

## Hot Air Balloon

ID: 8245

Time required  
45 minutes

## Activity Overview

*In this activity students will model integer addition and subtraction by adding or subtracting the amount of helium and sandbags for a hot air balloon.*

## Topic: Rational Functions &amp; Equations

- *Use technology to verify that adding the number  $-x$  is equivalent to subtracting  $x$*
- *Solve one-step linear equations of the form  $x + a = b$  where  $a$  and  $b$  are real numbers*

## Teacher Preparation and Notes

- *It is very important that you thoroughly describe the model to students prior to them exploring the TI-Nspire document on their own. Use the computer software or a real balloon to demonstrate the model in a whole class, teacher-led setting. Some students will catch on very quickly and wean themselves from using the model. Others will prefer and/or need to stay a longer time with the model.*
- *Notes for using the TI-Nspire™ Navigator™ System are included throughout the activity. The use of the Navigator System is not necessary for completion of this activity.*
- ***To download the student TI-Nspire document (.tns file) and student worksheet, go to <http://education.ti.com/exchange> and enter "8245" in the search box.***

## Associated Materials

- *HotAirBalloon\_Student.doc*
- *HotAirBalloon.tns*

## Suggested Related Activities

*To download any activity listed, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter the number in the quick search box.*

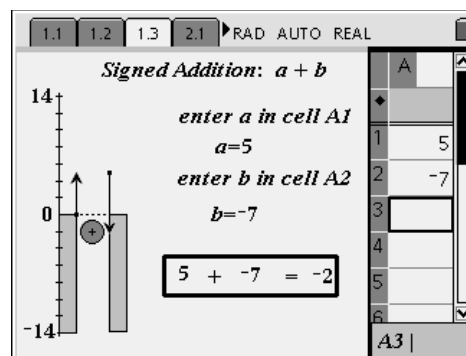
- *Integers: Integer Builder (TI-Nspire technology) — 12182*
- *Operations of Signed Numbers (TI-84plus and TI-Navigator technology) — 6018*
- *Discovering Integer Rules (Multiplying and Dividing) — 5866*

**Problem 1 – Integer addition**

Help students through additional examples of using this model to add integers as needed. Be sure they understand the concepts of adding helium bags and sand bags to change the balloon's position, and how the helium and sand bags are related to positive and negative integers. Remind them to reset the initial position of the balloon between each calculation.

**Solutions**

- 1. 3
- 2. 10
- 3. -2
- 4. -8



**TI-Nspire Navigator Opportunity: Live Presenter and Screen Capture**

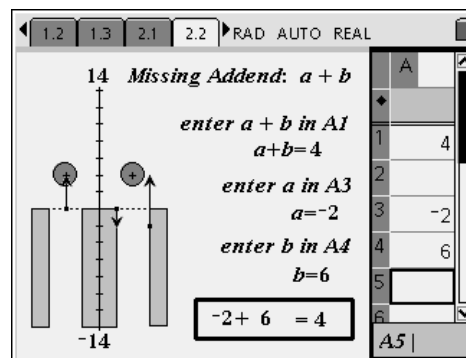
See Note 1 at the end of this lesson.

**Problem 2 – Missing addend**

The model in Problem 2 displays two balloons side by side and is used to find a missing addend when the sum and the other addend are given. The balloon on the left is set at the target sum,  $a + b$ , and the one on the right is set at the known addend,  $a$ . The challenge is to find the value for  $b$ , the missing addend, such that the right balloon aligns with the target balloon.

**Solutions**

- 1. -5
- 2. 5
- 3. -4
- 4. 6



**TI-Nspire Navigator Opportunity: Live Presenter and Screen Capture**

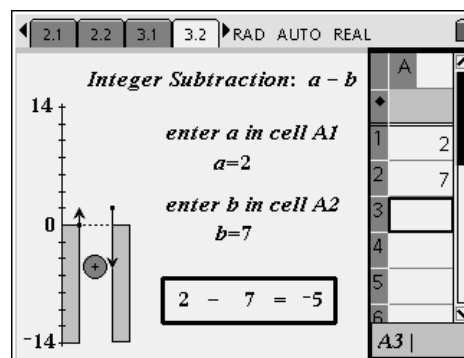
See Note 2 at the end of this lesson.

