

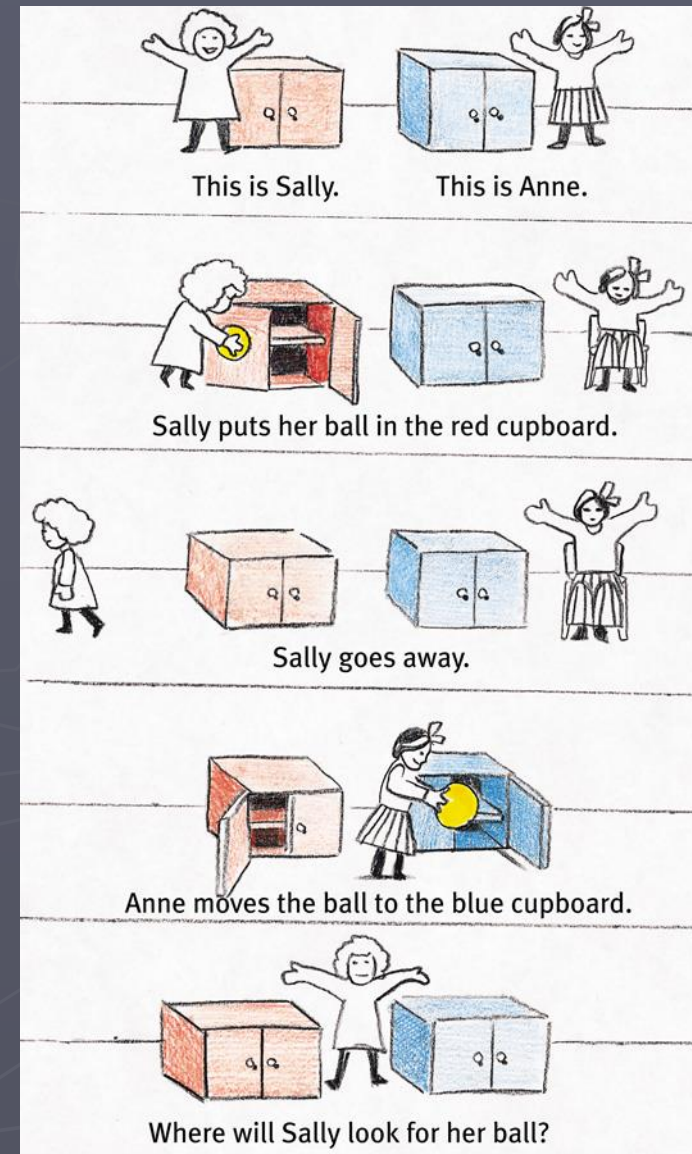
# Preoperational Stage

LIMITATION: 2 - 4

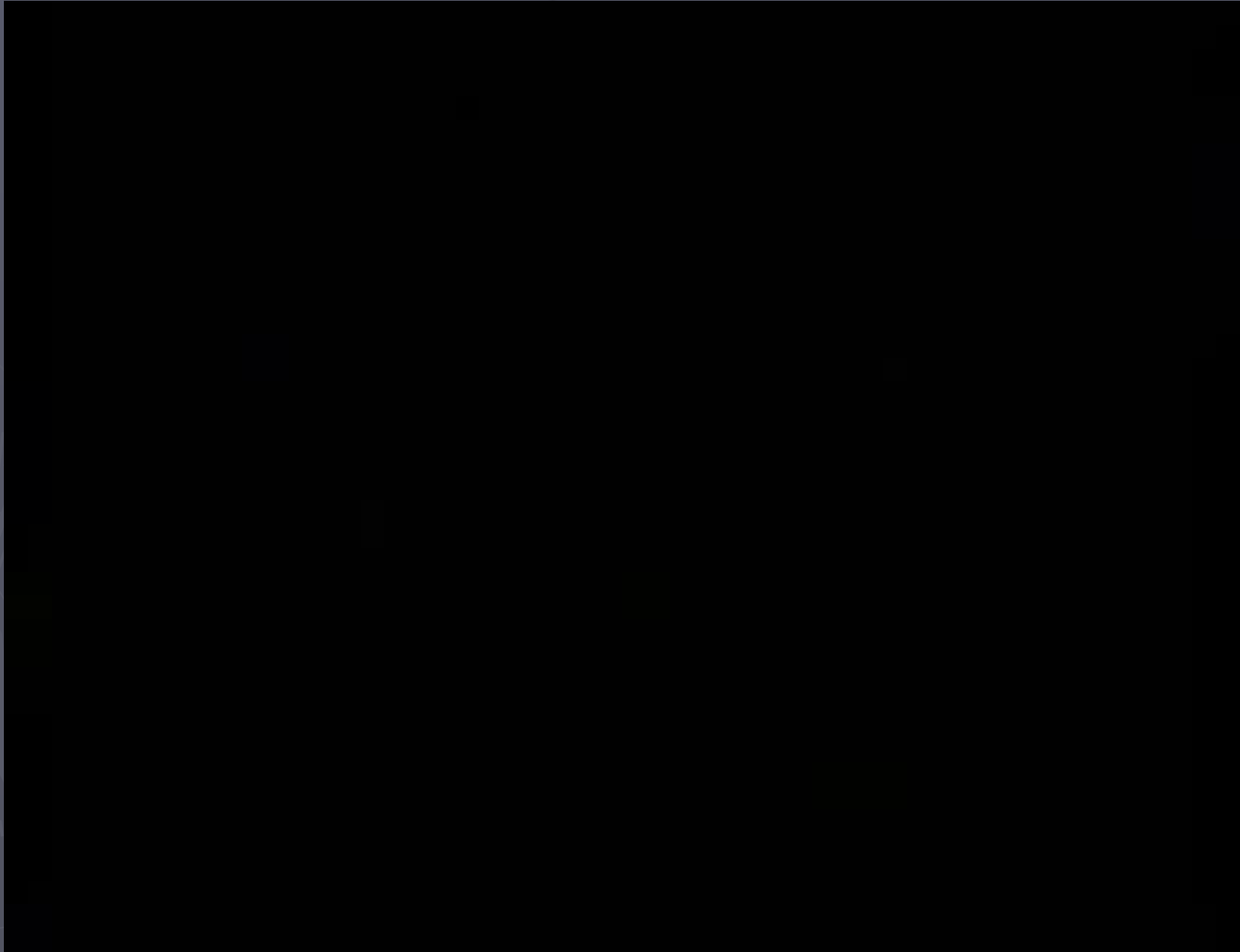
ACQUISITION: 4 +

**Theory of Mind:** The ability to consider their own and others' mental states and processes.

Autism: This is absent in many autistic children. (when asked where Sally will look when she returns to the room, autistic children will say in the blue cupboard.)



# Theory of Mind

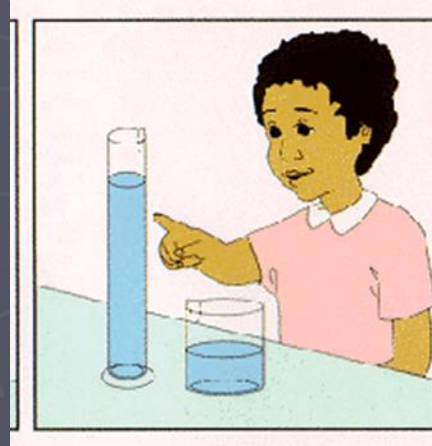




# *Preoperational Stage*

## LIMITATION:

- **Centration** - the tendency to focus on a single, perceptually striking feature of an object or event.
- Leads to an inability to understand the concept of **conservation**.
  - *The idea that merely changing the appearance of objects does not change their key properties.*



