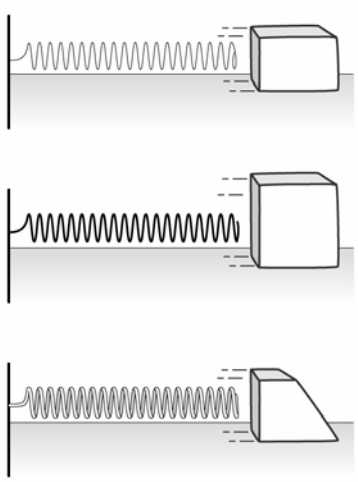
InterActions Unit 1 Chapter 1 Sample Quiz KEY

Use your Scientists' Consensus Ideas sheets for assistance.

Refer to the following situation:

A class was going to build a device that launched blocks by using a spring. They wanted to find out which spring of the three available would launch a block the furthest. They had three different shaped blocks they were testing, each with the same footprint. They kept the distance the spring was compressed the same. The blocks were launched on the same surface.

Table: Results of spring launch experiment	
Thickness of Spring	Average Distance of launched block.
thin spring	20 cm
medium spring	24 cm
thick spring	31 cm



1. Is the experiment a fair test?

    a. This experiment is a fair test because all variables were carefully measured.

    b. This experiment is a fair test because the spring was pulled back the same amount each time.

    c. This experiment is not a fair test because the springs used were of different thickness.

    d. This experiment is not a fair test because different shaped blocks were used.

    e. This experiment is not a fair test because the launched blocks traveled different distances.

This is not a fair test because the manipulated and responding variables were not the only variables that changed in the experiment. The blocks also changed during the experiment. To be a fair test the same block should be used for all the spring types. To answer this test question you need to decide if an experiment is a fair test. For more information see *How To Analyze an Experiment Design and Determine if the Experiment is a Fair Test.*

Fair tests are important to know not only for *InterActions*, but for every bit of evidence (data) you ever come across. Pick up a newspaper and check out how much evidence is collected and presented every day!

2. A fair test is

   a. an experiment in which only the manipulated and responding variables are allowed to change and all other variables and conditions are kept the same.

   b. a statement based on past experience that can be proved or disproved by experimental or observational evidence.

   c. a question about what happens when the manipulated variable changes.

   d. an experiment in which many variables are tested and involves a question, collection of data, and repeated trials.

   To answer this question you need to know the definition of fair test. The science words you might need to define are located in the margins of your textbook. The glossary is also a good way to look up the definition of words.

3. Evidence collected in an experiment is

   a. the data collected by the investigator.

   b. an experiment in which only one variable is tested at a time.

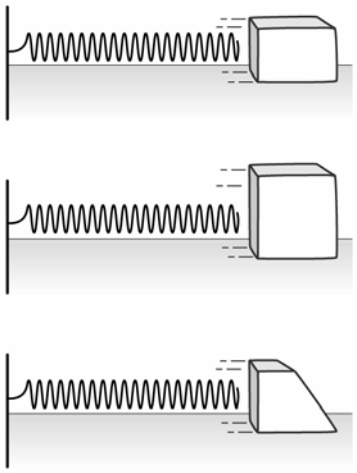
   c. a statement based on past experience that can be proved or disproved by experimental or observational evidence.

   d. a question about what happens when the manipulated variable changes.

   To answer this question you need to know the definition of evidence from an experiment.

Refer to the following situation:

A class is building a device that uses a spring to launch blocks. They have three different shaped blocks. They needed to choose one block to use in their device. They wanted the block that would slide the farthest. The students designed an experiment to measure how the block shape affected the distance the block traveled after it was launched. They conducted a fair test and obtained the following data.



4. Complete the table.

Table 2: Distance traveled by launched blocks

	Block 1 Distance traveled (cm)	**Block 2 Distance traveled (cm)**	**Block 3 Distance traveled (cm)**
Trial 1	10.1	10.4	8.7
Trial 2	9.5	10.2	7.9
Trial 3	9.7	10.5	7.7
Best Value	9.8	10.4	8.1
Uncertainty	0.2	0.2	0.5

To answer this question you need to know how to calculate the best value and the uncertainty for a set of data. To calculate the best vale you first you remove all the outliers and then you calculate the average. The equations used for the calculations are:

$Average = \frac{Trial\ 1 + Trial\ 2 + Trial\ 3}{3}$, since there are only three trials.

$Uncertainty = \frac{Highest\ value - Lowest\ value}{2}$,

5. What is the manipulated (independent) variable?

   a. The block shape.

   b. The spring thickness

   c. The distance the launched block travels.

   d. The distance the spring is pulled back.

   e. The spring and the block shape.

   The variable that is intentionally changed or manipulated is the block shape. To answer this question you need to know that a manipulated variable is the variable deliberately changed. And you need to be able to identify the manipulated variable in an experiment that is new to you.

   Note also that 'e' is wrong because the spring is not changing.

6. What is the responding (dependent) variable?

   a. The block shape

   b. The spring thickness.

   c. The distance the launched block travels.

   d. The distance the spring is pulled back.

   e. The spring and the block shape.

