

Action On load.

Outcome Scene is described to non-visual user.



Non-visual feedback "Forces and Motion Basics. There is a heavily loaded cart on wheels sitting on a track. Attached to the left side of the cart is a thick 8 foot rope with 4 large knots spaced at equal intervals. Standing near this knotted rope is a group of 4 people. On the opposite side of the cart, a similar rope with 4 large knots is attached to the right side of the cart. There is another group of 4 people - they are standing near this other rope. The centre position of the cart has been marked on the ground."

Description of keyboard controls can be given too:
"Tab key moves focus around areas in the game.
Arrow keys moves selection.
Enter key to choose or perform an action."

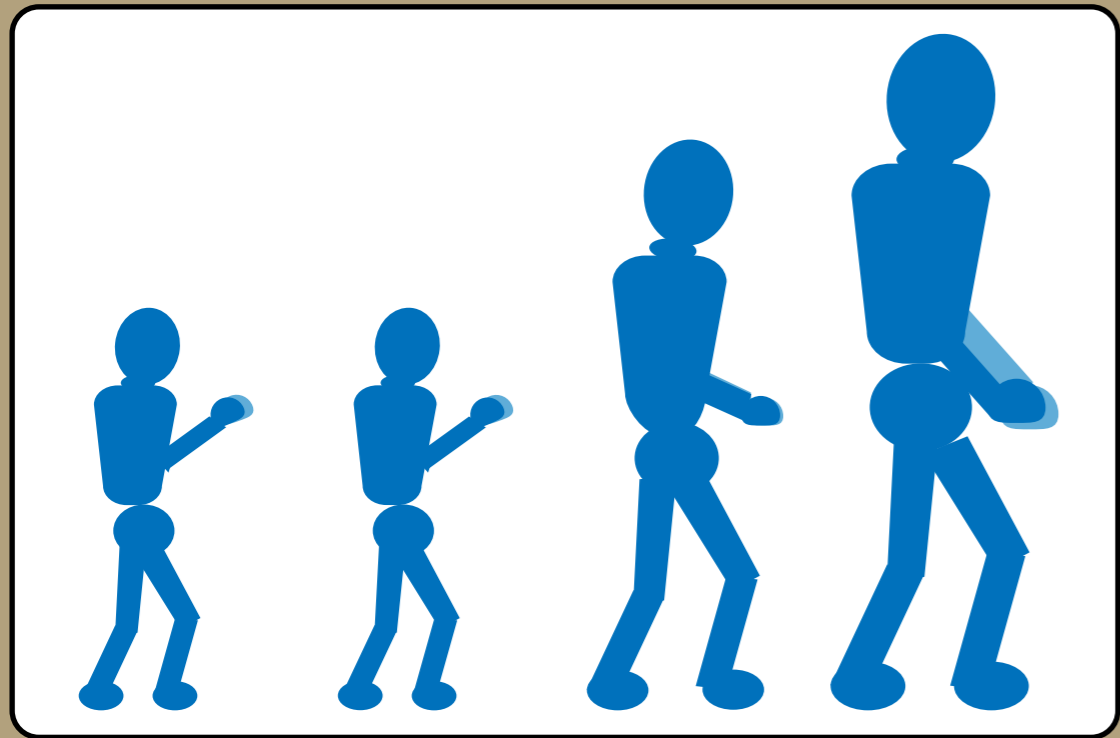
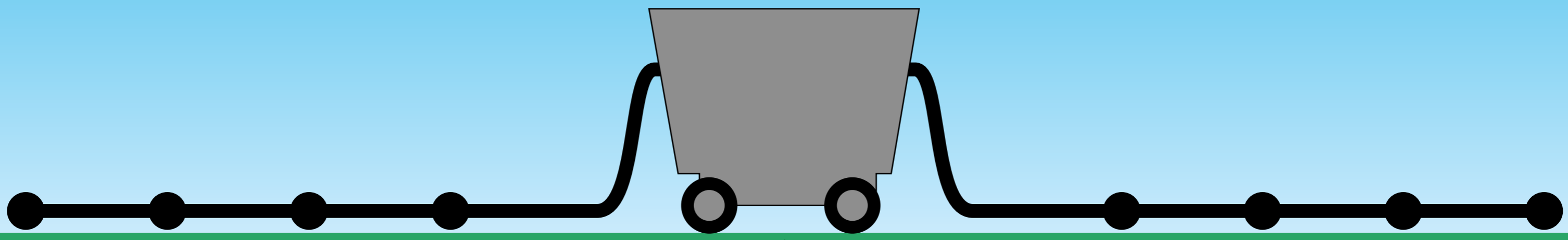
Show:

Sum of Forces

Number Values

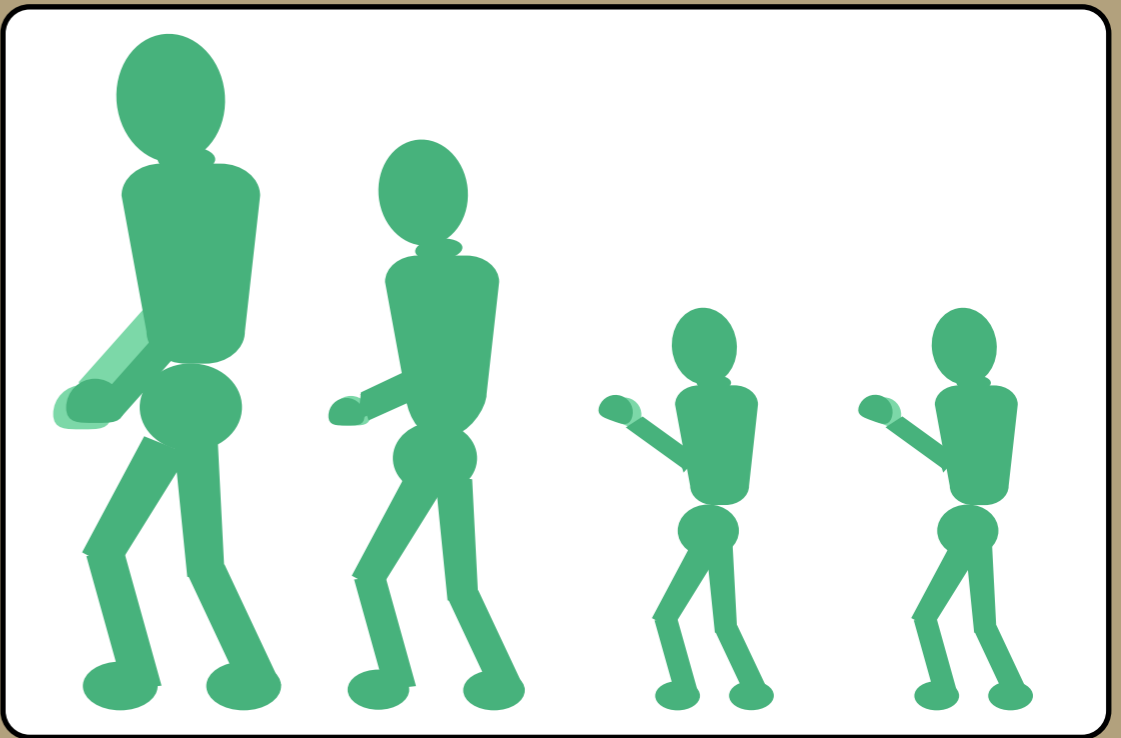
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Tab key.



Outcome Focus box moves to left group and rope.

Non-visual feedback "A thick, 8 foot rope is attached to the left side of the cart. The rope has 4 positions marked at equal intervals: 8 feet, 6 feet, 4 feet, and 2 feet. A group of four people standing near this rope."

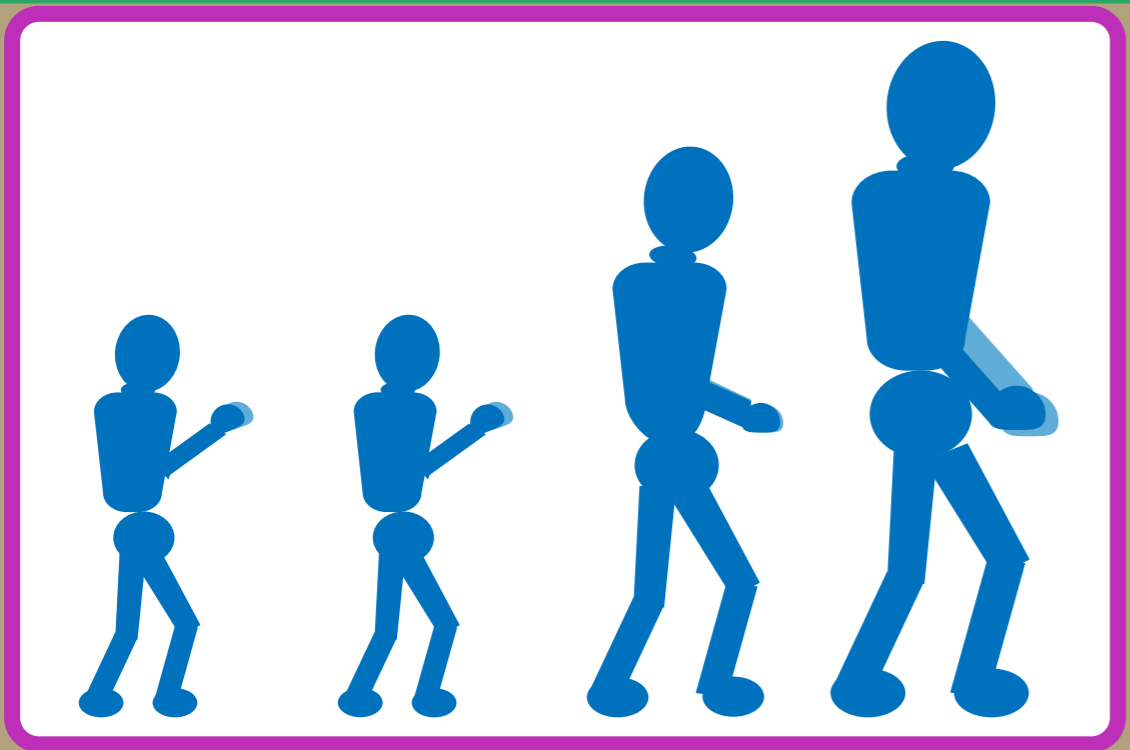
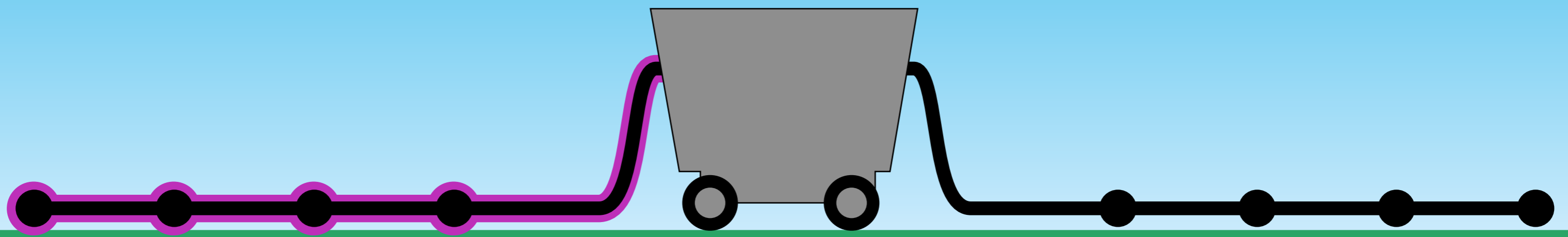
Show:

Sum of Forces

Number Values

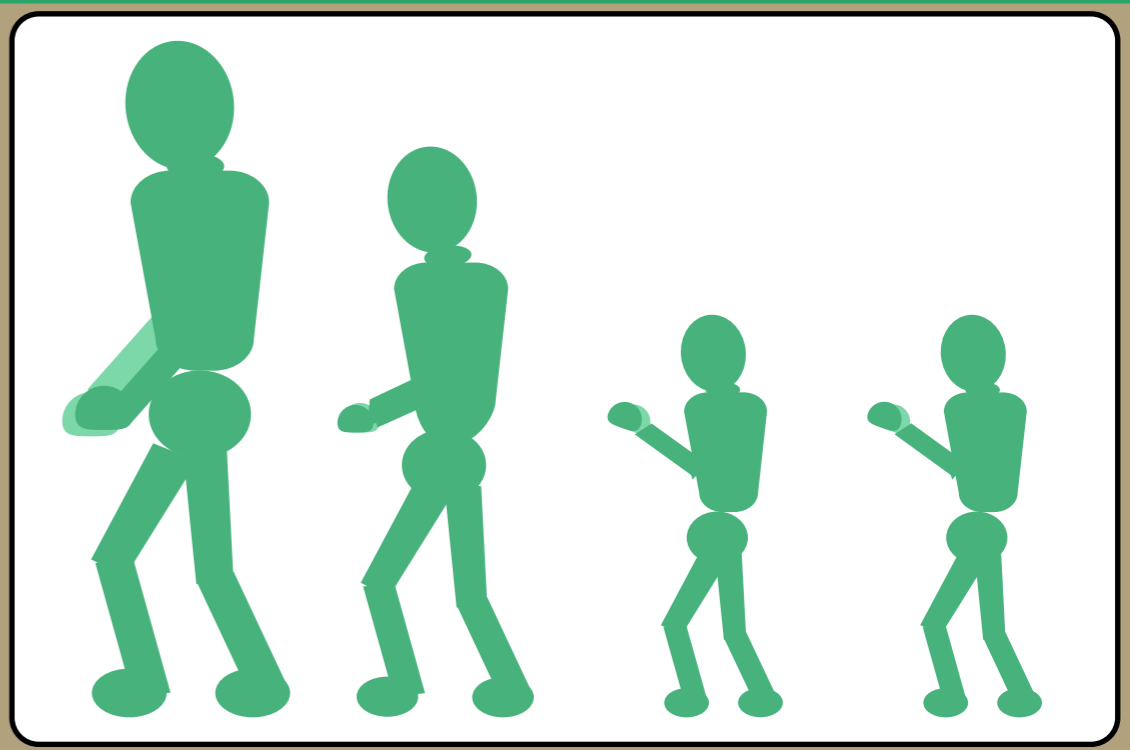
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Enter key.



Outcome Focus box appears around first available person. If a person was on the rope, focus would appear there instead.

Non-visual feedback "Left group: strong person."

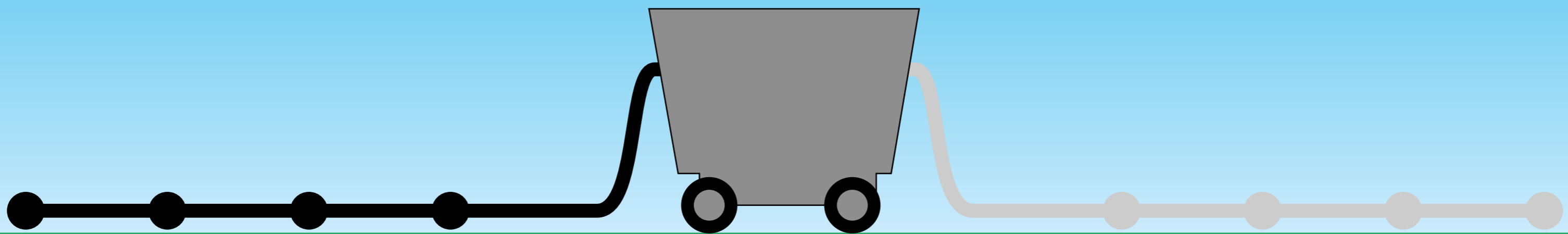
Show:

Sum of Forces

Number Values

[Keyboard instructions](#)



Go!

Reset 

New Game

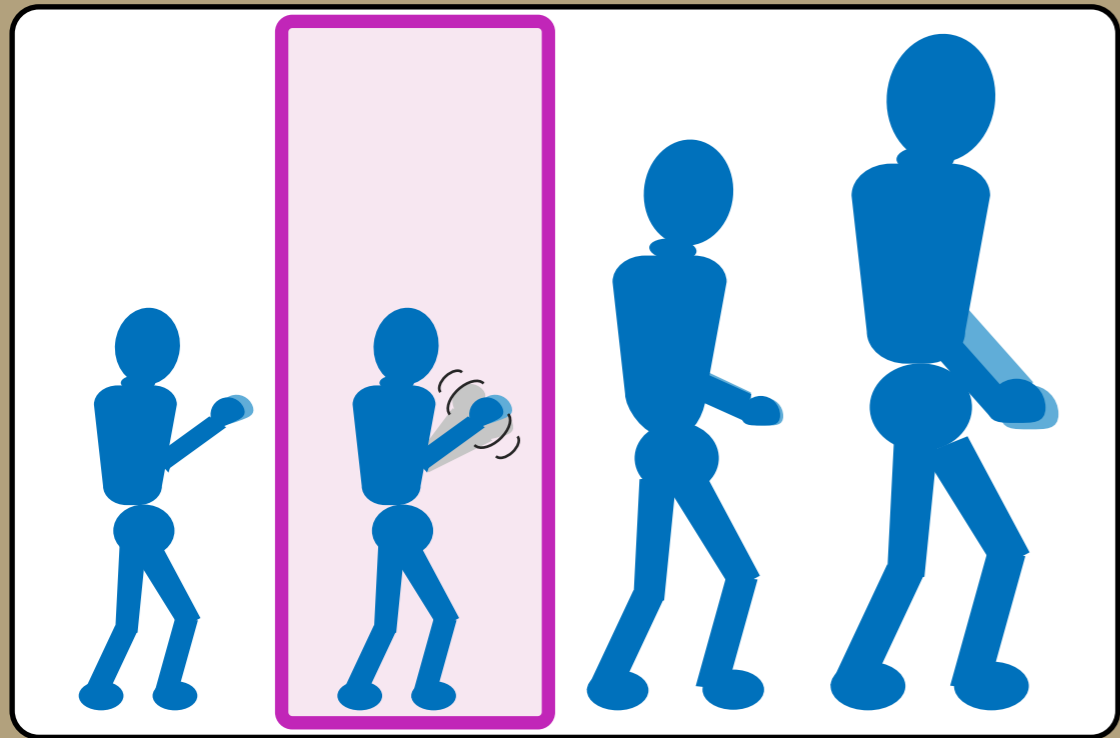
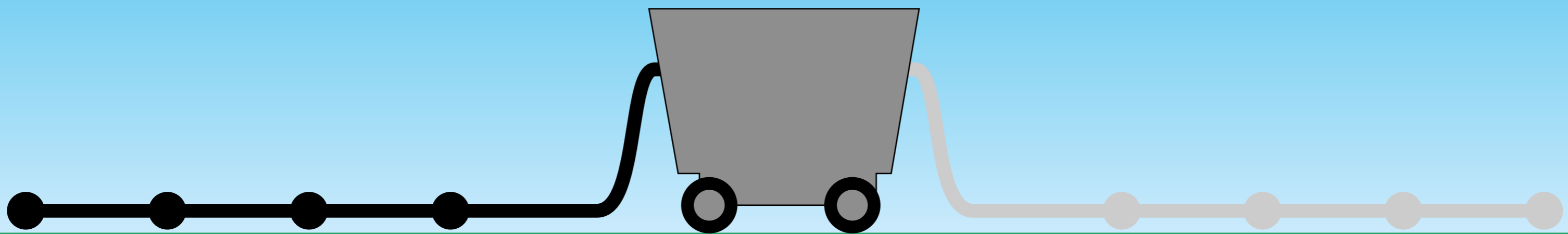


- Action** Right arrow.
- Outcome** Focus box appears around second available person.
- Non-visual feedback** "Left group: other strong person."

Show:

- Sum of Forces
- Number Values

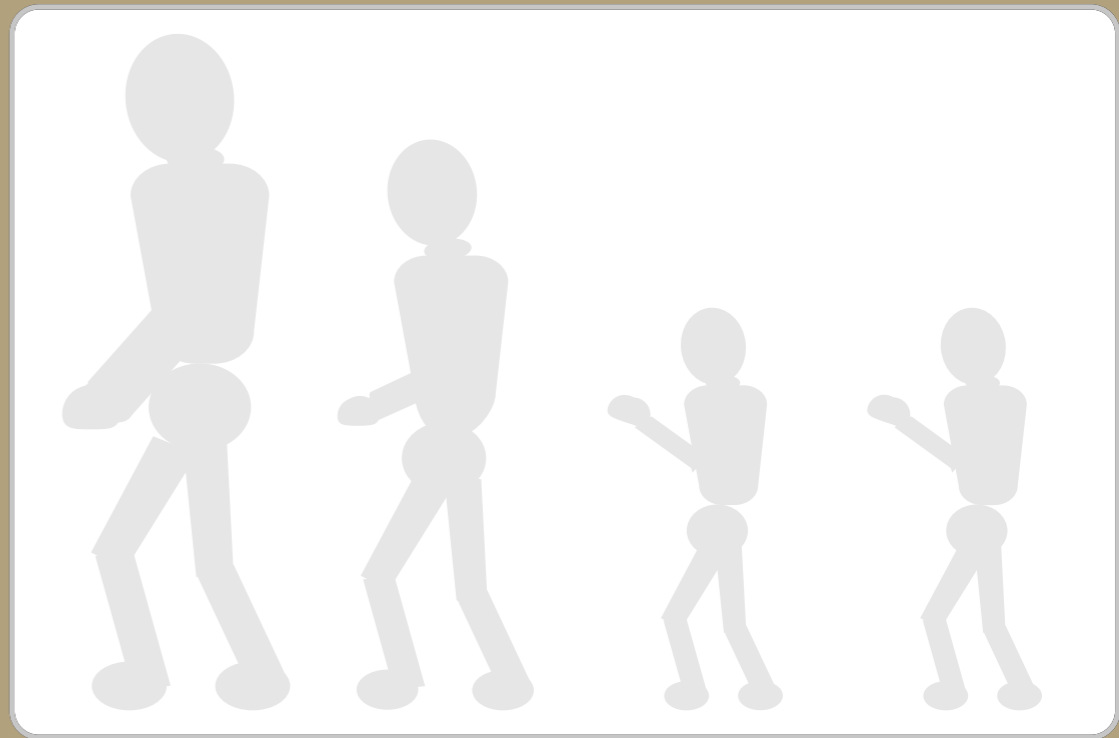
[Keyboard instructions](#)



Go!

Reset 

New Game

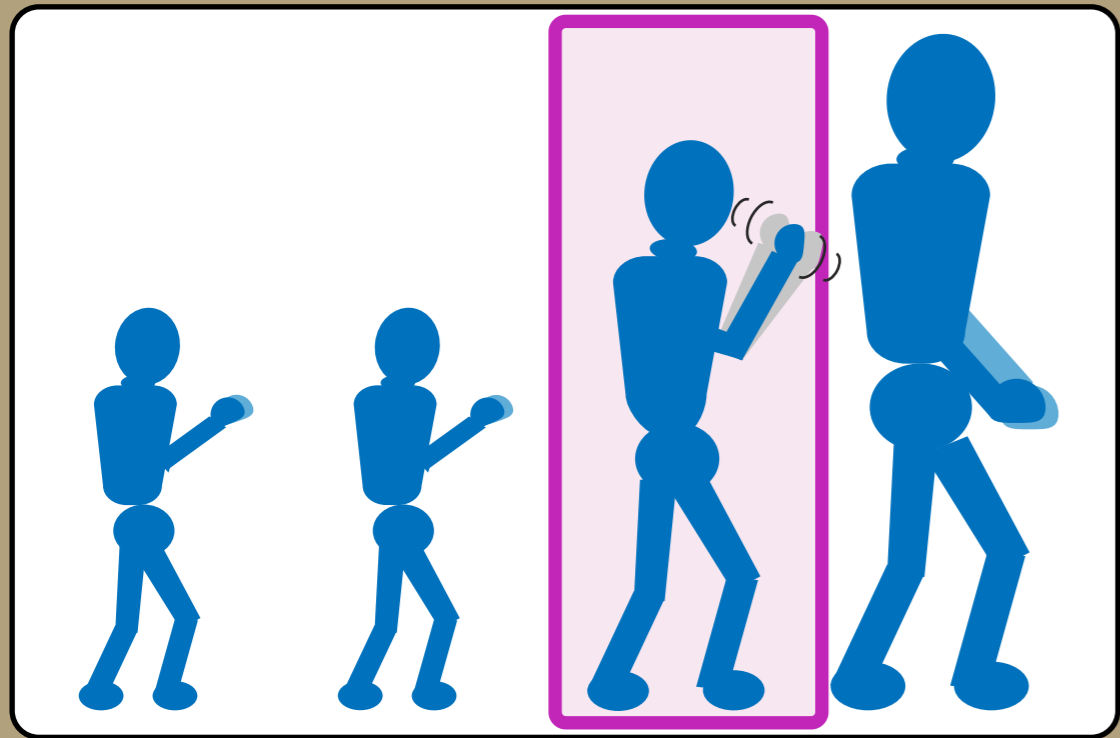
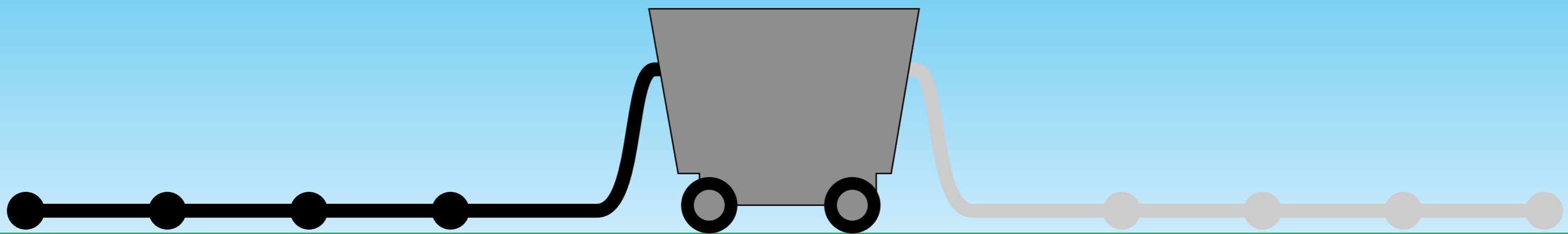


- Action** Right arrow.
- Outcome** Focus box appears around third available person.
- Non-visual feedback** "Left group: stronger person."

Show:

- Sum of Forces
- Number Values

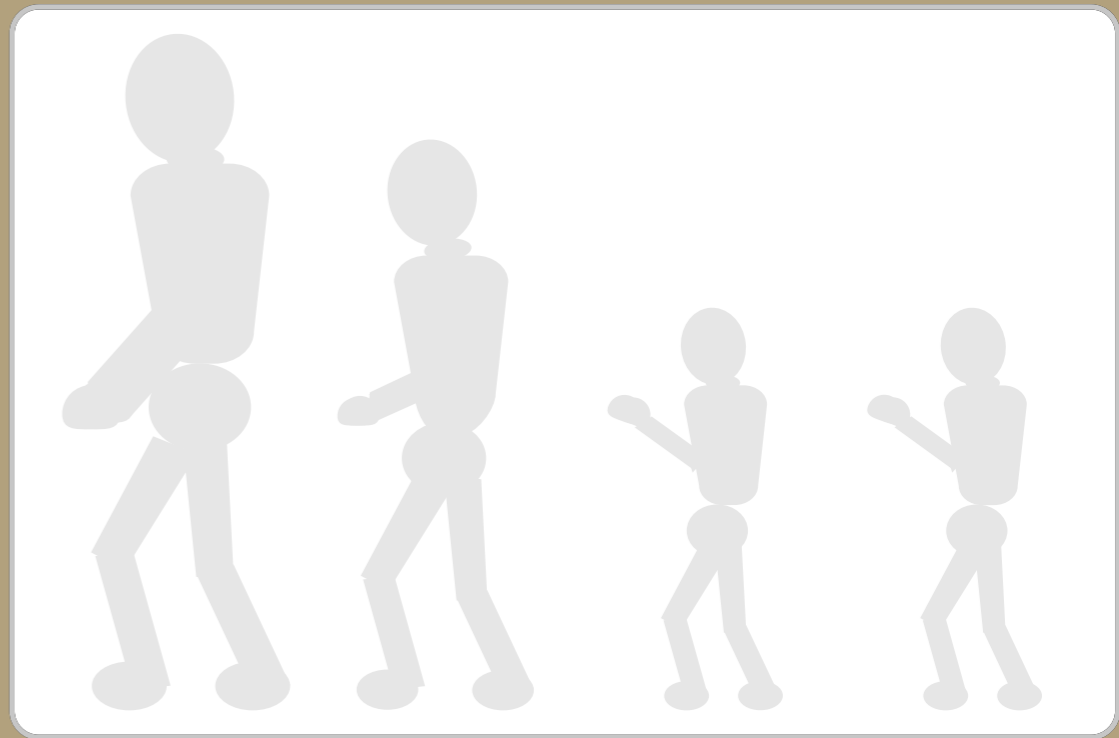
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Right arrow.



Outcome Focus box appears around forth and final available person.

Non-visual feedback "Left group: strongest person."

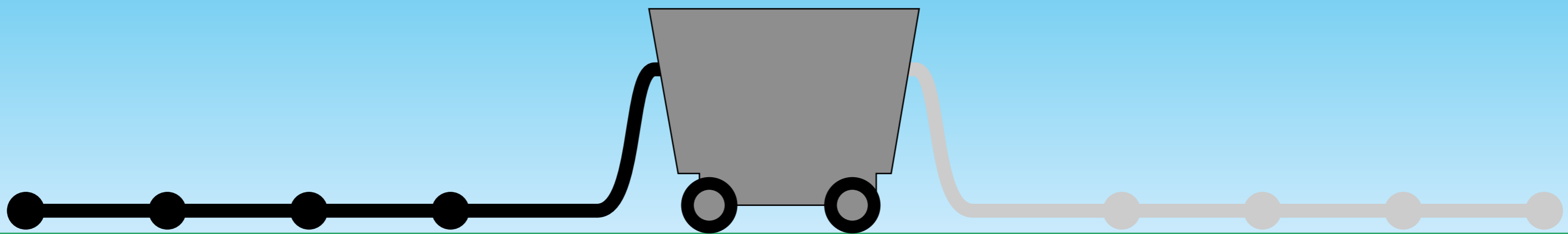
Show:

Sum of Forces

Number Values

[Keyboard instructions](#)



Go!

Reset 

New Game



Action Enter key.



Outcome User selects strongest person. Sim goes into "Move mode". Selected person appears next to the first vacant spot on the rope.

