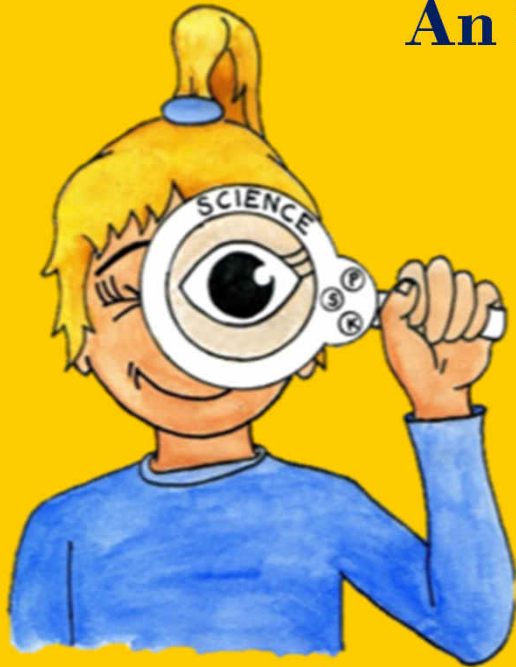


# The Science-K Inventory (SK-I)

**An instrument for measuring scientific  
thinking in kindergarten**



Susanne Koerber & Christopher Osterhaus

# THIS TEST IS FREE TO USE FOR RESEARCH.

If using this test please cite as:

**Koerber, S. & Osterhaus, C. (2019) Individual differences in early scientific thinking: Assessment, cognitive influences, and their relevance for science learning. *Journal of Cognition and Development*, 20, doi: 10.1080/15248372.2019.1620232**

This paper also provides further information on this test and on results concerning 6-year olds competence in scientific thinking.

Additional information can be obtained by

<b>Susanne Koerber</b>	<b>Christopher Osterhaus</b>
Freiburg University of Education	Ludwig-Maximilians-Universität
Kunzenweg 21	Leopoldstraße 44
79117 Freiburg	80802 München
Susanne.Koerber@ph-Freiburg.de	c.osterhaus@psy.lmu.de

© Koerber & Osterhaus, 2019

# Booklets and Pictures

# Experimentation

Tom wants to find out if his dog is able to jump high. Therefore he wants to lure him with a sausage. What does he have to do?



He has to hold the sausage **very high.**

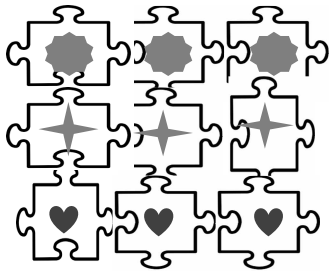


He has to hold the sausage **low.**

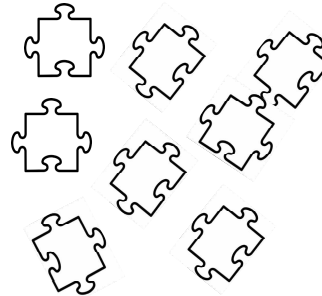


He has to hold up **two sausages.**

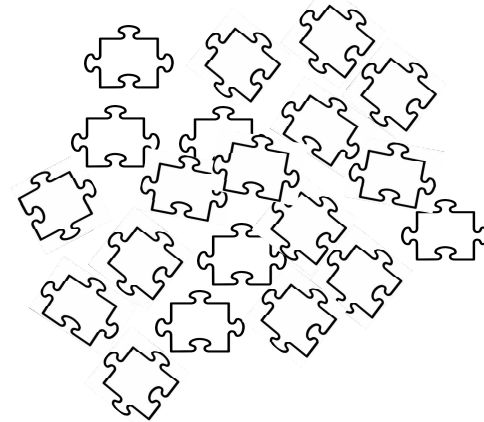
Tom wants to find out if Mia is good at doing puzzles.  
What does she have to do?



Mia has to piece together  
her **favorite puzzle**.

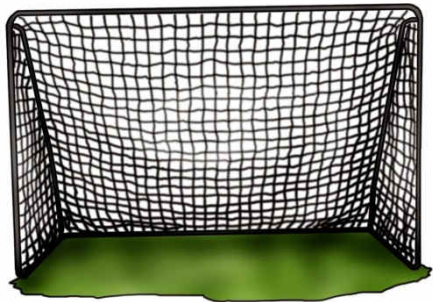


Mia has to piece together a  
puzzle with a **few** pieces.

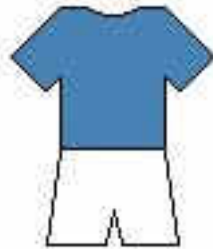


Mia has to piece together a  
puzzle with **many** pieces.

Tom wants to find out if Jan does good at scoring goals.  
What does he have to do?



Jan has to score on a **big** goal.