   The variable that is measured in response to changing the block shape, or the responding variable, is the distance the launched block travels. To answer this question you need to know the definition of responding variable so you can identify the responding variable in this new situation.

7. Evaluate if Xie's conclusion is valid and if his reasons are good. Xie wrote:

   Conclusion – I conclude that the block 2 travels the greatest distance when launched with the spring launcher.

   Reason – Block 1 traveled between 9.6 and 10.2 cm. Block 2 traveled between 10.2 and 10.6 cm. Block 3 launched traveled between 7.6 and 8.6 cm. None of these ranges overlap, so the medium block travels the farthest when launched.

   Xie's conclusion is:

   a. not valid because his supporting reason is not based on all the evidence.

   b. not valid because his supporting reason is an opinion.

   c. valid because the experiment is a fair test, his supporting reasons are not opinions, and are based on all of the available evidence (data).

   d. There is not enough information to determine whether Xie's conclusion is valid or not.

   Xie's conclusion contains all the data, it is not an opinion, and the experiment is a fair test. These are the criteria for a valid conclusion with good supporting reasons. To answer this question you must know the three criteria for a valid conclusion and good supporting reasons. You can find these in the *How To Analyze an Experiment Design and Determine if the Experiment is a Fair Test* found in the *InterActions'* appendix.

8. Evaluate if Suzy's conclusion and reasons. Suzy wrote:

   Conclusion – I conclude that block 1 travels the greatest distance when launched with the spring launcher.

   Reason –Block 1 is the smallest and small blocks always travel the farthest.

   Suzy's conclusion is:

   a. not valid because her supporting reason is not based on all the evidence.

   b. not valid because her supporting reason is an opinion.

   c. valid because the experiment is a fair test and her supporting reasons are based on all of the available evidence (data).

   d. There is not enough information to determine whether Suzy's conclusion is valid or not.

   e. Both a and b

   Suzy's conclusion is based on what she believes; it is her opinion. Suzy did not base her conclusion on the evidence (data) available. In this question you are evaluating someone's conclusion. To answer this question you must know the three criteria for a valid conclusion and good supporting reasons. You can find these in the *How To Analyze an Experiment Design and Determine if the Experiment is a Fair Test* found in the *InterActions'* appendix.

9. Antonia is a ping-pong player. She wants to find out which brand of ping-pong ball is the best to use. She has three different brands of ping-pong balls. She devises an experiment in which she drops each ball from a height of 50 cm above her paddle, which is resting on the ping-pong table. She then measures the height of the bounce. The higher the bounced ball reaches, the better the ball. Below is her data.

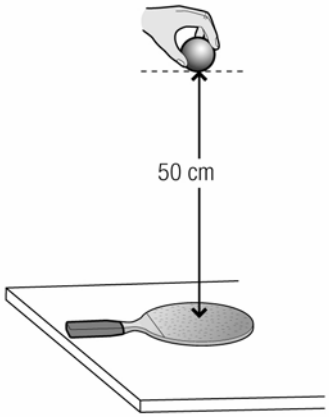


Table 3: Height of bounced ping pong ball

	Ball 1 height (cm)	**Ball 2 height (cm)**	**Ball 3 height (cm)**
Trial 1	48	48	49
Trial 2	47	47	48
Trial 3	47.5	46	49
Best Value	47.5	47	48.7
Uncertainty	0.5	1	0.5
Range of Values	47 to 48	46 to 48	48.2 to 49.2

What is the manipulated variable in Antonia's experiment?

Antonia is deliberately changing the type of ping pong balls, so this is the manipulated variable.

In this test question you need to know that the manipulated variable is the variable that is deliberately changed.

What is the responding variable in Antonia's experiment?

How high the ball bounces after it rebounds. This is what she measures for each type of ping-pong ball.

In this test question you need to know that the responding variable is the variable being measured in response to changing the manipulated variable.

What are some of the controlled variables in Antonia's experiment?

The height that the ping pong ball is dropped from, the type of surface it bounces off of (the ping-pong paddle.

In this test question you need to know that controlled variables are the variables held constant during the experiment.

Is Antonia's experiment a fair test? Give your reasons.

This experiment is a fair test because only the manipulated variable and the responding variable change, all other variables are held constant (controlled).

In this test question you need to know that the criteria for an experiment to be a fair test. Review the document *How To Analyze an Experiment Design and Determine if the Experiment is a Fair Test* found in the *InterActions'* appendix for help.

Write an experimental conclusion with reasons for Antonia's experiment.

I conclude that Ball 3 bounced the highest because when ball 3 was dropped from 50 cm it bounced to a distance within the range of 48.2 to 49.2 cm. When Ball 1 was dropped from 50 cm it bounced to a distance in the range of 47 to 48 cm and Ball 2 bounced within the range of 46 to 48 cm.

To answer this test question you need to know how to write a good experimental conclusion. To write a good experimental conclusion you must use all of the evidence to support your answer to the experiment question. You must use evidence and not your opinions. To do this apply the 3 criteria found in the document *How To Evaluate an Experiment Conclusion* found in the *InterActions'* appendix.