Captcha

Are you a bot?

Liam says to Emma: "It's a beautiful day, isn't it?"

Who is Liam talking to? (case sensitive)

Are you a bot?

Mia says to Benjamin: "It's a beautiful day, isn't it?"

Who is Mia talking to? (case sensitive)

Are you a bot?

William says to Ava: "It's a beautiful day, isn't it?"

Who is William talking to? (case sensitive)

Are you a bot?

Amelia says to Noah: "It's a beautiful day, isn't it?"

Who is Amelia talking to? (case sensitive)

Are you a bot?

Evelyn says to James: "It's a beautiful day, isn't it?"

Who is Evelyn talking to? (case sensitive)

Intro_Consent

CONSENT FORM

DESCRIPTION: You are invited to participate in a research study in cognitive psychology. You will be asked to perform various tasks on a computer which may include: looking at images or videos, listening to sounds, reading scenarios, or playing games. You may be asked a number of different questions such as giving descriptions of what happened, making causal judgments, and intepreting people's actions. All information collected will remain confidential.

RISKS AND BENEFITS: Risks involved in this study are the same as those normally associated with using a computer (e.g., mild eye/arm strain). If you have any pre-existing conditions that might make reading and completing a computer-based survey strenuous for you, you should probably elect to not participate in this study. If at any time during the study you feel unable to participate because you are experiencing strain, you may end your participation without penalty. We cannot and do not guarantee or promise that you will receive any benefits from this study. Your decision whether or not to participate in this study will not affect your employment/medical care/grades in school.

TIME INVOLVEMENT: Your participation in this experiment will take ca. 8 minutes.

PAYMENTS: If recruitment materials indicate payment (e.g., Amazon or other recruitment), you will receive compensation as indicated.

SUBJECT'S RIGHTS: If you have read this notice and have decided to participate in this project, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. You have the right to refuse to answer particular questions. Your individual privacy will be maintained in all published and written data resulting from the study.

CONTACT INFORMATION: Questions, Concerns, or Complaints: If you have any questions, concerns or complaints about this research study, its procedures, risks and benefits, you should ask the Protocol Director, (Professor Tobias Gerstenberg, Phone: (650) 725-2431; Email: gerstenberg@stanford.edu).

INDEPENDENT CONTACT: If you are not satisfied with how this study is being conducted, or if you have any concerns, complaints, or general questions about the research or your rights as a participant, please contact the Stanford Institutional Review Board (IRB) to speak to someone independent of the research team via email at irb2-manager@lists.stanford.edu, or via phone at (650) 723-2480 or toll free at 1-866-680-2906. You can also write to the Stanford IRB, Stanford University, 3000 El Camino Real, Five Palo Alto Square, 4th Floor, Palo Alto, CA 94306.

You may want to print a copy of this consent form to keep. By clicking the button below, you acknowledge that you have read the above information, that you are 18 years of age, or older and give your consent to participate in our internet-based study and consent for us to analyze the resulting data.

Thank you for your participation in this experiment!

In this experiment, you will see some video clips showing collisions between billiard balls in a billiard ball machine. You will then be asked a couple of questions about the clips.

Before you start watching the video clip, **it is important that you understand how the billiard machine works**. On the next page, you will receive some information about the set up of the billiard ball machine. Please read it carefully.

If you are ready, click on the button below to continue.

Instructions_DT

Instructions

In this experiment you will see video clips of colliding billiard balls in a billiard machine. The billiard machines come with two different setups, which will be explained in more detail further below. However, there are two things all billiard machines have in common.

First, **ball A** and **ball B** always enter the scene from the right, and **ball E** is initially at rest (see Figure 0).

Second, there are also two red motion blocks. Darker motion blocks are better at blocking balls than lighter ones. In fact, the **light red motion block** has a 20% chance of blocking a ball, while the **dark red motion block** has an 80% chance of blocking a ball. There is always one dark and one light motion block in every billiard machine, and they are always at the same position. For example, in Figure 0 there is a stronger motion block for **ball A** than there is for **ball B**.

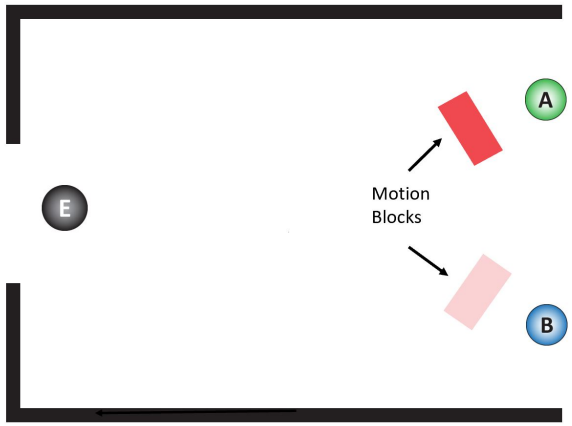


Figure 0. Starting positions of the balls.

The billiard machines come with two different setups that mainly differ in the position of **ball E**. In SETUP 1, **ball A**, **ball B** and **ball E** are positioned in a way such that **ball E** goes through the gate if either **ball A** or **ball B,** or both, hit **ball E**.

SETUP 1

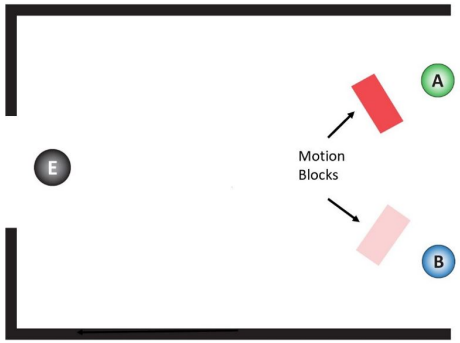


Figure 1. Starting position of the balls.

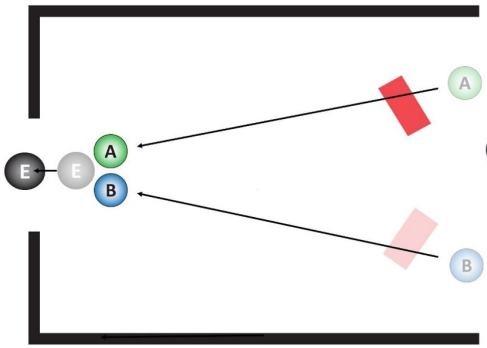


Figure 2. **Ball A** and **ball B** went through the motion block. **Ball E** did go through the gate.