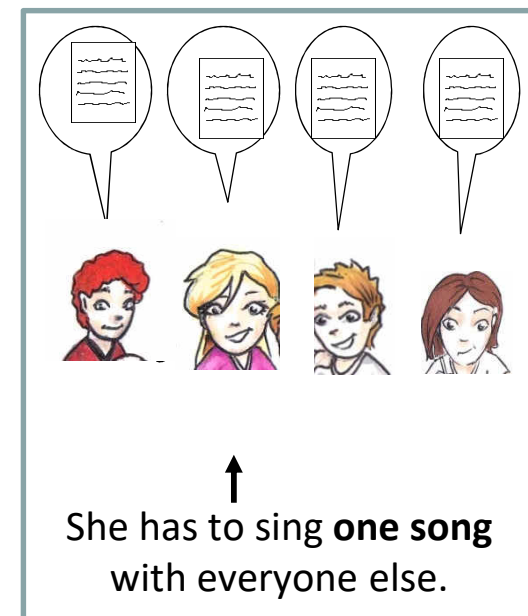
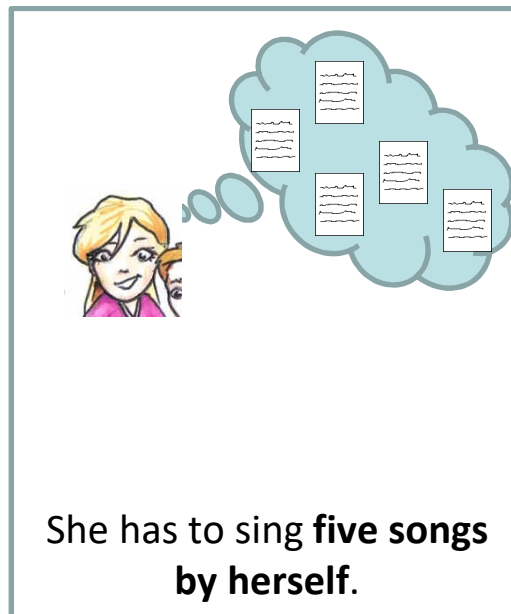
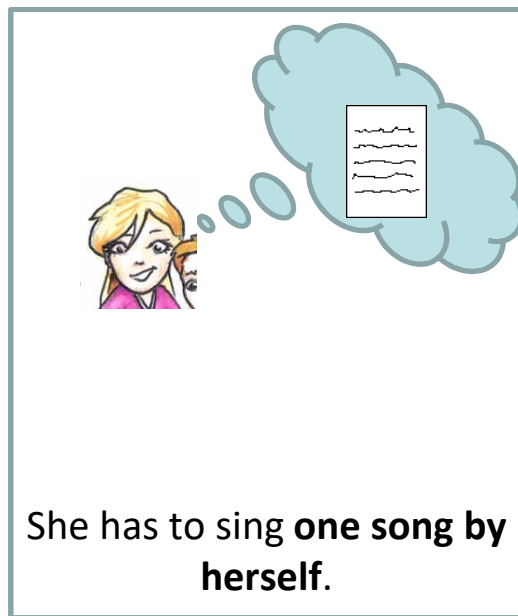


Jan has to wear a **football** shirt.



Jan has to score on a **small** goal.

Tom wants to find out if Annika is good at memorising songs.  
What does she have to do?





Mia wants to find out if plants grow better with warm or with cold water. What does she have to do?



Water one palm tree with **warm** water and water another palm tree with **cold** water.

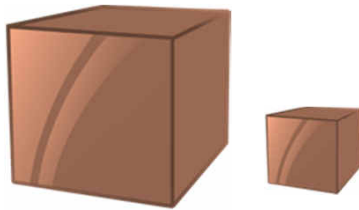


Water a **palm tree** with **warm** water and water a **snowdrop** with **cold** water.

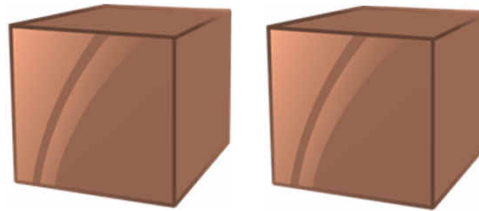


Water a **palm tree** with **warm** water and water a **snowdrop** **warm** water.

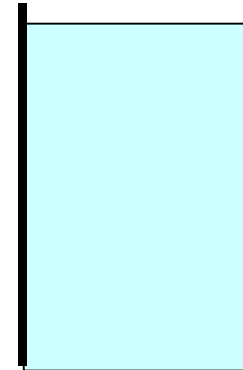
Tom wants to find out if big blocks sink faster than small blocks.  
What does he have to throw into the water?



A **big** and a **small** block.

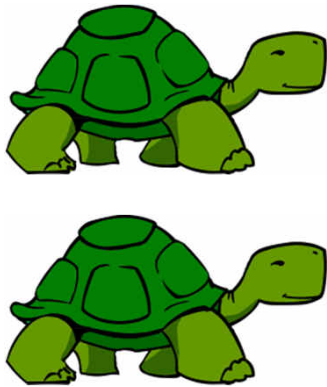


**Two big** blocks.

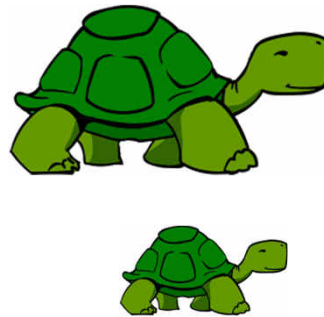


**It doesn't matter** which kind of blocks he uses. The main point is that the water is deep.

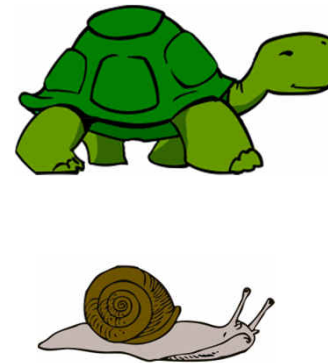
Paul wants to find out if big turtles are faster than small turtles.  
What does he have to do?



He only lets **big** turtles race against each other.



He lets **big** and **small** turtles race against each other.



He lets **turtles** and **snails** race against each other.

Mia wants to find out if cocoa powder dissolves better in warm or in cold milk.

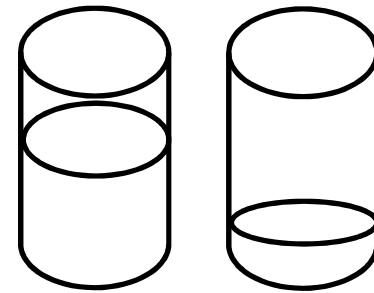
What does she have to do?



Give cocoa powder in **warm**  
and in **cold** milk.



Give cocoa powder only in  
**warm** milk.



Give cocoa powder in **a lot**  
**of** and in **a little** milk.

Paul wants to find out if big slugs are faster than small slugs.  
What does he have to do?



He only lets **big** slugs race  
against each other.