Non-visual feedback "Selected strongest person. 8 feet mark on the rope. Place strongest person here?"

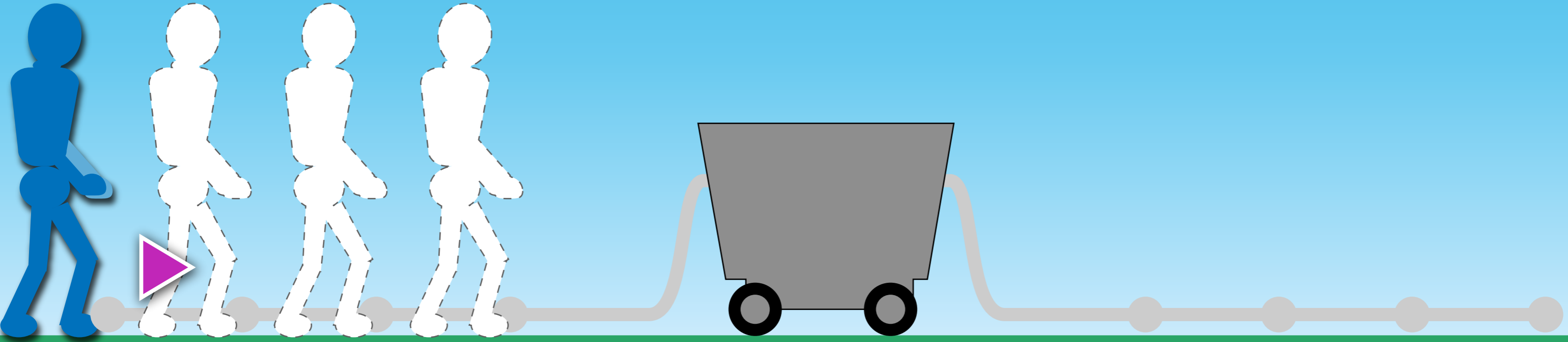
Show:


Sum of Forces

Number Values

[Keyboard instructions](#)

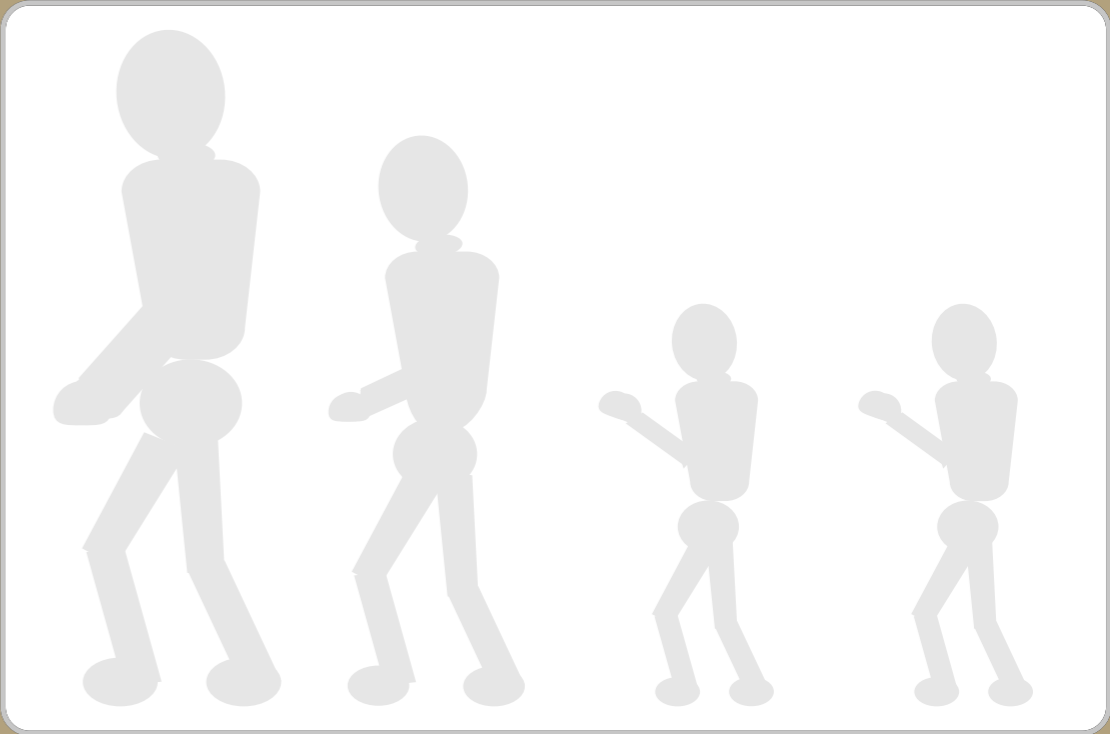




Go!

Reset 

New Game



Action Right arrow.

Outcome Person moves to next vacant spot on rope.

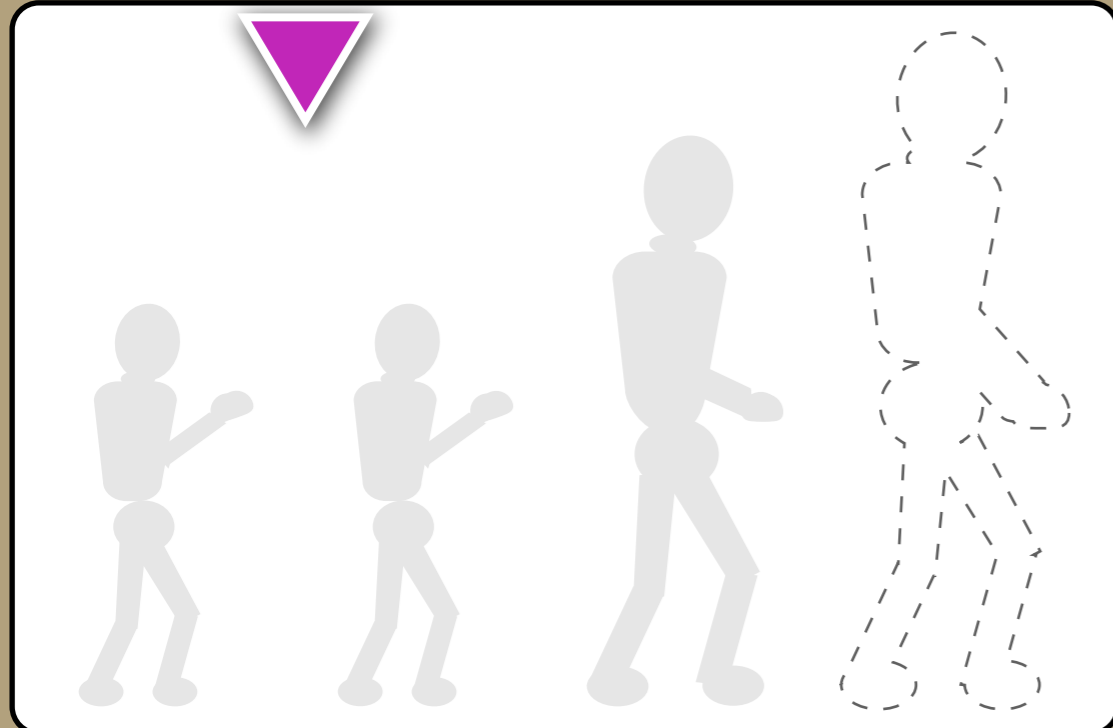
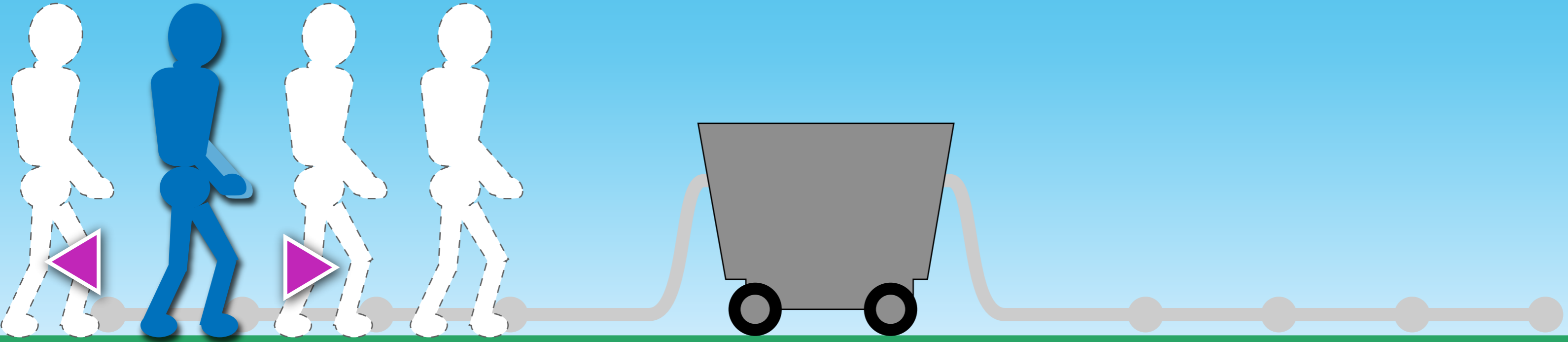
Non-visual feedback "6 feet mark on rope. Place strongest person here?"

Show:

Sum of Forces

Number Values

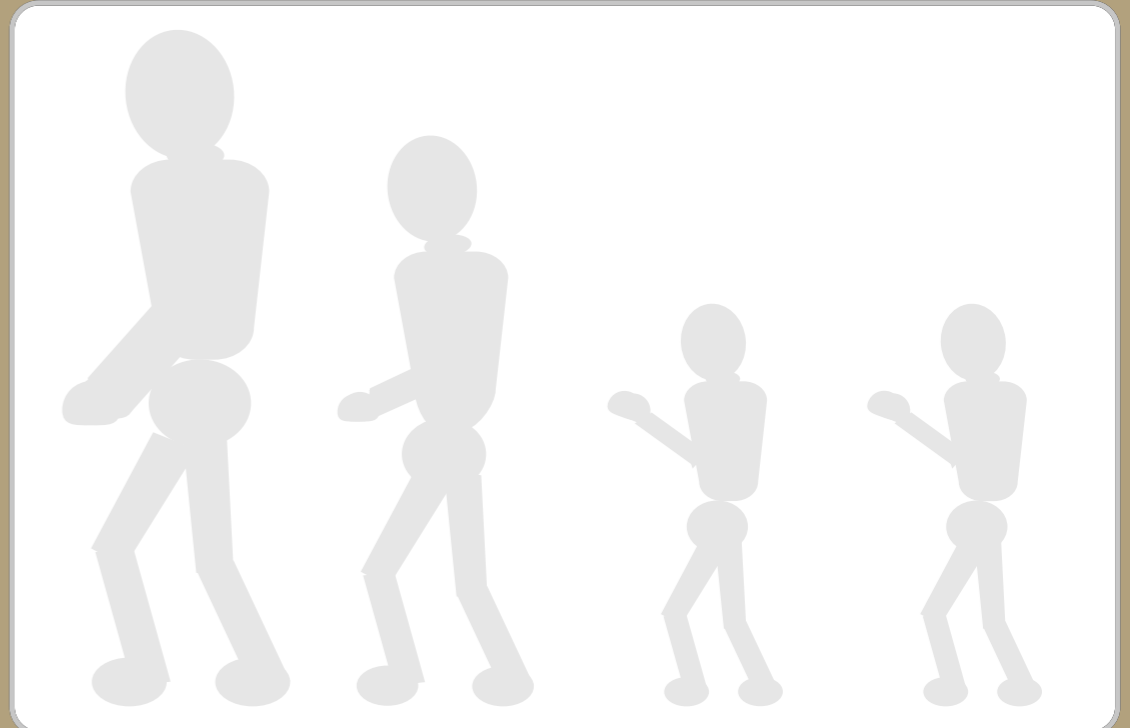
[Keyboard instructions](#)



Go!

Reset

New Game



Action Right arrow.



Outcome Person moves to next vacant spot on rope.

Non-visual feedback "4 feet mark on rope. Place strongest person here?"

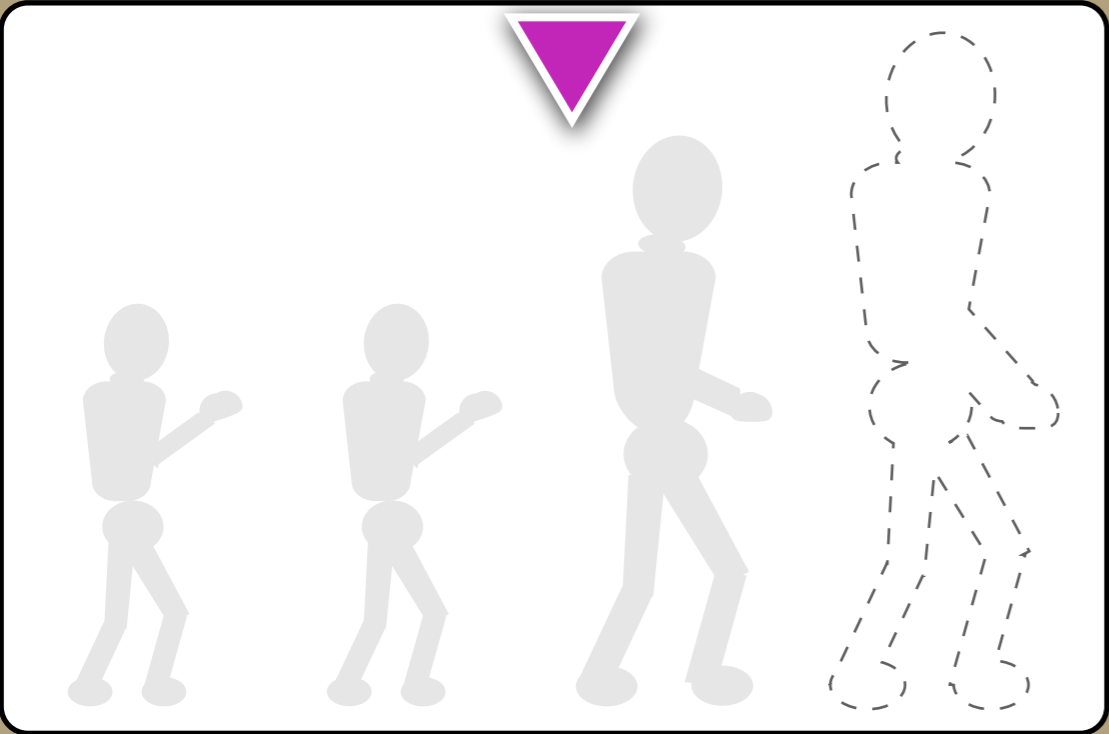
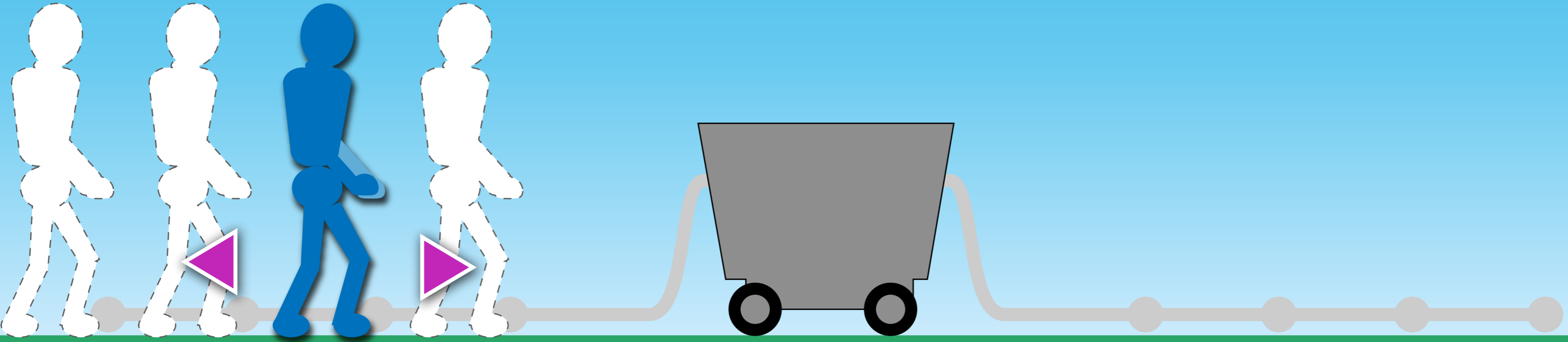
Show:

Sum of Forces

Number Values

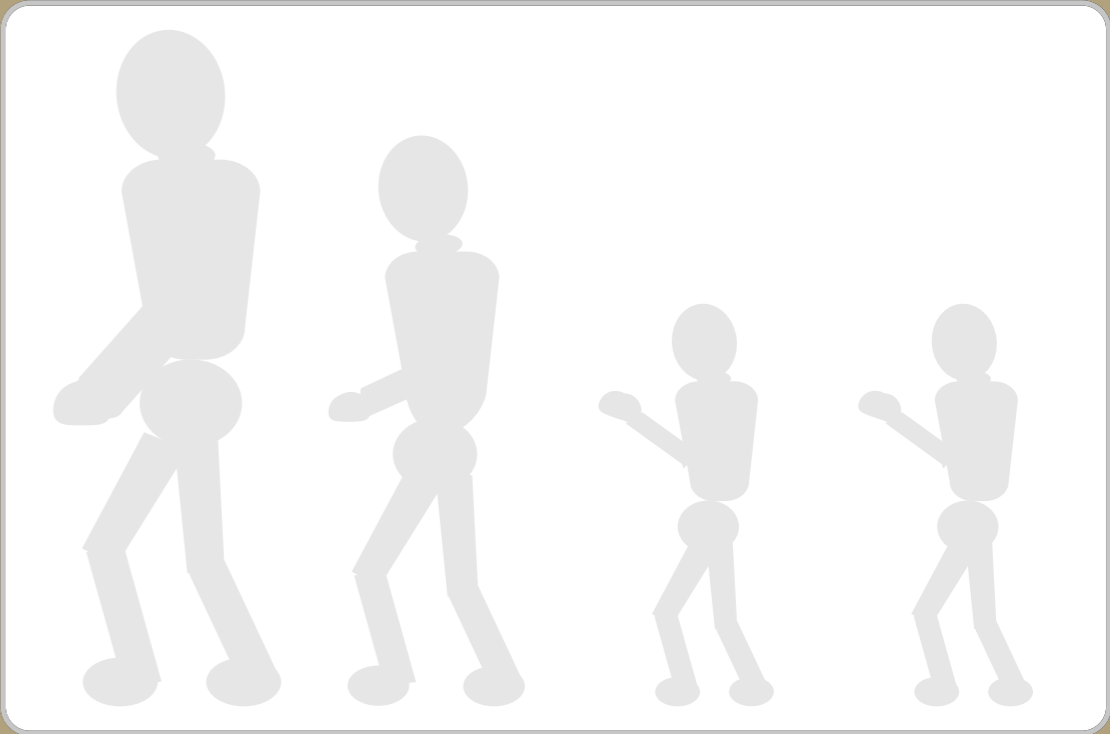
[Keyboard instructions](#)



Go!

Reset 

New Game




- Action** Right arrow.
- Outcome** Person moves to next vacant spot on rope.
- Non-visual feedback** "2 feet mark on rope. Place strongest person here?"
- Notes** If right arrow is pressed again there should be a beep or a message conveyed.

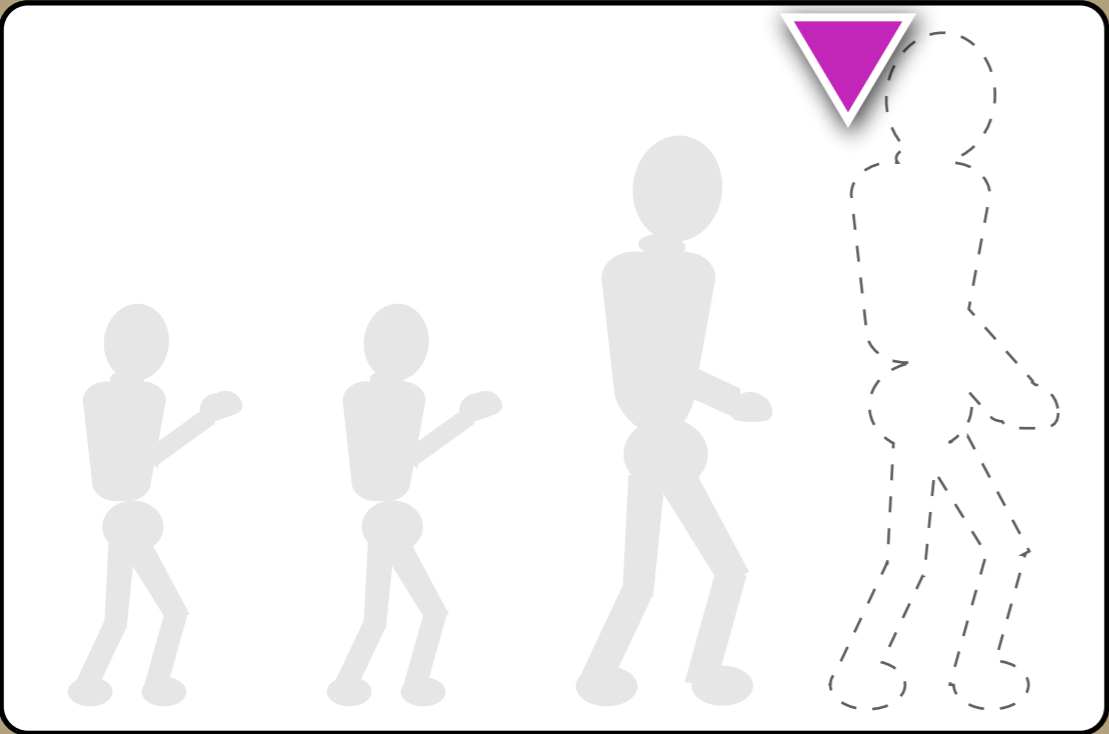
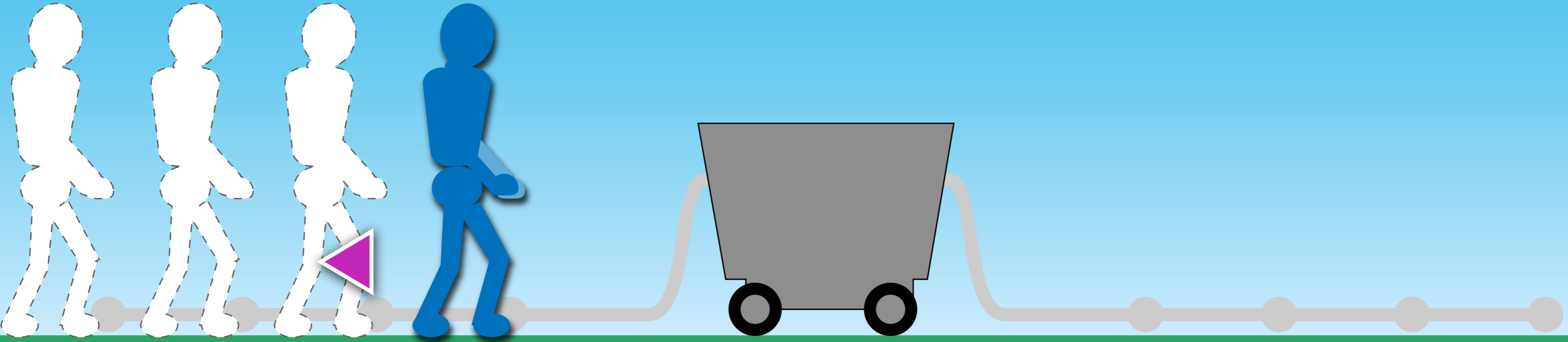
Show:

Sum of Forces

Number Values



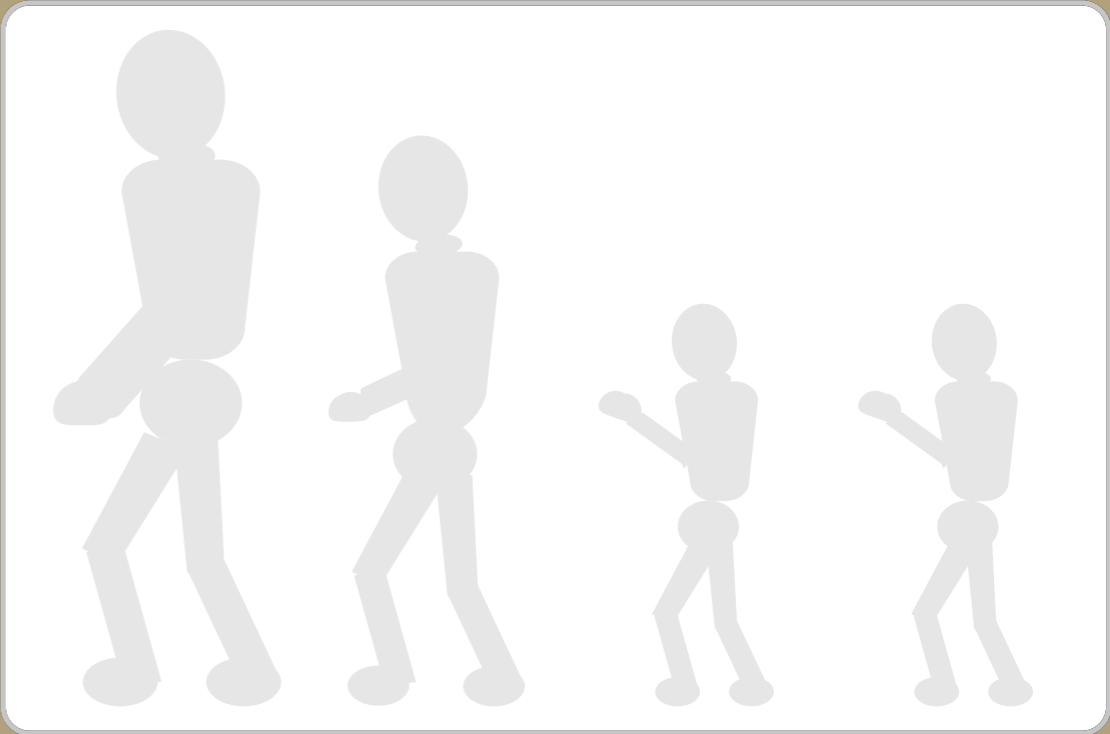
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Left arrow.


Outcome Person moves left on the rope.

Non-visual feedback "4 feet mark on rope. Place strongest person here?"

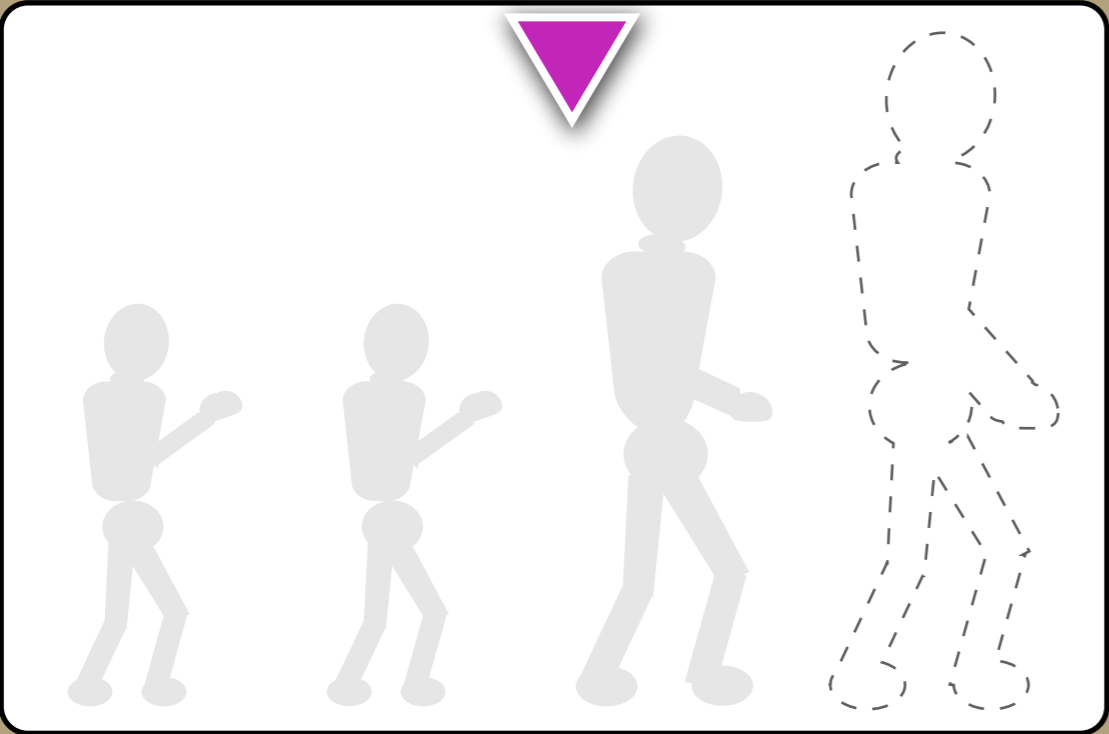
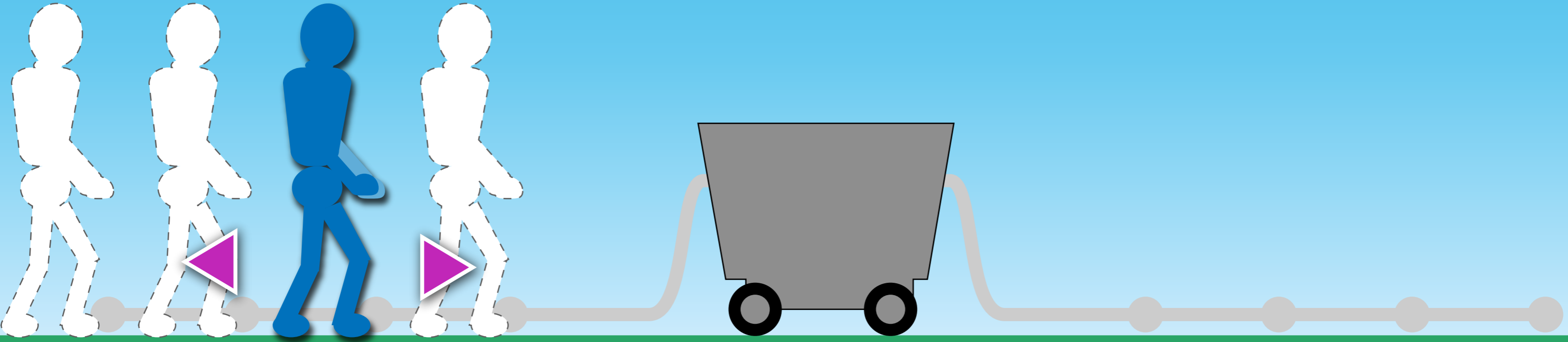
Show:

Sum of Forces

Number Values



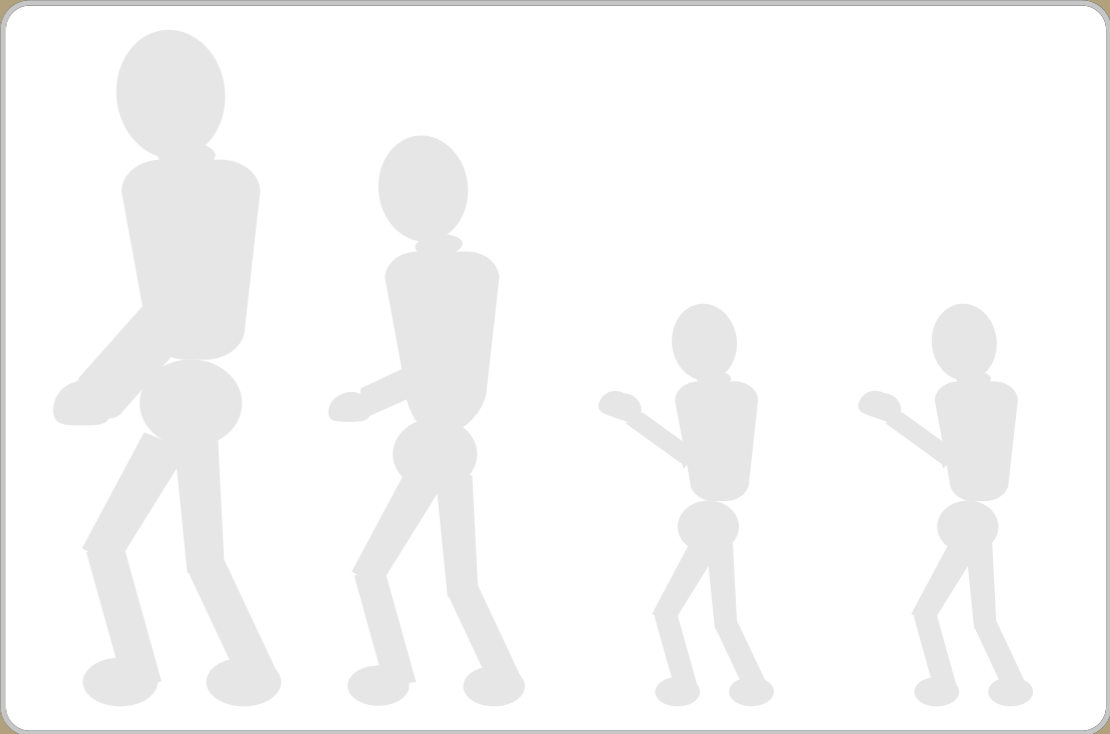
[Keyboard instructions](#)



Go!