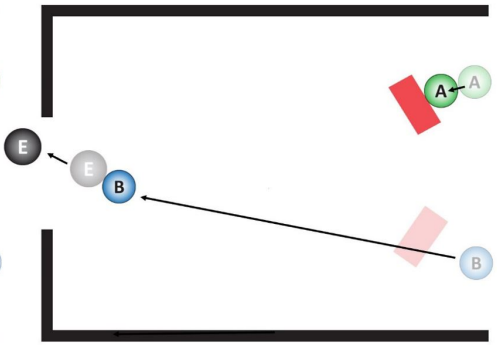


Figure 3. **Ball A** did not go through the motion block, **ball B** did go through the motion block. **Ball E** did go through the gate.

For example, in Figure 2, **ball A** and **ball B** hit **ball E**, and **ball E** went through the gate.

In Figure 3, only **ball B** hit **ball E**, and **ball E** went through the gate.

However, there is also a second structure. In SETUP 2, **ball A**, **ball B** and **ball E** are set up in a way such that **ball E** only goes through the gate if **ball A** and **ball B** hit **ball E**.

SETUP 2

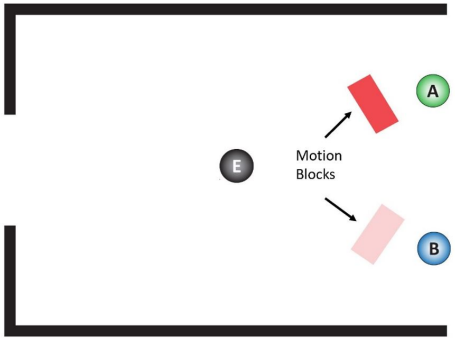


Figure 4. Starting position of the balls.

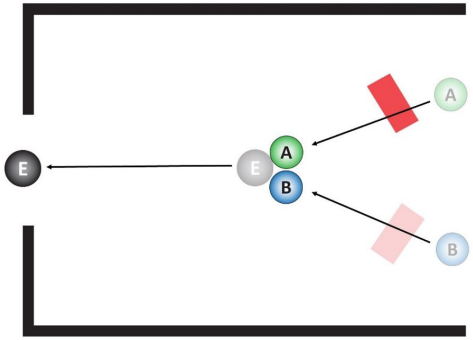
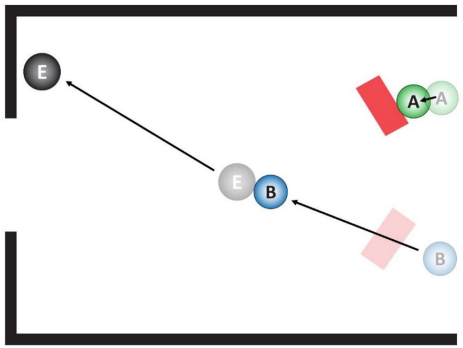


Figure 5. **Ball A** and **ball B** went through the motion block. **Ball E** did go through the gate.



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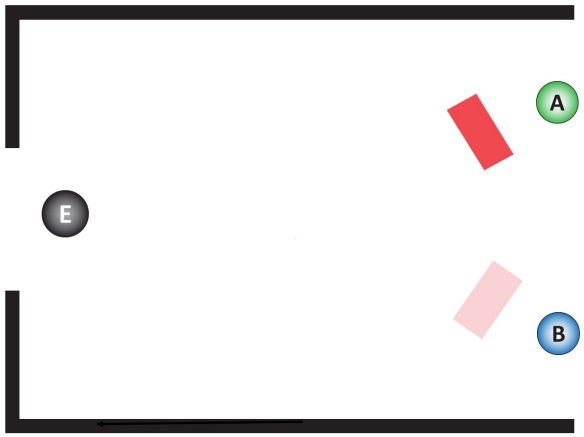
For example, in Figure 5, **ball A** and **ball B** hit **ball E**, and **ball E** went through the gate.

In Figure 6, only **ball B** hit **ball E**, and **ball E** did not go through the gate.

On the next page, you will be asked a few comprehension check questions.

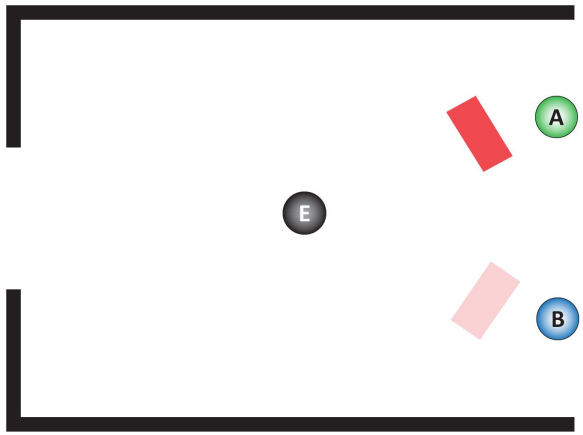
Introcheck_DT

Please answer the following questions:



In this set up, if *both balls* go through the motion block and hit **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false



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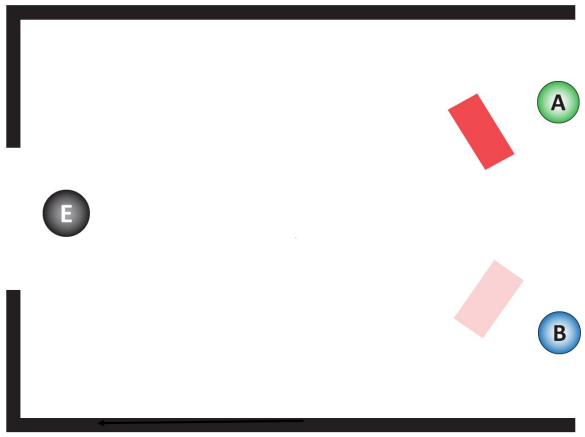
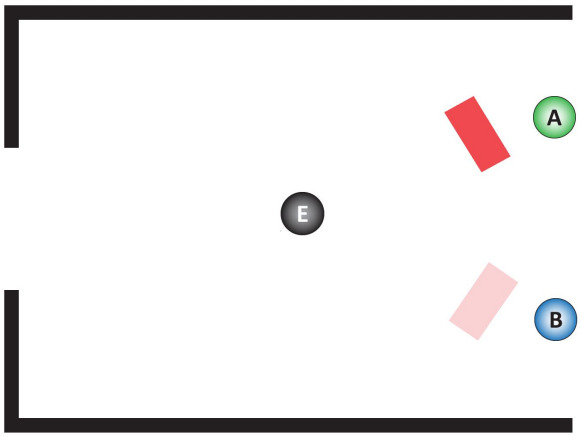


In this set up, if *only one of the balls* goes through the motion block and hits **ball E**, **ball E** will go

through the gate.

- ○ true
- ○ false



In this set up, if *only one of the balls* goes through the motion block and hits **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false

Which motion block is *more likely* to block a ball?