**Problem 3 – Integer subtraction**

Discuss the differences between this model and the one from Problem 1. In Problem 1, the number entered into cell A2 represents the number of bags added to the balloon, whereas in Problem 2, this number represents the number removed from the balloon. It is in this way that this model is for subtracting two integers.

**Solutions**

- 1. -5
- 2. -4
- 3. 7
- 4. 3



**TI-Nspire Navigator Opportunity: Live Presenter and Screen Capture**

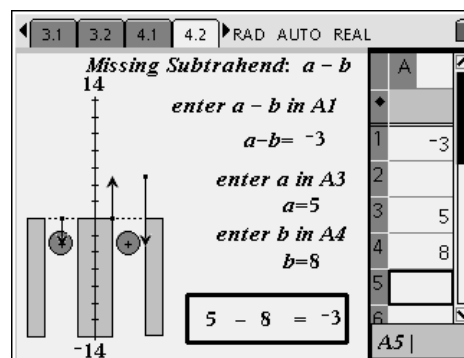
See Note 3 at the end of this lesson.

**Problem 4 – Missing subtrahend**

Like the model in Problem 2, this model shows two balloons side by side; however, this model is used to find a missing subtrahend. The balloon on the left is set at the difference, and the balloon on the right is set at the minuend (known). The goal is to find the subtrahend that aligns the two balloons.

**Solutions**

- 1. -3
- 2. 8
- 3. -3
- 4. -8



**TI-Nspire Navigator Opportunity: Live Presenter and Screen Capture**

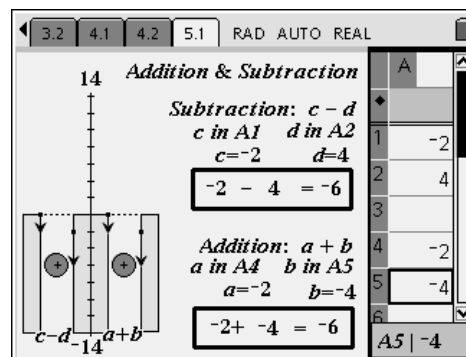
See Note 4 at the end of this lesson.

**Problem 5 – Addition and subtraction exploration**

Again, the model shows two balloons side by side. The left balloon shows subtraction and the right balloon shows addition. Guide students to use this model to explore a relationship between addition and subtraction. Namely, that subtraction is equivalent to adding the additive inverse (opposite).

**Solutions**

- |   |          |
|---|----------|
| 1. -6                                     | 2. -6    |
| 3. 11                                     | 4. 11    |
| 5. -6                                     | 6. 6     |
| 7. 7                                      | 8. -7    |
| 9. helium                                 | 10. sand |
| 11. $-b$ ; opposite (or additive inverse) |          |



**TI-Nspire Navigator Opportunity: Quick Polls (Open Response)**

See Note 5 at the end of this lesson.

**TI-Nspire Navigator Opportunities**

**Note 1**

**Problem 1, Live Presenter and Screen Capture**

Consider using *Live Presenter* when going over the example given in problem 1 to demonstrate to the students how to enter values into the table as well as how this model works. Also consider using *Screen Capture* to monitor student progress

**Note 2**

**Problem 2, Live Presenter and Screen Capture**

Consider using *Live Presenter* when going over the example given in Problem 2 to demonstrate to the students how to enter values into the table as well as how this model works. Also consider using *Screen Capture* to monitor student progress

**Note 3**

**Problem 3, Live Presenter and Screen Capture**

Consider using *Live Presenter* when going over the example given in Problem 3 to demonstrate to the students how to enter values into the table as well as how this model works. Also consider using *Screen Capture* to monitor student progress

**Note 4****Problem 4, *Live Presenter and Screen Capture***

Consider using *Live Presenter* when going over the example given in Problem 4 to demonstrate to the students how to enter values into the table as well as how this model works. Also consider using *Screen Capture* to monitor student progress

**Note 5****Problem 5, *Quick Polls (Open Response)***

Consider using a *Quick Poll (Open Response)* to have the students submit their answers to Questions 1–11.