Reset 

New Game




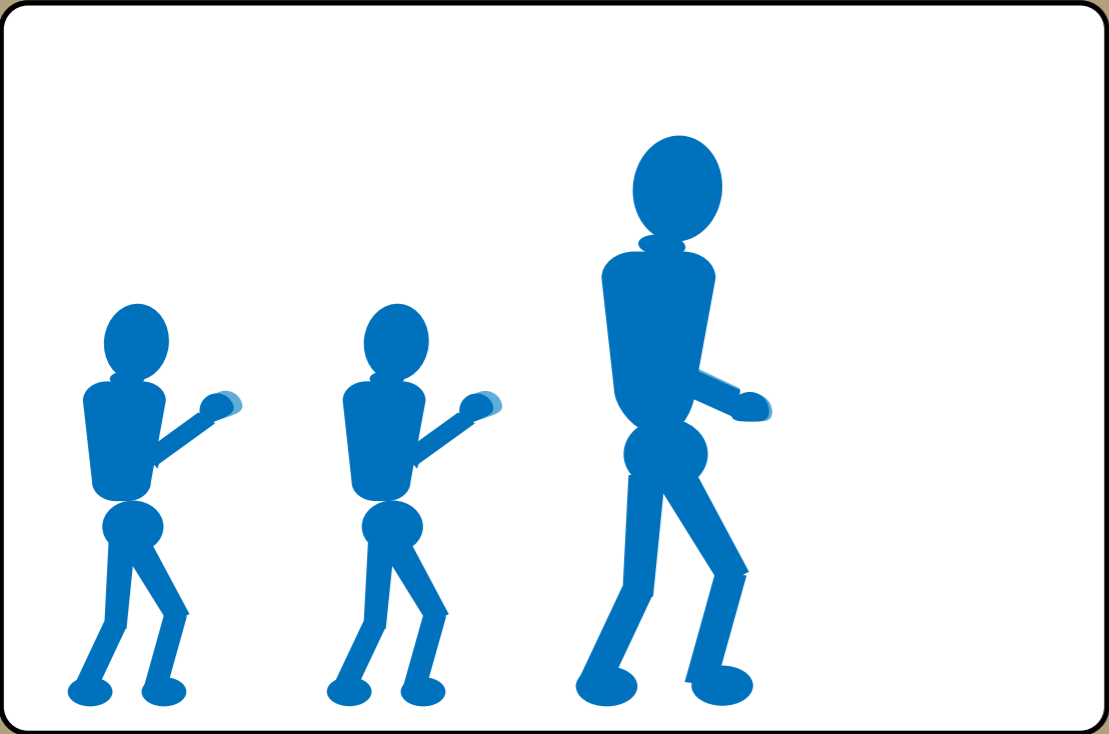
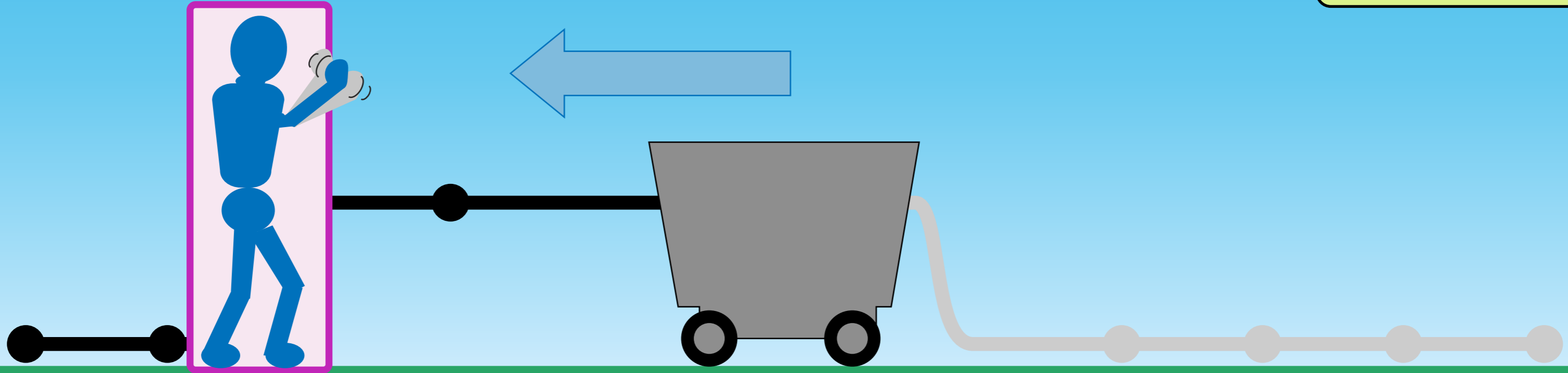
- Action** Enter key.
- Outcome** Person gets placed at 4 feet position. Sim goes back to "Browse mode". Focus box appears around the puller.
- Non-visual feedback** "strongest person now at 4 feet mark on rope."
- Notes** After placing the person, left and right arrow keys do not move focus. Down arrow moves focus down to other people, or Tab changes focus to another area.

Show:

Sum of Forces

Number Values

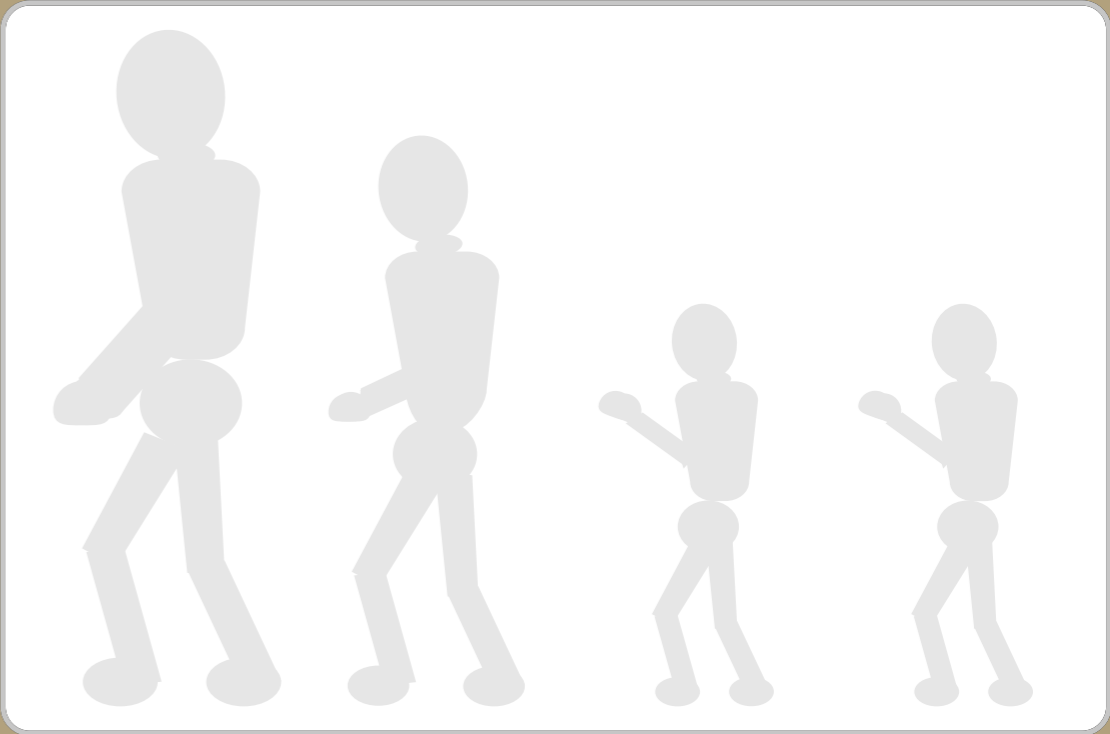
 [Keyboard instructions](#)



Go!

Reset 

New Game



Action Tab key


Outcome Focus box moves to right group

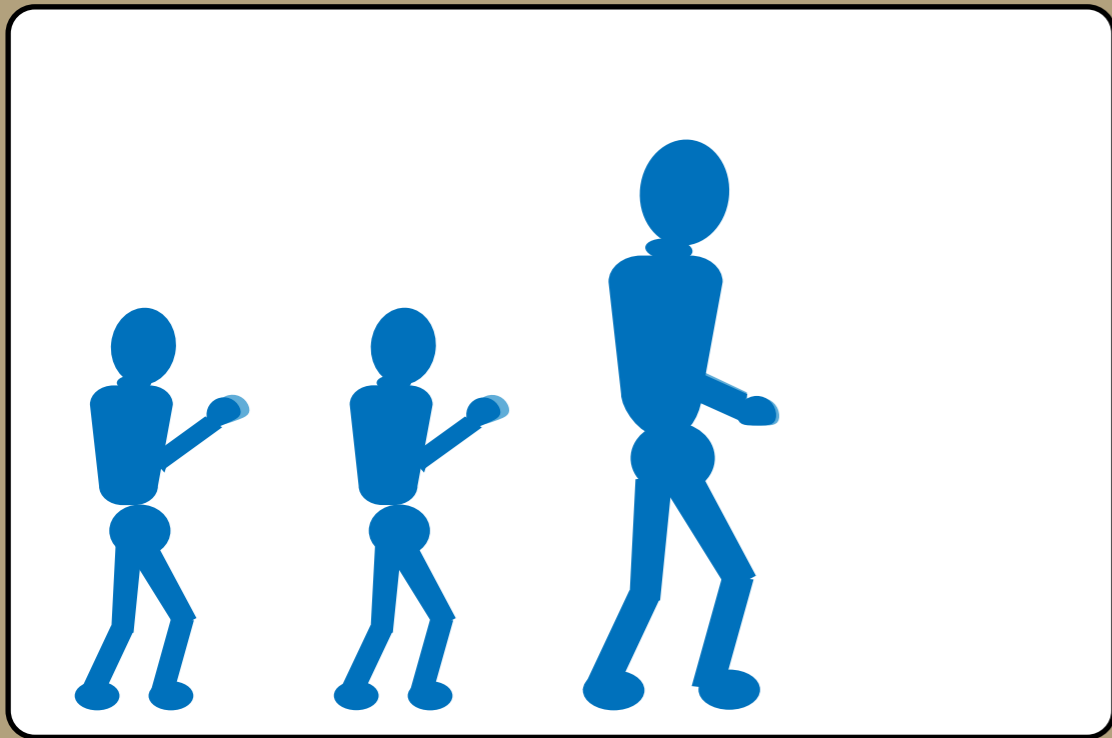
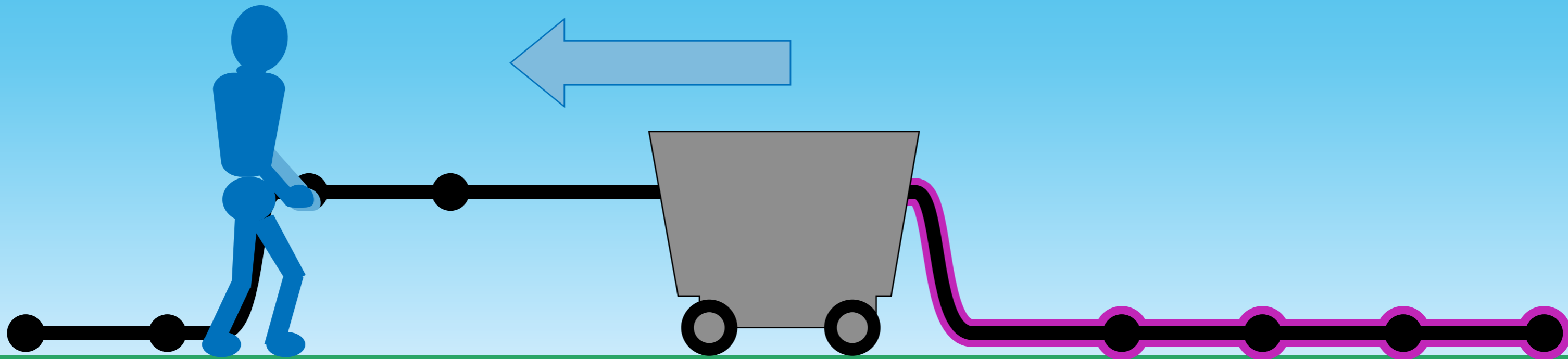
Non-visual feedback "A thick, 8 foot rope is attached to the right side of the cart. The rope has 4 positions marked at equal intervals: 8 feet, 6 feet, 4 feet, and 2 feet. A group of four people standing near this rope."

Show:

Sum of Forces

Number Values

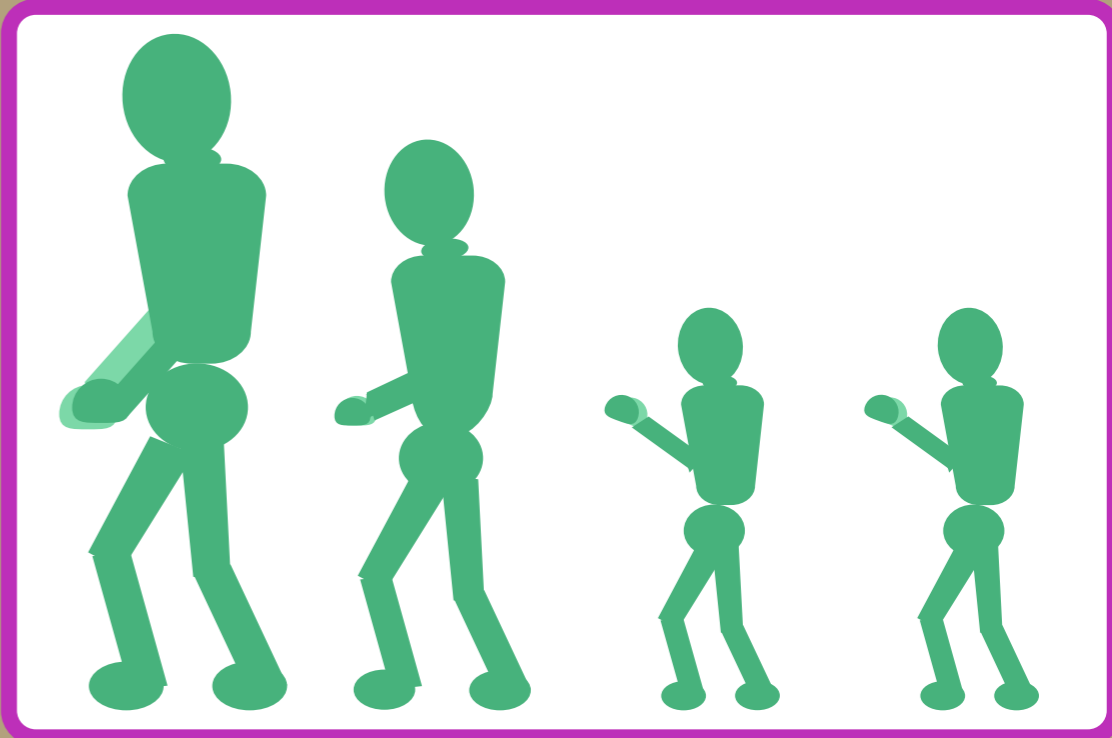
 [Keyboard instructions](#)



Go!

Reset 



New Game



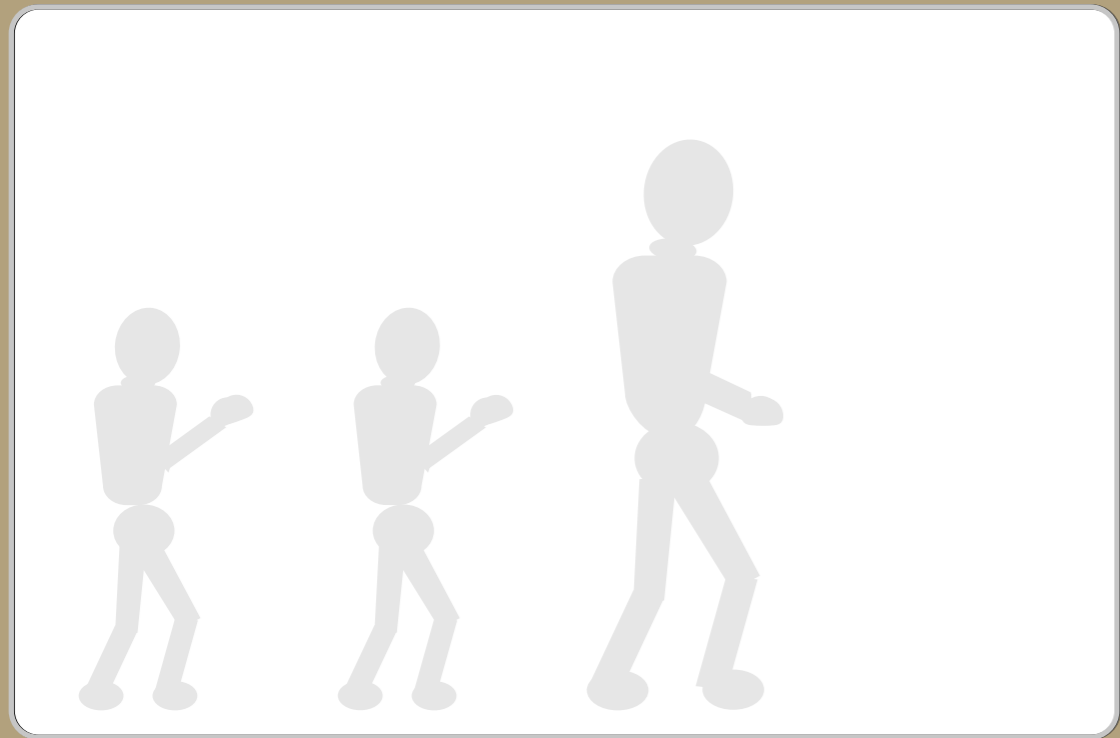
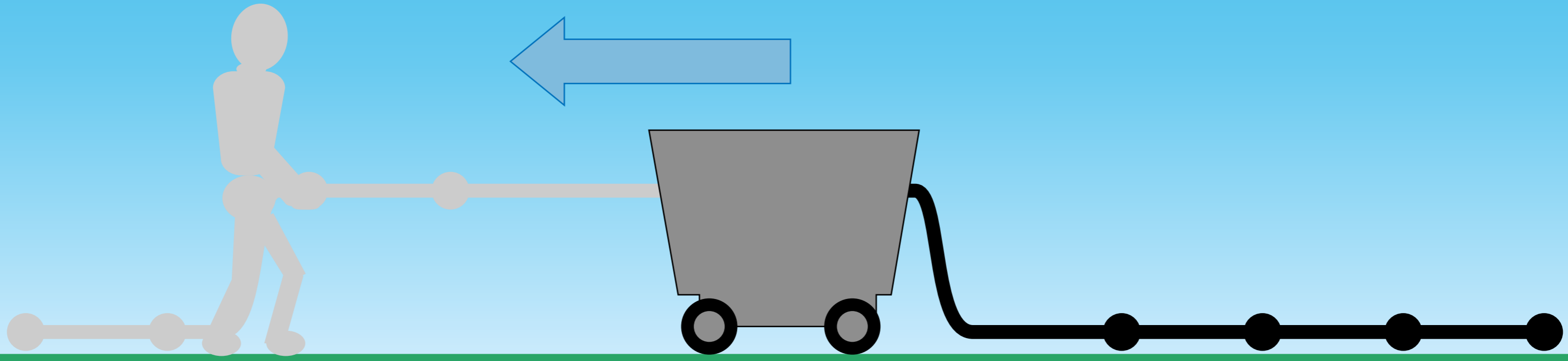
- Action** Enter key
- Outcome** Focus box appears around first available puller.
- Non-visual feedback** "Right group: strong person."

Show:

- Sum of Forces
- Number Values

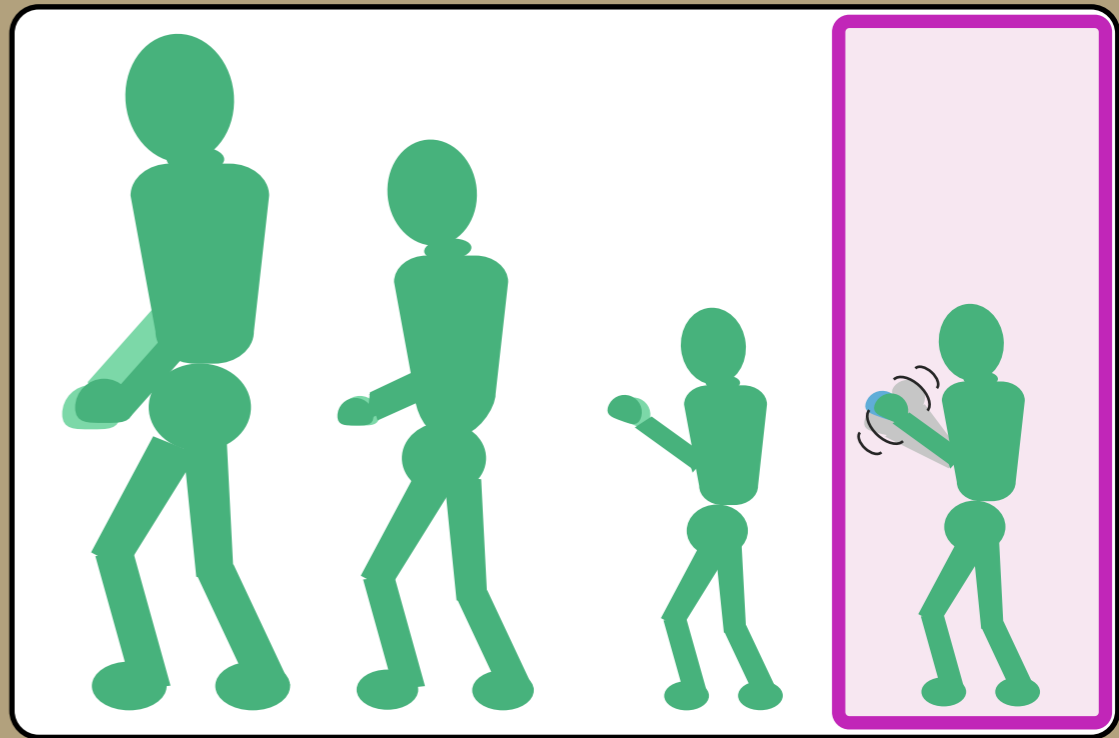
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Enter key



Outcome Focus box appears around first available puller.

Non-visual feedback "Selected strong person. 8 feet mark on rope. Place strong person here?"

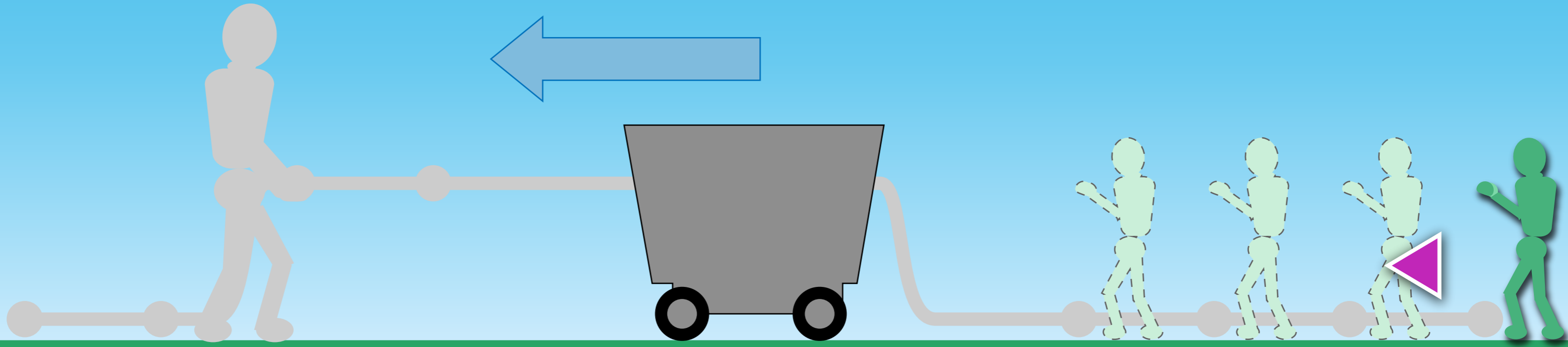
Show:

Sum of Forces

Number Values

[Keyboard instructions](#)



Go!

Reset 


New Game

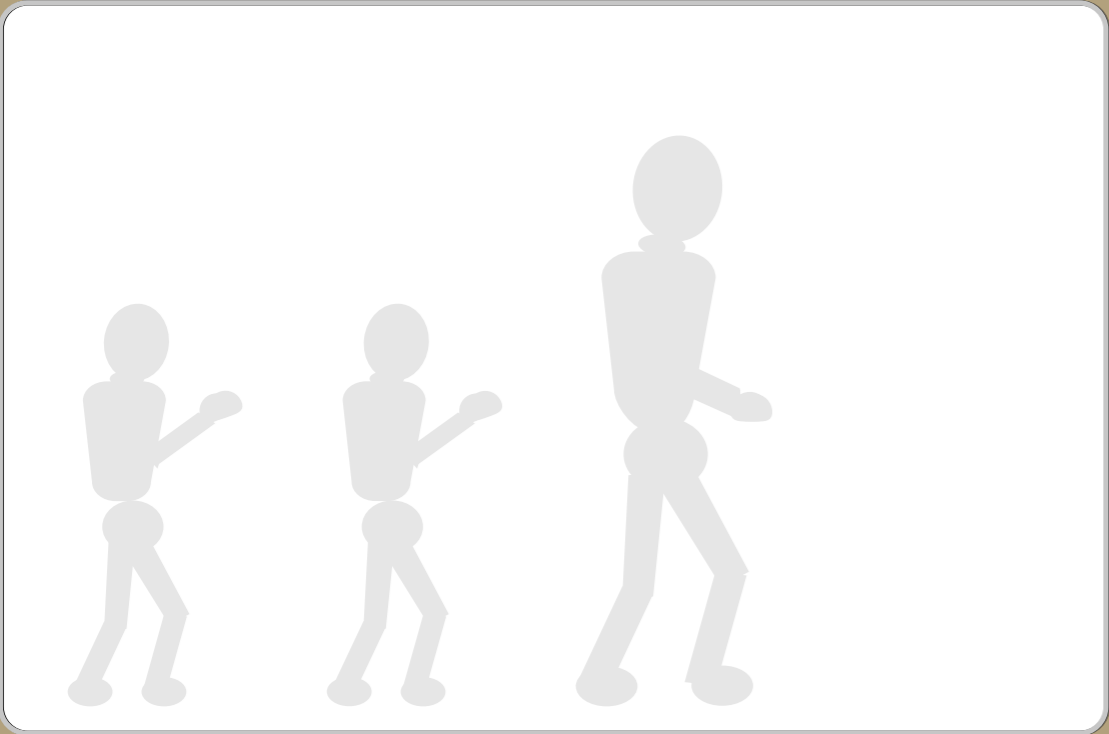
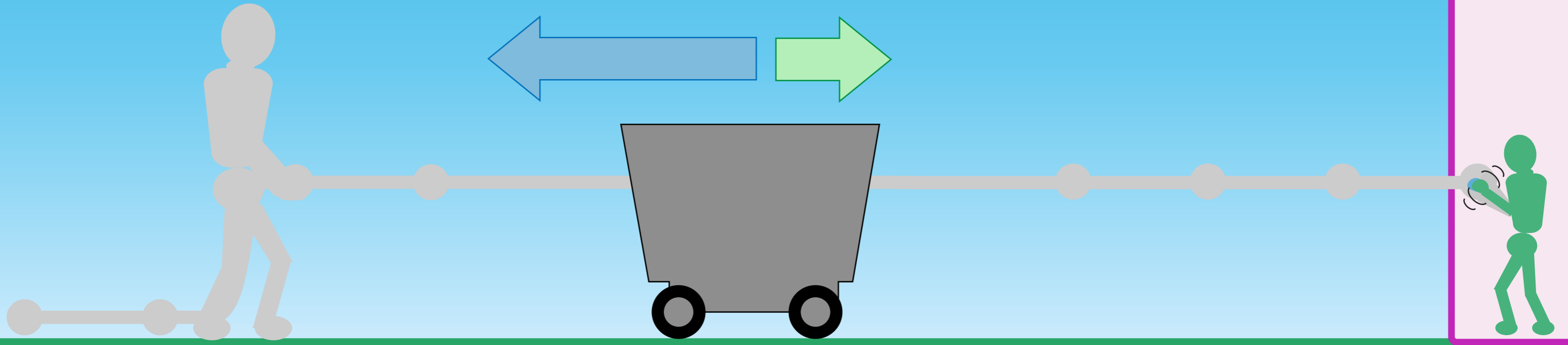


- Action** Enter key
- Outcome** Person is placed at 8 feet. Sim goes back to "Browse mode. Focus box appears at the person.
- Non-visual feedback** "strong person now at 8 feet mark on rope."