- ○ The light red one
- ○ The dark red one

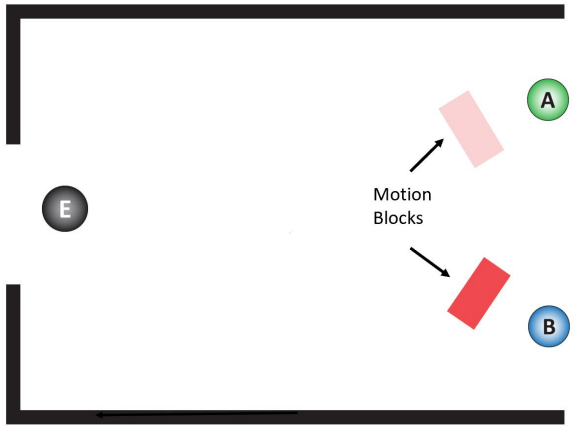
Instructions_DB

Instructions

In this experiment you will see video clips of colliding billiard balls in a billiard machine. The billiard machines come with two different setups, which will be explained in more detail further below. However, there are two things all billiard machines have in common.

First, **ball A** and **ball B** always enter the scene from the right, and **ball E** is initially at rest (see Figure 0).

Second, there are also two red motion blocks. Darker motion blocks are better at blocking balls than lighter ones. In fact, the **light red motion block** has a 20% chance of blocking a ball, while the **dark red motion block** has an 80% chance of blocking a ball. There is always one dark and one light motion block in every billiard machine, and they are always at the same position. For example, in Figure 0 there is a stronger motion block for **ball B** than there is for **ball A**.



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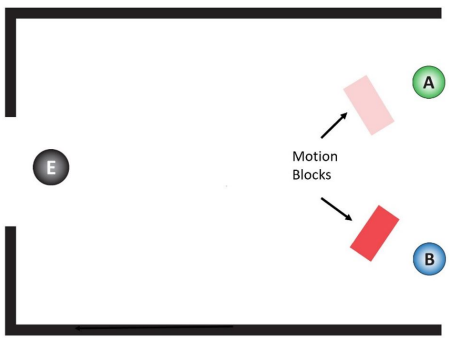
SETUP 1



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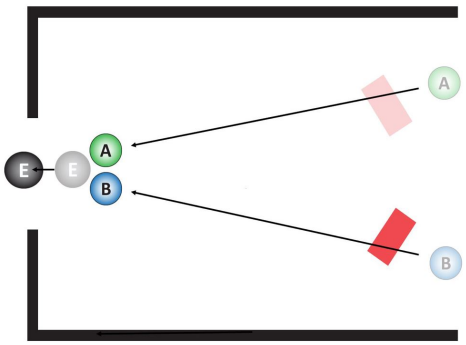

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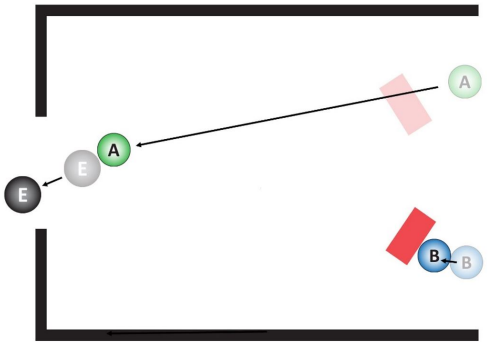

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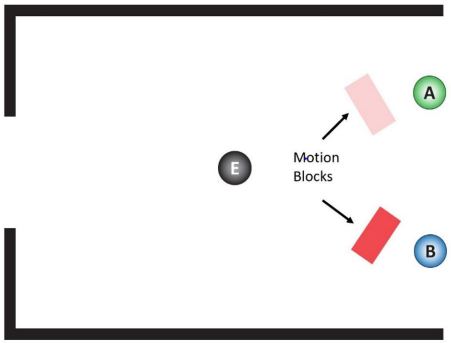
However, there is also a second structure. In this SETUP 2, **ball A**, **ball B** and **ball E** are set up in a way such that **ball E** only goes through the gate if **ball A** and **ball B** hit **ball E**.

SETUP 2



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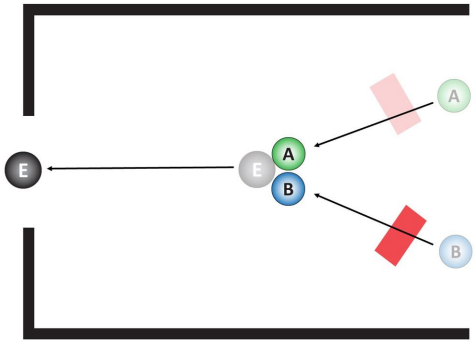

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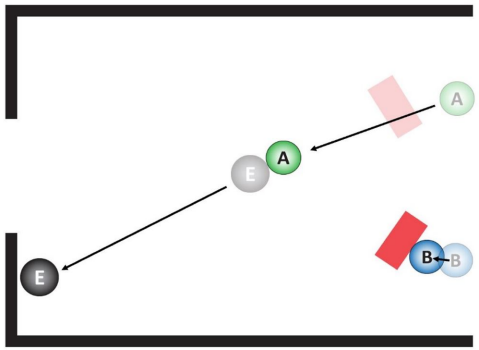

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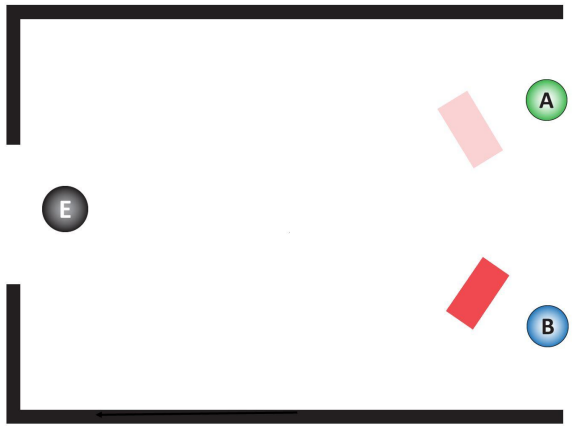
For example, in Figure 5, **ball A** and **ball B** hit **ball E**, and **ball E** went through the gate.

In Figure 6, only **ball A** hit **ball E**, and **ball E** did not go through the gate.

On the next page, you will be asked a few comprehension check questions.