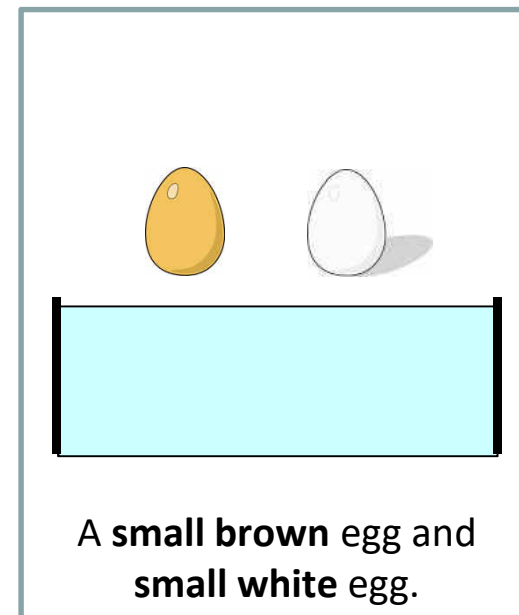
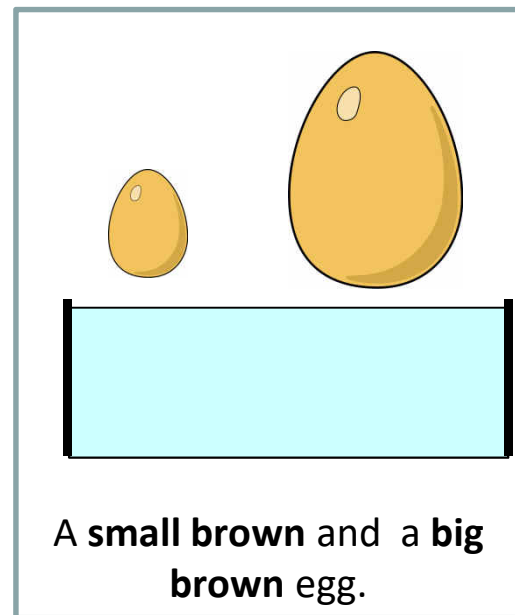
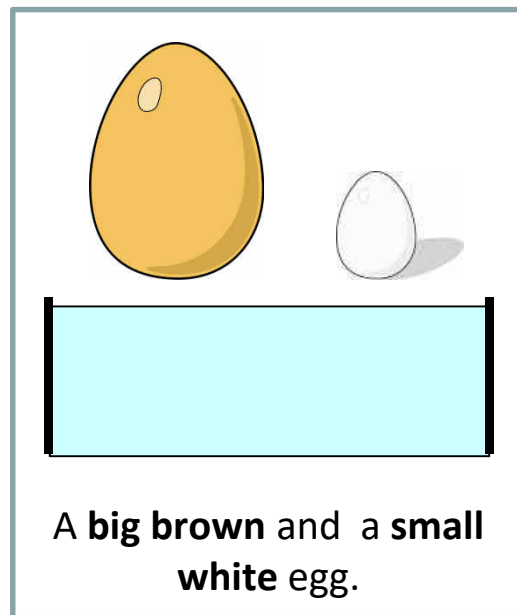


He lets a big **slug** race  
against a big **snail**.

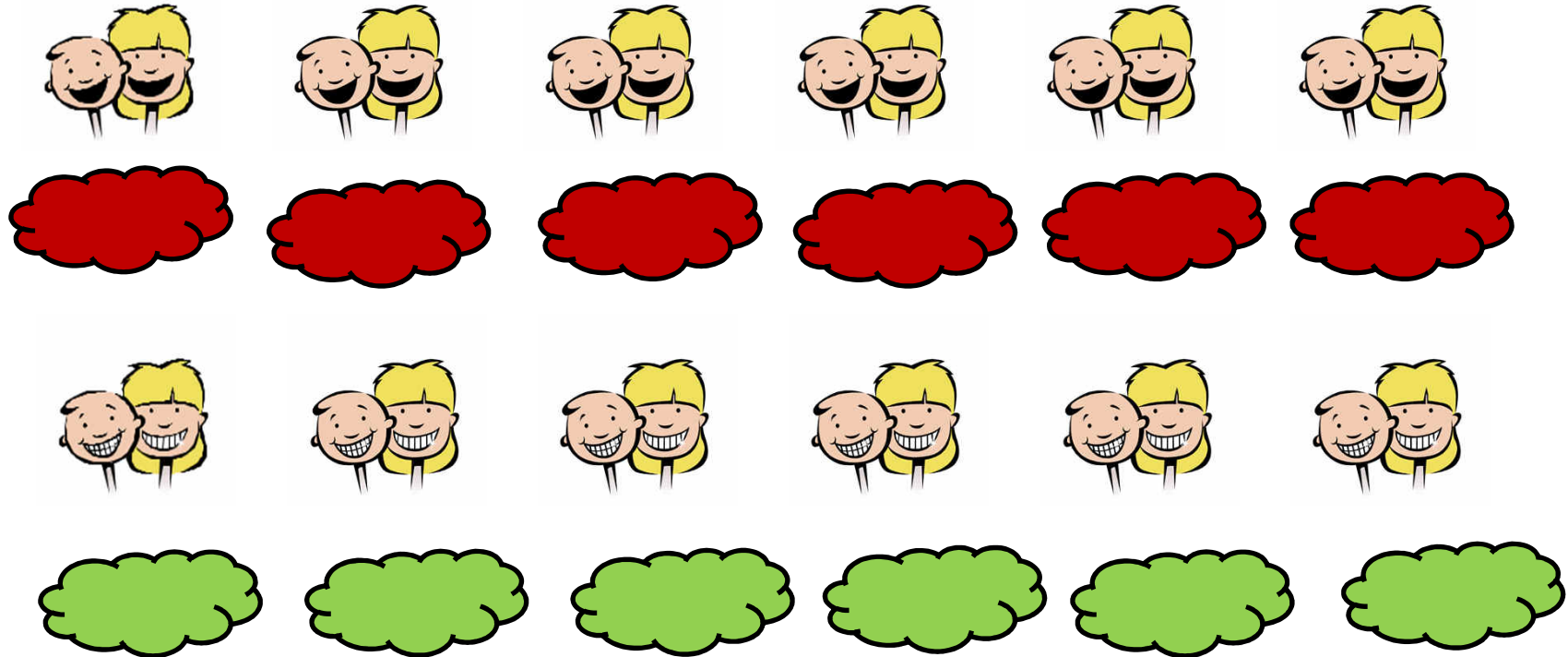
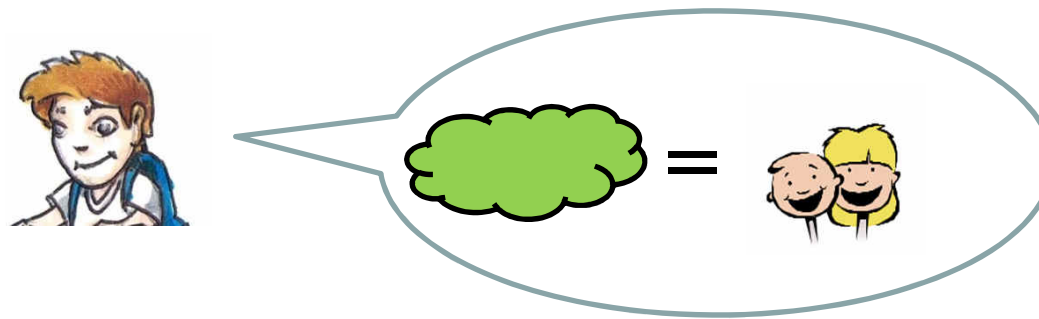


