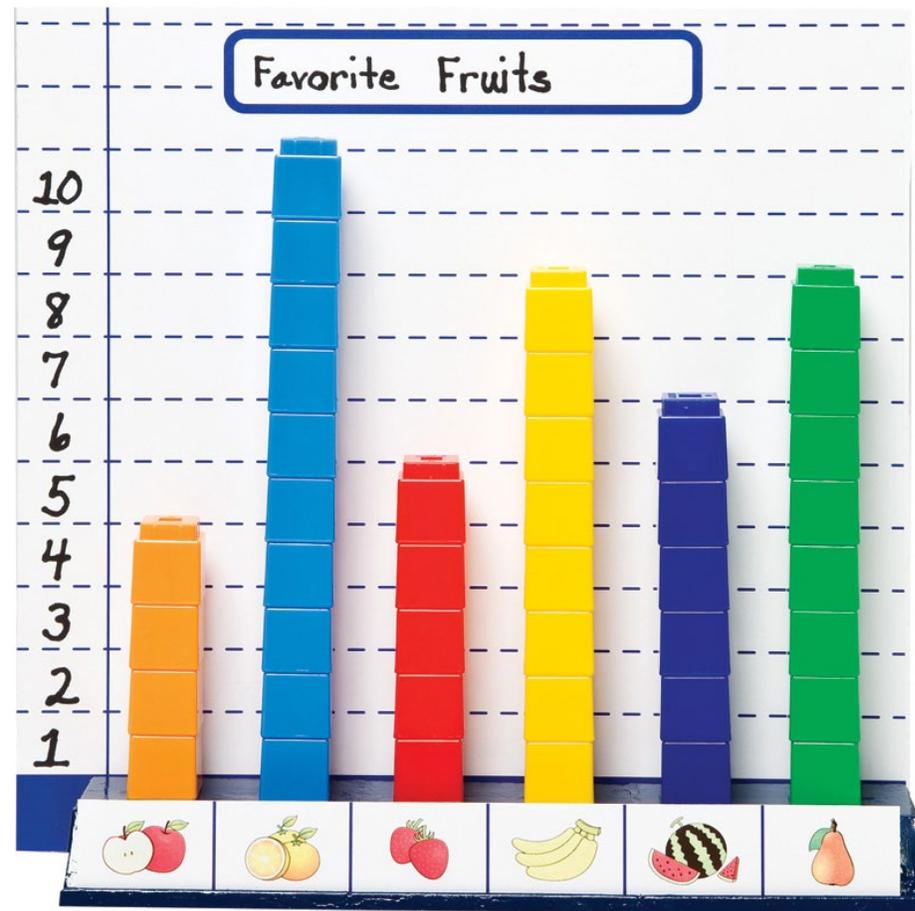
Type of pet	Number of pets
Cat	4
Dog	5
Bird	2
Fish	1