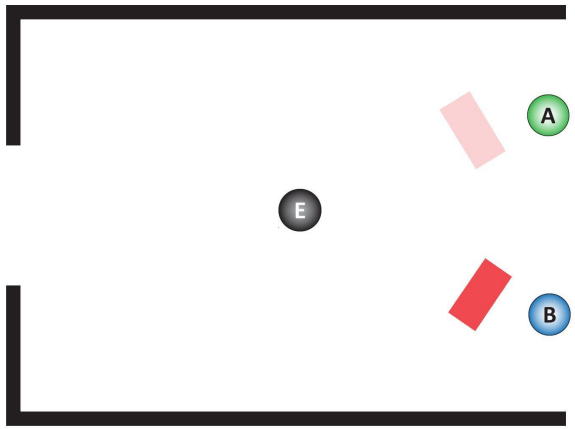
Introcheck_DB

Please answer the following questions:



In this setup, if *both balls* go through the motion block and hit **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false



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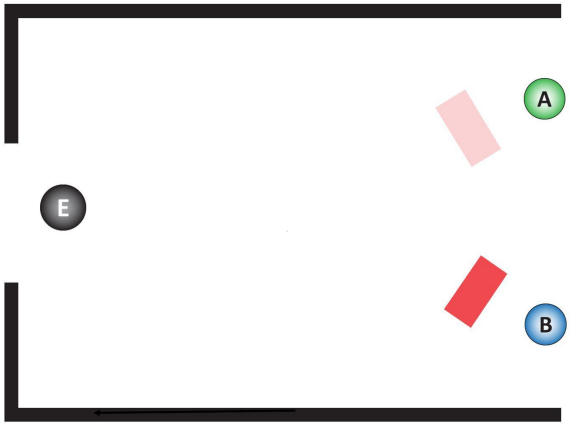
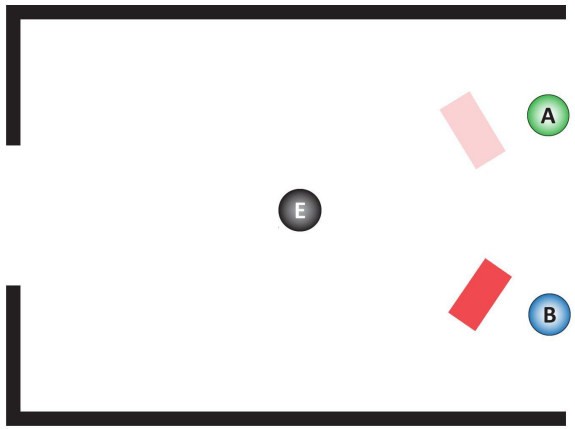


In this setup, if *only one of the balls* goes through the motion block and hits **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false



In this setup, if *only one of the balls* goes through the motion block and hits **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false

Which motion block is *more likely* to block a ball?

- ○ The light red one
- ○ The dark red one

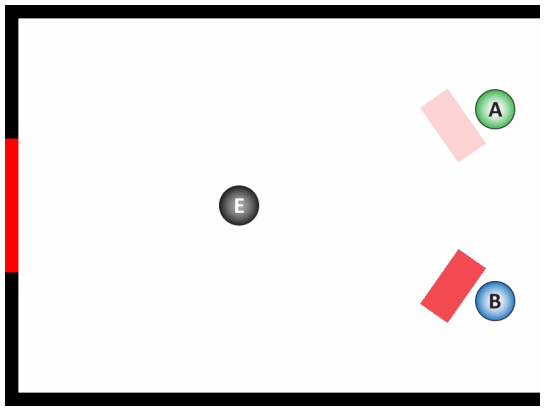
Test_Questions_Correct

Great, you answered all questions correctly. You can now begin with the experiment!

You will now watch two clips from the billiard machine. The first part of each clip will stop at the beginning and you will be asked some questions about the scenario. In the second part you will then see the rest of the clip and you will be asked some more questions.

Now click on the button below to continue.

Conj_Learning_DB



How much do you agree with the following statements?

"**Ball A** will hit **Ball E**".

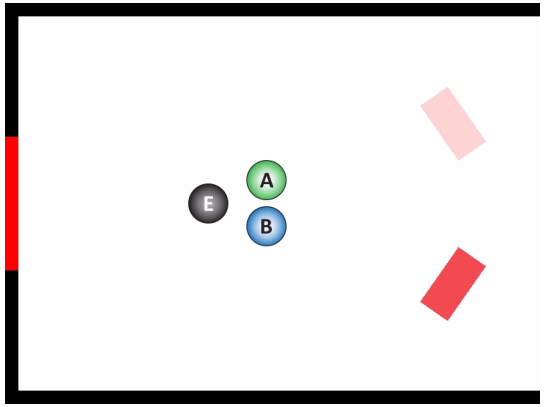
Not at all Very much

"**Ball B** will hit **Ball E**".

Not at all Very much

"If only one of the two balls goes through the block and hits **Ball E** then **Ball E** will go through the gate."

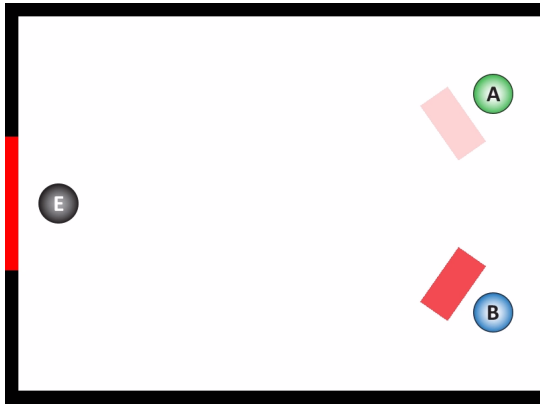
Not at all Very much



Which of the following statements better describes what has happened in this situation?

- ○ **Ball E** did go through the gate because **ball A** did go through the motion block.
- ○ **Ball E** did go through the gate because **ball B** did go through the motion block.

Disj_Learning_DB



How much do you agree with the following statements?

"**Ball A** will hit **Ball E**".

Not at all Very much

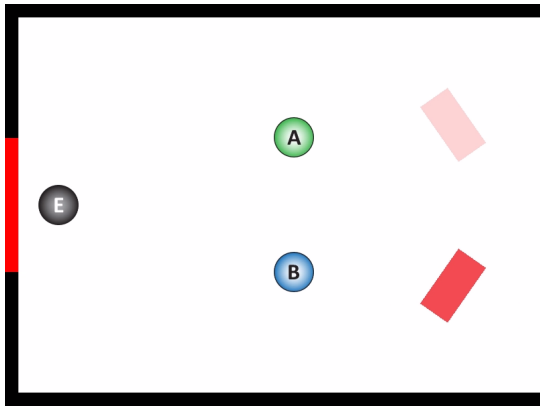
"**Ball B** will hit **Ball E**".

Not at all Very much

Not at all Very much

"If only one of the two balls goes through the block and hits **Ball E** then **Ball E** will go through the gate."

Not at all Very much



Which of the following statements better describes what has happened in this situation?

