

Experiments with Brains



Ask a question

What question are we trying to answer today?

Research

Scientists can learn about how the brain works using _____

How well an animal can do a certain task is related to the _____
of the corresponding portion of the brain.

The part of the brain that helps animals smell is called the

Hypothesis

Out of the human, dog, or mouse, I think the _____ has the best
sense of smell because _____

Experimental Design

I can use MRI images of brains to measure an animal's ability to smell by

I will know which animal has the best sense of smell because the images of that animal's
brains will _____

Performing the Experiment

Counting the grid squares is one way to estimate the _____.

How many grid squares are contained in the Olfactory bulb of each animal?

Animal	Size of the olfactory bulb (squares)
Human	
Dog	
Mouse	

Analyze the Results

Based on these results, the _____ has the best sense of smell because _____.

Based on what you know about humans, dogs, and mice, does this conclusion make sense? _____ because _____

Does this conclusion match your hypothesis?

Experimental Re-Design

I can use MRI images of brains to measure an animal's ability to smell by

I will know which animal can smell best because the images of that animal's brains will

Performing the Experiment

How many grid squares are contained in the Olfactory bulb of each animal?

Animal	Size of Olfactory bulb (squares) :	Total brain area (cm ²)	Ratio of olfactory bulb to total brain area	Ratio with common denominator
Human	:		_____ × _____	_____
Dog	:		_____ × _____	_____
Mouse	:		_____ × _____	_____

Analyze the Results

Based on these results, the _____ has the best sense of smell because _____.

Based on what you know about humans, dogs, and mice, does this conclusion make sense? _____ because _____

Does this conclusion match your hypothesis?

Share your Results

Animal	Your Results	Other Group's Results
Human	_____ × _____ = _____	_____ × _____ = _____
Dog	_____ × _____ = _____	_____ × _____ = _____
Mouse	_____ × _____ = _____	_____ × _____ = _____

Experiments with Brains II!



Ask a question

What question are we trying to answer?

Research

The part of the brain that helps animals solve problems is called the

What do I already know about how the brain works and how to measure the size of part of a brain?

What do you already know about human, dog, and mouse brains? _____

Hypothesis

Out of the human, dog, or mouse, I think the _____ can solve problems best because _____

Experimental Design

I can use MRI images of brains to measure an animal's ability to solve problems by

I will know which animal can solve problems the best because the images of that animal's brains will _____

Performing the Experiment

How many grid squares are contained in the cerebral cortex of each animal?

Animal	Size of Cerebral Cortex (squares) : Total brain area (cm ²)	Ratio of cerebral cortex to total brain area	Ratio with common denominator
Human	:	_____ × _____	_____
Dog	:	_____ × _____	_____
Mouse	:	_____ × _____	_____

Analyze the Results

Based on these results, the _____ is the best at problem solving because _____.

Based on what you know about humans, dogs, and mice, does this conclusion make sense? _____ because _____.

Does this conclusion match your hypothesis?

Share your Results

Animal	Your Results	Other Group's Results
Human	_____ × _____ = _____	_____ × _____ = _____
Dog	_____ × _____ = _____	_____ × _____ = _____
Mouse	_____ × _____ = _____	_____ × _____ = _____



Answer Key



Ask a question

What question are we trying to answer today?

Out of a human, a dog, and a mouse, which animal has the best sense of smell?

Research

When I learn new things, my brain Gets stronger.

Scientists can measure which part of the brain controls a specific part of the body by (Answers may vary) expected answer: Measuring brain activity while performing a certain task. Studying cases where part of the brain has been removed or damaged.

What do you think would happen if a part of the brain was injured or destroyed?
(Answers may vary) expected answer: A person might lose the ability to complete a specific task

How well an animal can do a certain task is related to the Size of the corresponding portion of the brain.

The part of the brain that helps animals smell is called the

Olfactory

Bulb.

Hypothesis

Out of the human, dog, or mouse, I think the Dog or mouse expected can smell best because Answers may vary

Experimental Design

I can use MRI images of brains to measure an animal's ability to smell by (Answers may vary) expected answer: Measuring the area of the olfactory bulb

I will know which animal can smell best because the images of that animal's brains will (Answers may vary) expected answer: Have the olfactory bulb with the biggest area

Performing the Experiment

Counting the grid squares is another way to measure the Area.
How many grid squares are contained in the Olfactory bulb of each animal?