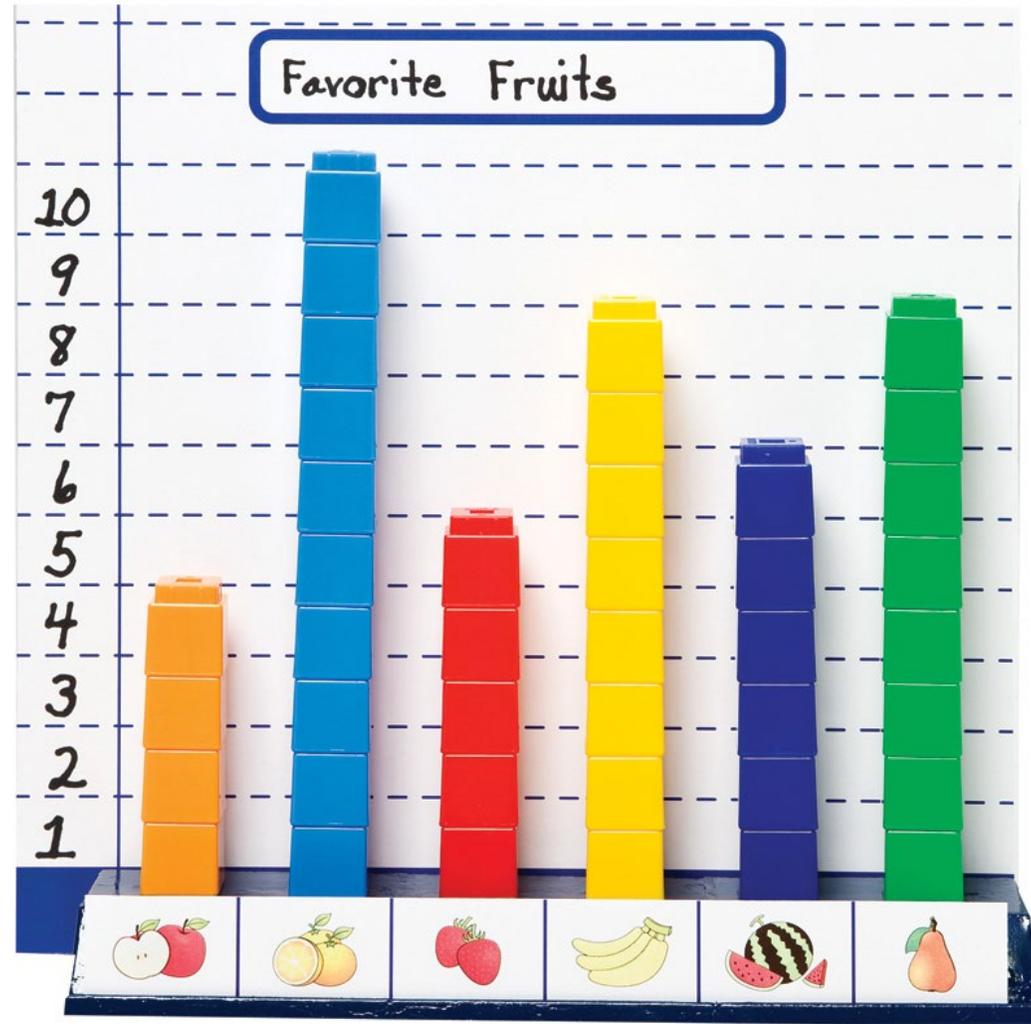
# Block Graphs

Connecting cubes can be stacked against or attached to the board.

What questions could you ask for comparison of data?