- ○ **Ball E** did go through the gate because **ball A** did go through the motion block.
- ○ **Ball E** did go through the gate because **ball B** did go through the motion block.

Interim Message

Well done so far!

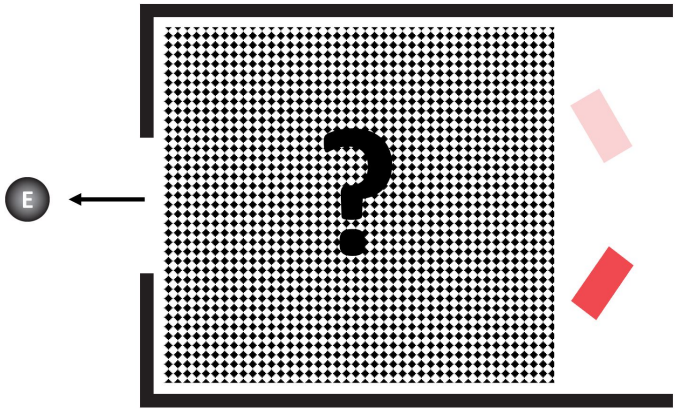
You will now get to see one more diagram of a billiard scene. However, in this diagram, some information about what happened is missing.

Your task is to figure out the missing information based on a statement that someone made who actually saw what happened.

Please click on the 'next' button if you are ready.

Abnormal_Ball_B_Conj_Left

The following picture shows the scene of a billiard situation in which **ball A** and **ball B** both went through the motion blocks and **ball E** went through the gate. However, it does not show where **ball E** was positioned, i.e. whether one ball would have been sufficient to make **ball E** go through the gate (SETUP 1), or whether both **ball A** and **ball B** were needed in order to make **ball E** go through the gate (SETUP 2).

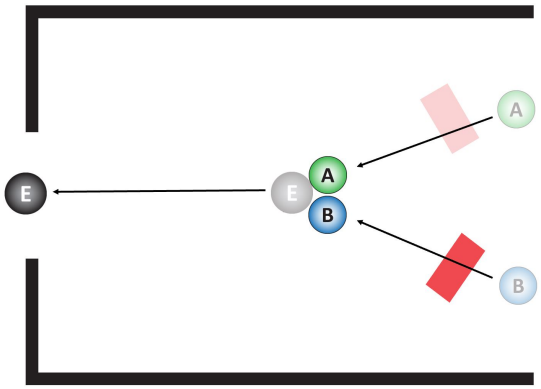


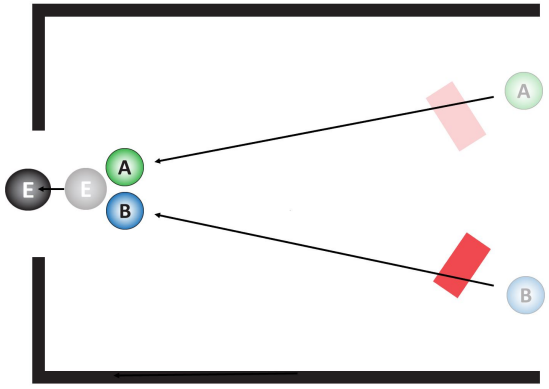
Imagine that Ben also participated in the same experiment that you are doing right now. He saw a video clip like you did earlier and had to choose an explanation for what has happened in this video. Ben saw the position of the motion blocks (like in the picture above), but also the position of **ball E**. In the clip, both **ball A** and **ball B** went through the motion blocks, hit **ball E**, and **ball E** went through the gate. He was then given two statements to choose from to best describe what has happened in this situation. For the scenario above, Ben chose the following statement:

Which of the following statements better describes what has happened in this situation?

- ○ **Ball E** did go through the gate because **ball A** did go through the motion block.
- ◉ **Ball E** did go through the gate because **ball B** did go through the motion block.

Given Ben's decision, which of these two scenes did he see?

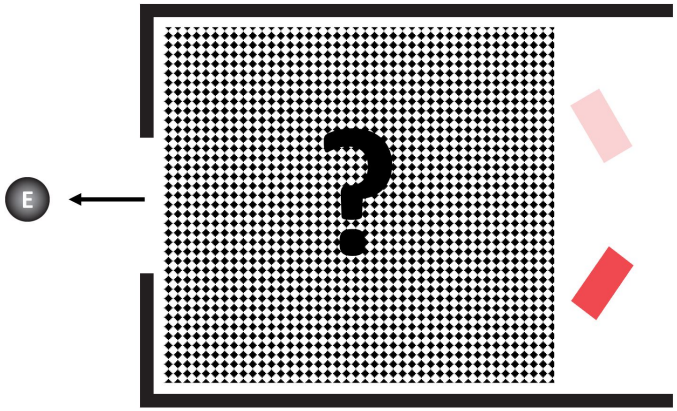




Definitely this one Unsure Definitely this one

Abnormal_Ball B_Conj_Right

The following picture shows the scene of a billiard situation in which **ball A** and **ball B** both went through the motion blocks and **ball E** went through the gate. However, it does not show where **ball E** was positioned, i.e. whether one ball would have been sufficient to make **ball E** go through the gate (SETUP 1), or whether both **ball A** and **ball B** were needed in order to make **ball E** go through the gate (SETUP 2).



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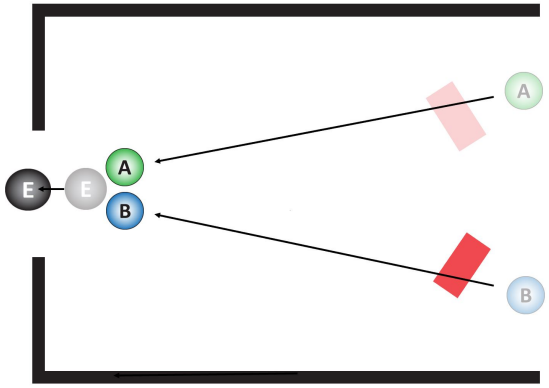
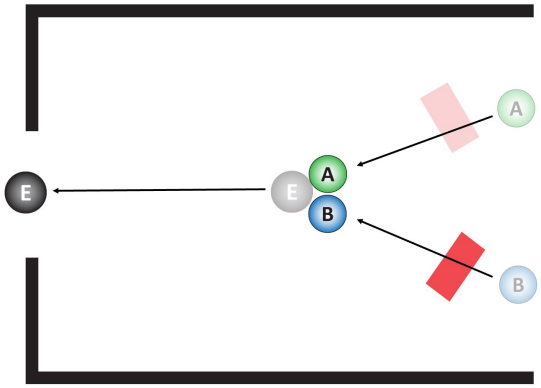


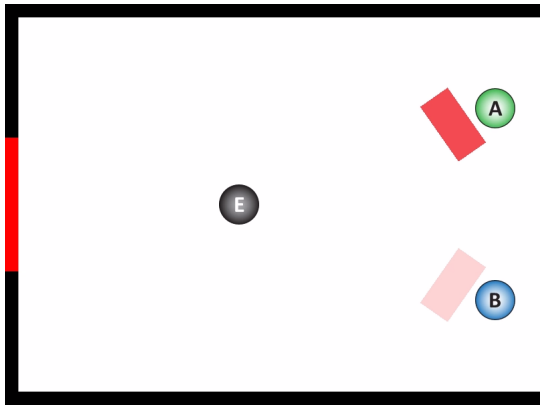
Definitely this one



Unsure

Definitely this one

Conj_Learning_DT



How much do you agree with the following statements?