Show:

- Sum of Forces
- Number Values

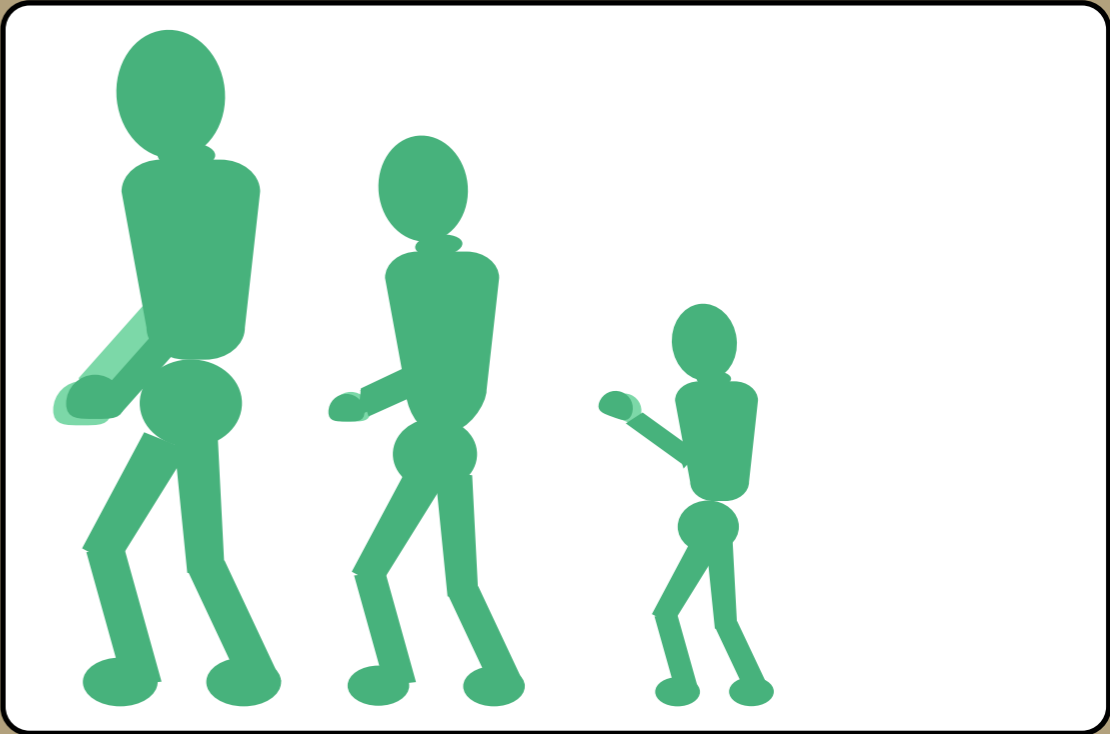
 [Keyboard instructions](#)



Go!

Reset 

New Game

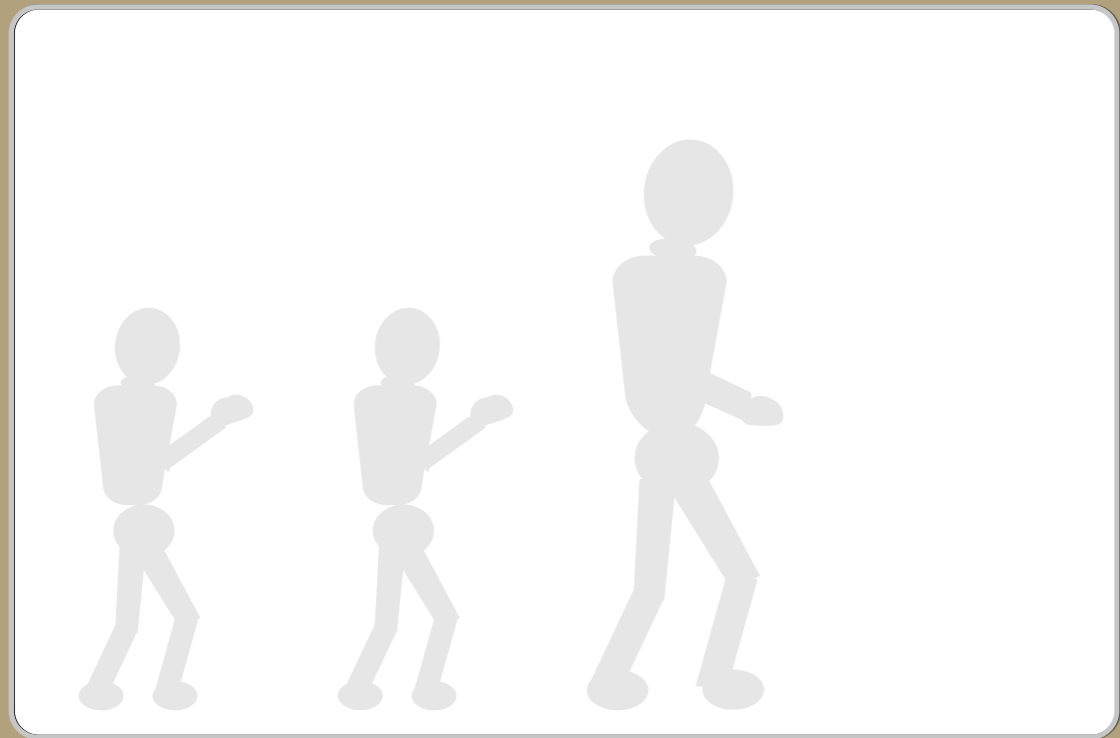
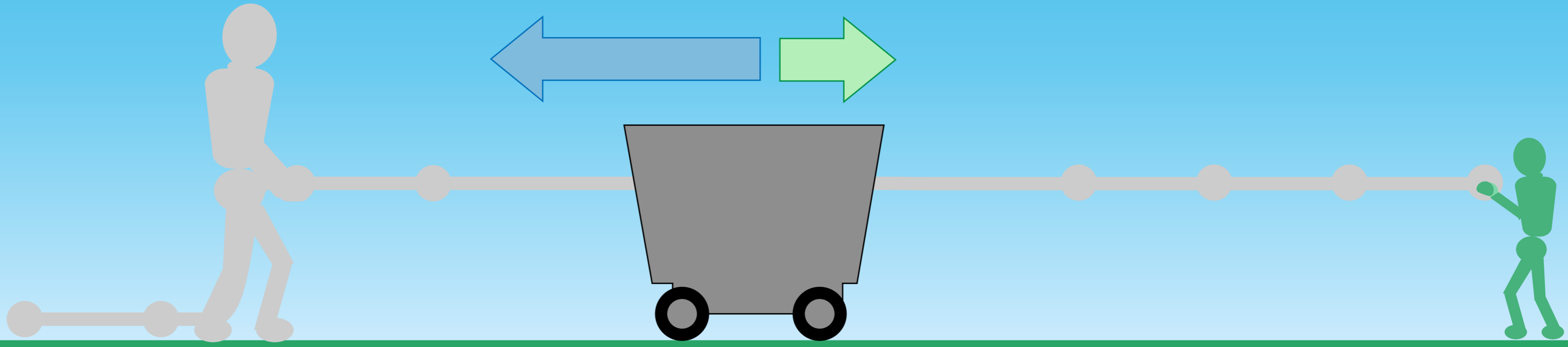


- Action** Down arrow
- Outcome** Focus box appears above the next person (the other small person)
- Non-visual feedback** "Right group: other strong person."

Show:

- Sum of Forces
- Number Values

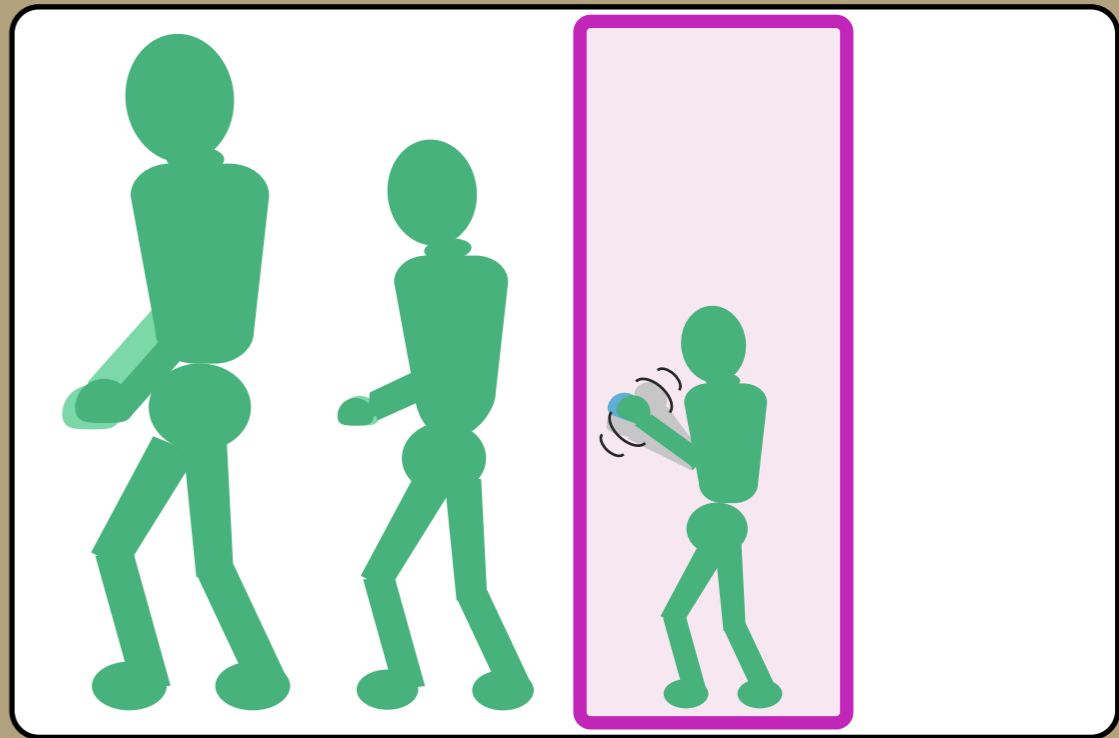
[Keyboard instructions](#)



Go!

Reset

New Game




- Action** Enter key.
- Outcome** User selects small person. Sim goes into "Move mode". Person moves to 6 feet position.
- Non-visual feedback** "Selected other strong person. 6 feet mark on rope. Place other strong person here?"
- Notes** If right arrow is pressed again there should be a beep and a message conveyed: "*beep* 8 feet mark occupied. Now at 6 feet mark on rope. Place other strong person here?"

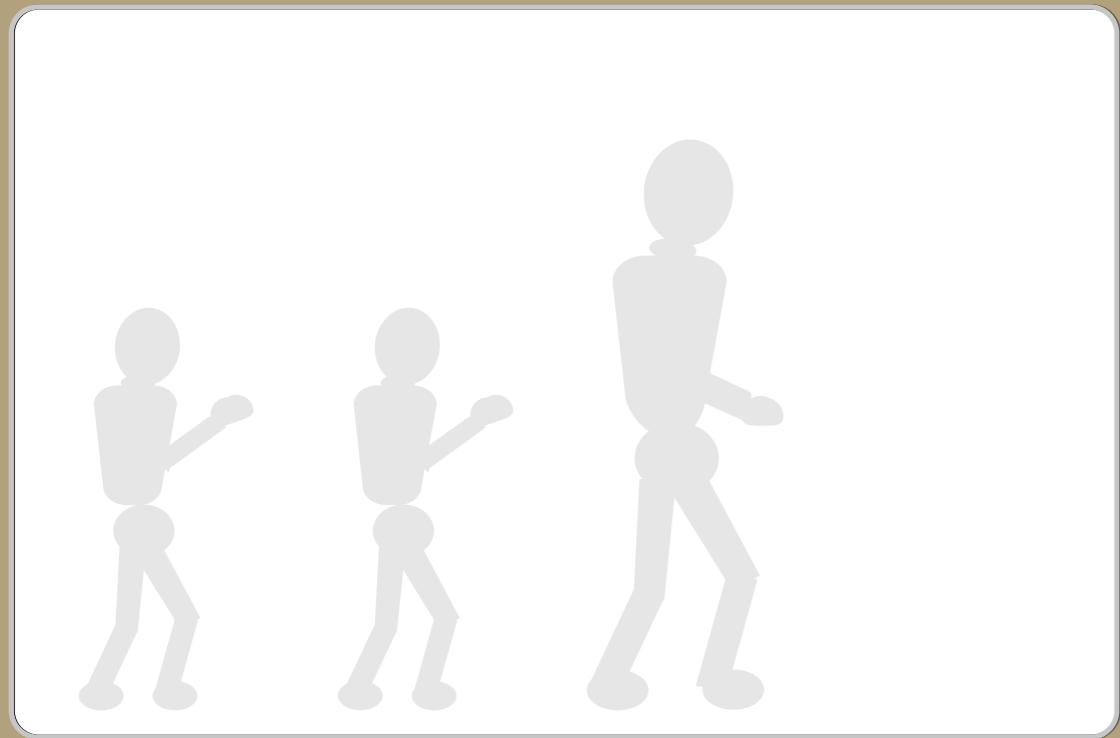
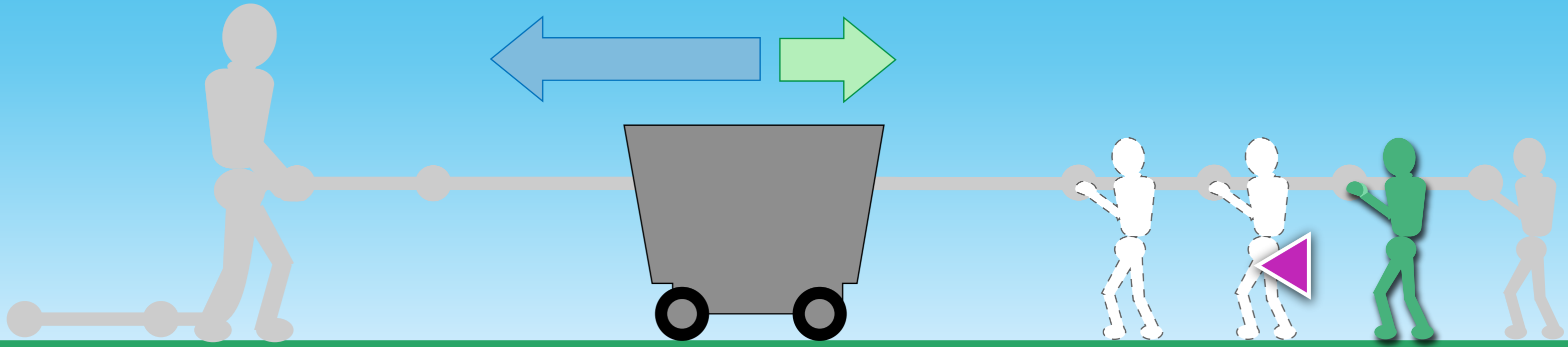
Show:

Sum of Forces

Number Values



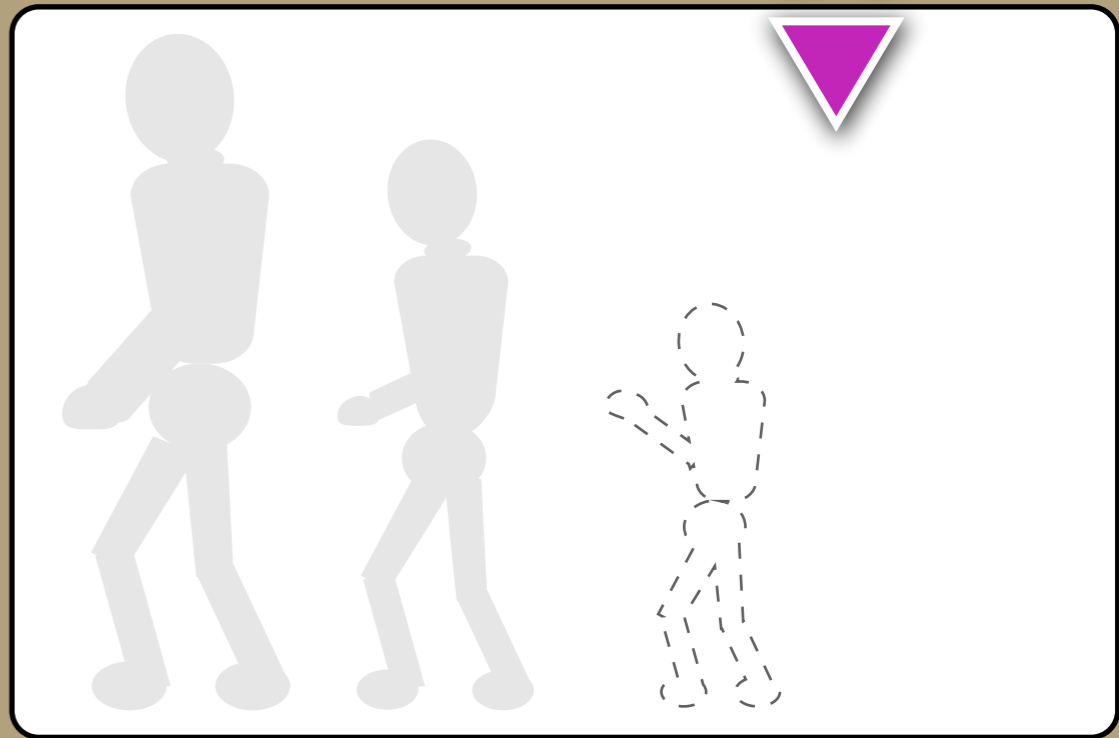
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Left arrow.



Outcome person moves left to 4 feet position.

Non-visual feedback "4 feet mark on rope. Place other strong person here?"

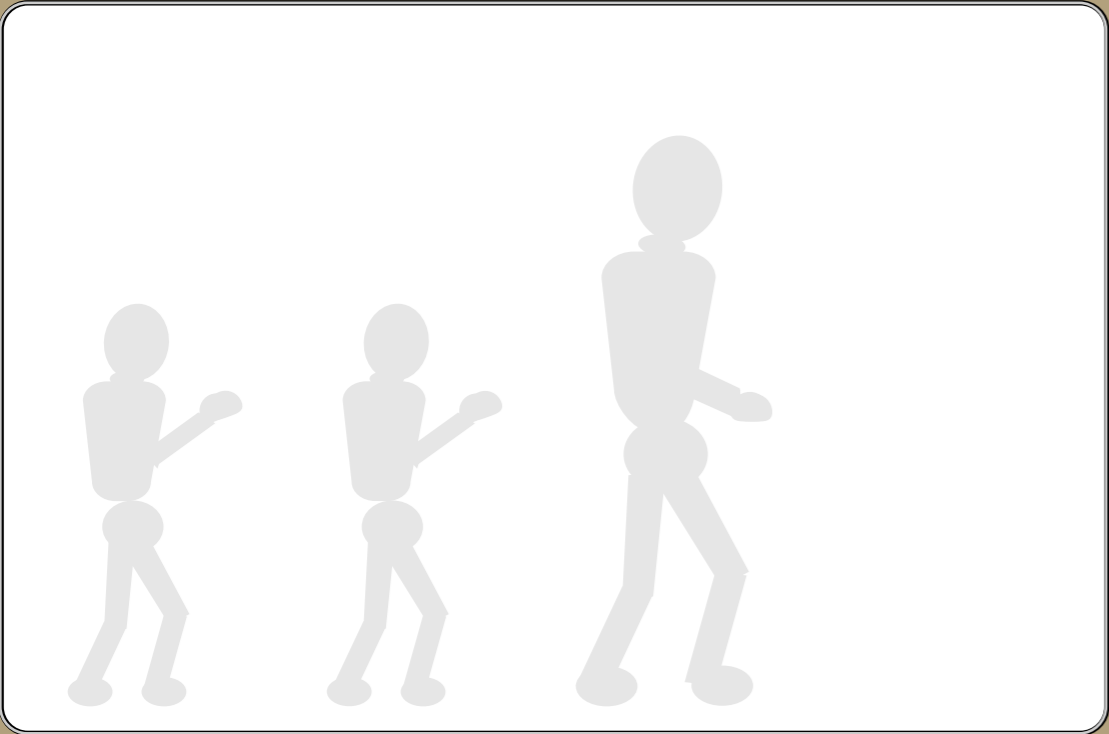
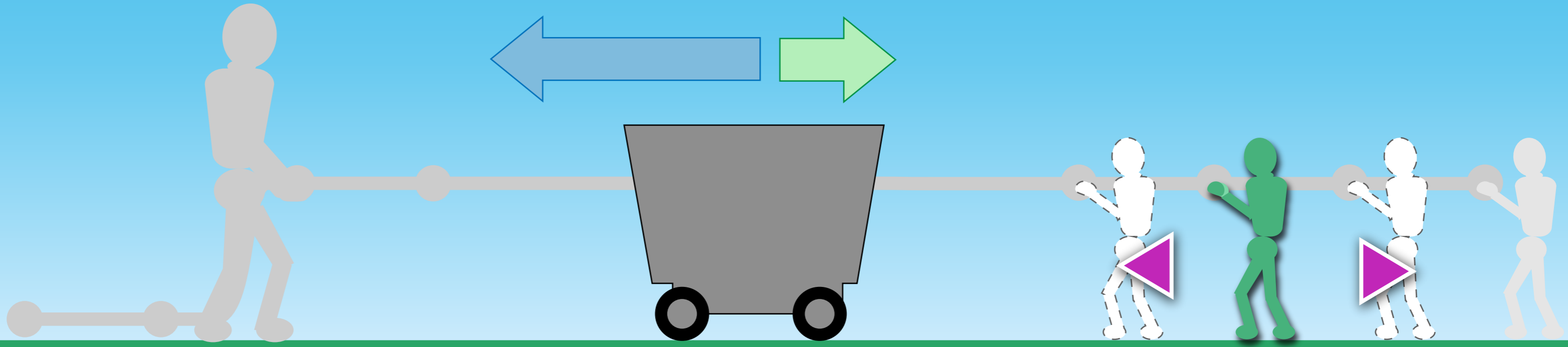
Show:

Sum of Forces

Number Values

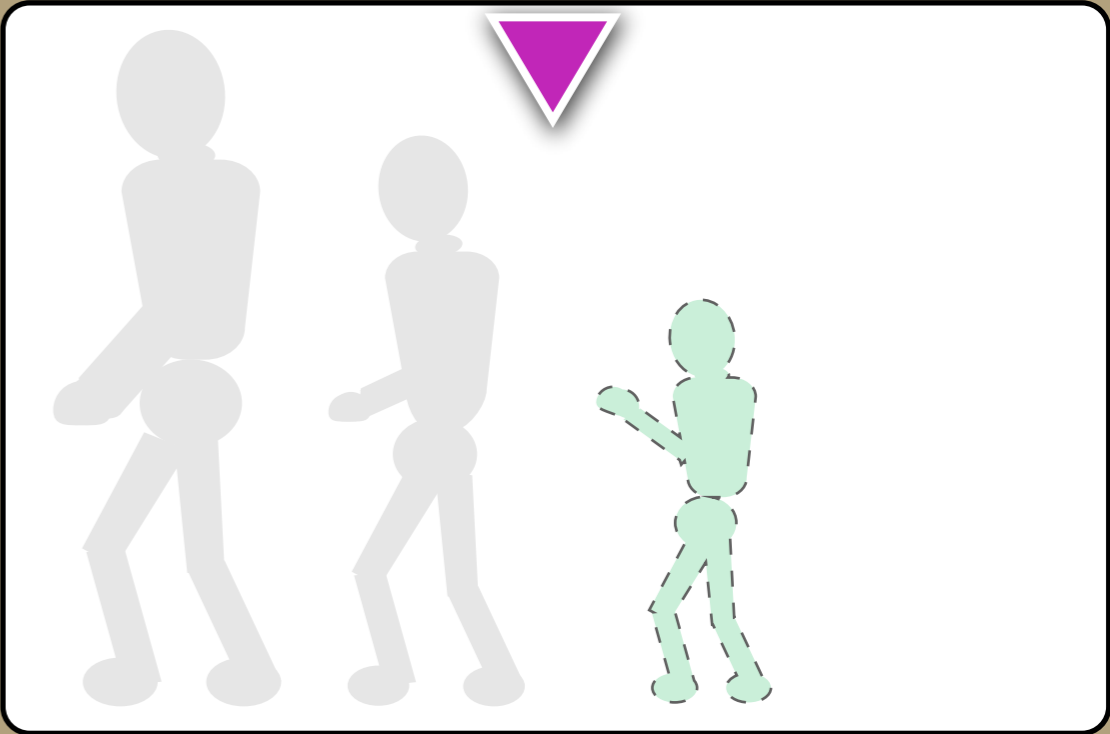
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Enter key.

Outcome person is placed at 4 feet. Sim goes back to "Browse mode". Focus box appears at the person.

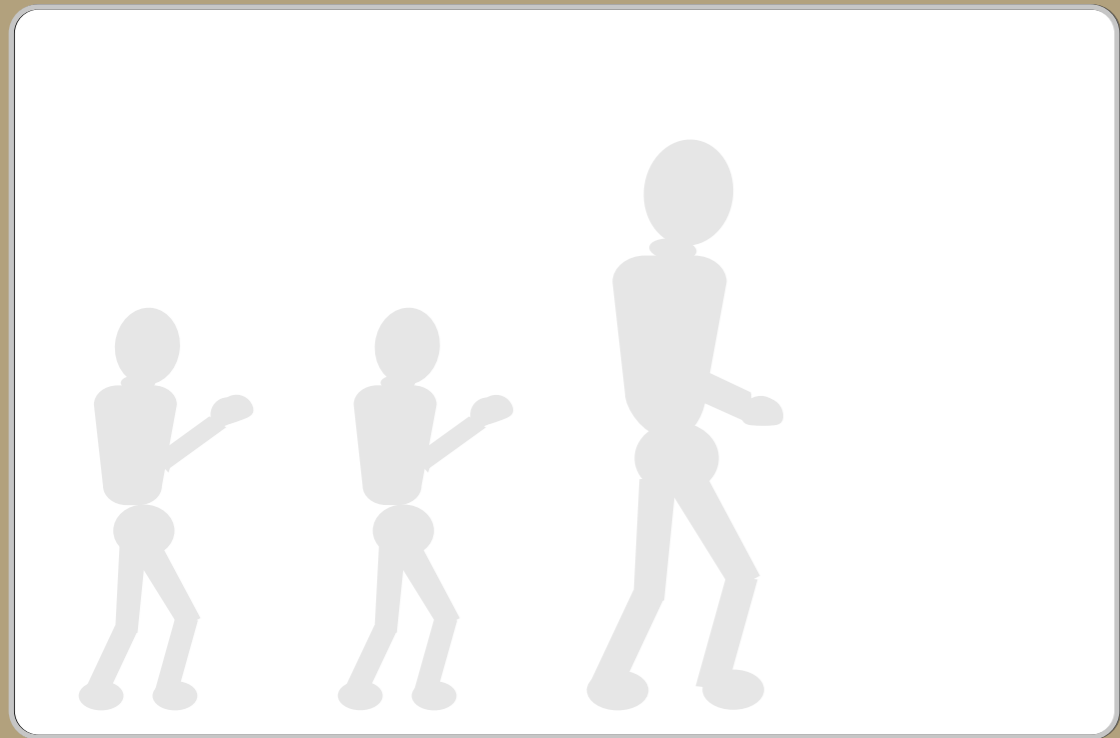
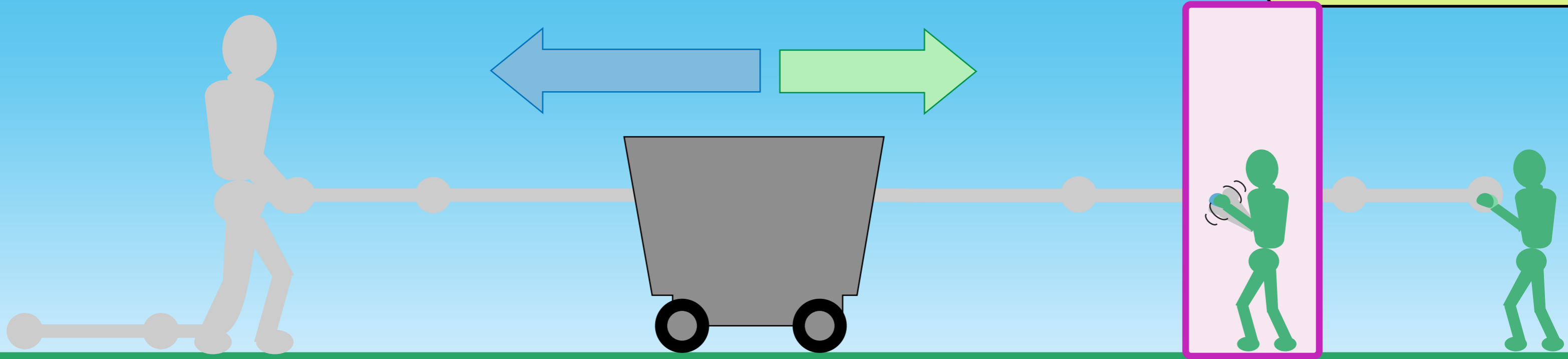
Non-visual feedback "Other strong person now at 4 feet mark on rope."