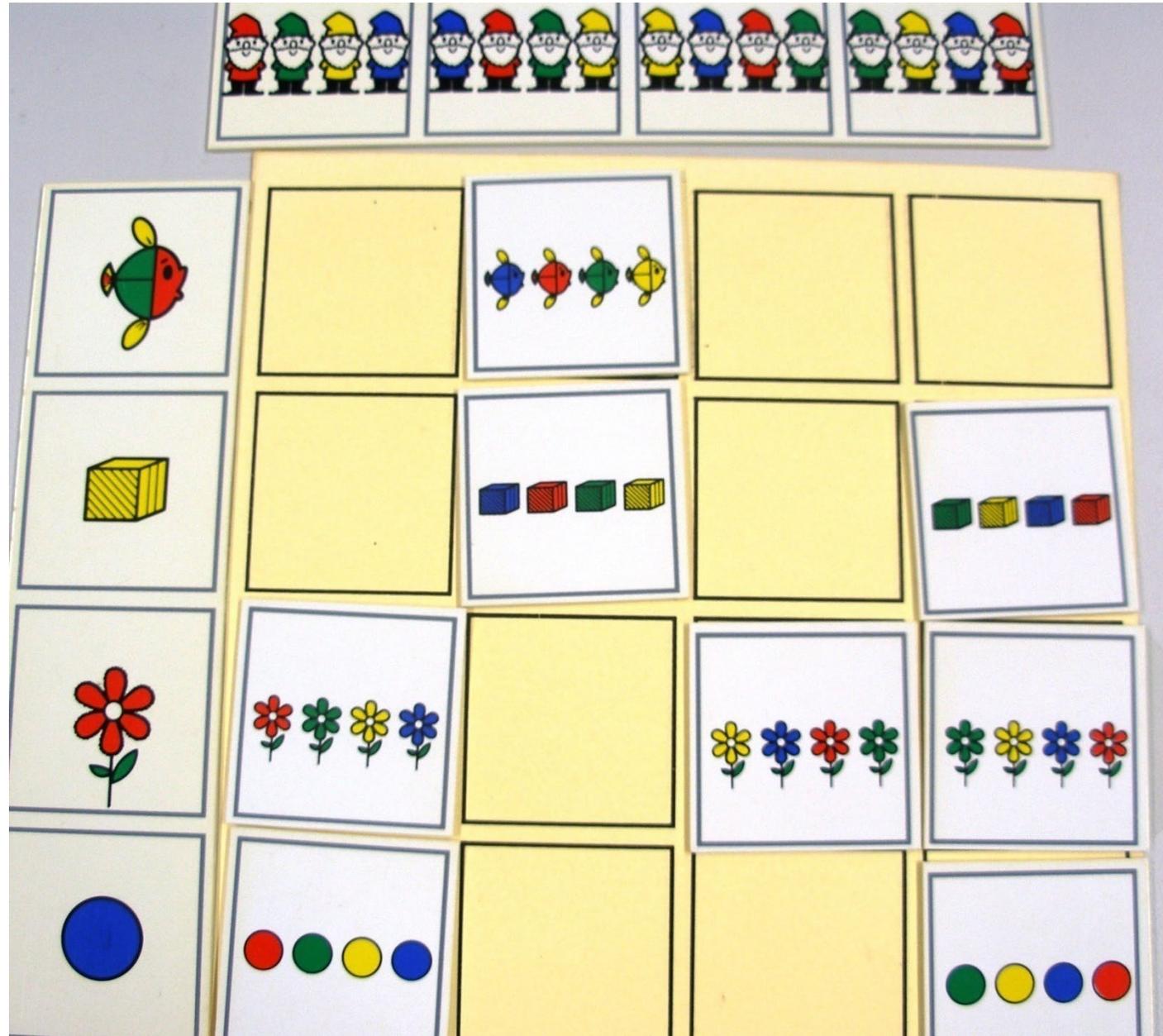


# Block Graphs: Leads to Bar Graphs



**This two dimensional sorting (commercially called Concepts Diagram)**

**Is appropriate for 7 year old children. It is challenging because the child's brain needs to consider two attributes for each selection.**