Preoperational Stage: Lacking grasp of conservation

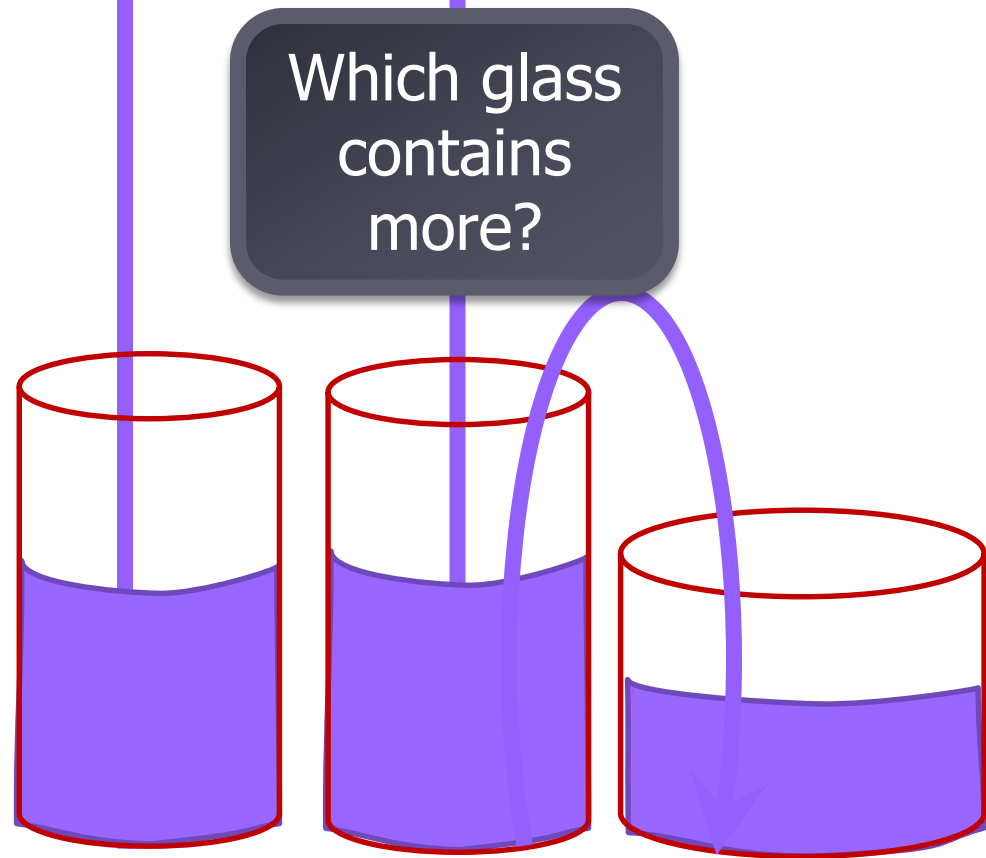


# ***Concrete Operational Stage***

- ▶ **7-11 years old**
- ▶ **Can think logically, use analogies, and perform mathematical transformations ( $5+9$  is the same as  $9+5$ ) also known as reversibility.**
- ▶ **Understand analogies** (*My brain is like a computer.*)
- ▶ **Lacks abstract thought**
- ▶ ***Understand concept of conservation.***

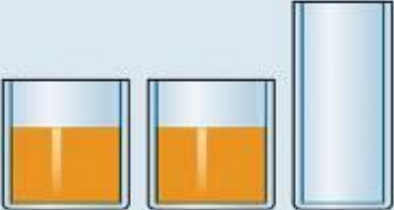

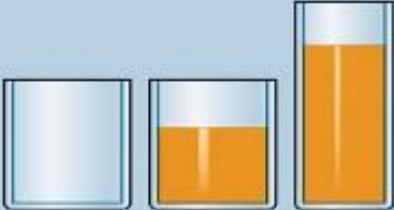






## Piaget Stage 3: Concrete Operational (7 – 12 yrs)

- **Conservation** - the ability to understand that a quantity is **conserved** (does not change) even when it is arranged in a different shape.
- Children learn how various actions or "operations" can affect or transform "concrete" objects




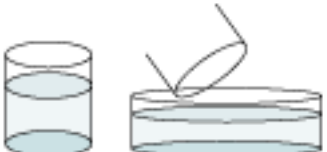






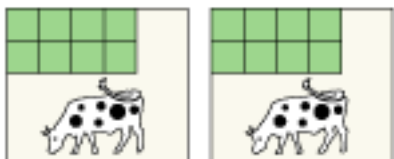
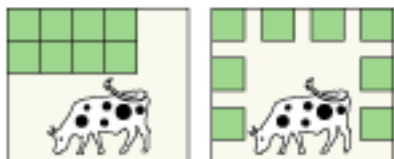
# Procedures Used to Test Conservation

