

HOPSCOTCH

Ready, Set, Grow!

Teaching Proportional Relationships in Hopscotch Mathematics | Grades 5-8

Time | 45 - 60 minutes

Big Idea | Students will create programs in Hopscotch to analyze proportional relationships.

Lesson Goals

- Students will explain an object's size as a percentage.
- Students will name the proportional relationship between two or more objects.
- Students will manipulate a percent of a quantity as a rate per 100.

Skill Focus

- Following a multi-step procedure to complete a task
- Using Hopscotch as a tool to express understanding of mathematical concepts

Key Vocabulary

- **Ratio:** the difference between two or more things in terms of quantity or size
- **Percentage:** a portion of a whole stated in hundredths
- **Event:** When something happens
- **Sequence:** A list of instructions, in order

Materials

- 1 iPad or iPhone per student, or 1 device per 2 students, for pair programming. Email educators@gethopscotch.com for bulk-created student accounts.
- Starter Projects available in Hopscotch:
 - **Beginner:** 3 objects that change size when tapped
 - **Intermediate:** shapes moving around the screen; player must find the same object, grow object, and shrink object. Once they do, a 'win' screen appears.
 - **Advanced:** players must find the grow and shrink objects amongst many different same objects. There is a score counter and the play gets a point when they find the correct object, but loses a point when they tap an incorrect one. The player wins once all the objects have been identified.

Teacher Brief

Students will create a program in Hopscotch that demonstrates understanding of proportional relationships. Students will explore the concept of ratios and percentages by manipulating an object's size. Suggested modifications are included below and may prove helpful for students in need of more structure to demonstrate their understanding. This lesson assumes that students and teachers have little to no experience coding in Hopscotch.

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Lesson

0. Whole Group Discussion (5-10 minutes)

- [Show screenshot to students](#): ask students what they notice and solicit a few responses.
- Explain that this is the code for an object in Hopscotch. You control the size of the objective using percentages. The size of the object when added to the workspace or stage is 100% - that is the whole.
- Show students how to grow an object by 100% when tapped. Next, demonstrate what will happen if an object is coded to shrink by 100% when tapped.
- Discuss the following equation with students to articulate what is happening to an object's size in Hopscotch.



Object's Original Size (100%) + Grow By Size (___%) = Total percentage of the whole
For example:
 $100\% + 300\% = 400\%$
The object is now 4 times its original size.

Object's Original Size (100%) - Shrink By Size (___%) = Total percentage of the whole
For example:
 $100\% - 25\% = 75\%$
The object is now $\frac{3}{4}$ its original size.

1. Getting to Hopscotch (5 min)

1.1 Find the Hopscotch app on your iPad

1.2 Sign in to your account (students may need to create accounts)

1.3 Making a new project: Tap on the highlighted + on the bottom of the screen

2. Getting Familiar with Size Blocks (5-10 min)

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2.1 Give students some time to explore the size blocks

- Encourage them to try percentages of the whole such as 10%, 25%, or 50%.
- It might be helpful to have students add "When Game Starts > Set Size Percent 100" to their codes. This will help them practice with different percentages and be able to reset quickly.

2.2 Check in with students

Answer common questions about adding objects, or finding code, if necessary.

3. Make a Game! (15 min)

3.1 Display challenge to students

Challenge: Create a game in Hopscotch that uses at least 3 objects. You can choose your objects, but your game must meet the following criteria:

- 1 object must stay in the same size during the game (**same object**)
- 1 object must shrink during the game (**shrink object**)
- 1 object must grow during the game (**grow object**)
- The **grow object** should finish the game 4 times larger than the **same object**
- The **shrink object** should finish the game 2 times smaller than the same object

3.2 Show Example Games

- **Beginner:** 3 objects that change size when tapped
- **Intermediate:** shapes moving around the screen; player must find the same object, grow object, and shrink object. Once they do, a 'win' screen appears.
- **Advanced:** players must find the grow and shrink objects amongst many different same objects. There is a score counter and the play gets a point when they find the correct object, but loses a point when they tap an incorrect one. The player wins once all the objects have been identified.

4. Reflection (5 min)

4.1 Whole Group Reflection

- Choose a few student projects to share and discuss as a class
- Suggested questions for student presenters:
 - What part(s) of your project are the most proud of?
 - What challenges did you experience?
 - What choices did you make while designing your project?
- For students commenting on projects, it may be helpful to recommend a format for

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feedback such as red/yellow/green, plus/delta, etc.

- Suggested questions for students giving feedback:
 - What do you think the creator did well?
 - What do you think could be improved?
 - What questions do you have about the choices the creator made?

5. (Optional) Sharing Projects with the Hopscotch Community (15min)

5.1 Publishing a Project

- When students finish, they can publish projects to the Hopscotch community. This is a great opportunity for students to share their work with a digital audience. Students can "like" another student's project and remix it to see how it was made.

5.2 Evaluating a Classmate's Project

- Show students how to search for projects in the Hopscotch community.
- Encourage students to remix their classmates' projects in order to see how they created their project.
- Students may use the project rubric or pre-determined criteria for success to evaluate each other's work and give helpful feedback.

Modifications

- Pair programming (this is a great opportunity for students to work together to create strong projects that they are proud of)
- [Printed copies of challenge for note-taking](#)
- Students can remix one of the project examples in Hopscotch
- Build in time for students to get comfortable in Hopscotch; encourage students to work through all of the introductory tutorials
 - Coding Journey Tutorials
 - Build Your World
 - You're the Boss!
 - Sharing is Caring
- Example code for 3 objects without percentages ([screenshot here](#))
- [Visual of equation available while coding](#)

Curriculum Extensions

- Add more criteria that the games must meet (i.e. more proportional relationships).
- Use a variety of mathematical statements when sharing the game criteria (i.e. the shrink object must be half the size of the same object or the grow object must be 4:1 the same object).
- Encourage students to add more objects that shrink and grow by various percentages; have other students test these and try to guess the percentages used to grow and shrink the objects
- Have students create their own challenges for one another with differing game criteria

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Common Core State Standards

CCSS.MATH.CONTENT.6.RP. Understand ratio concepts and use ratio reasoning to solve problems.

CCSS.MATH.CONTENT.6.RP.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

CCSS.MATH.CONTENT.7.RP. Analyze proportional relationships and use them to solve real-world and mathematical problems.

CCSS.ELA-Literacy.RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or following technical tasks.

CCSS.ELA-Literacy.RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific and technical context relevant to grades 6-8 texts and topics.

CCSS.ELA-Literacy.RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).