# Continuous Data (Measurement)



Think about the language being developed for each learning experience

## Bottle 'Graph'

### Do you prefer fried rice or steamed rice?

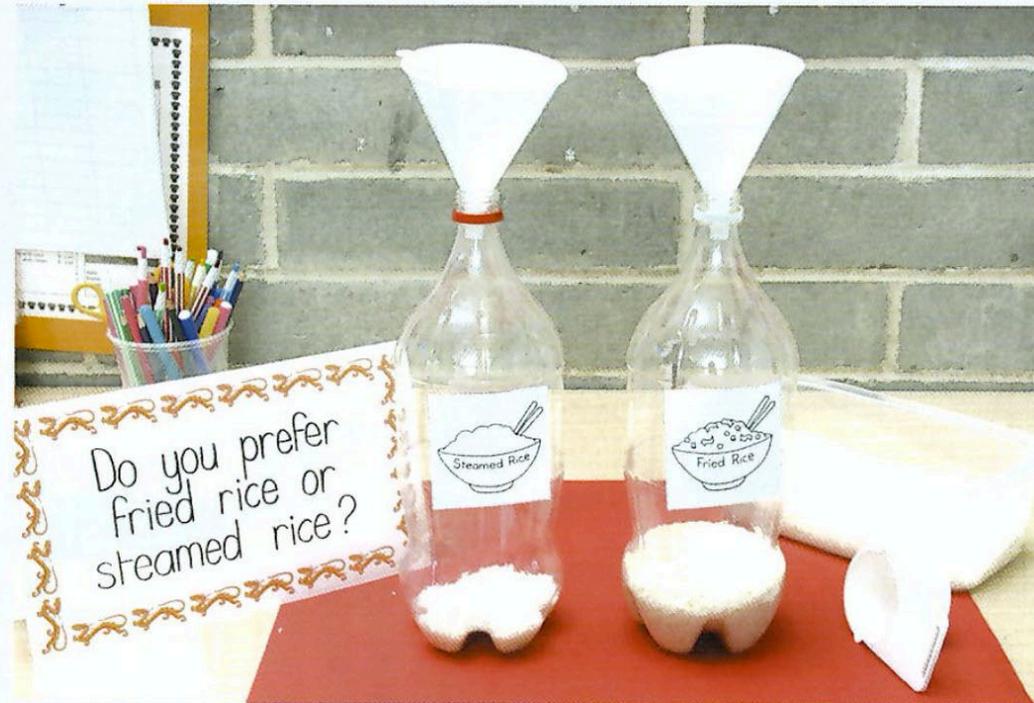
**Choices** Fried rice,  
Steamed rice

#### Collecting the data

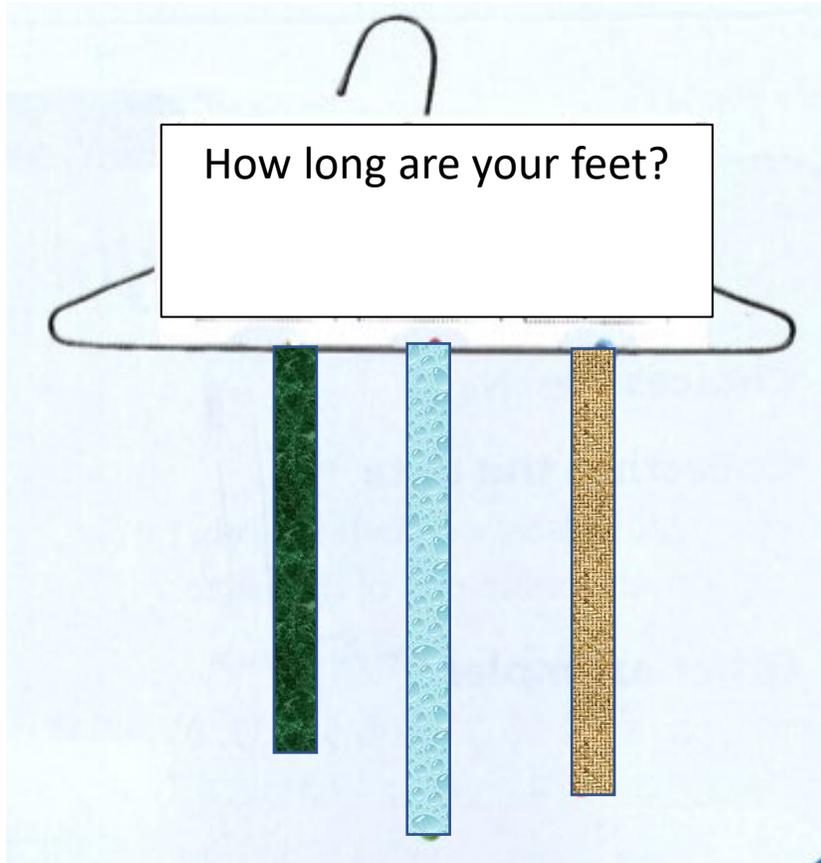
Each child pours one measure of rice, water or other material into the appropriate bottle.

#### Other examples

See pages 14, 43, 44.