He lets a **big** slug race  
against a **small** slug.

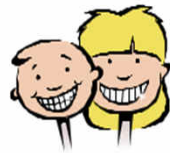
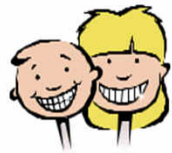
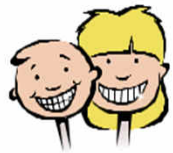
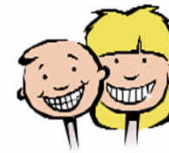
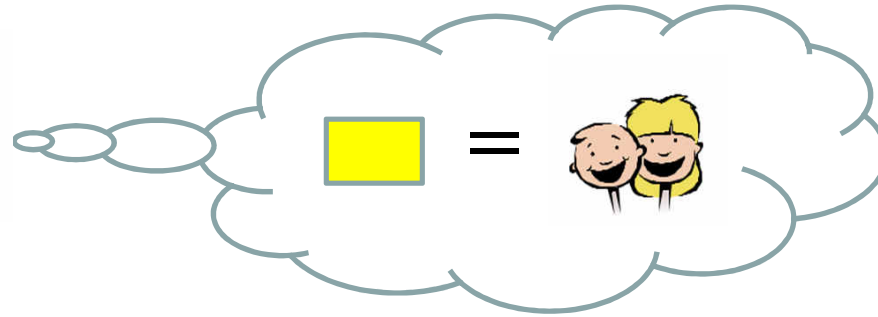
Tom wants to find out if brown eggs sink faster than white eggs.  
Which kind of eggs does he have to put into the water?

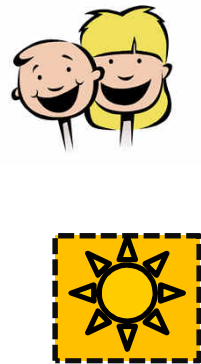
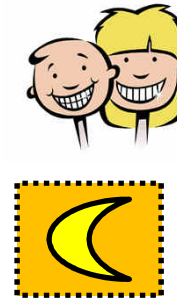
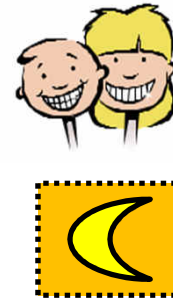
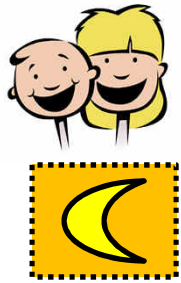
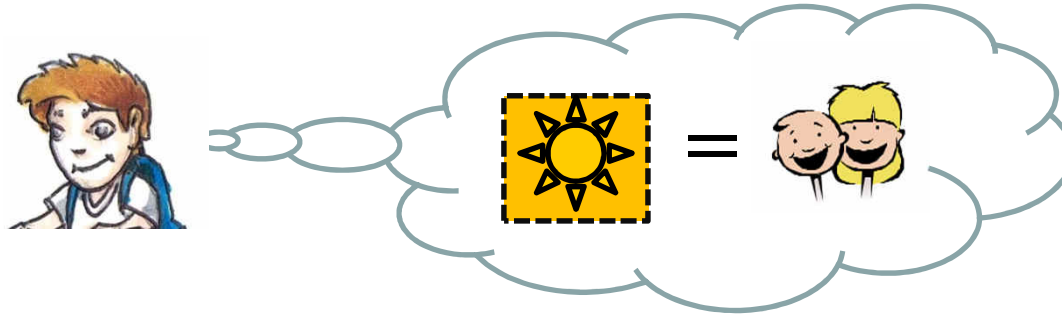


# Data Interpretation

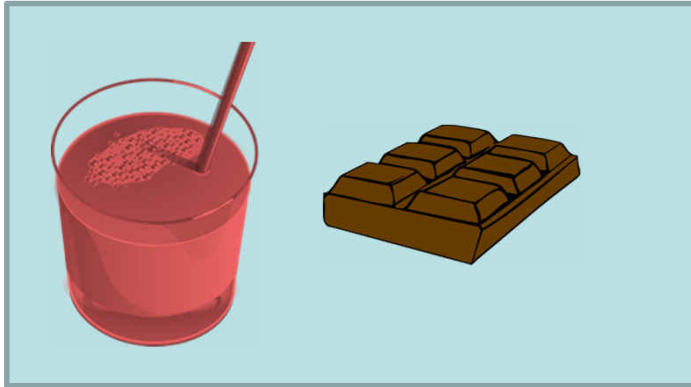








Mia believes that red juice causes teeth to fall out...



teeth fell out



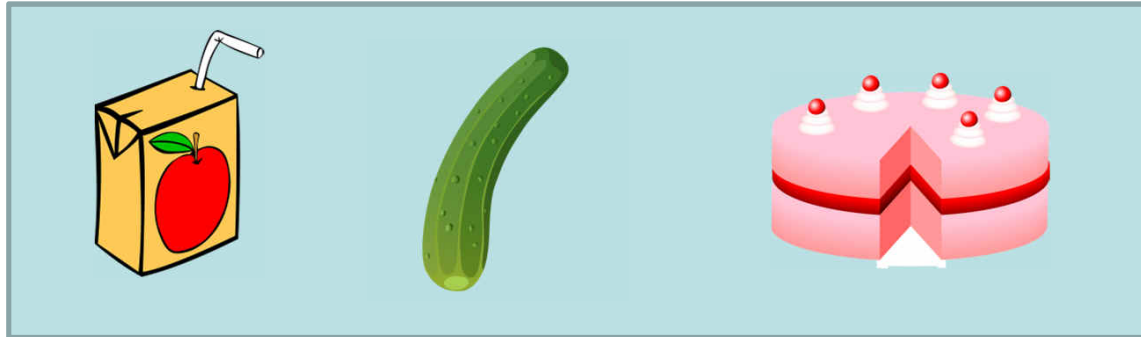
healthy teeth



What does Mia believe now?