"**Ball A** will hit **Ball E**".

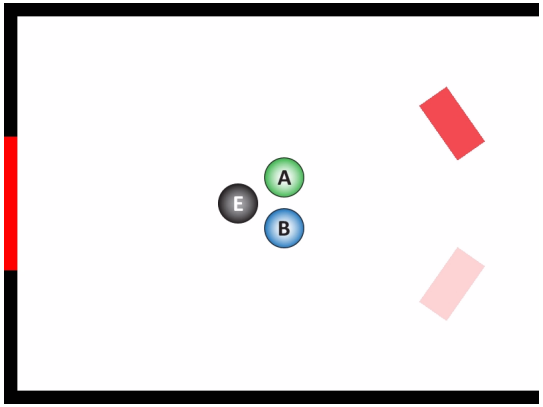
Not at all Very much

"**Ball B** will hit **Ball E**".

Not at all Very much

"If only one of the two balls goes through the block and hits **Ball E** then **Ball E** will go through the gate."

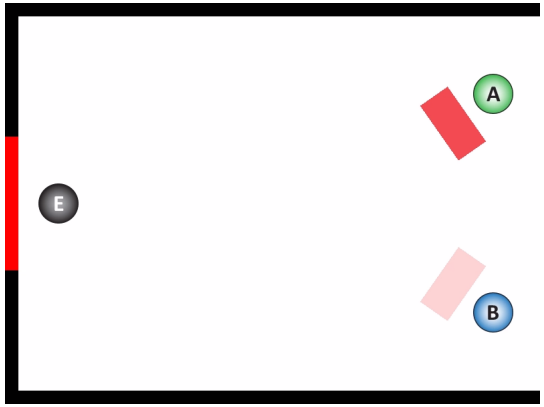
Not at all Very much



Which of the following statements better describes what has happened in this situation?

- **Ball E** did go through the gate because **ball A** did go through the motion block.
- **Ball E** did go through the gate because **ball B** did go through the motion block.

Disj_Learning_DT



How much do you agree with the following statements?

"**Ball A** will hit **Ball E**".

Not at all Very much

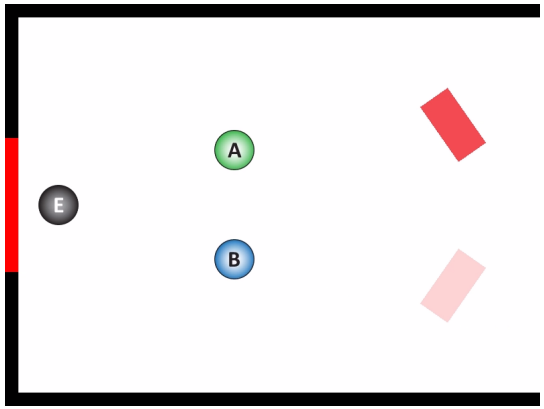
"**Ball B** will hit **Ball E**".

Not at all Very much

Not at all Very much

"If only one of the two balls goes through the block and hits **Ball E** then **Ball E** will go through the gate."

Not at all Very much

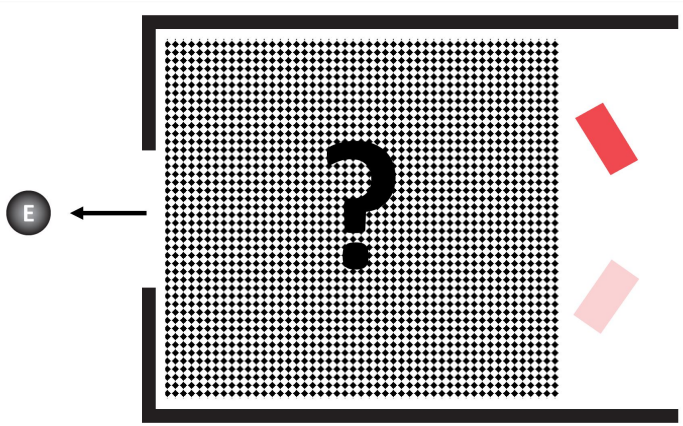


Which of the following statements better describes what has happened in this situation?

- ○ **Ball E** did go through the gate because **ball A** did go through the motion block.
- ○ **Ball E** did go through the gate because **ball B** did go through the motion block.

Abnormal_Ball_A_Conj_Left

The following picture shows the scene of a billiard situation in which **ball A** and **ball B** both went through the motion blocks and **ball E** went through the gate. However, it does not show where **ball E** was positioned, i.e. whether one ball would have been sufficient to make **ball E** go through the gate (SETUP 1), or whether both **ball A** and **ball B** were needed in order to make **ball E** go through the gate (SETUP 2).

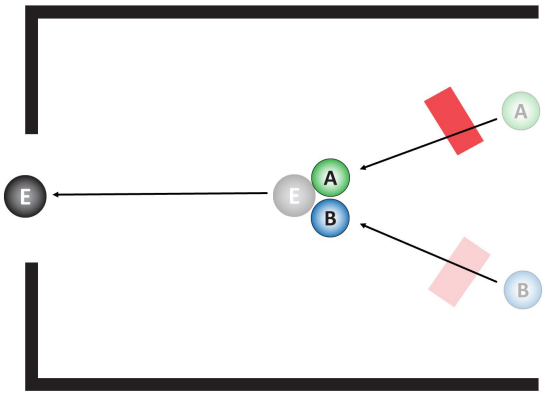


Imagine that Ben also participated in the same experiment that you are doing right now. He saw a video clip like you did earlier and had to choose an explanation for what has happened in this video. Ben saw the position of the motion blocks (like in the picture above), but also the position of **ball E**. In the clip, both **ball A** and **ball B** went through the motion blocks, hit **ball E**, and **ball E** went through the gate. He was then given two statements to choose from to best describe what has happened in this situation. For the scenario above, Ben chose the following statement:

Which of the following statements better describes what has happened in this situation?