Animal	Area of the Olfactory bulb
Human	
Dog	
Mouse	

Analyze the Results

What facts do you know from your results?

(Answers may vary) expected answer: The human's olfactory bulb has the biggest area, the mouse's brain has the smallest area

Based on these results, the Human can smell the best because (Answers may vary) expected answer: The human's olfactory bulb has the biggest area.

Based on what you know about humans, dogs, and mice, does this conclusion make sense? No because _____

(Answers may vary) expected answer: because I know dog's smell better than humans

Does this conclusion match your hypothesis?

No

If not, do you think the problem is in your hypothesis, your results or your experiment design?

(Answers may vary)

What other factors might influence brain size?

(Answers may vary) expected answer: The size of the animal, the age of animal, the health of the animal

How could you change your experiment to take these factors into account?

(Answers may vary) expected answer: We could measure the ratio of the area of the olfactory bulb to the area of the entire brain or the size of the animal

Experimental Re-Design

I can use MRI images of brains to measure an animal's ability to smell by

(Answers may vary) expected answer: Measuring the ratio of the area of the olfactory bulb to the area of the entire brain or the size of the animal

I will know which animal can smell best because the images of that animal's brains will _____
 (Answers may vary) expected answer: Have the biggest ratio of the area of the olfactory bulb to the area of the entire brain

Performing the Experiment

How many grid squares are contained in the Olfactory bulb of each animal?

Animal	Area of Olfactory bulb		Ratio	Ratio with common denominator
Human			_____ × _____	_____
Dog			_____ × _____	_____
Mouse			_____ × _____	_____

Analyze the Results

What facts do you know from your results?

(Answers may vary) expected answer: The human's brain is biggest, the mouse has the biggest ratio

Based on these results, the _____ mouse _____ can smell the best because _____
 (Answers may vary) expected answer: the mouse has the biggest ratio of the area of the olfactory bulb to the area of the entire brain or the size of the animal

Based on what you know about humans, dogs, and mice, does this conclusion make sense? yes because _____
 (Answers may vary)

Does this conclusion match your hypothesis?

(Answers may vary)



Experiments with Brains II!



Ask a question

What question are we trying to answer?

Is a human, a dog, or a mouse better at solving problems?

Research

The part of the brain that helps animals solve problems is called the

Cerebral

Cortex

What do I already know about how the brain works and how to measure the size of part of a brain?

(Answers may vary) expected answer: Different parts of the brain control different

tasks. The relative size of that part of the brain tells how good that animal is at that task

What do you already know about human, dog, and mouse brains?

(Answers may vary) expected answer: The human brain is biggest, the mouse brain is smallest. I

know that humans are smarter than mince.

Hypothesis

Out of the human, dog, or mouse, I think the human can

solve problems best because (Answers may vary)

Experimental Design

I can use MRI images of brains to measure an animal's ability to solve problems by

(Answers may vary) expected answer: Measuring the ratio of the area of the Cerebral cortex to the

area of the entire brain or the size of the animal

I will know which can solve problems the best because the images of that animal's

brains will (Answers may vary) expected answer: Have the biggest ratio of the area of the cerebral

cortex to the area of the entire brain or size of the animal

Performing the Experiment

How many grid squares are contained in the Olfactory bulb of each animal?

Animal	Cerebral cortex area	Total brain area	Ratio of the area of the cerebral cortex to the total area of the brain	Ratio with common denominator
Human			_____ × _____	_____
Dog			_____ × _____	_____
Mouse			_____ × _____	_____

Analyze the Results

What facts do you know from your results?

(Answers may vary) expected answer: The human's brain is biggest, the mouse has the smallest ratio

Based on these results, the _____ human _____ is the best at problem solving because (Answers may vary) expected answer: The human's brain has the biggest ratio

Based on what you know about humans, dogs, and mice, does this conclusion make sense? yes because (Answers may vary)

Does this conclusion match your hypothesis?
(Answers may vary)