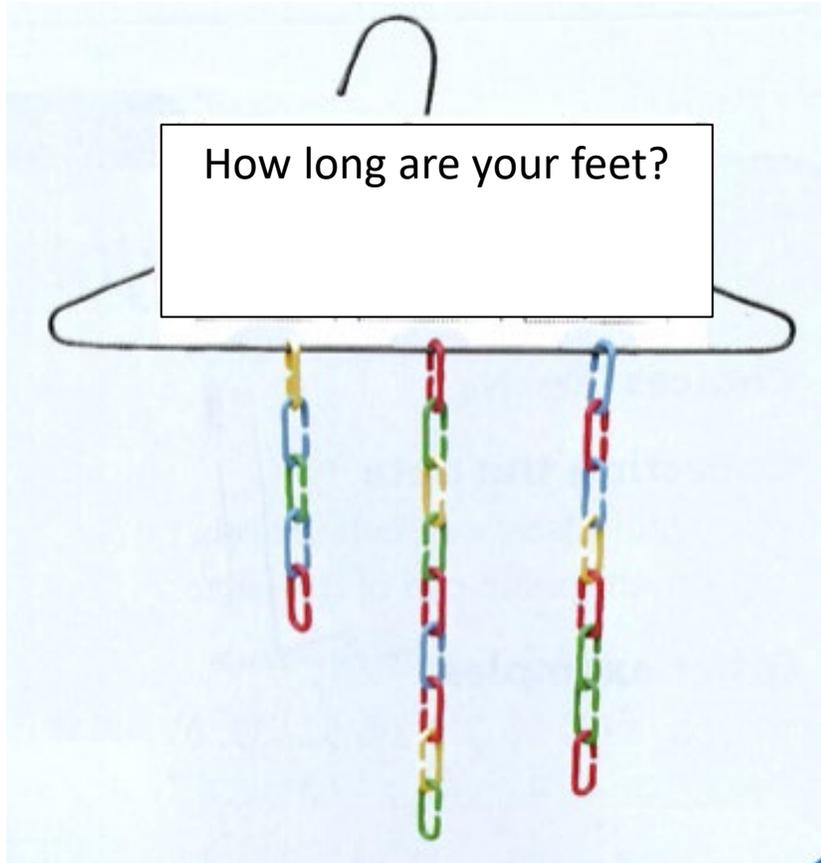
# Continuous Data (Measurement)



Don't let me hear "est" words  
before "er" words!