*The idea that merely changing the appearance of objects does not change their key properties*

|                                 | PHASE 1  | PHASE 2  | PHASE 3   |
|---------------------------------|--|--|---|
| CONSERVATION OF LIQUID QUANTITY |  <p>"Do they have the same amount of orange drink or a different amount?"</p> |  <p>"Now watch what I do" (pouring contents of one glass).</p> |  <p>"Now, do they have the same amount of orange drink or a different amount?"</p> |
| CONSERVATION OF SOLID QUANTITY  |  <p>"Do they have the same amount of clay or a different amount?"</p>        |  <p>"Now watch what I do" (stretching one piece of clay).</p> |  <p>"Now, do they have the same amount of clay or a different amount?"</p>        |
| CONSERVATION OF NUMBER          |  <p>"Is there the same number or a different number?"</p>                   |  <p>"Now watch what I do" (spreading one row).</p>           |  <p>"Now, is there the same number or a different number?"</p>                   |



# More Conservation Tasks

| Type of Conservation | Starting Configuration   | Transformation  | Final Configuration   |
|----------------------|--|---|---|
| Liquid quantity      |  <p>Is there the same amount of water in each glass?</p>      | Pour water from one glass into a shorter, wider glass.            |  <p>Now is there the same amount of water in each glass, or does one have more?</p>          |
| Number               |  <p>Are there the same number of pennies in each row?</p>     | Stretch out the top row of pennies, push together the bottom row. |  <p>Now are there the same number of pennies in each row, or does one row have more?</p>     |
| Length               |  <p>Are these sticks the same length?</p>                     | Move one stick to the left and the other to the right.            |  <p>Now are the sticks the same length, or is one longer?</p>                                |
| Mass                 |  <p>Does each ball have the same amount of clay?</p>         | Roll one ball so that it looks like a sausage.                    |  <p>Now does each piece have the same amount of clay, or does one have more?</p>            |
| Area                 |  <p>Does each cow have the same amount of grass to eat?</p> | Spread out the squares in one field.                              |  <p>Now does each cow have the same amount of grass to eat, or does one cow have more?</p> |

Concrete Stage: Understanding of conservation – Attained! **LEVEL UP!**



# Formal Operational Stage

- ▶ What way do you best learn? (metacognition)
- ▶ What would happen if people stopped having children?
- ▶ If you had a third eye, where would you put it?
- ▶ 11-15 years old
- ▶ Abstract reasoning (algebra)
- ▶ Manipulate objects in our minds without seeing them (no need for "symbols")
- ▶ Hypothesis testing
- ▶ Trial and Error
- ▶ Not every adult gets to this stage