- (1) Red juice cause teeth to fall out,
- (2) Green juice cause teeth to fall out,
- (3) You can't tell if red juice cause teeth to fall out.

Mia believes that apple juice helps sick people feel healthy again...



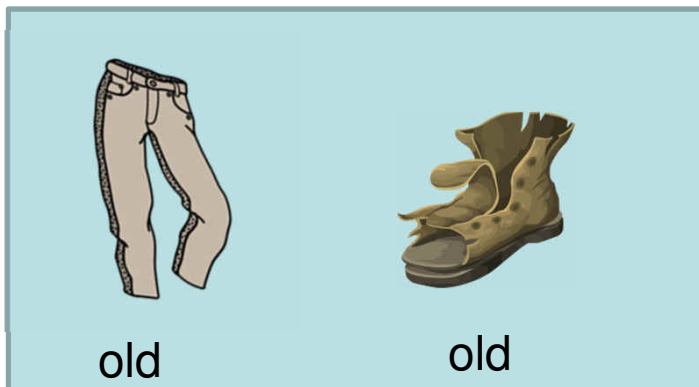
What does Mia believe now?

- (1) Mia believes that apple juice helps sick people feel healthy again.
- (2) Mia believes that orange juice helps sick people feel healthy again.
- (3) Mia believes that you can't tell if apple juice helps sick people feel healthy again.

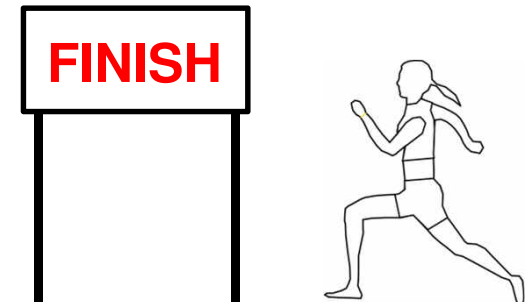
Mia believes that she can run fast because of her new pair of trousers...



run fast



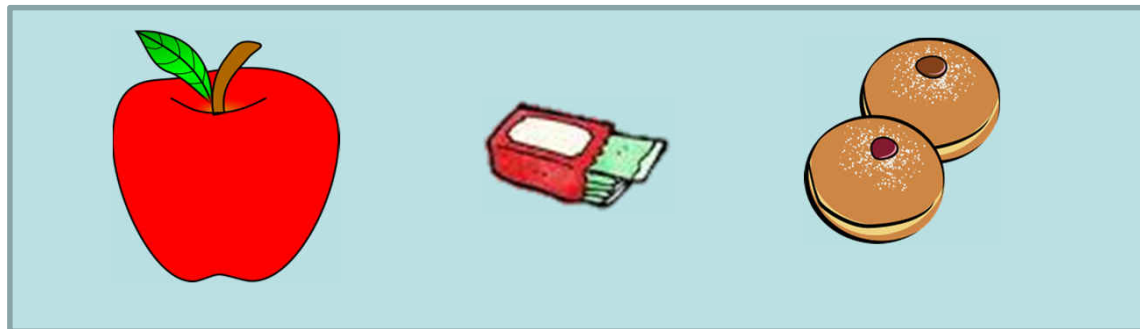
run slowly



What does Mia believe now?

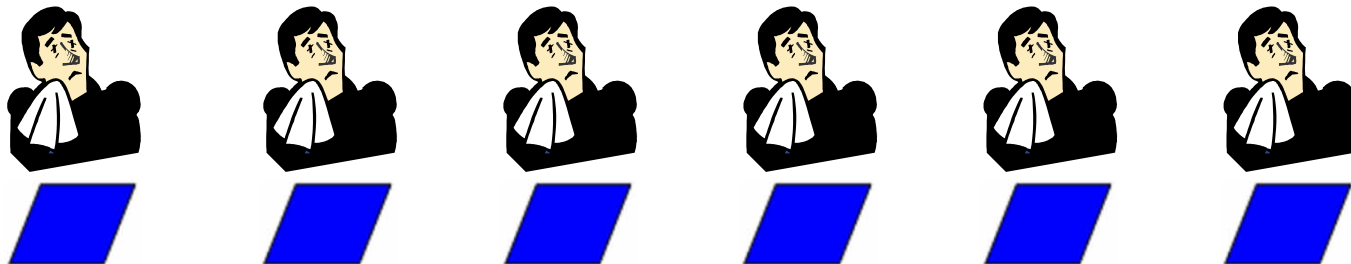
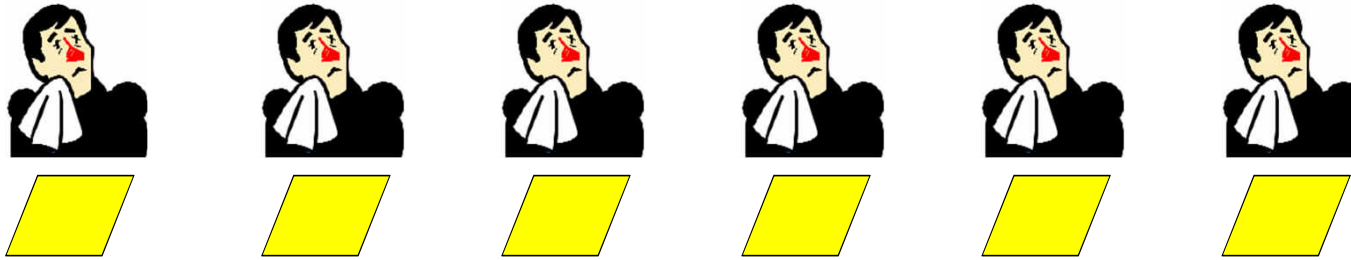
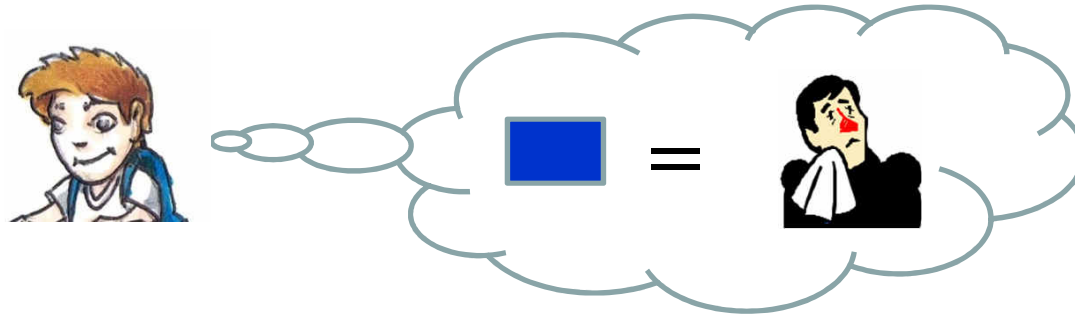
- (1) Mia believes that she can run fast because of her new pair of trousers.
- (2) Mia believes that she can run fast because of her new pair of shoes.
- (3) Mia cannot tell if she can run fast because of her new pair of trousers or because of her new pair of shoes.