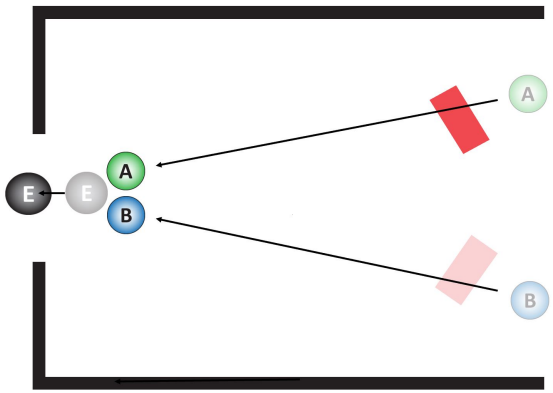
- (●) **Ball E** did go through the gate because **ball A** did go through the motion block.
- ( ) **Ball E** did go through the gate because **ball B** did go through the motion block.

Given Ben's decision, which of these two scenes did he see?



Definitely this one

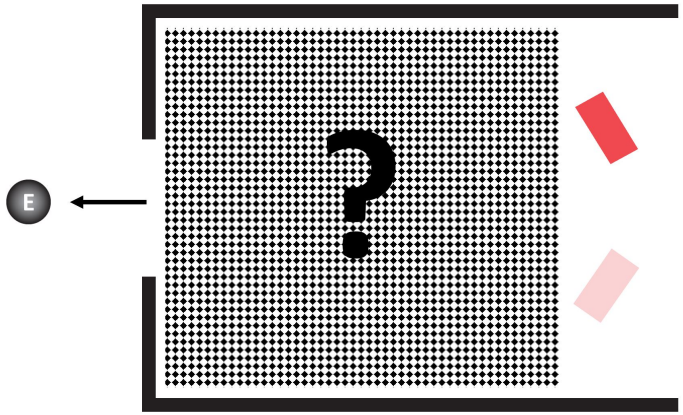
Unsure



Definitely this one

Abnormal_Ball_A_Conj_Right

The following picture shows the scene of a billiard situation in which **ball A** and **ball B** both went through the motion blocks and **ball E** went through the gate. However, it does not show where **ball E** was positioned, i.e. whether one ball would have been sufficient to make **ball E** go through the gate (SETUP 1), or whether both **ball A** and **ball B** were needed in order to make **ball E** go through the gate (SETUP 2).

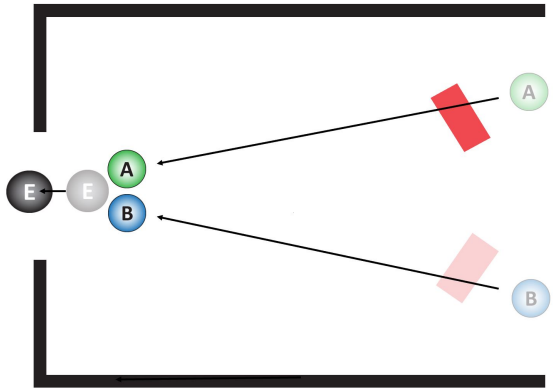


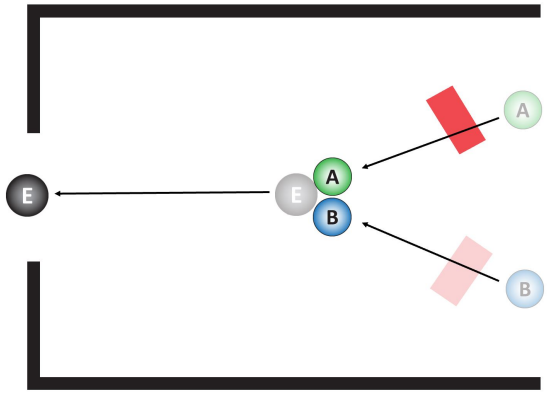
Imagine that Ben also participated in the same experiment that you are doing right now. He saw a video clip like you did earlier and had to choose an explanation for what has happened in this video. Ben saw the position of the motion blocks (like in the picture above), but also the position of **ball E**. In the clip, both **ball A** and **ball B** went through the motion blocks, hit **ball E**, and **ball E** went through the gate. He was then given two statements to choose from to best describe what has happened in this situation. For the scenario above, Ben chose the following statement:

Which of the following statements better describes what has happened in this situation?

- **Ball E** did go through the gate because **ball A** did go through the motion block.
- **Ball E** did go through the gate because **ball B** did go through the motion block.

Given Ben's decision, which of these two scenes did he see?





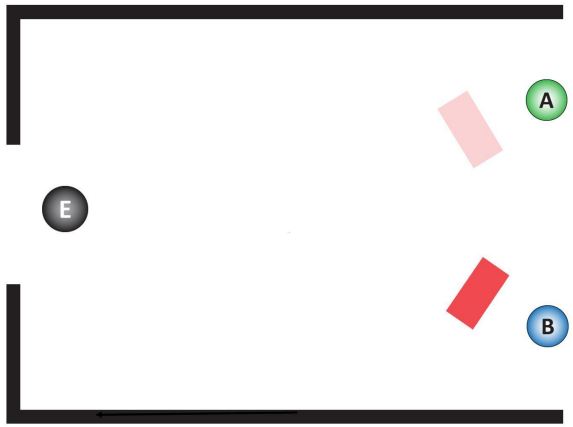
Definitely this one | Unsure | Definitely this one

Test_Questions_Incorrect

One or more of your responses were incorrect. Please re-read the instructions and try again!

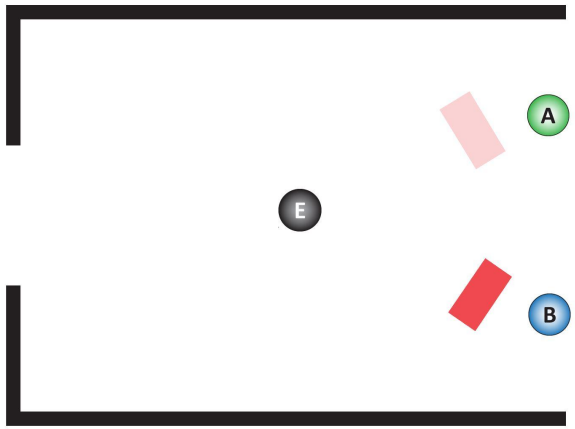
Introcheck_DB2

Please answer the following questions:



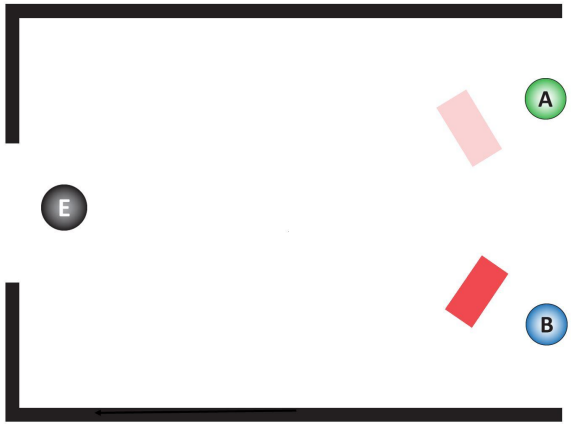
In this set up, if *both balls* go through the motion block and hit **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false



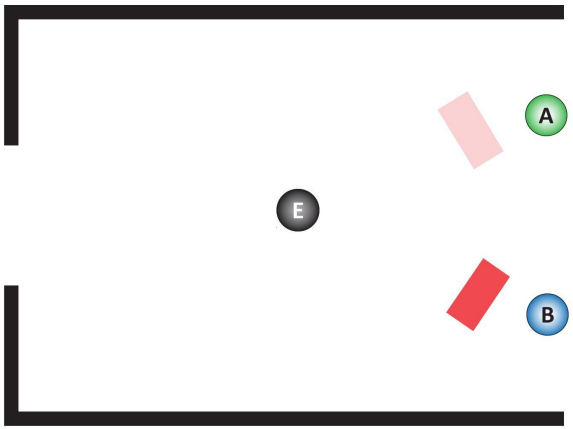
In this set up, if *both balls* go through the motion block and hit **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false



In this set up, if *only one of the balls* goes through the motion block and hits **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false



In this set up, if *only one of the balls* goes through the motion block and hits **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false

Which motion block is *more likely* to block a ball?

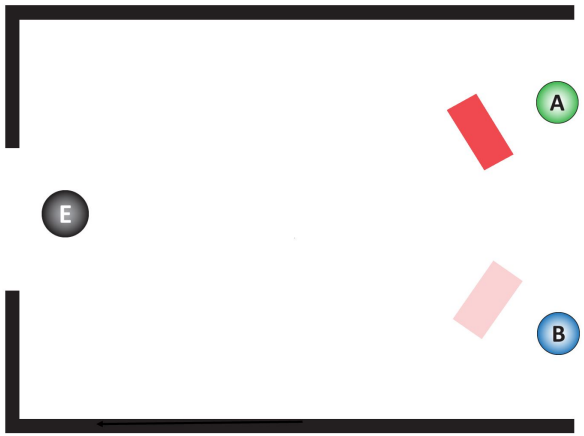
- ○ The light red one
- ○ The dark red one

Test_incorrect_2

You have answered one or more questions wrong for the second time. The survey ends here, thank you very much for your participation.

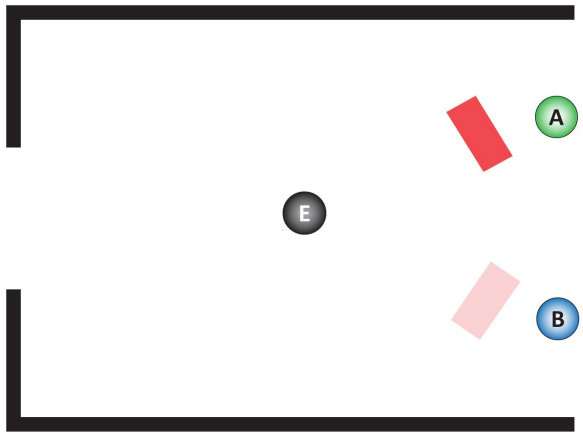
Introcheck_DT2

Please answer the following questions:



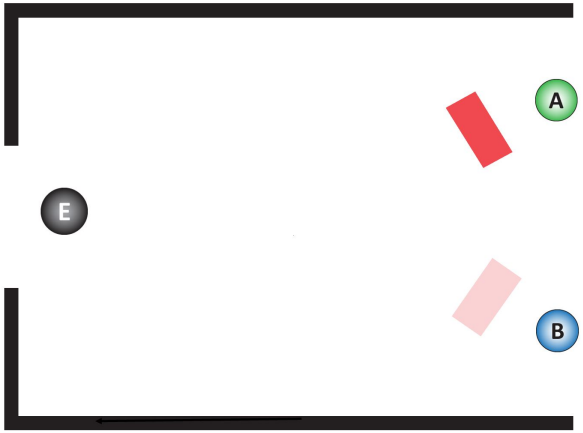
In this set up, if *both balls* go through the motion block and hit **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false



In this set up, if *both balls* go through the motion block and hit **ball E**, **ball E** will go through the gate.

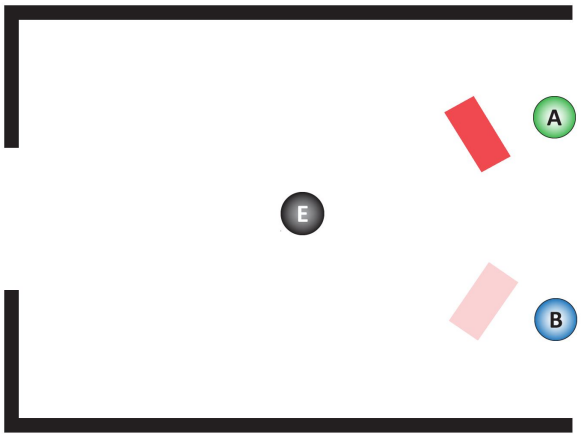
- ○ true
- ○ false



In this set up, if *only one of the balls* goes through the motion block and hits **ball E**, **ball E** will go

through the gate.

- ○ true
- ○ false



In this set up, if *only one of the balls* goes through the motion block and hits **ball E**, **ball E** will go through the gate.

- ○ true
- ○ false

Which motion block is *more likely* to block a ball?

- ○ The light red one
- ○ The dark red one

Feedback, Demographics and Payment Code

Thank you for answering these questions.

What factors influenced your decision about which of the two scenes was more likely? Do you have any other comments about the experiment?

Please provide the following demographic information to complete the study.

1. My age is:

- ○ My age in years is
- ○ Prefer not to say.

2. Gender

- ○ Female
- ○ Male
- ○ Non-binary
- ○ Prefer not to say.

3. Race

- ○ I am _____
- ○ Prefer not to say.

Ethnicity

- ○ Hispanic
- ○ Non-Hispanic
- ○ Prefer not to say.

Thank you very much for participating in this experiment!

If you have any questions or comments, please contact Aaron Beller (abeller@stanford.edu).

In order to receive credit for taking our survey, you will need to paste the following validation code into the box on MTurk:

JK90P7

Press the button below to end the experiment.