# Formal Operational Stage (Age 11 +)

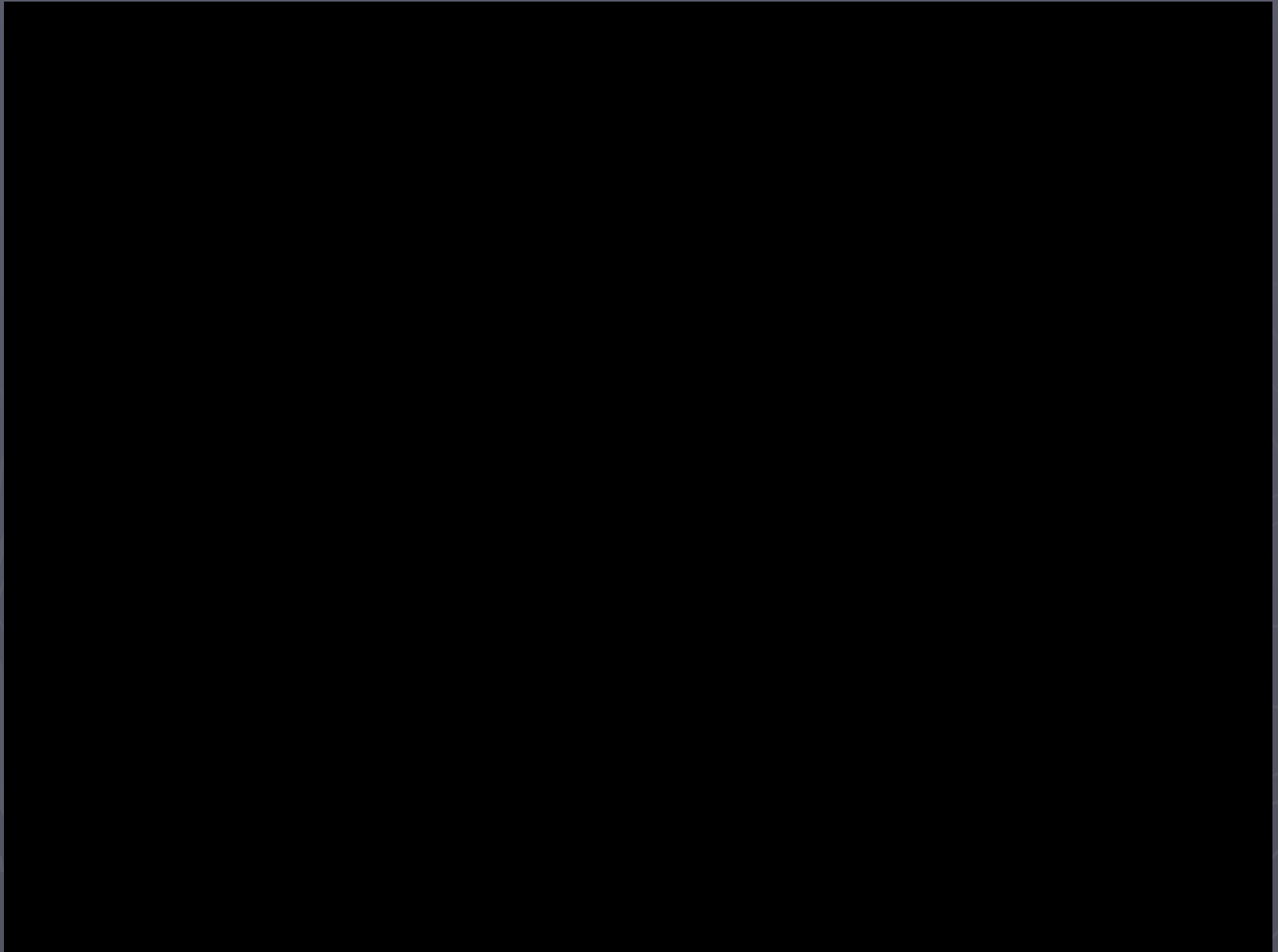
**Concrete operations** include **analogies** such as “My brain is like a computer.”

Includes arithmetic transformations:  
if  $4 + 8 = 12$ ,  $12 - 4 = ?$

**Formal operations** includes **allegorical** thinking such as “People who live in glass houses shouldn’t throw stones” (understanding that this is a comment on hypocrisy).

Includes algebra:  
if  $x = 3y$  and  $x - 2y = 4$ ,  
what is  $x$ ?

# Concrete v. Formal, deductive reasoning



# Jean Piaget's Stages of Cognitive Development

| Typical Age Range             | Description of Stage  | Developmental Phenomena   |
|-------------------------------|---|---|
| Birth to nearly 2 years       | <i>Sensorimotor</i><br>Experiencing the world through senses and actions (looking, hearing, touching, mouthing, and grasping)               | <ul style="list-style-type: none"><li>• Object permanence</li><li>• Stranger anxiety</li></ul>                  |
| About 2 to about 6 or 7 years | <i>Preoperational</i><br>Representing things with words and images; using intuitive rather than logical reasoning                           | <ul style="list-style-type: none"><li>• Pretend play</li><li>• Egocentrism</li></ul>                            |
| About 7 to 11 years           | <i>Concrete operational</i><br>Thinking logically about concrete events; grasping concrete analogies and performing arithmetical operations | <ul style="list-style-type: none"><li>• Conservation</li><li>• Mathematical transformations</li></ul>           |
| About 12 through adulthood    | <i>Formal operational</i><br>Abstract reasoning   | <ul style="list-style-type: none"><li>• Abstract logic</li><li>• Potential for mature moral reasoning</li></ul> |



(a)



(b)



(c)

**Figure 4.15** Piaget's stages (a) Sensorimotor stage (b) Preoperational stage (c) Concrete/formal operational stage  
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# Mnemonics for Piaget's 4 Stages

The best mnemonics are often ones that you create for yourself. Here, however, are some common ones!