# Continuous Data (Measurement)

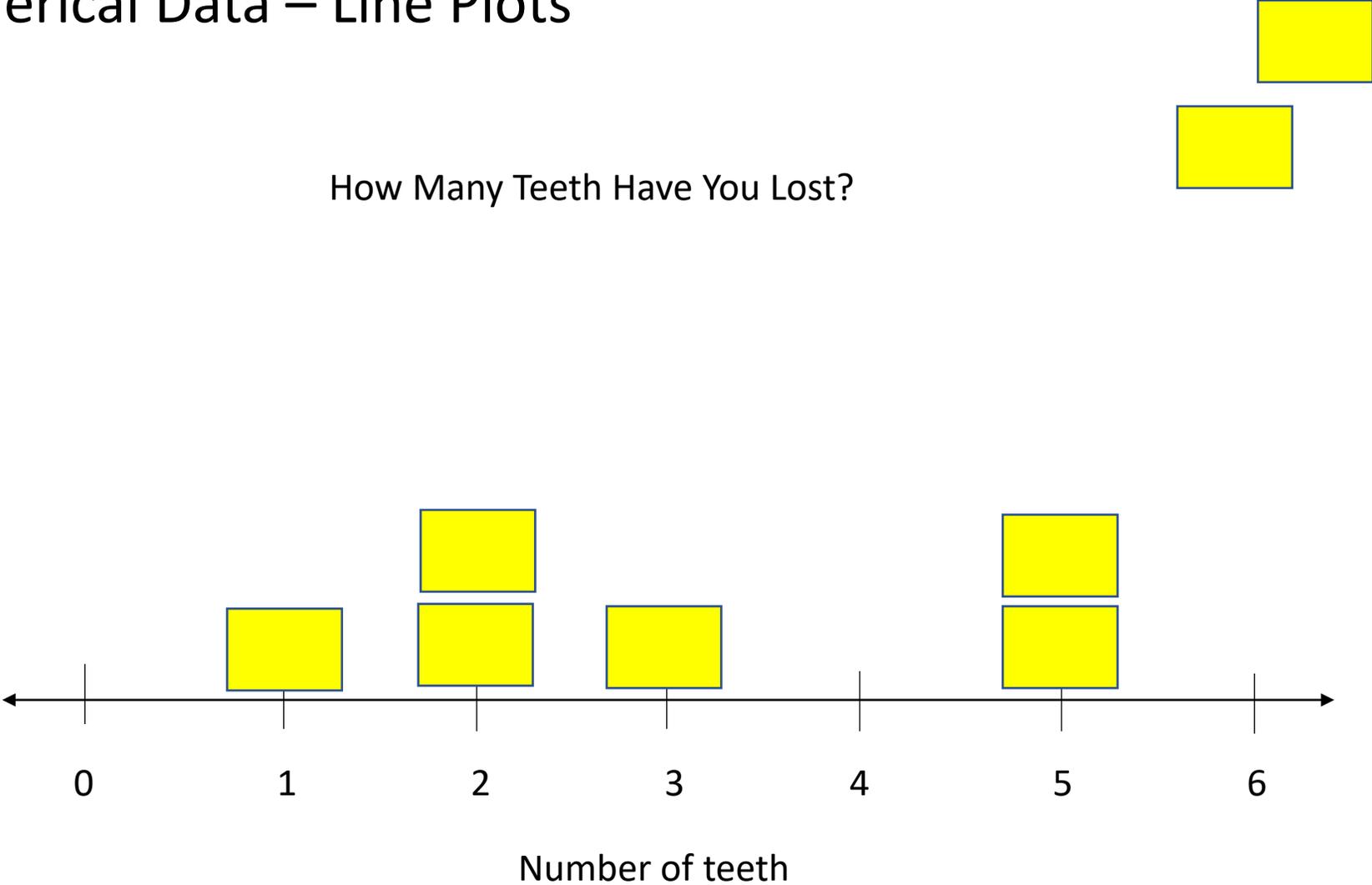


These feet are all long. How could you describe each length?



# Numerical Data – Line Plots

How Many Teeth Have You Lost?



How do I know if my children are school ready?

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## OUTCOME 5: CHILDREN ARE EFFECTIVE COMMUNICATORS

### Children begin to understand how symbols and pattern systems work

This is evident, for example, when children:

- use symbols in play to represent and make meaning
- begin to make connections between and see patterns in their feelings, ideas, words and actions and those of others
- notice and predict the patterns of regular routines and the passing of time
- develop an understanding that symbols are a powerful means of communication and that ideas, thoughts and concepts can be represented through them
- begin to be aware of the relationships between oral, written and visual representations
- begin to recognise patterns and relationships and the connections between them
- begin to sort, categorise, order and compare collections and events and attributes of objects and materials, in their social and natural worlds
- listen and respond to sounds and patterns in speech, stories and rhyme
- draw on memory of a sequence to complete a task
- draw on their experiences in constructing meaning using symbols

Educators promote this learning, for example, when they:

- draw children's attention to symbols and patterns in their environment and talk about patterns and relationships, including the relationship between letters and sounds
- provide children with access to a wide range of everyday materials that they can use to create patterns and to sort, categorise, order and compare
- engage children in discussions about symbol systems, for example, letters, numbers, time, money and musical notation
- encourage children to develop their own symbol systems and provide them with opportunities to explore culturally constructed symbol systems

# INVESTIGATING NUMBERS (1-5)

## Learning Outcomes

EYLF outcome 5: Children are effective communicators.

Children begin to understand how symbols and pattern systems work.

This outcome is evident when children begin to recognise relationships among objects, pictures and numerals.

### THIS TOPIC INCLUDES:

- 2 x Whole Group Activities
- 4 x Small Group Activities
- 1 x Formative Interviews
- 1 x Newsletter to Home

## Investigating numbers (1-5) introduction

For children to have a firm grasp of what a number represents, they must first understand the quantity aspect of number. This should progress naturally from counting objects to seeing pictorial quantities to recognising dot arrangements, to eventually linking these quantities to the number symbol. Only after children understand the meaning of quantity should they be shown the corresponding numeral. Because the concept of numeral is so abstract, showing numerals to young children too early may create misconceptions or misunderstandings. At this age, children are not expected to write the numerals because they are physically and developmentally too young to accomplish this. They are only expected to recognize the number symbol and represent its quantity.