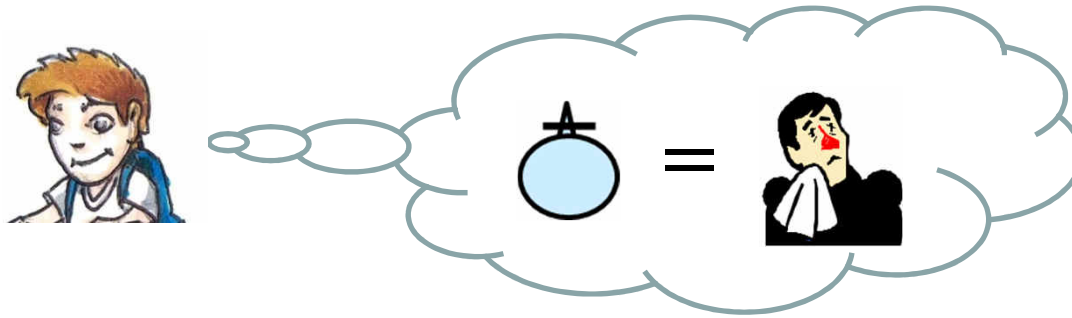
Mia believes that pears make people happy.



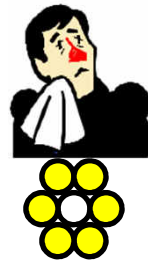
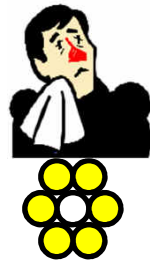
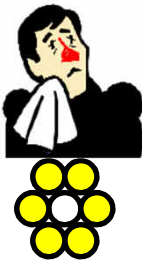
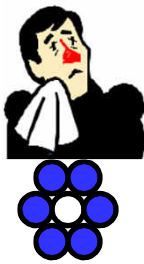
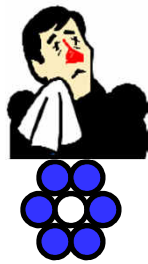
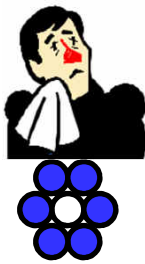
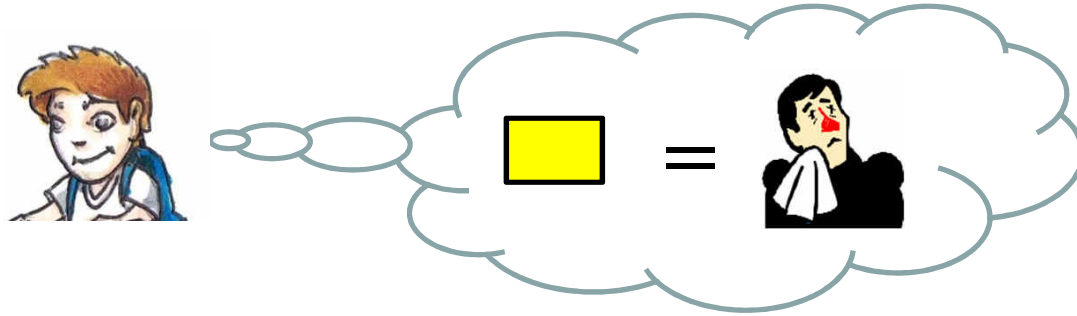
What does Mia believe now?

- (1) Mia believes that chocolate cookies make people happy.
- (2) Mia believes that pears make people happy.
- (3) Mia believes that you can't tell if pears make people happy.









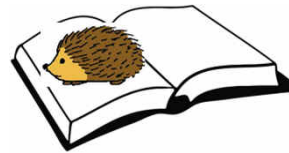
# NOS

Understanding the  
nature of science

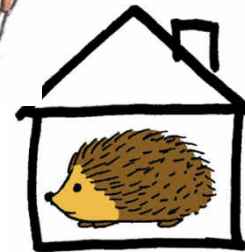
Here are three children. Who is doing science?



Mia observes a hedgehog.



Anna reads a story about a hedgehog.



Luis helps a hedgehog to sleep in the winter.

Here are three children. Who is doing science?



An illustration of a young girl with blonde hair in a ponytail, wearing a pink shirt. She is looking at two overlapping circles, one yellow and one blue, which overlap to form a green circle. A speech bubble with a question mark is above her head.

Anna thinks about why mixing yellow and blue makes green.



An illustration of a young boy with brown hair, wearing a green shirt, looking at a yellow circle and a red circle that are overlapping to form an orange circle.

Tim watches his father mix colors.