Stinkin' Pigs Can't Fly

Sometimes Piaget Can Frustrate



# A Constructivist Approach

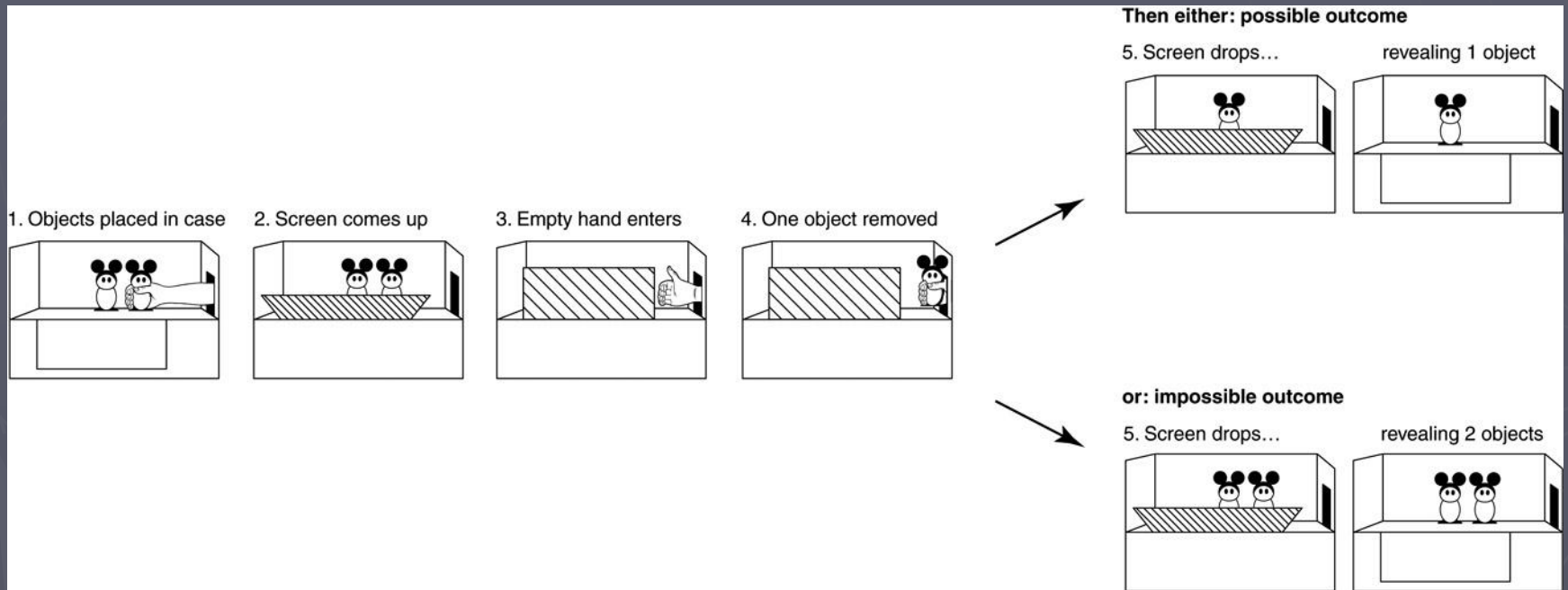
- ▶ Jean Piaget's theory remains the standard against which all other theories are judged.
  - Often labeled **constructivist** because it depicts children as constructing knowledge for themselves.
- ▶ Children are seen as
  - Active
  - Learning many important lessons on their own
  - Intrinsically motivated to learn

**"Little scientists"**



# Criticisms of Piaget

1. Ages of stages vary quite a bit.
  - Object permanence in 3 month olds
  - Conservation with 4 year olds
2. Piaget believed that children could not think (had no abstract concepts or ideas.)
3. Individuals who have taken science courses (scientific procedures) are always in formal operations
4. Formal operational thinking is not universal
5. Piaget's tasks are culturally biased



**Figure 4.12** Baby math  
 Myers: Psychology, Eighth Edition  
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