A note on zero: For young children to understand the concept of zero, they first need to understand the meaning of a quantity, how to represent a quantity, and which numeral is the symbolic representation of that quantity. Zero is only introduced after children understand and internalise the idea of quantity.

## Research into practice

Young children come to school with many preconceived ideas about the concept of number, including the idea of quantity and symbolic representations. They gather such information from everyday life and even TV shows or phone apps. Each child's idea of number may be different depending on their experiences. Regardless of their background knowledge, research shows that children benefit from learning experiences — involving sorting, classifying, matching, comparing, and eventually ordering numbers — by using both quantity and symbolic representations.

## Reading list

Baroody, Arthur J. and Jesse L. M. Wilkins. 1999. "The Development of Informal Counting, Number, and Arithmetic Skills and Concepts." In *Mathematics in the Early Years*, edited by Juanita V. Copley, 48–65. Reston, VA: National Council of Teachers of Mathematics.

Clements, Douglas B. and Julie Sarama. 2007. "Early Childhood Mathematics Learning." In *Second Handbook of Research on Teaching and Learning Mathematics*, edited by Frank K. Lester, vol. 1, 461–555. Charlotte, NC: Information Age Publishing.

MacDonald, Beth L. and Jessica F. Shumway. 2016. "Subitizing Games: Assessing Preschoolers' Number Understanding." *Teaching Children Mathematics* 22: 340–348.

## Whole Class Activity

### Matching quantities 1 to 5

In this whole class activity, children match dog quantities to practice subitizing.

#### Step 1 Preparing the activity

You will need:

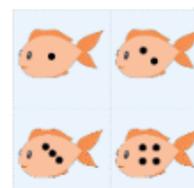
- 1 set of domino dot cards from *The Math Case: Green set 5*

Each child will need:

- 1 set of fish cards from *ORIGO Stepping Stones Activity Book Pre-K page 7*

#### Step 2 Starting the activity

Say, **We have been learning about the numbers one, two, three, four, and five.** Hold up your hand and show them how to count using the five fingers on one hand. Distribute the cards and say, **When I hold up a number of fingers, I want you to show me your fish card that shows that number of dots. Ready?** Hold up two fingers and ask, **What card shows this number of dots?** Repeat to show three fingers, four fingers, and five fingers. Then repeat with numbers in random order.



#### Step 3 Teaching the activity

Say, **We are going to play musical numbers. When the music is playing, you can dance around the circle. When I turn off the music, I make a group that has the same number of children as the dot card. A dot card showing four dots, you move into groups of four.** If children are in groups, ask them to count how many is in their group and say the number to engage in this activity. Ensure you show each dot card

#### Step 4 Reflecting on the work

Say, **Today we identified quantities from one to five.** Prompt the children. Encourage them to share their reflections with the group. Provide



# Summary

Data analysis involves stages of development.  
The stages for early childhood are:

- collecting data,
- representing data,
- reading the data.

The first (non-graphical) data representations:

- Diagrams to show sorting activities  
(yes/no and Venn or Carroll diagrams)
- Tables (rows, columns, labels and headings)

# Reflection

- How does language of mathematics especially sorting and comparing support childrens' thinking and learning about data information?
- Do you know the mathematical data/statistics words to model?
- How does play initiative, table activities and teacher guided activities boost mathematical ideas for data collection?

Enjoy reading books that emphasize mathematical concepts as well as commercial children's literature that is of interest to the children.

Remember to model the correct mathematical language as you interact with the children during their learning experiences.

Mathematics is ever evolving and is what makes things in the world work. Help children to keep their motivation for learning about mathematics in the early childhood years.

*All the best to you in your early childhood teaching career,  
Rosemary and Peter*