An illustration of a young boy with orange hair, wearing a white shirt, holding a paintbrush.

Steve helps his dad paint the wall.

Here are three children. Who is doing science?



Ole thinks about why leaves fall off the trees in fall.



Luis observes which animals live in the leaves.



Jan draws a colorful picture with leaves.

Here are three children. Who is doing science?



Tom investigates a ladybird.



Jan paints a ladybird.

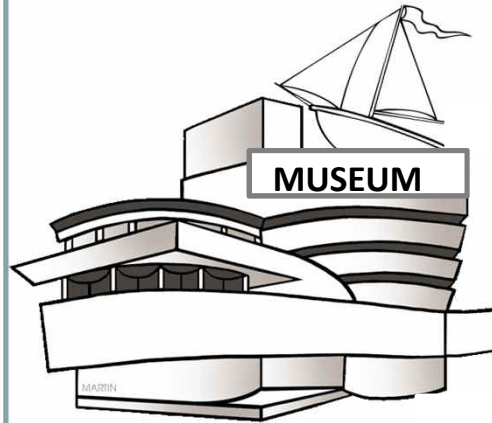


Nick masquerades as a ladybird.

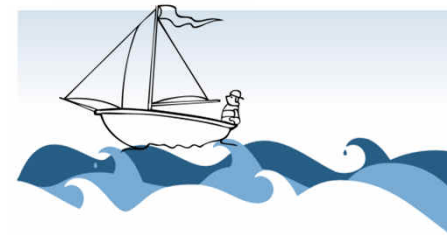
Here are three children. Who is doing science?



Anna thinks about why a wooden log can float.

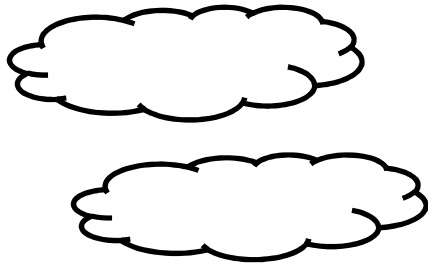


Lisa visits a museum about ships.



Mia plays with her little boat.

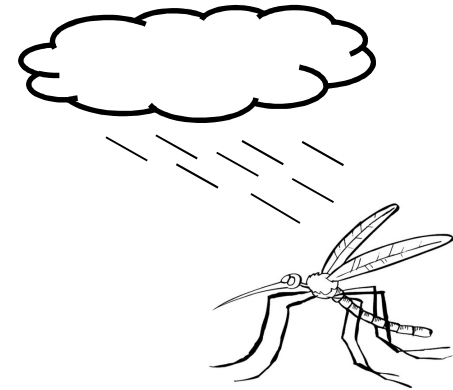
Here are three questions about clouds and rain. Listen carefully and tell me: Which one is a science question?



Are clouds dark?



Why does it rain?



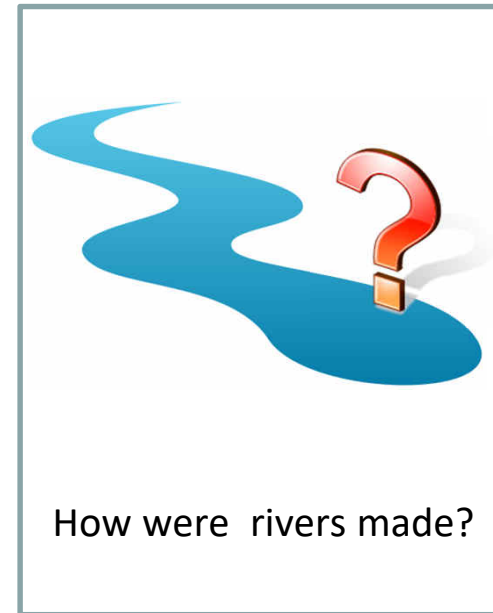
Can mosquitoes fly when it is raining?



Here are three questions about flowers. Listen carefully and tell me:  
Which one is a science question?



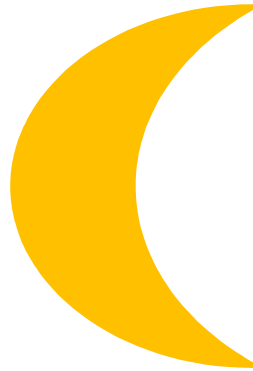
Here are three questions about a river. Listen carefully and tell me:  
Which one is a science question?



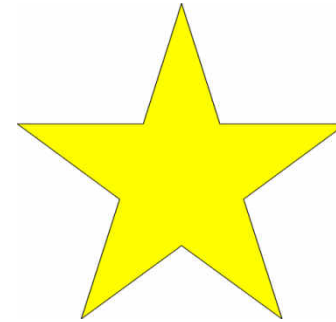
Here are three questions about the universe. Listen carefully and tell me: Which one is a science question?



Can you see Mars at night?



How was the moon made?

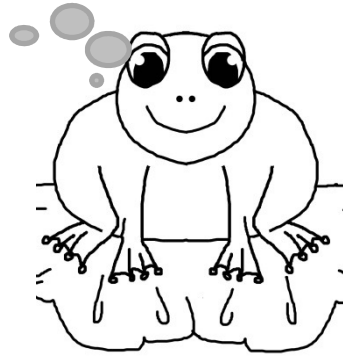


Do the stars shine brightly?

Here are three questions about the sea. Listen carefully and tell me:  
Which one is a science question?



Why is seawater salty?



Can frogs dive?



Is the sea wild?

# Notes to the Instruction

## Instructions

*For each item, read out the questions and the answer options slowly and clearly and point to the respective picture.*

*For young children consider to pose a check question after the answer of the child: „Can you tell me again what I wanted to know?“. For five-year-olds our prestudies revealed that it isn't necessary to pose check questions.*

*The instruction on the items of data interpretation are given on the next pages.*

*The three parts of the test (NOS, Ex, Dat) are given in a random order, the items within each component are given in the order of 1 to 10.*

## Instruction for items on data interpretation

### *11\_Dat1*

Robby believes that green chewing *gum causes teeth to fall out*.