Show:

Sum of Forces

Number Values

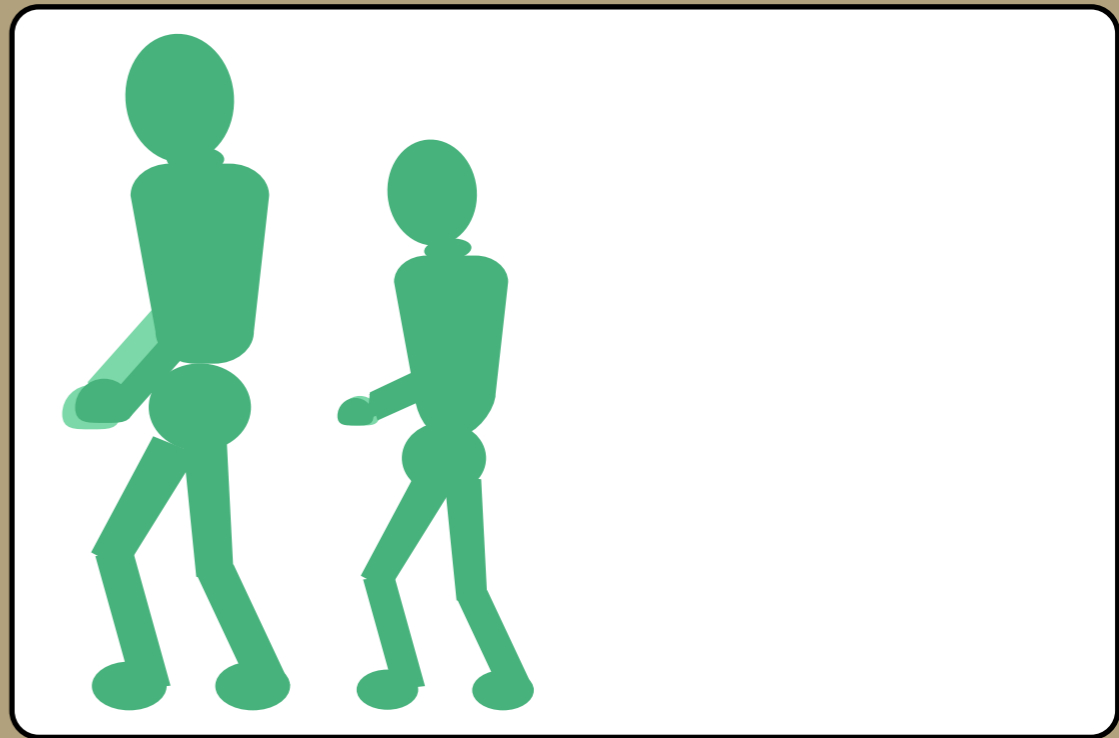
[Keyboard instructions](#)



Go!

Reset

New Game



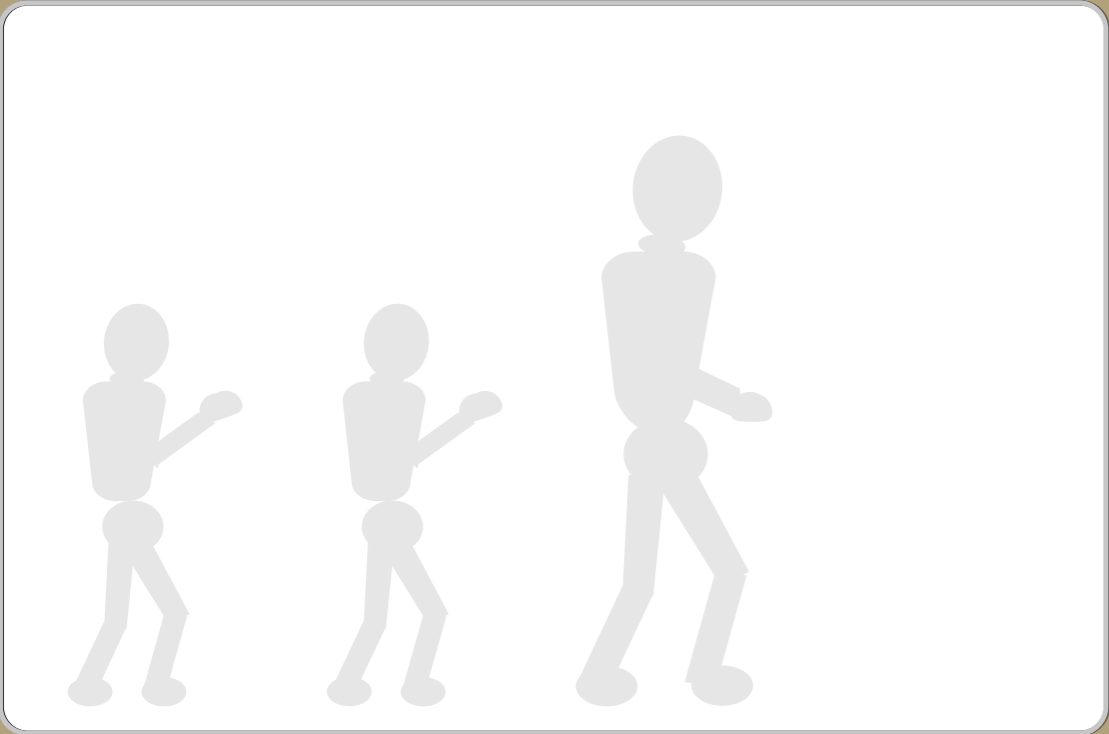
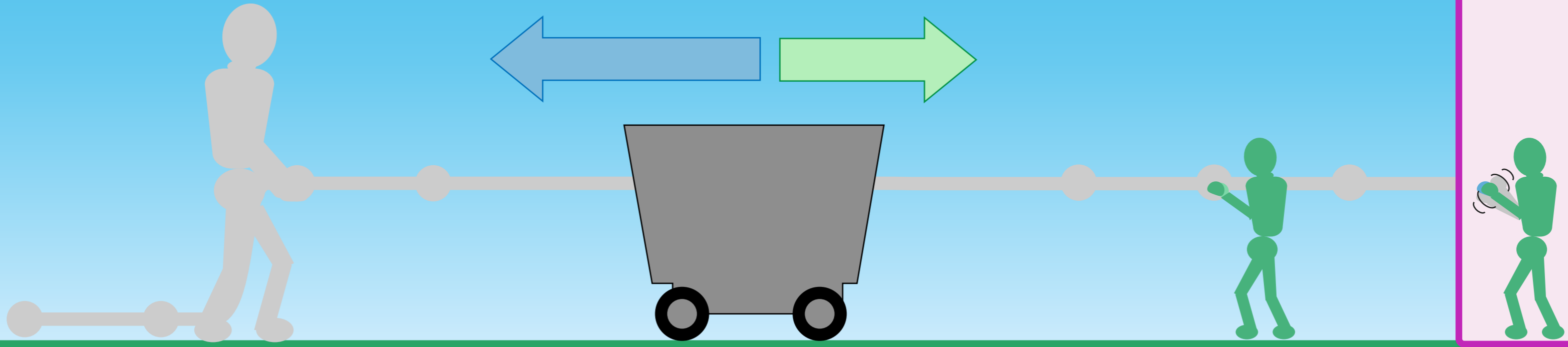
- Action** Right arrow.
- Outcome** Focus box appears at person at 4 feet.
- Non-visual feedback** "Rope: 8 feet. Strong person."
- Notes** When in browse mode, the Focus box will move from person to person on the rope, skipping over vacant spots.

Show:

Sum of Forces

Number Values

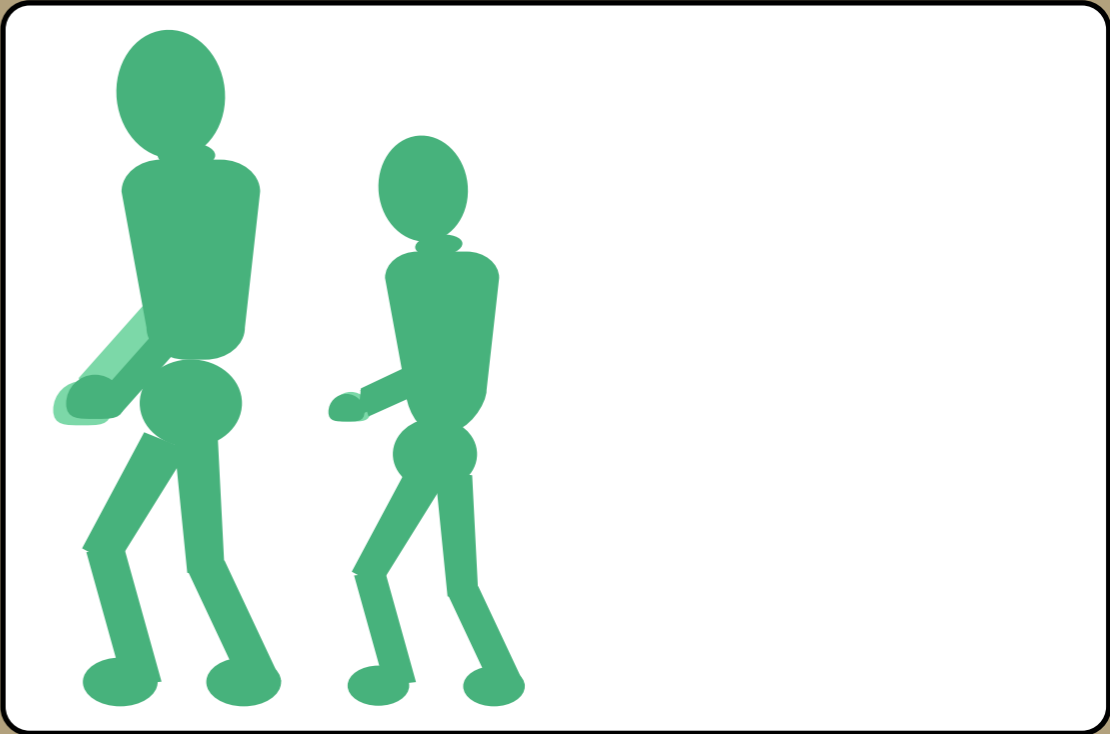
[Keyboard instructions](#)



Go!

Reset

New Game



Action Enter key.



Outcome Sim goes into "Move mode".

Non-visual feedback "Selected strong person."

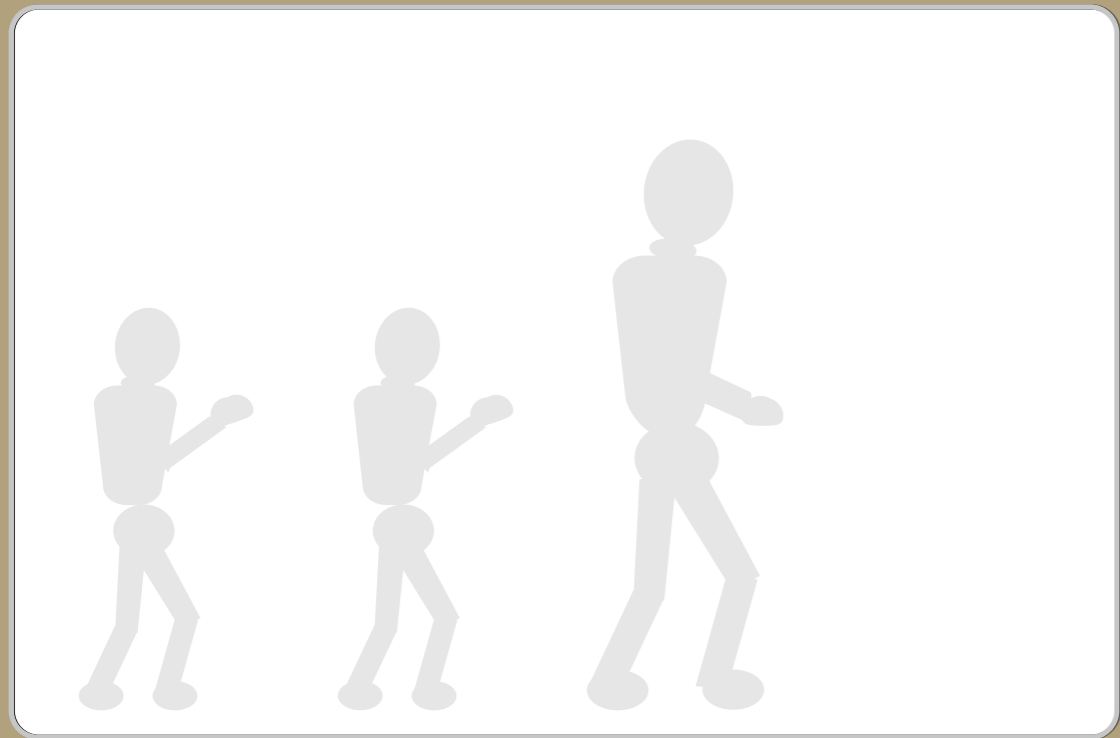
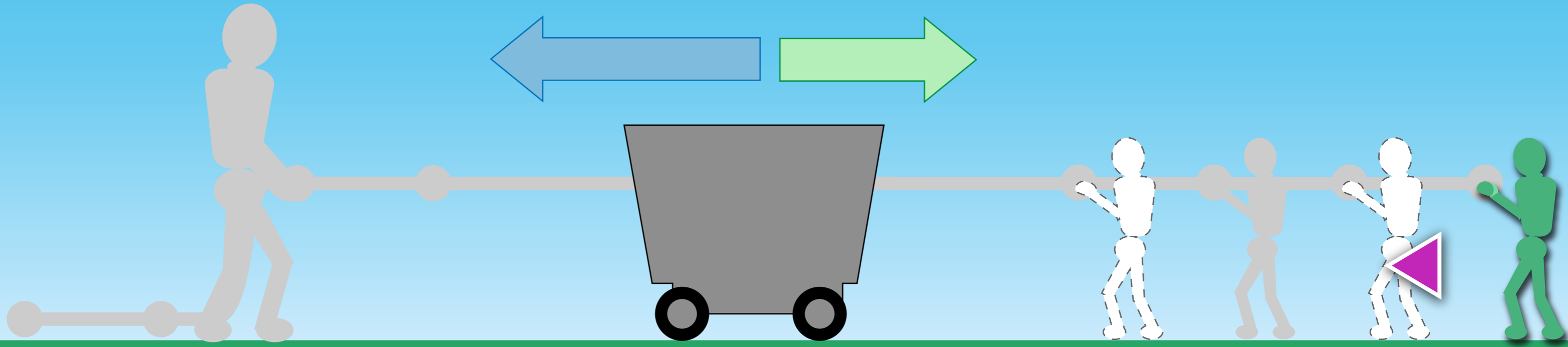
Show:

Sum of Forces

Number Values

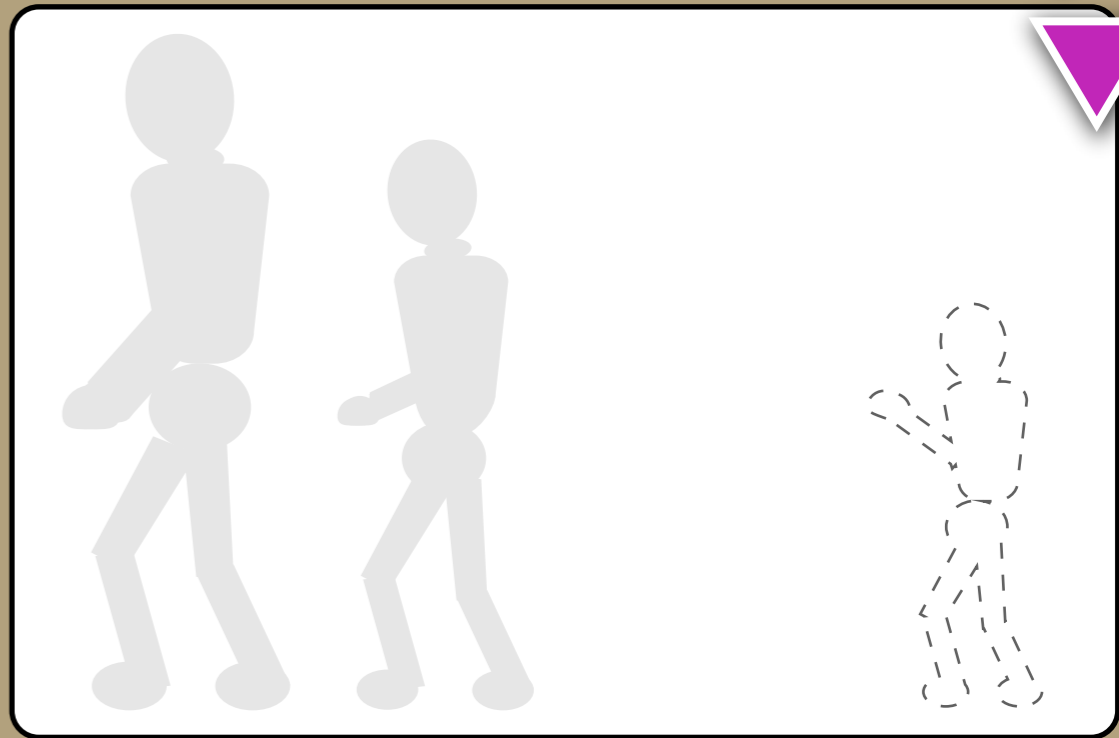
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Left arrow.



Outcome Person moves left.

Non-visual feedback "Place strong person at 6 feet mark on rope."

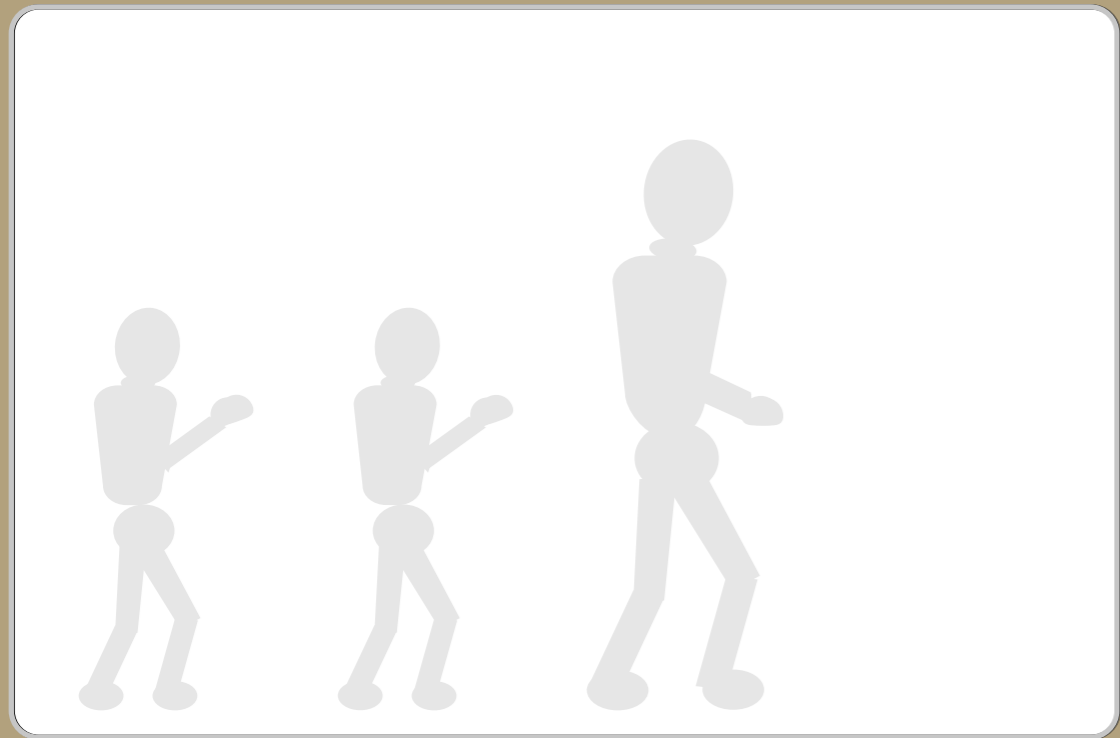
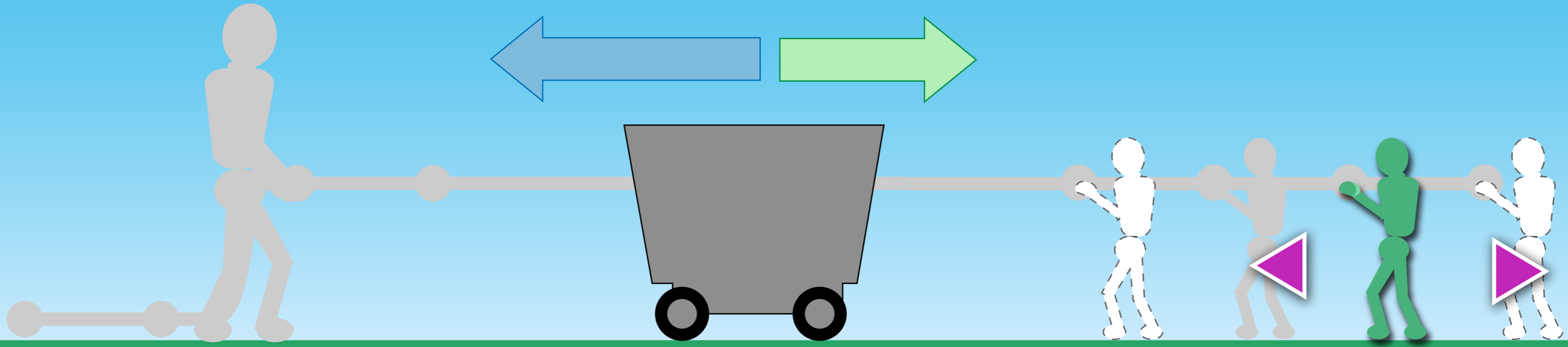
Show:

Sum of Forces

Number Values

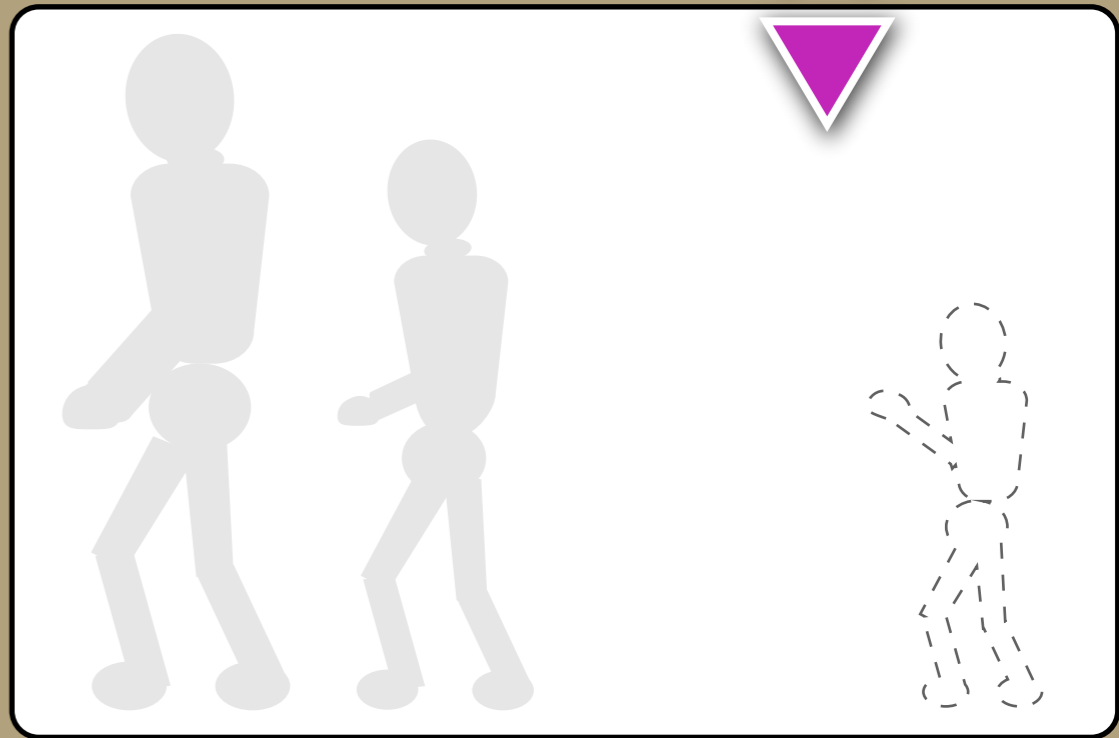
[Keyboard instructions](#)



Go!

Reset 

New Game




- Action** Left arrow.
- Outcome** person moves left 2 spots (skips over occupied space)
- Non-visual feedback** "4 feet mark occupied. Now at 2 feet mark on rope. Place strong person here?"
- Notes** If left arrow is pressed again there should be a beep and a message conveyed: "*beep* 2 feet mark on rope. Place other strong person here?"

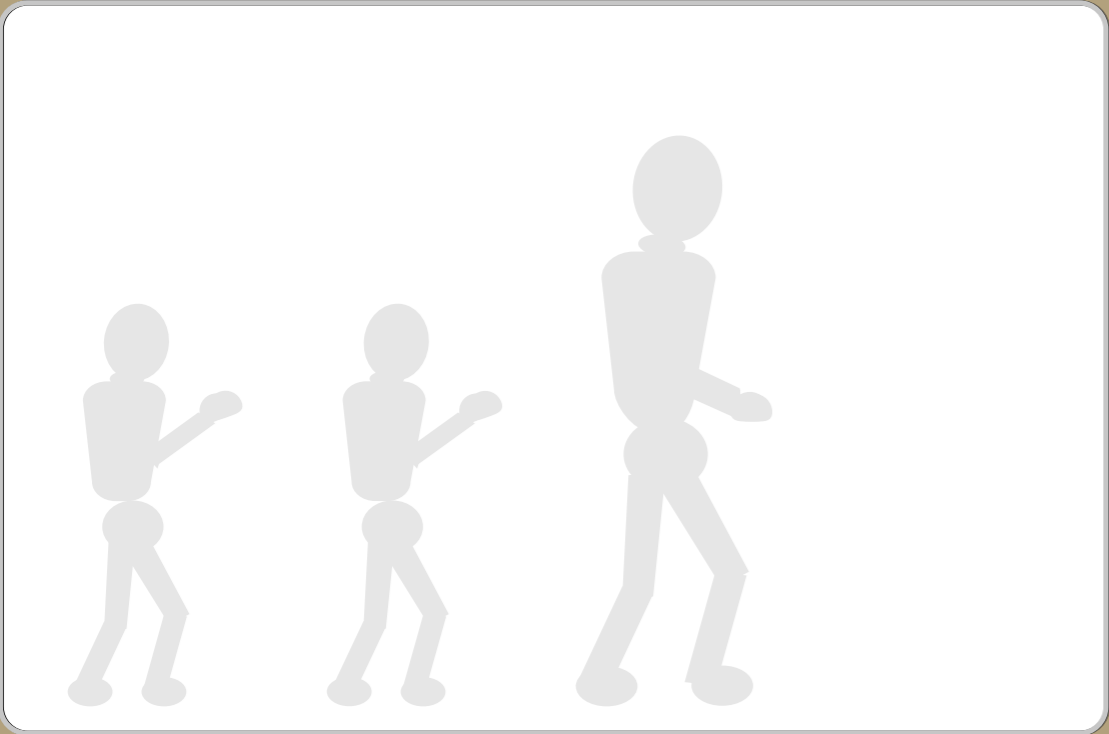
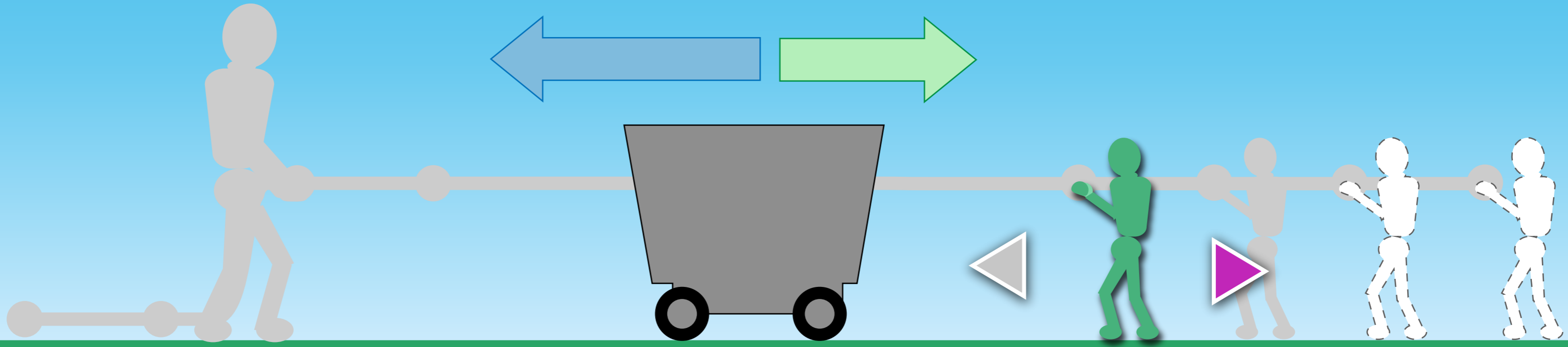
Show:

Sum of Forces

Number Values



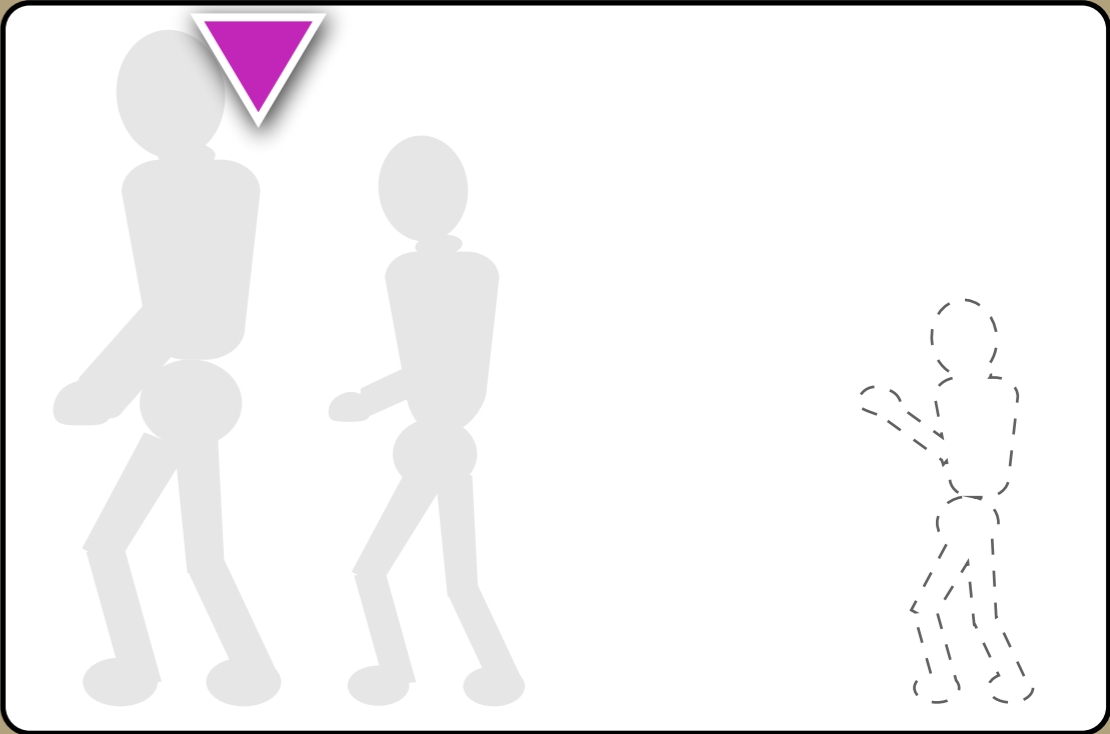
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Enter key.