*Check question: What does Robby believe?*

Now Robby sees the pictures with the green and red chewing gum. Let's take a look: These children chewed red chewing gum and their teeth fell out. These children chewed green chewing gum and they've all got healthy teeth.

He initially thought that green chewing gum *causes* teeth to fall out. What does Robby believe now?

- a) He believes that green chewing gum causes teeth to fall out.
- b) He believes that red chewing gums causes teeth to fall out.
- c) He believes that it actually doesn't matter if you chew green or red chewing gum.

## 12\_Dat2

Robby believes that yellow lemonade causes teeth to fall out.

*Check question: What does Robby believe?*

Now Robby sees the pictures with the yellow and blue lemonade. Let's take a look: These children drank blue lemonade and their teeth fell out. However, THESE children drank blue lemonade and *they still have* healthy teeth.

These children drank yellow lemonade and they have all got healthy teeth. However, THESE children drank yellow lemonade and their teeth fell out.

What does Robby believe now? He initially thought that yellow lemonade *causes* teeth to fall out.

- a) He believes that yellow lemonade causes teeth to fall out.
- b) He believes that blue lemonade causes teeth to fall out.
- c) He believes that it doesn't matter which kind of lemonade you drink.



### 13\_Dat3

Robby believes that cookies with suns cause teeth to fall out.

*Check question: What does Robby believe?*

Now Robby sees the pictures about the cookies with suns and with moons.

Let's take a look: Look, these children ate cookies with moons and their teeth fell out. However, *THESE* children ate cookies with moons and their teeth are healthy.

These children ate cookies with moons and their teeth fell out. However, *THESE* children ate cookies with moons and their teeth are healthy.

What does Robby believe now? He initially thought that cookies with suns cause teeth to fall out.

- a) He believes that cookies with suns cause teeth to fall out.
- b) He believes that cookies with moons cause teeth to fall out.
- c) He believes that it doesn't matter which kind of cookies you eat.

## 14\_Dat4

Mia believes that red juice causes teeth to fall out...

*Check question:* What does Mia believe?

Here you can see the children whose teeth fell out. They drank red juice AND ate chocolate.

Here you can see the children whose teeth are healthy. They drank green juice AND ate carrots.

What does Mia believe now?

- (1) Red juice causes teeth to fall out.
- (2) Green juice causes teeth to fall out.
- (3) You can't tell if red juice causes teeth to fall out.

*15\_Dat5*

Mia believes that apple juice helps sick people feel healthy again.

*Check question:* What does Mia believe?

Here you can see the healthy children. They had apple juice AND cucumber AND cake.

Here you can see the sick children. They had orange juice AND tomato AND cake.

What does Mia believe now?

- (1) Mia believes that apple juice helps sick people feel healthy again.
- (2) Mia believes that orange juice helps sick people feel healthy again.
- (3) Mia believes that you can't tell if apple juice helps sick people feel healthy again.

*15\_Dat5*

Mia believes that apple juice helps sick people feel healthy again.

*Check question:* What does Mia believe?

Here you can see the healthy children. They had apple juice AND cucumber AND cake.

Here you can see the sick children. They had orange juice AND tomato AND cake.

What does Mia believe now?

- (1) Mia believes that apple juice helps sick people feel healthy again.
- (2) Mia believes that orange juice helps sick people feel healthy again.
- (3) Mia believes that you can't tell if apple juice helps sick people feel healthy again.

## 16\_Dat6

Mia believes that she can run fast because of her new pair of trousers.

*Check question:* What does Mia believe?

Here you can see Mia when she runs fast. She wears her new pair of trousers AND her new pair of shoes.

Here you can see Mia when she runs slowly. She wears her old pair of trousers AND her old pair of shoes.

What does Mia believe now?

- (1) Mia believes that she can run fast because of her new pair of trousers.
- (2) Mia believes that she can run fast because of her new pair of shoes.
- (3) Mia can not tell if she can run fast because of her new pair of trousers or because of her new pair of shoes.

*17\_Dat7*

Mia believes that pears make people happy.

*Check question:* What does Mia believe?

Here you can see the children who are happy. They had pears AND chewing gum AND chocolate cookies.

Here you can see the children who are sad. They had apples AND chewing gum AND chocolate cookies.

What does Mia believe now?

- (1) Mia believes that chocolate cookies make people happy.
- (2) Mia believes that pears make people happy.
- (3) Mia believes that you can't tell if pears make people happy.

## *18\_Dat8*

Robby believes that blue handkerchiefs cause a red nose.

Check question: What does Robby believe?

Now Robby sees the pictures with the blue and yellow handkerchiefs.

Let's take a look:

These men used yellow handkerchiefs and they all got a red nose.

These men used blue handkerchiefs and they still have a healthy nose.

What does Robby believe now? He initially thought that blue handkerchiefs cause a red nose.

- a) He believes that blue handkerchiefs cause a red nose.
- b) He believes that yellow handkerchiefs cause a red nose.
- c) He believes that it doesn't matter which kind of handkerchief you use.

*19\_Dat9*

Robby believes that round nasal spray causes a red nose.

Check question: What does Robby believe?

Now Robby sees the pictures with the round and the angular nasal

sprays. Let's take a look:

These men used angular nasal spray and they got a red nose. However, THIS man used angular nasal spray and he has a healthy nose.

These men used round nasal spray and they still have healthy noses.

However, THIS man used round nasal spray and he got a red nose.

What does Robby believe now? He initially thought that round nasal

spray causes a red nose.

a) He believes that round nasal spray causes a red nose.

b) He believes that angular nasal spray causes a red nose.

c) He believes that it doesn't matter which kind of nasal spray you use.



20\_Dat10

Robby believes that yellow flowers cause a red nose.

Check question: What does Robby believe?

Now Robby sees the pictures with the yellow and blue flowers.

Let's take a look.

These men smelled blue flowers and they got a red nose. However,

THESE men smelled blue flowers and they've got healthy noses.

These men smelled yellow flowers and they got a red nose.

However, THESE men smelled yellow flowers and they've got healthy noses.

What does Robby believe now? He initially thought that yellow flowers cause a red nose.

- a) He believes that yellow flowers cause a red nose.
- b) He believes that blue flowers cause a red nose.
- c) He believes that it doesn't matter which flowers you smell.