Outcome person placed at 2 feet mark.

Non-visual feedback "Strong person now at 2 feet mark on rope."

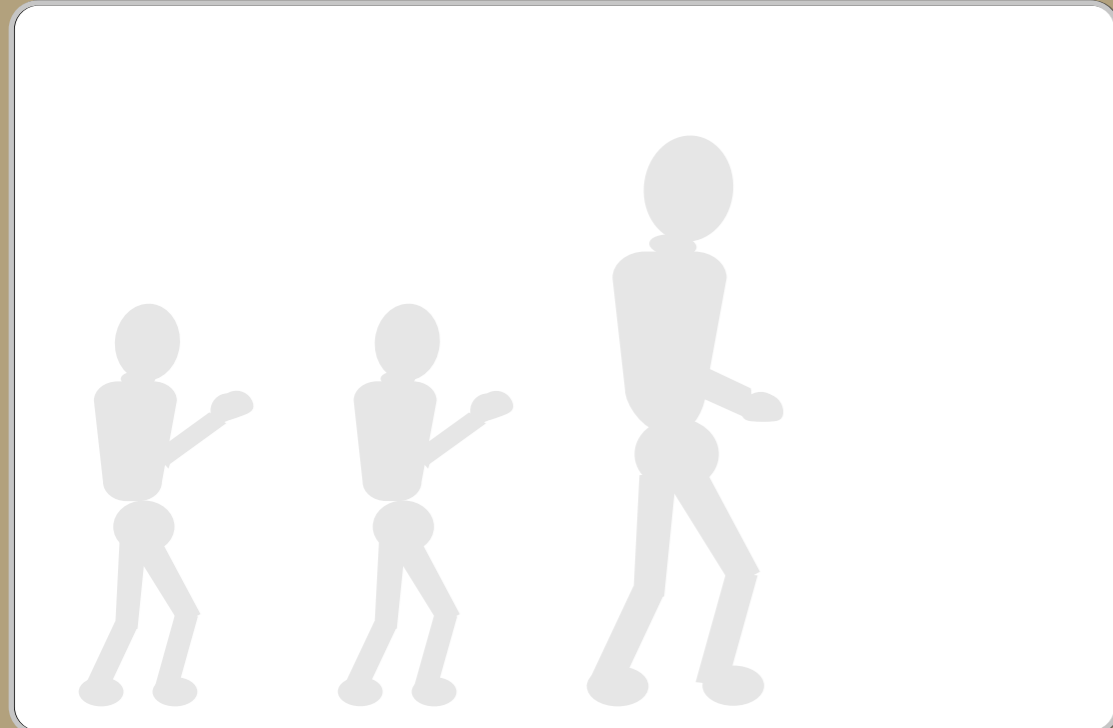
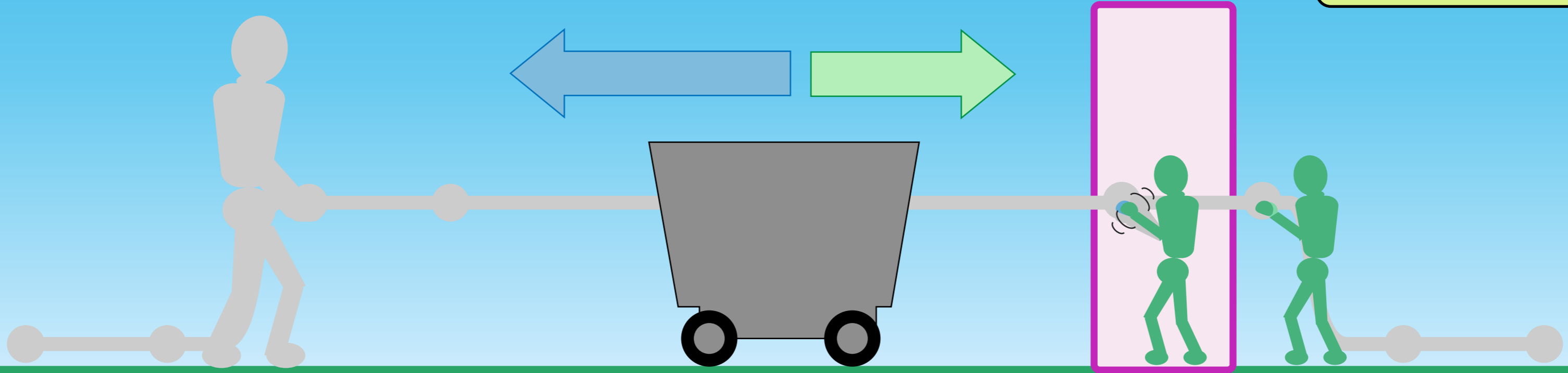
Show:

Sum of Forces

Number Values

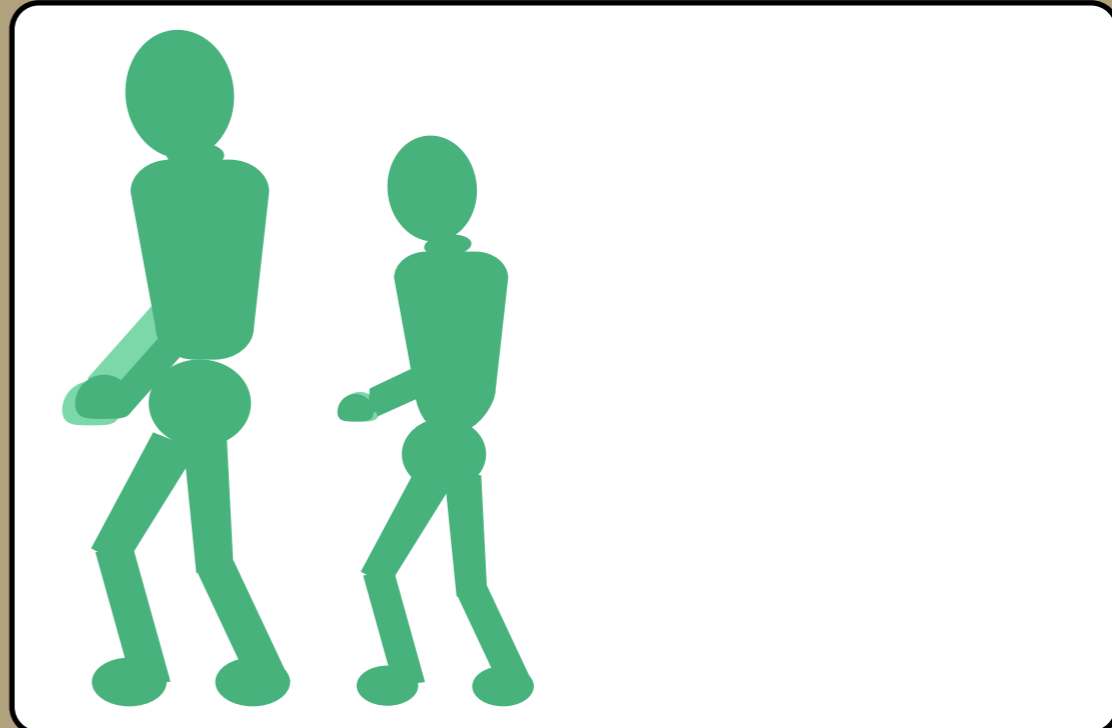
[Keyboard instructions](#)



Go!

Reset 



New Game



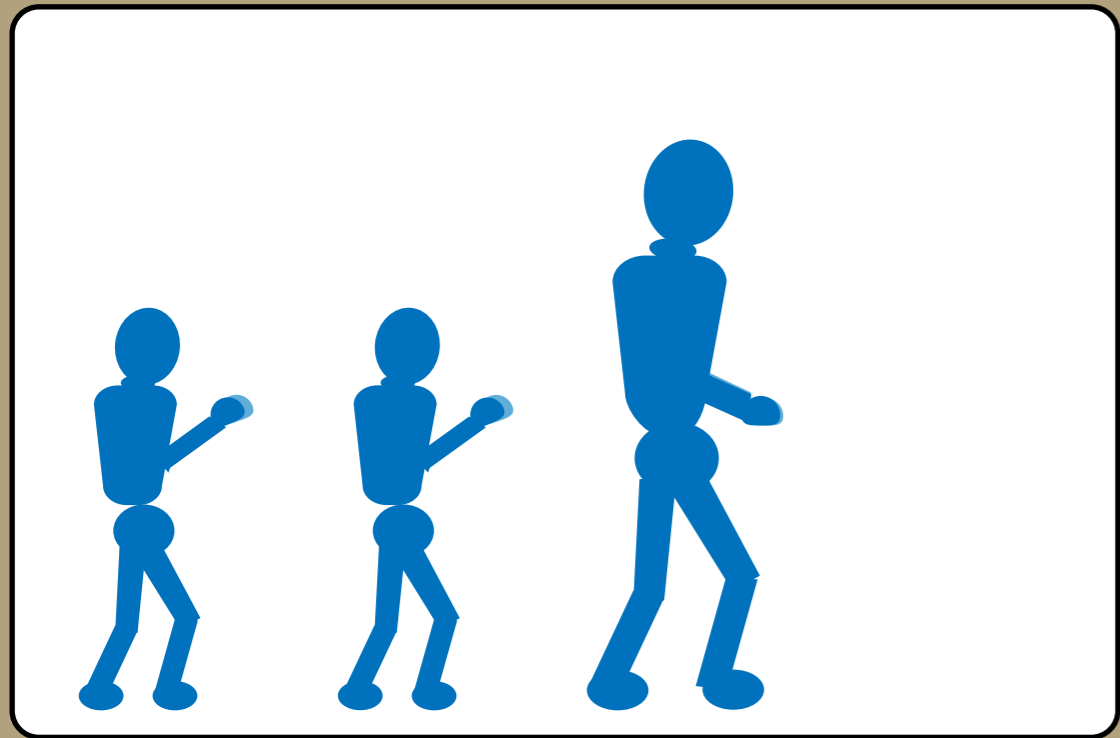
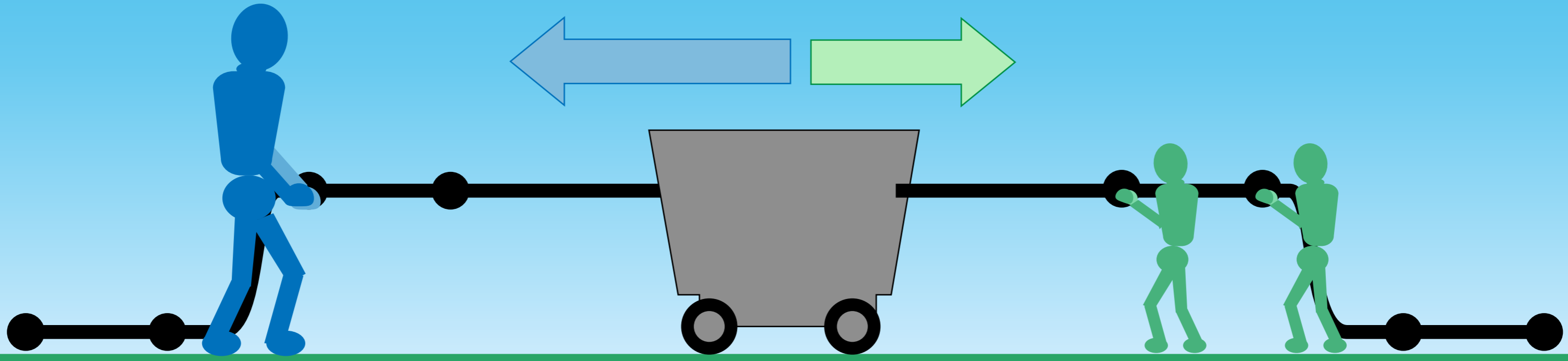
- Action** Tab key.
- Outcome** Focus box moves to GO button
- Non-visual feedback** "Go button"

Show:

- Sum of Forces
- Number Values

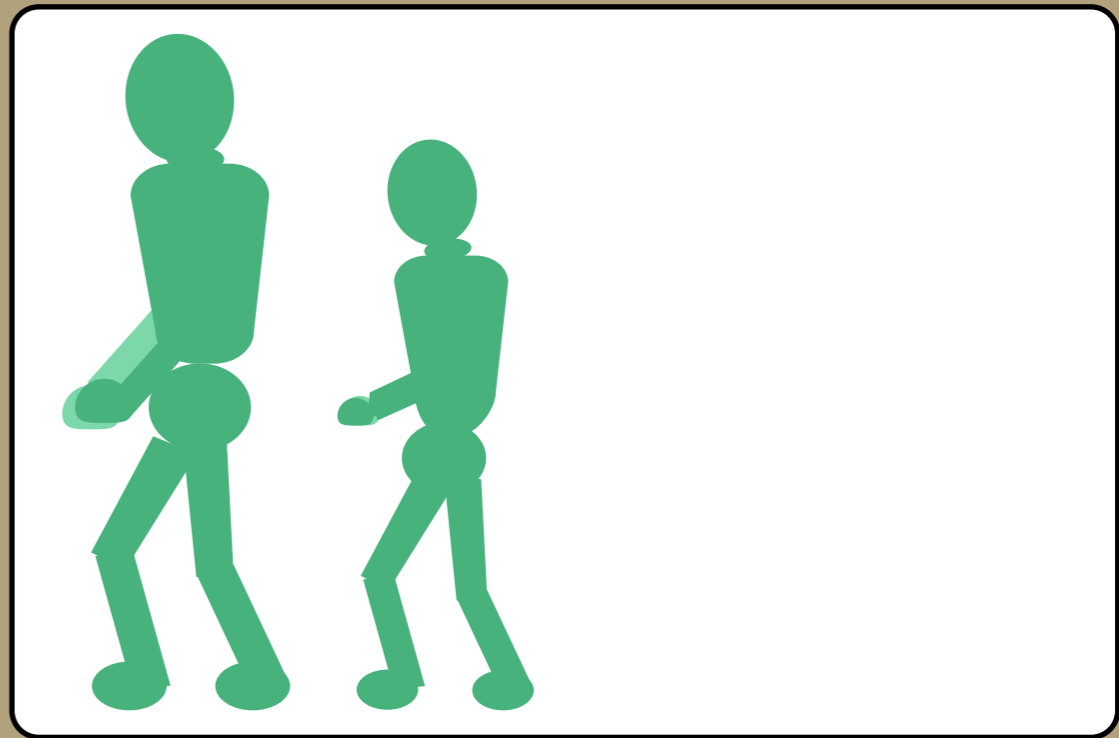
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Shift-Tab key.

Outcome Focus box moves to right group.



Non-visual feedback "Right group: Two people are holding the right rope, and two other people are not."

Notes Non-visual feedback changed to match the current state of the pullers and rope.

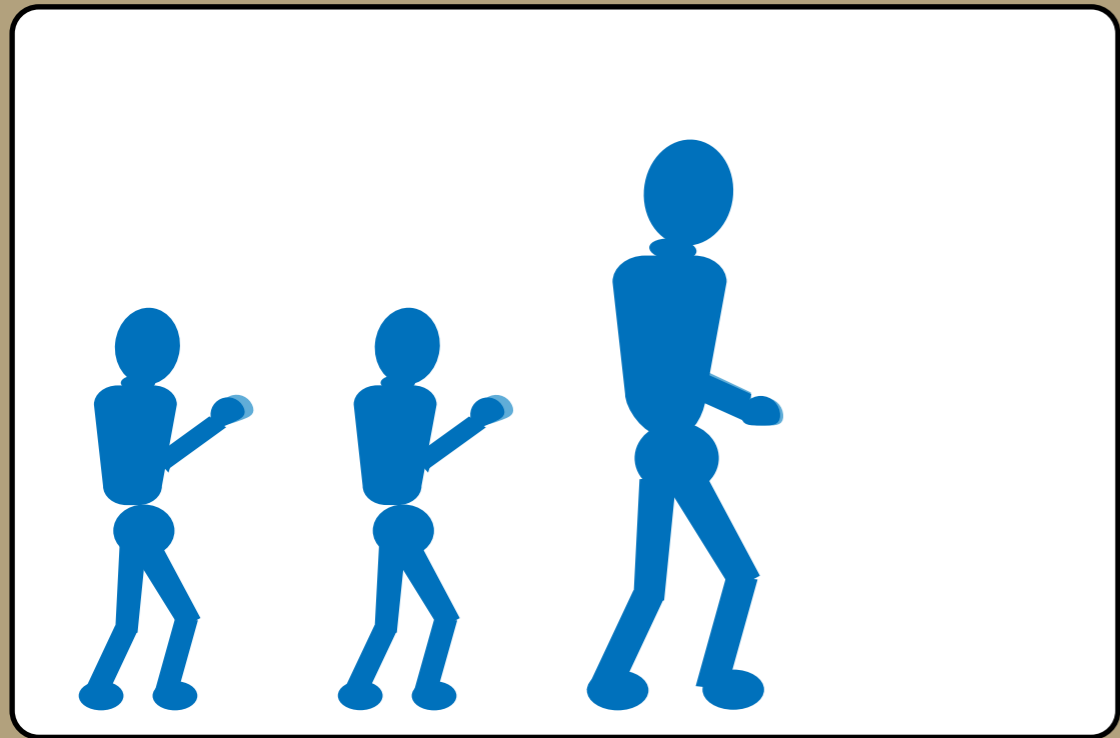
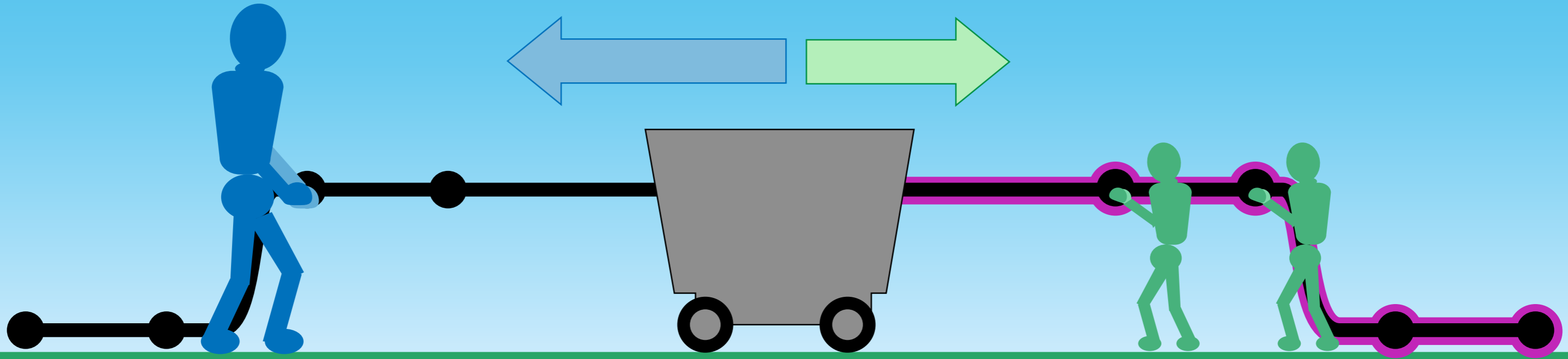
Show:

Sum of Forces

Number Values

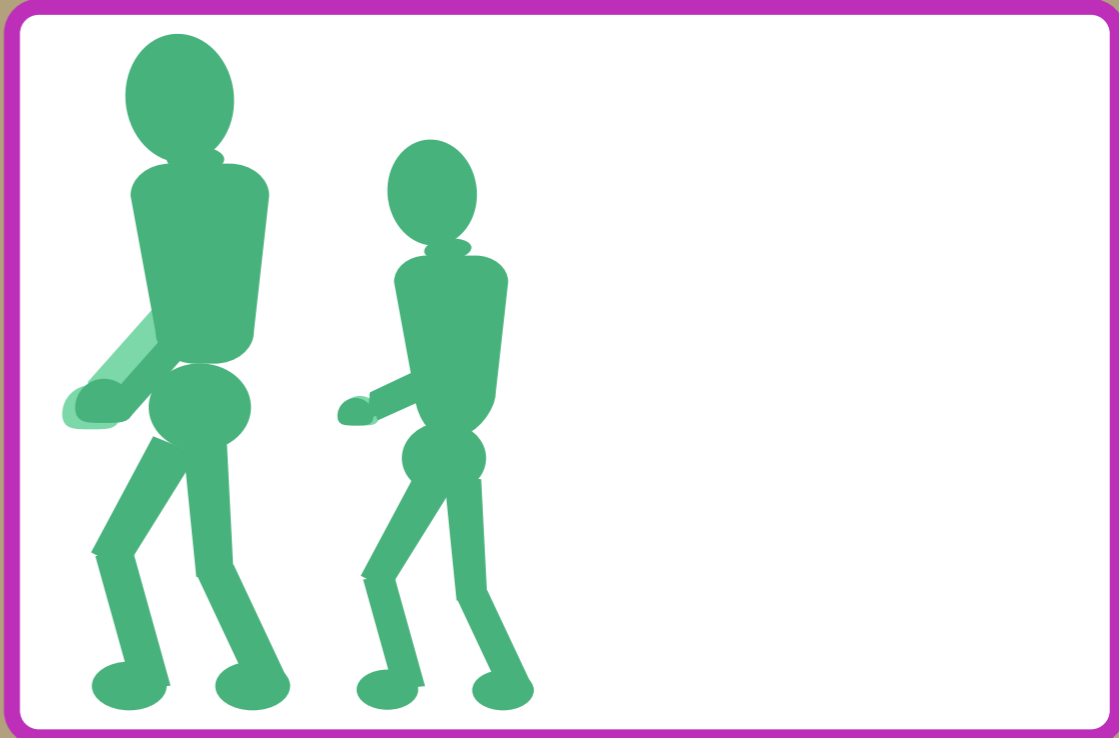
[Keyboard instructions](#)



Go!

Reset 

New Game



Action Enter key.



Outcome Focus box appears on the person on the rope furthest from the cart - in this case it is the person at 4 feet.

Non-visual feedback "Right group rope. 4 feet. The other strong person."

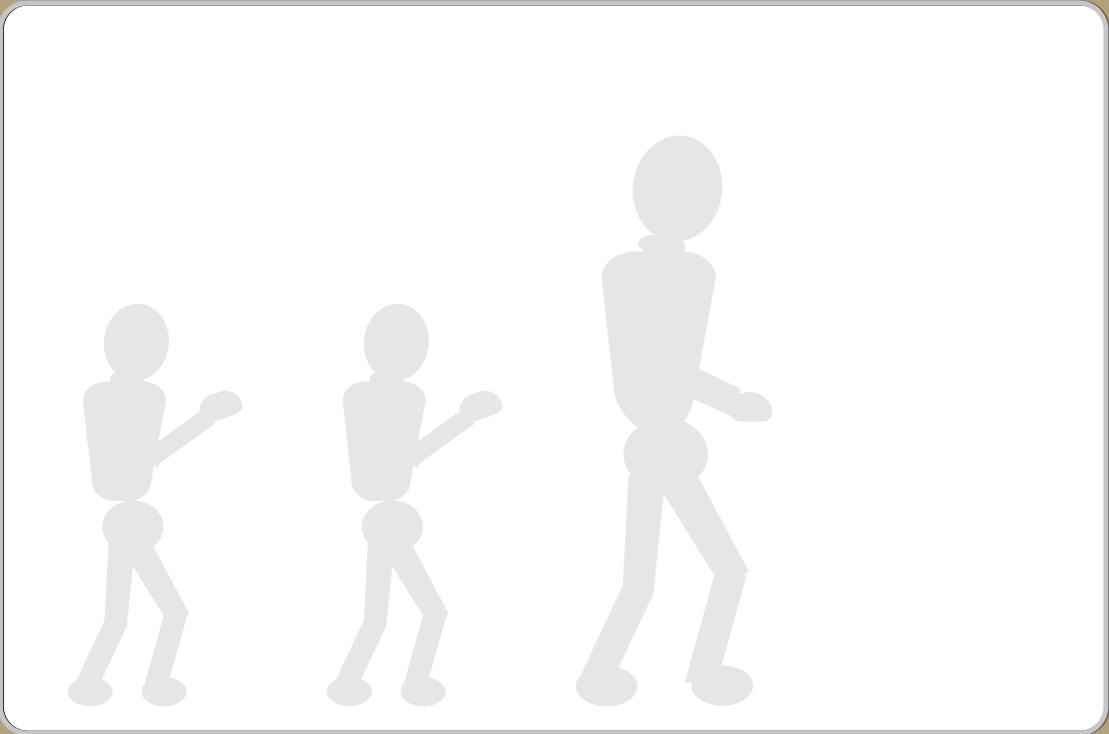
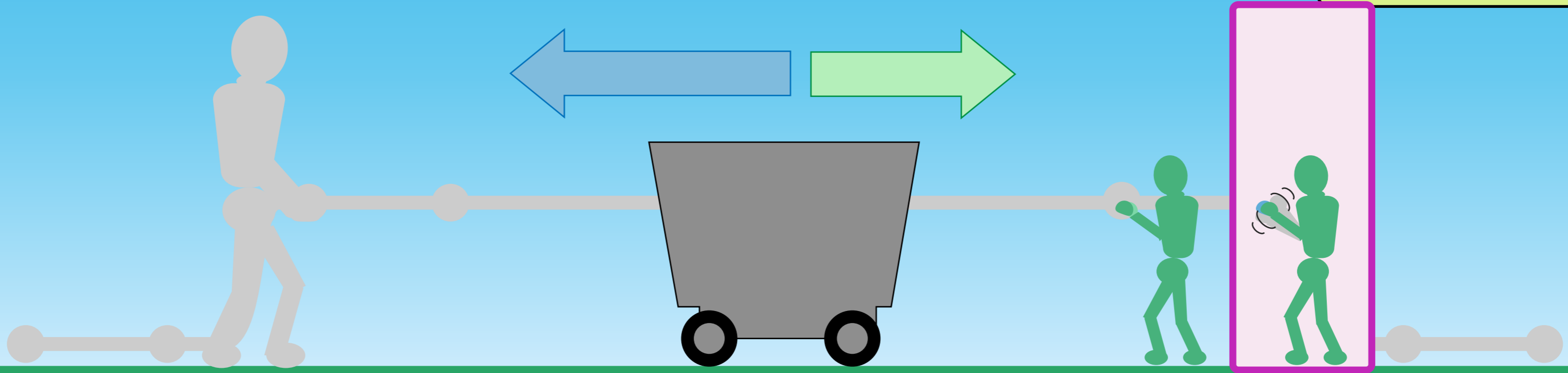
Show:

Sum of Forces

Number Values

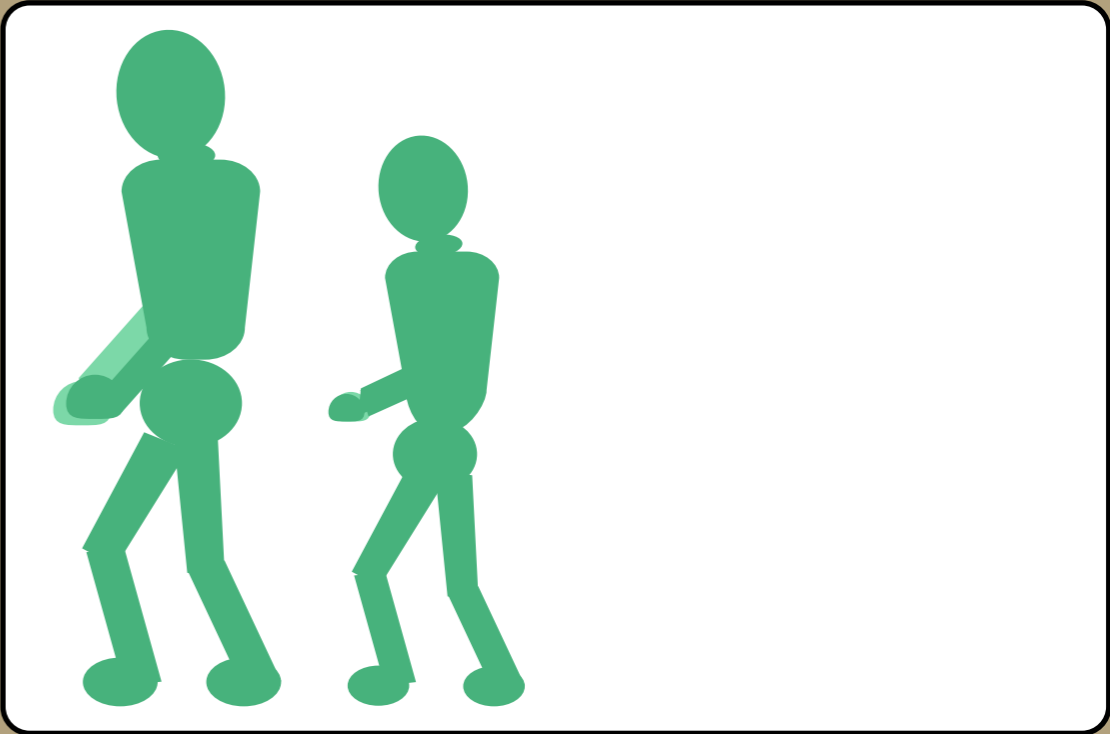
[Keyboard instructions](#)



Go!

Reset 

New Game

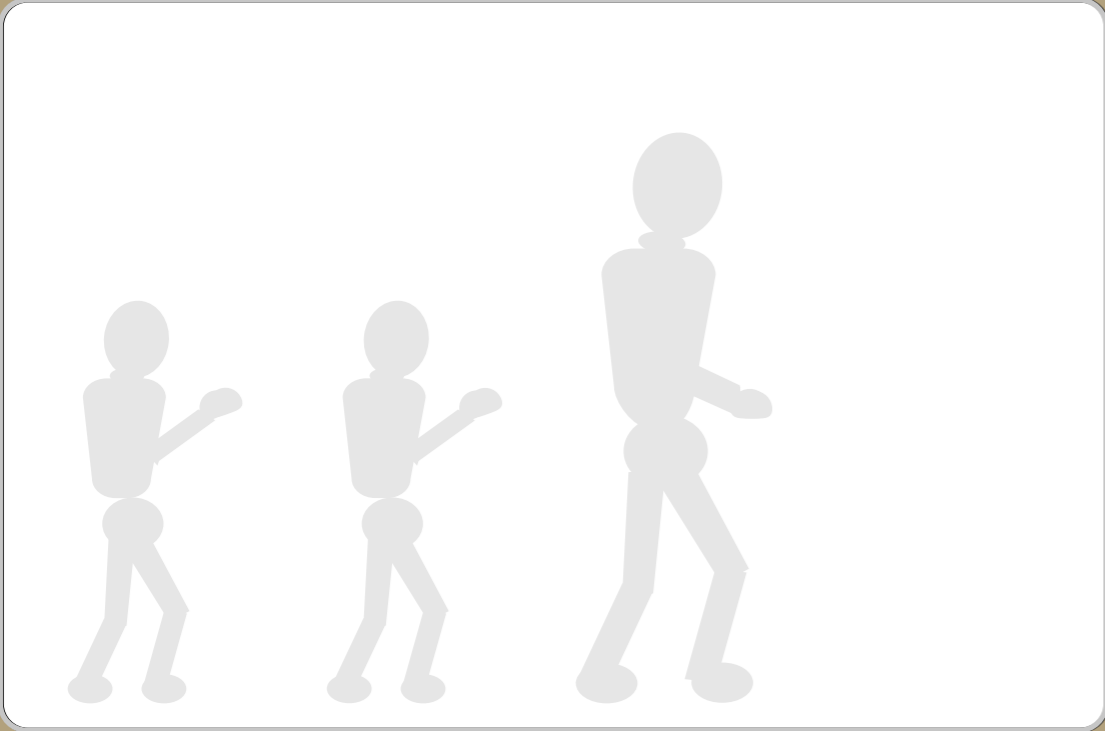
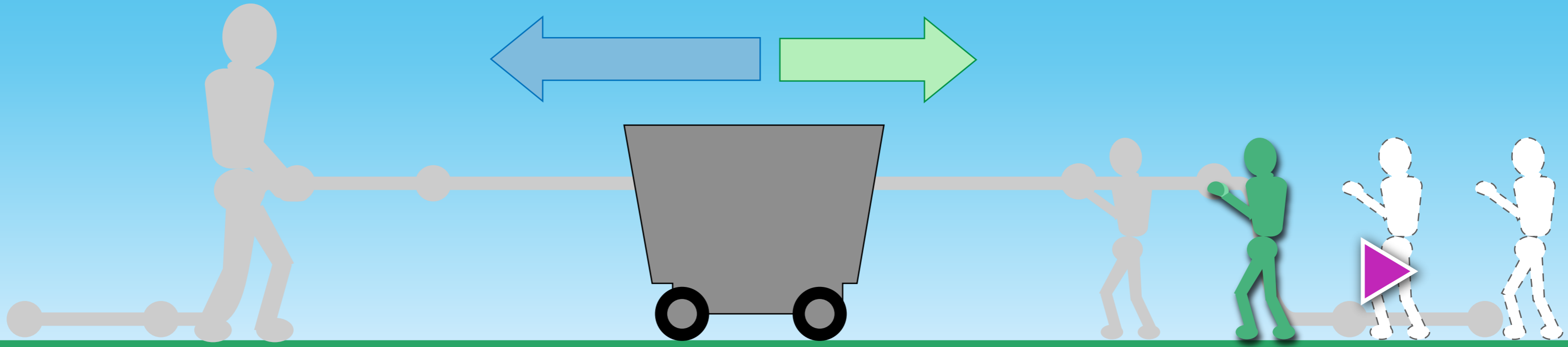


- Action** Enter key.
- Outcome** Sim goes into "move mode".
- Non-visual feedback** "Selected the other strong person."

Show:

- Sum of Forces
- Number Values

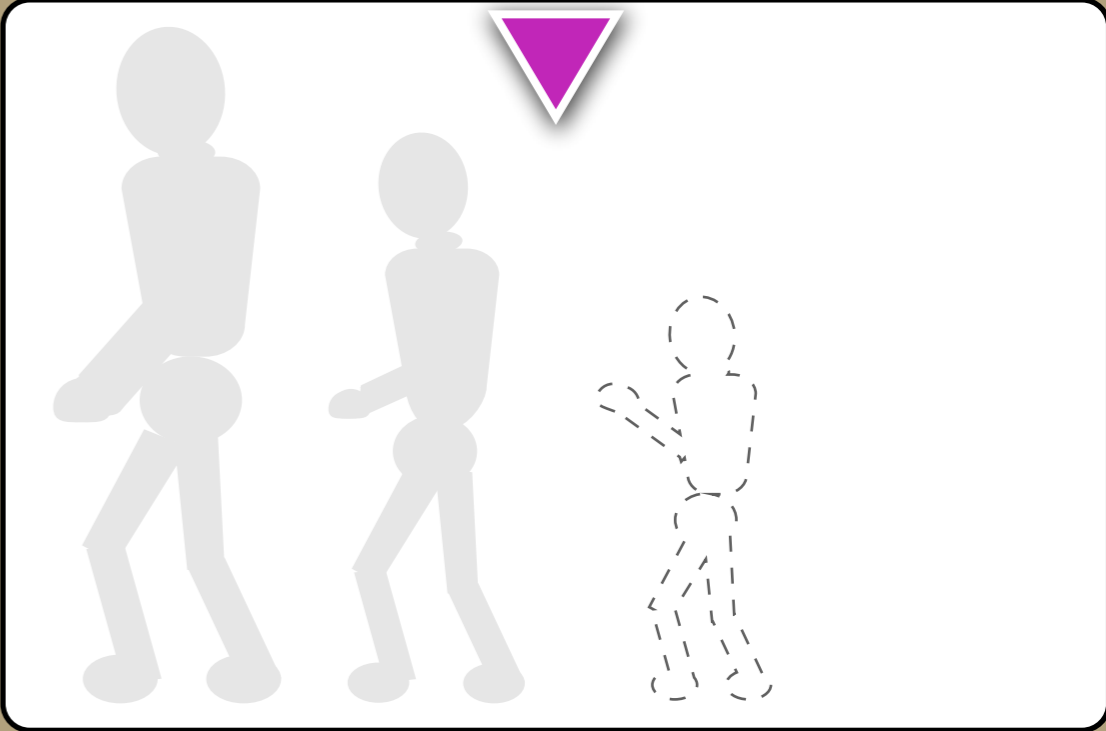
[Keyboard instructions](#)



Go!

Reset 

New Game




- Action** Down arrow.
- Outcome** person moves back to the group.
- Non-visual feedback** "Off the rope. Place the other strong person here?"
- Notes** If an invalid move is attempted, there would be a beep and a message.

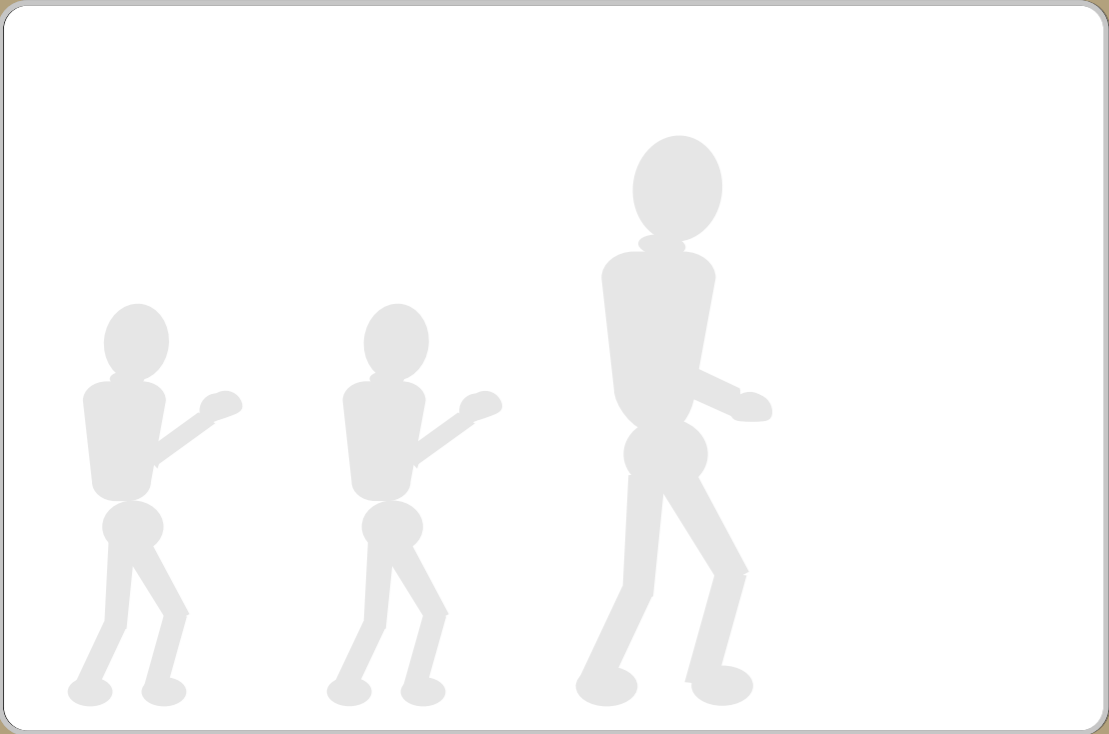
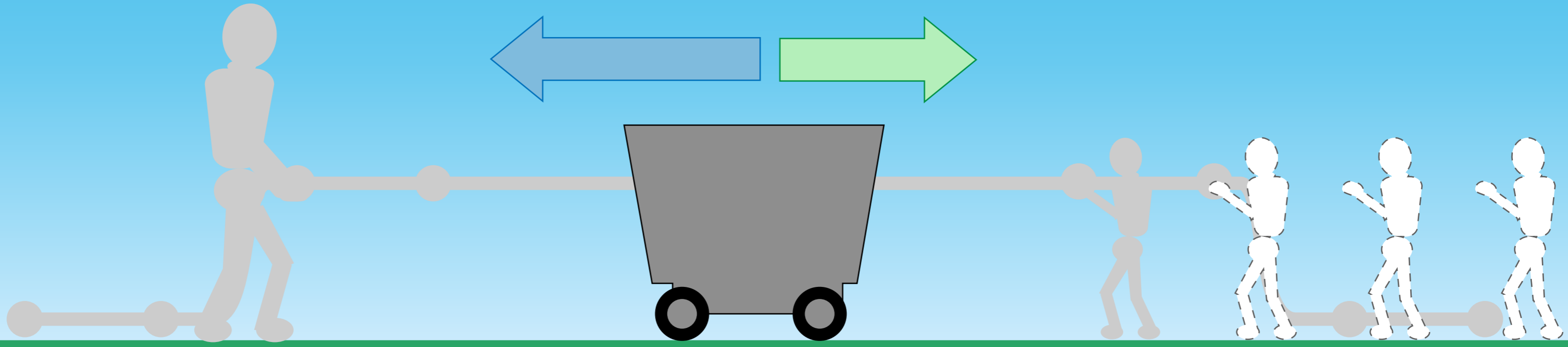
Show:

Sum of Forces

Number Values



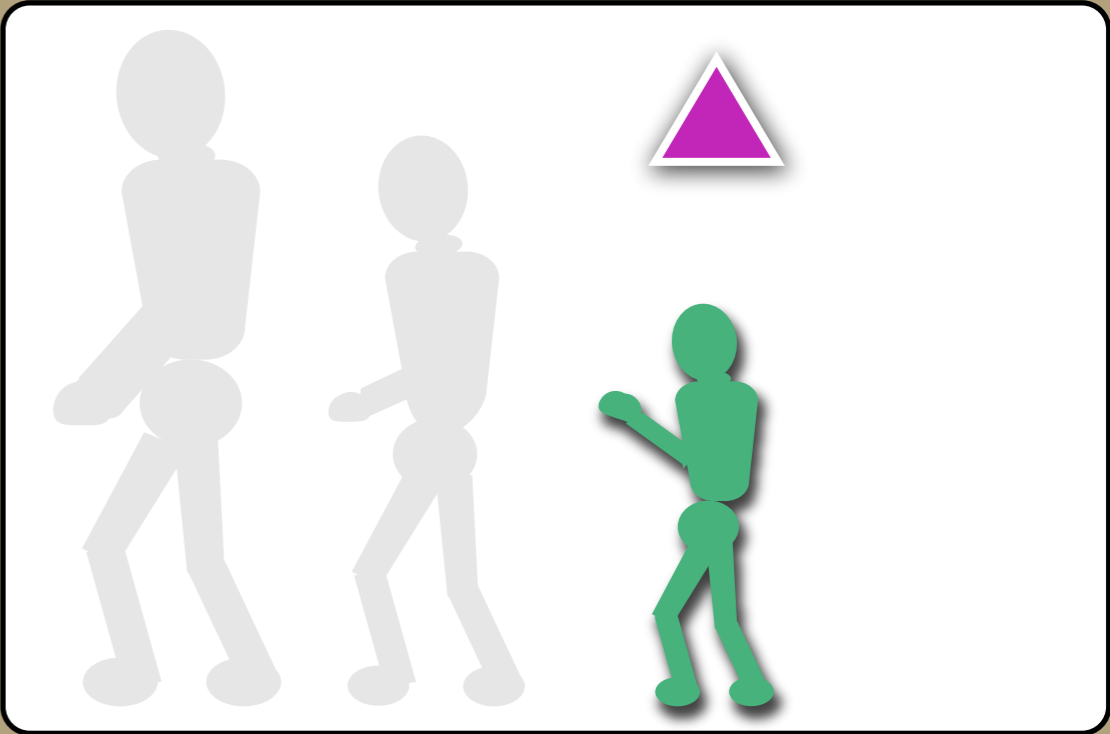
[Keyboard instructions](#)



Go!

Reset 

New Game

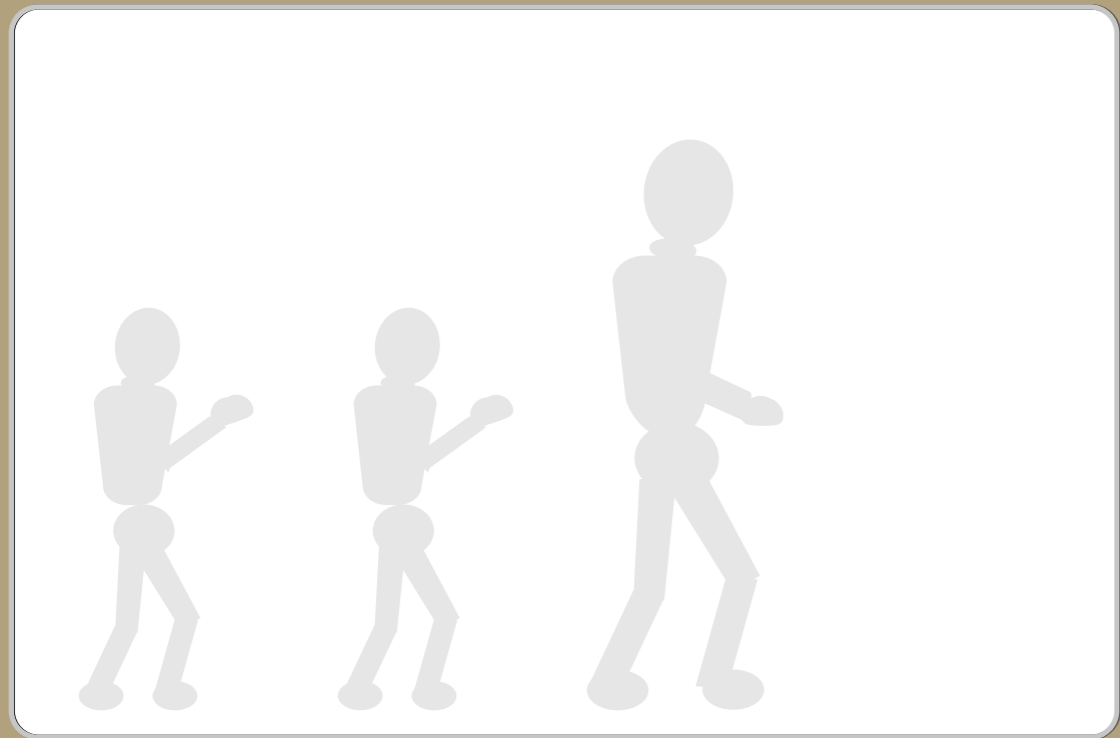
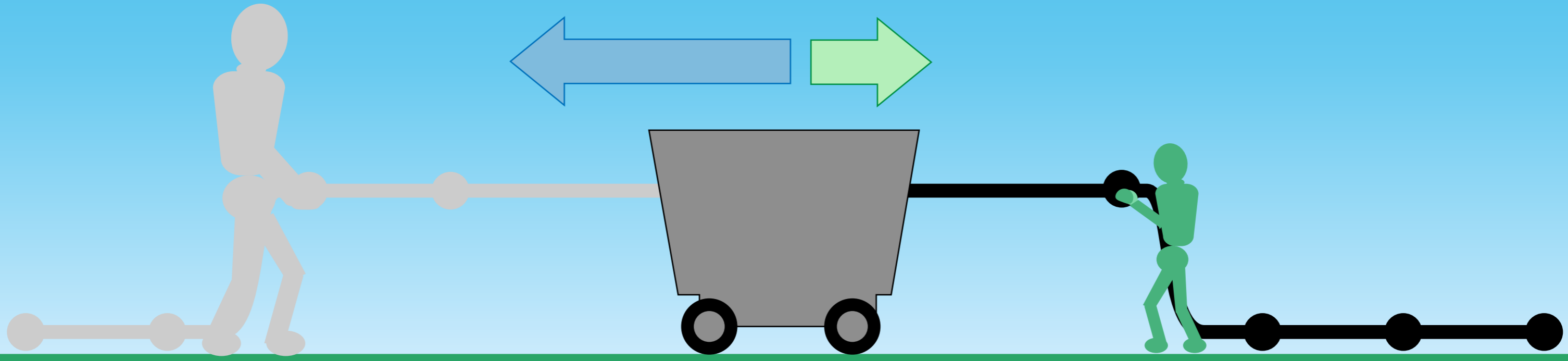


- Action** Enter key.
- Outcome** Confirm placing off the rope. Sim goes into "Browse mode". Focus box appears around the puller.
- Non-visual feedback** "The other strong person now off the rope."

Show:

- Sum of Forces
- Number Values

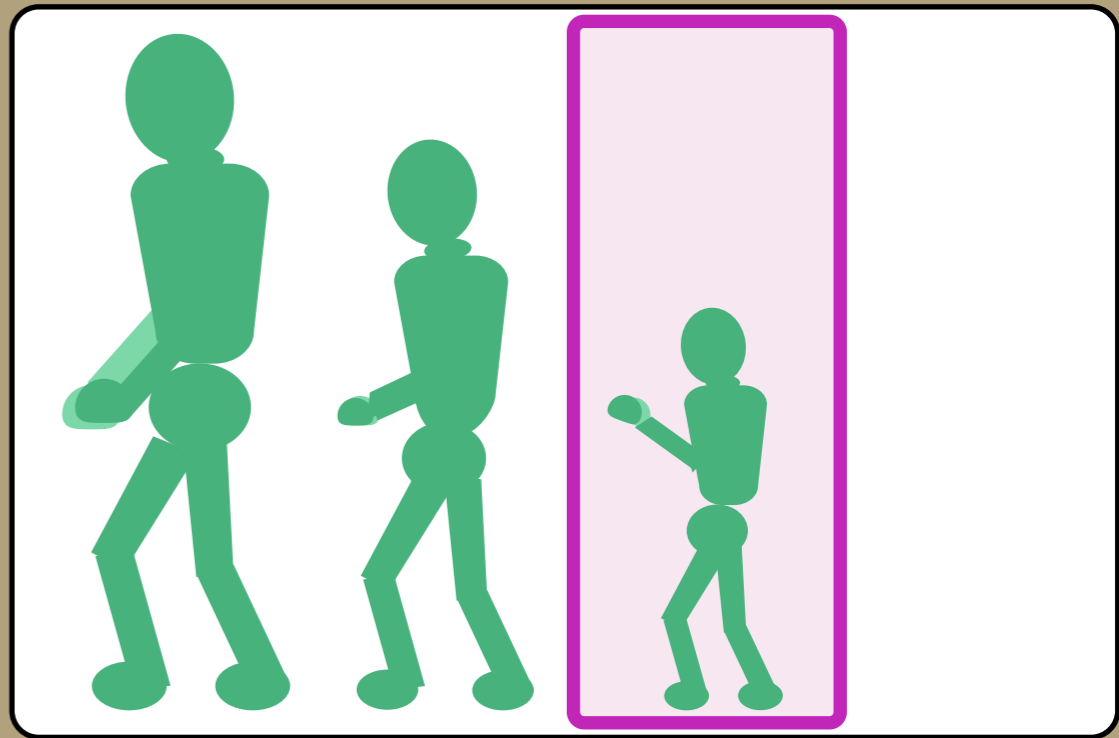
[Keyboard instructions](#)



Go!

Reset 



New Game



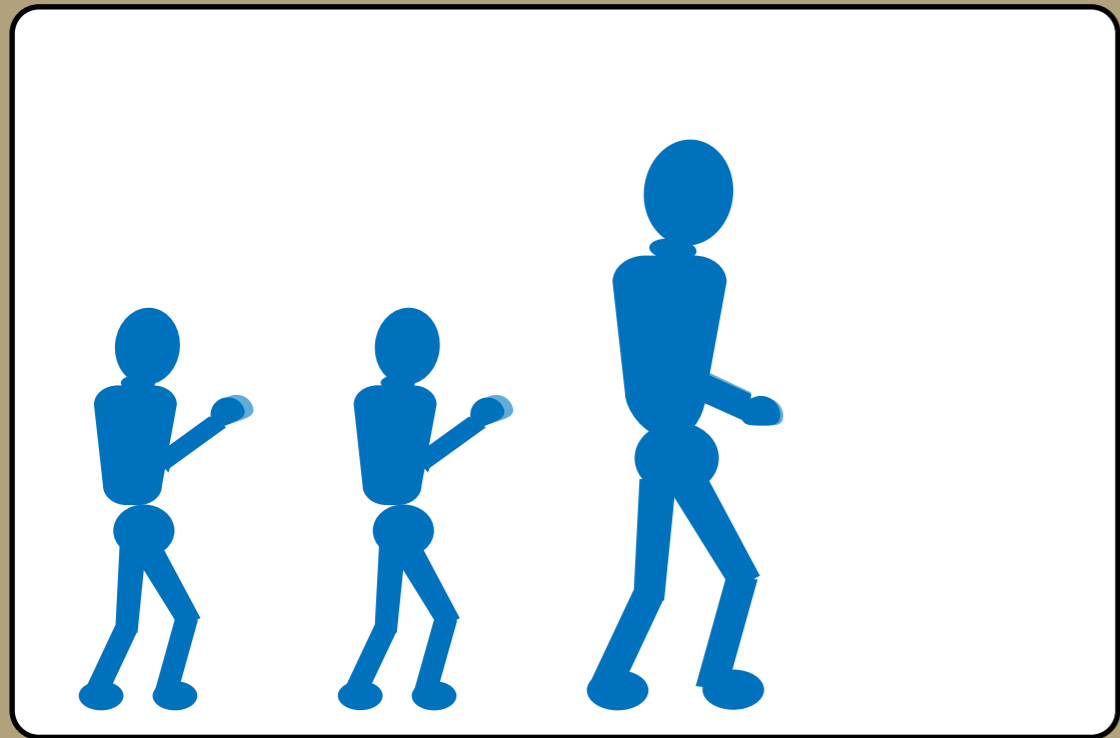
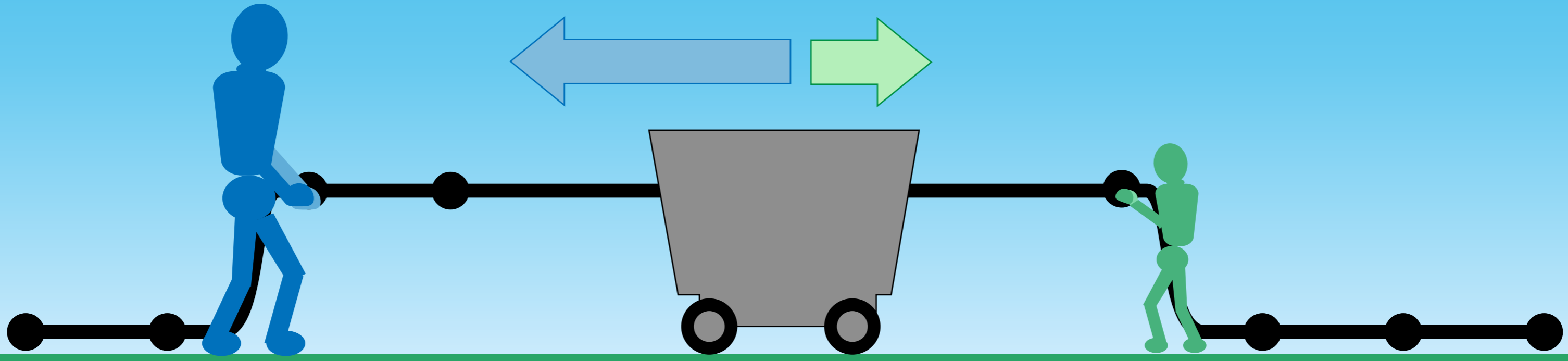
- Action** Tab key.
- Outcome** Focus box moves to GO button
- Non-visual feedback** "Go button"

Show:

- Sum of Forces
- Number Values

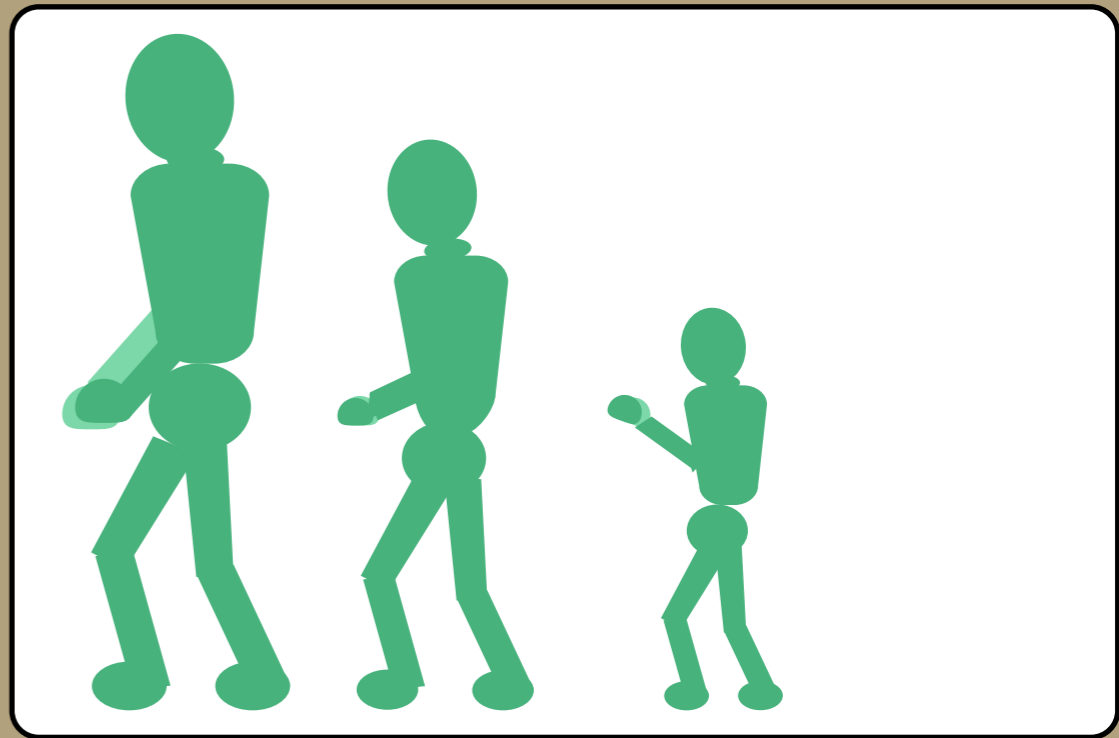
[Keyboard instructions](#)



Go!

Reset 

New Game

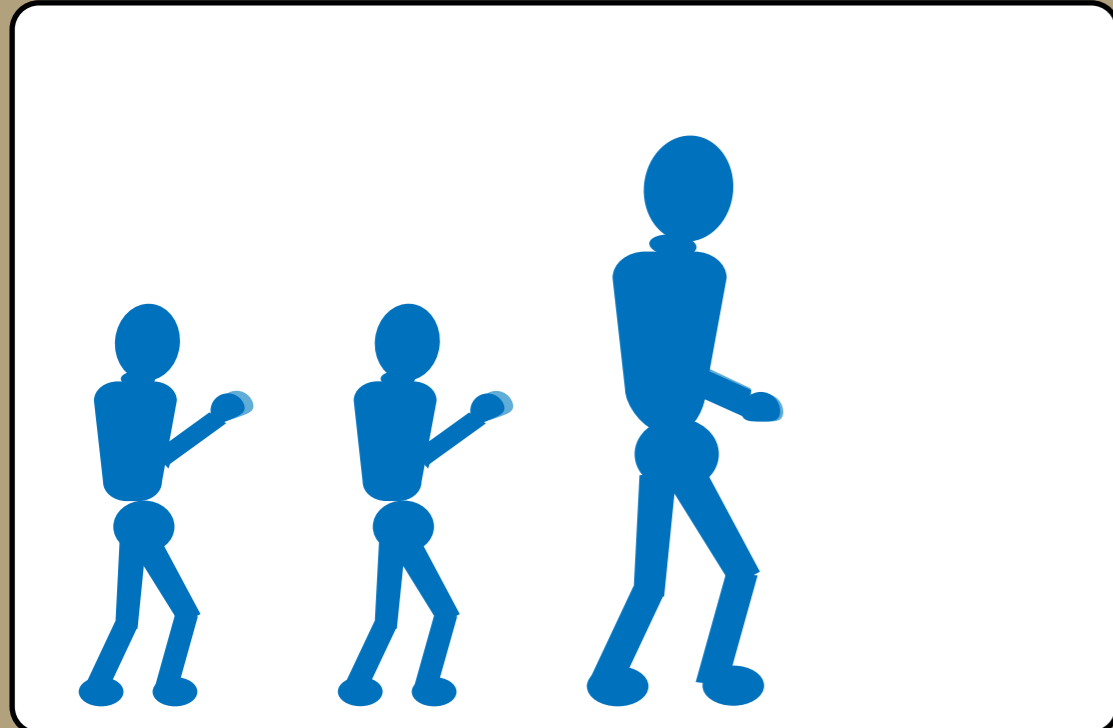
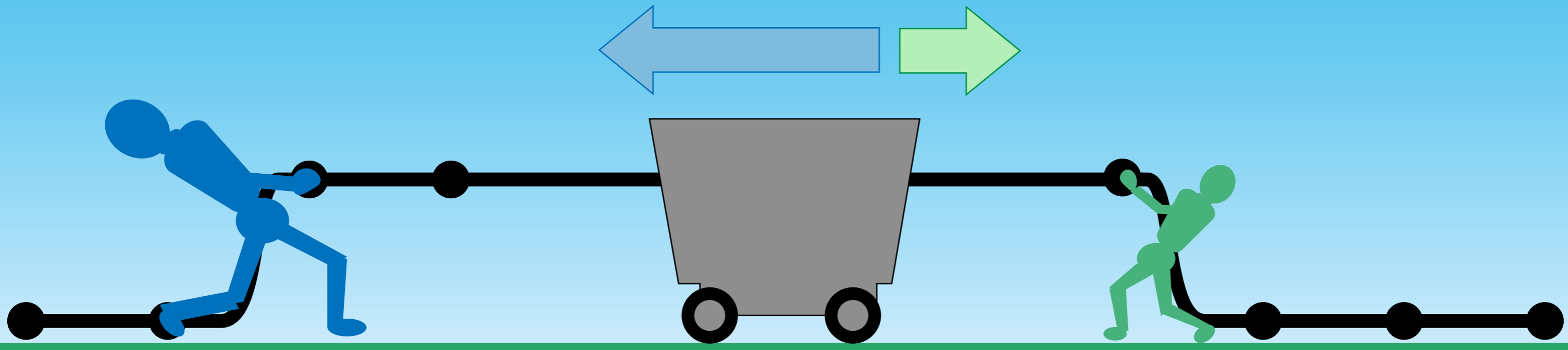


- Action** Tab key.
- Outcome** Focus box moves to GO button
- Non-visual feedback** "Go button"

Show:

- Sum of Forces
- Number Values

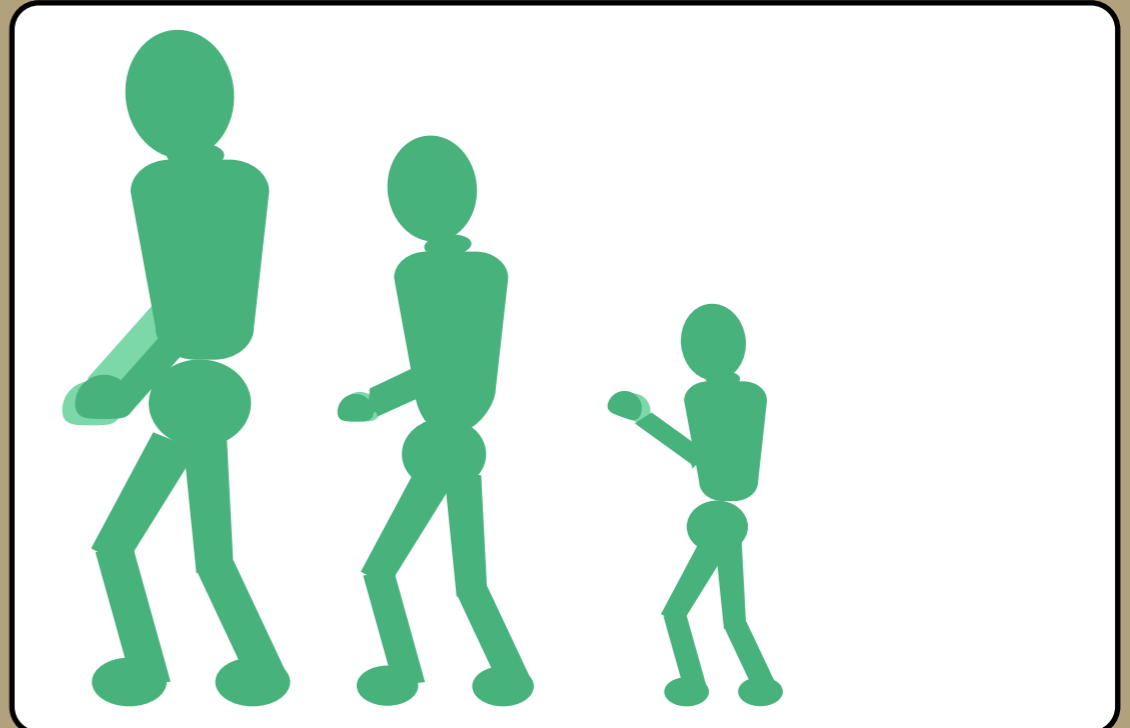
[Keyboard instructions](#)



Stop

Reset

New Game





Question

Edge case: If a puller is off screen and the user is using keyboard interaction - how will they know the off-screen puller has focus?

One possible solution would be to pop the cart, rope, and pullers back to center so focus is seen. Once Enter or Tab is pressed, the positions are restored.

Show:



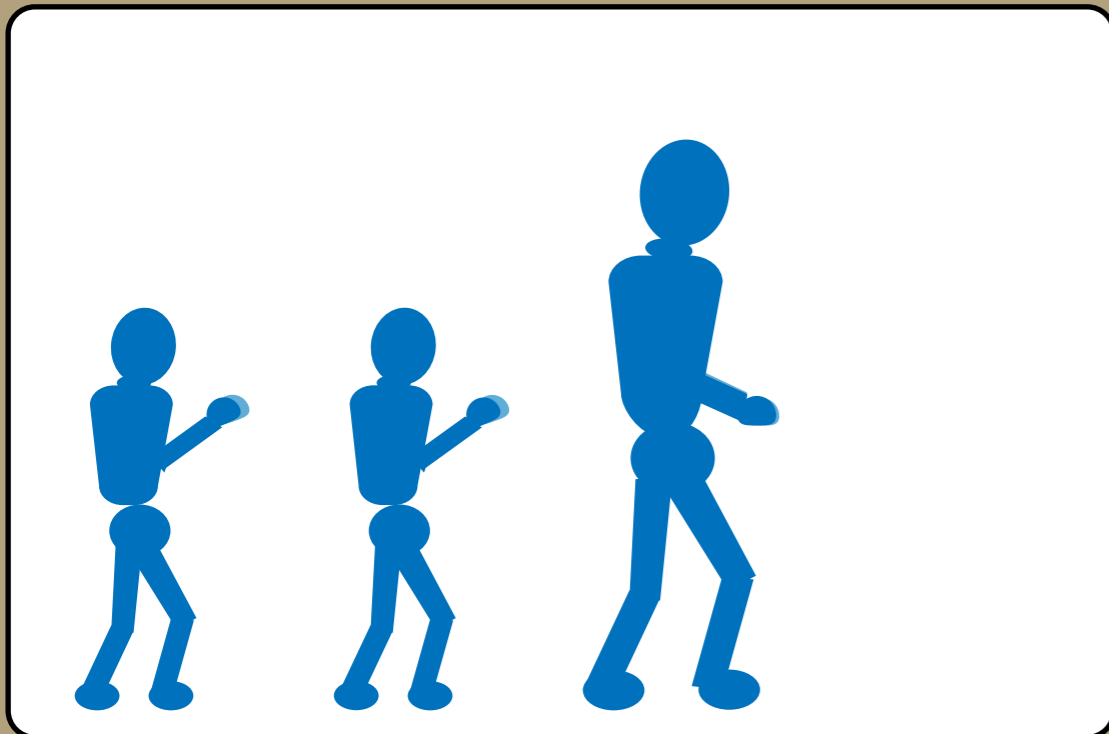
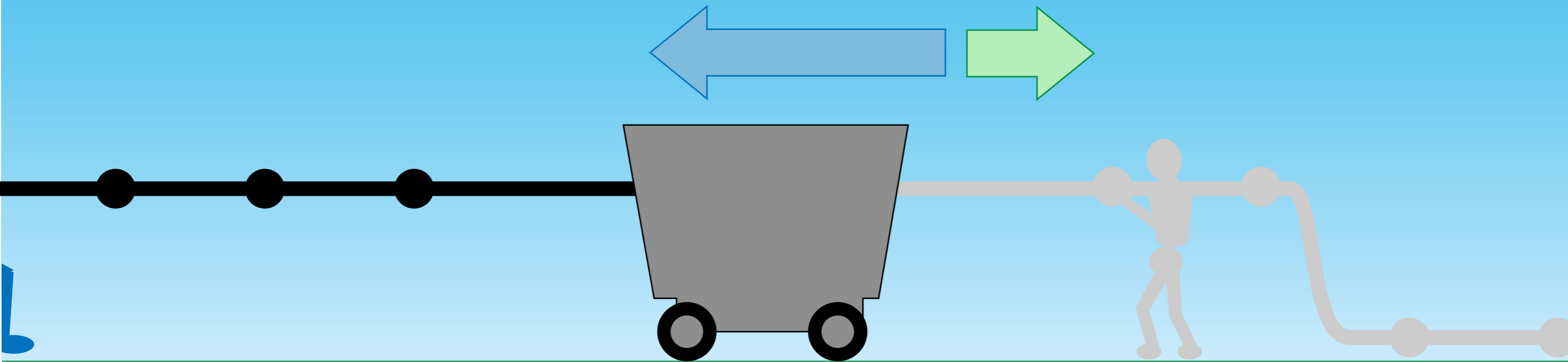
Sum of Forces



Number Values



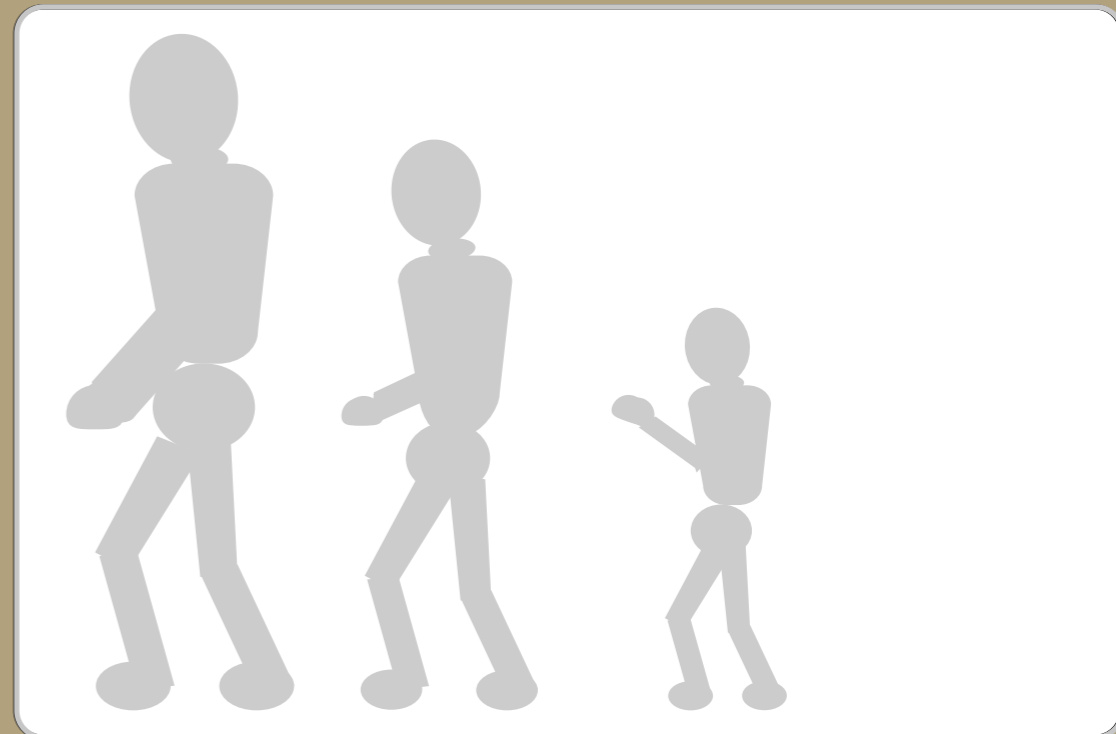
[Keyboard instructions](#)



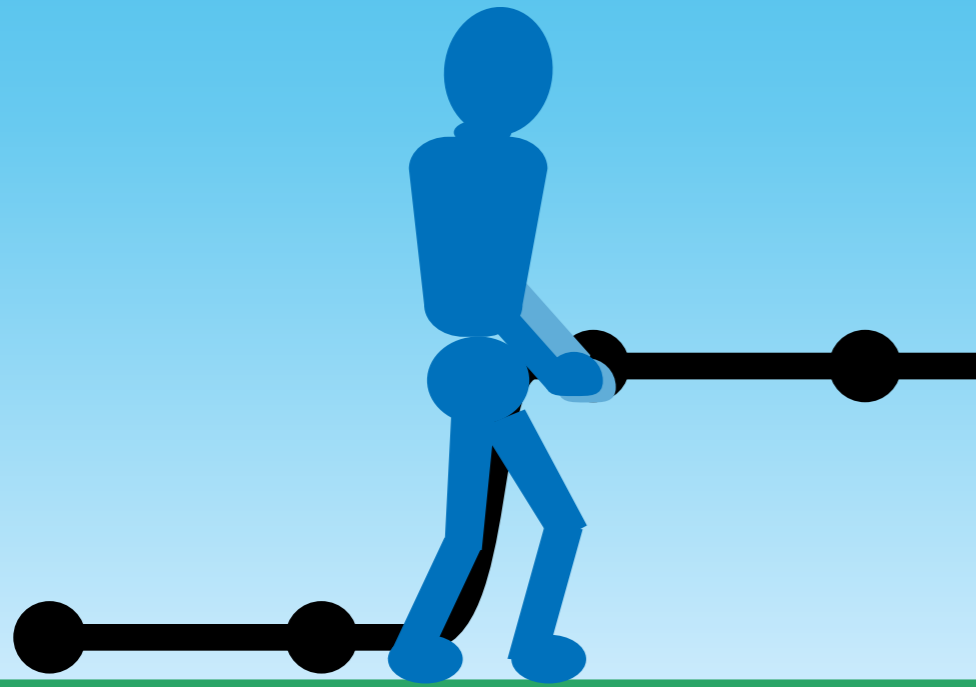
Go!

Reset

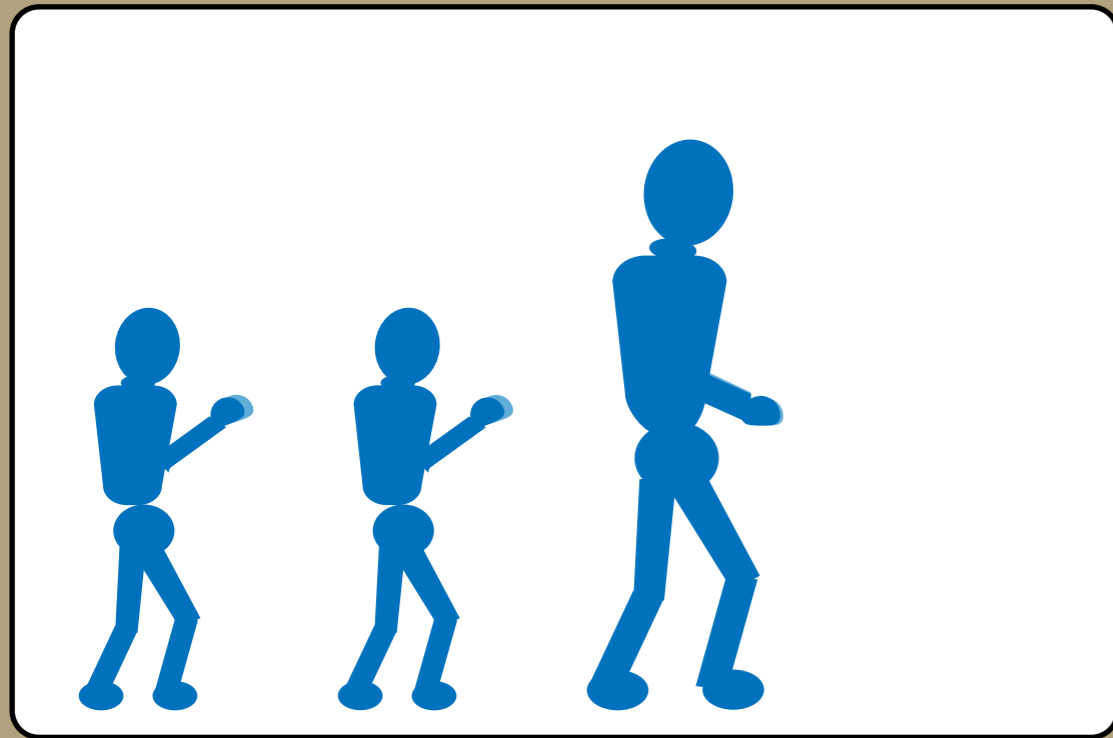
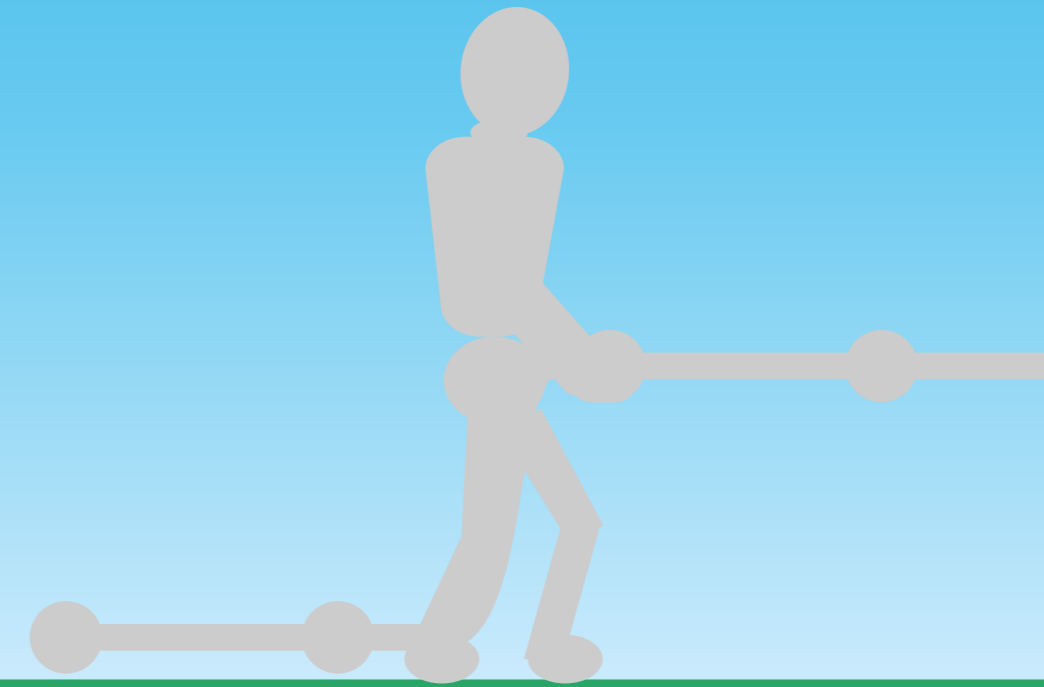
New Game



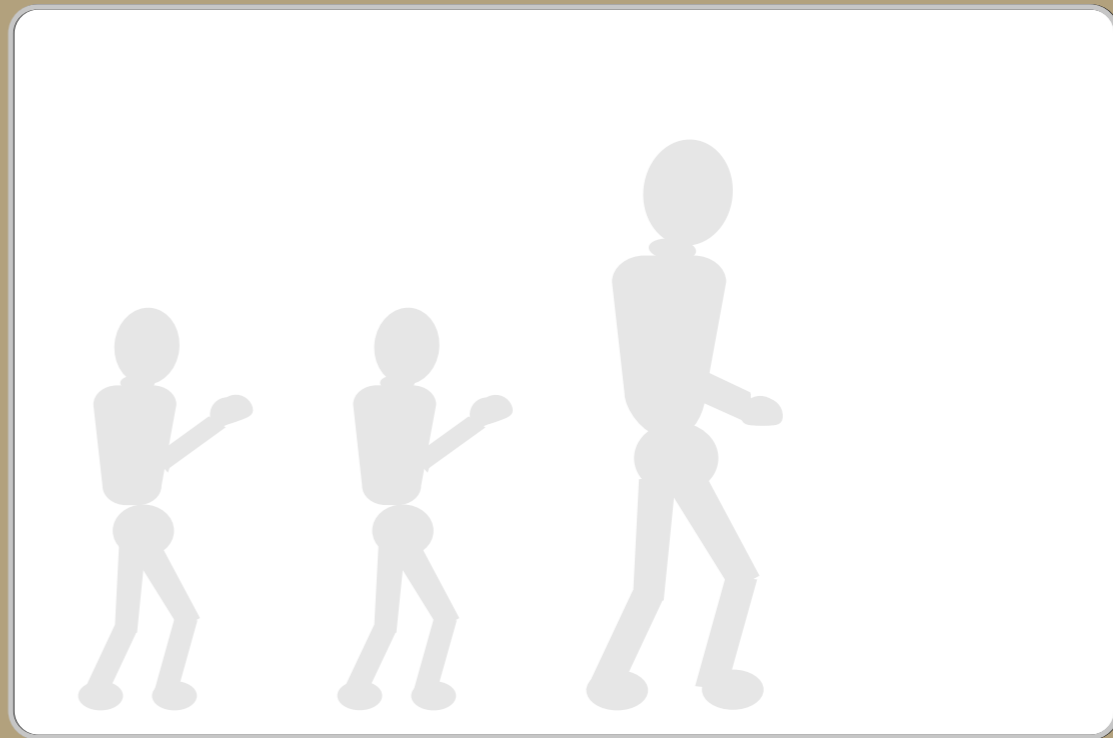
Focusable state



Un-focusable state



Note: change in border colours




Tab order

- 1. Left group.
- 2. Right group.
- 3. Go button.
- 4. Reset cart button.
- 5. New Game button.
- 6. Game options menu.
- 7. PhET menu.

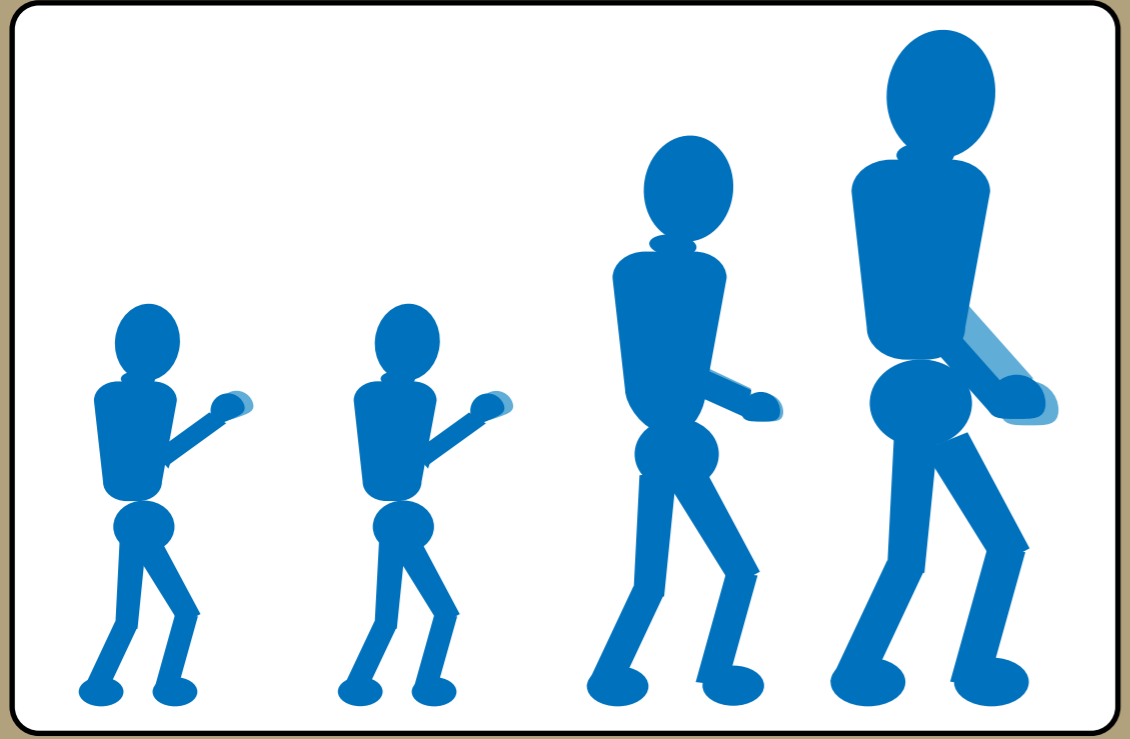
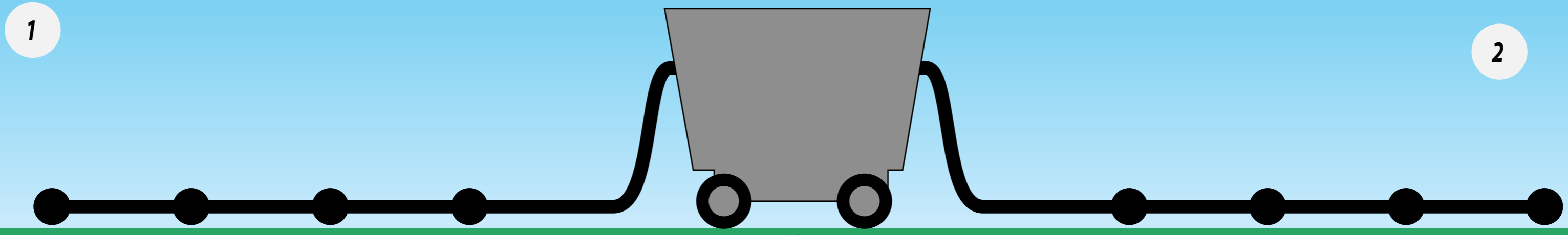
Show:

Sum of Forces

Number Values



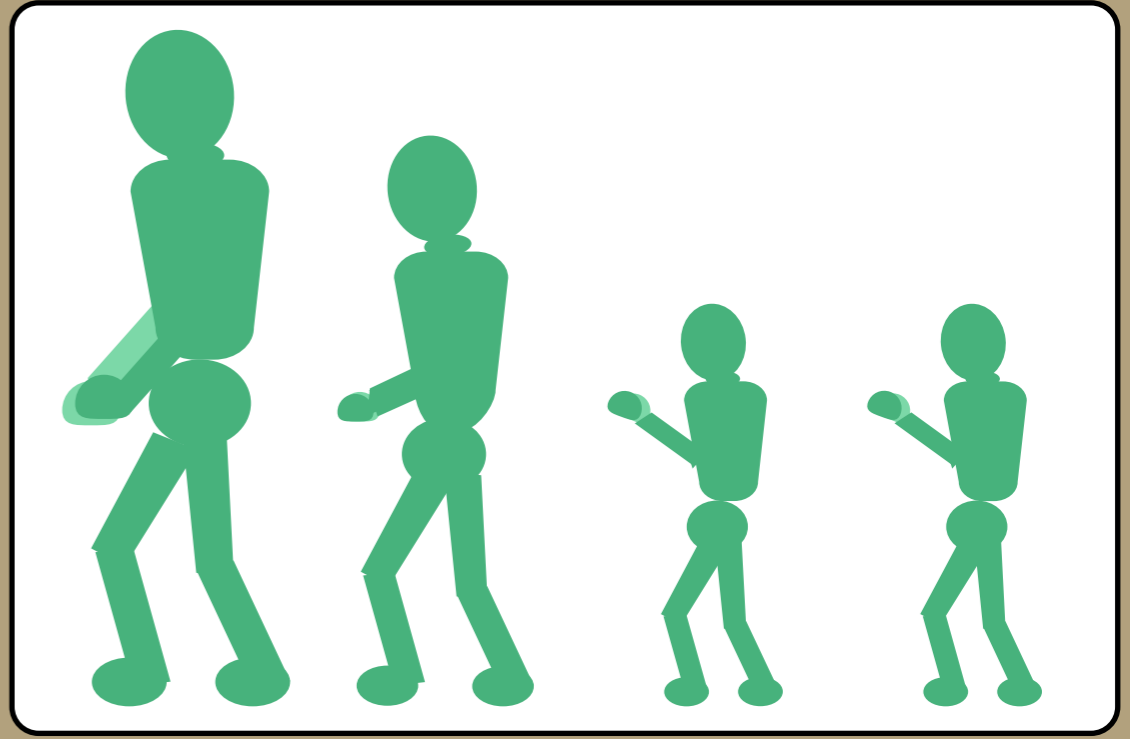
[Keyboard instructions](#)



3

4 

5





Up / left and down / right arrows moves up and down the list.

Reaching the top or bottom of the menu does not wrap the cursor around to the other end.

Show:

Sum of Forces

Number Values



[Keyboard instructions](#)

Enter key pressed
→

Show:

Sum of Forces

Number Values



[Keyboard instructions](#)

Down arrow pressed
→

Show:

Sum of Forces

Number Values



 

[Keyboard instructions](#)

Show:

Sum of Forces

Number Values



[Keyboard instructions](#)

Down arrow pressed
→

Show:

Sum of Forces

Number Values



[Keyboard instructions](#)

Down arrow pressed
→


Show:

Sum of Forces

Number Values

[Keyboard instructions](#)

 **Non-visual feedback** "*beep* keyboard instructions."