

Fractions in the Wild

Engage – *Fractions in Disguise*

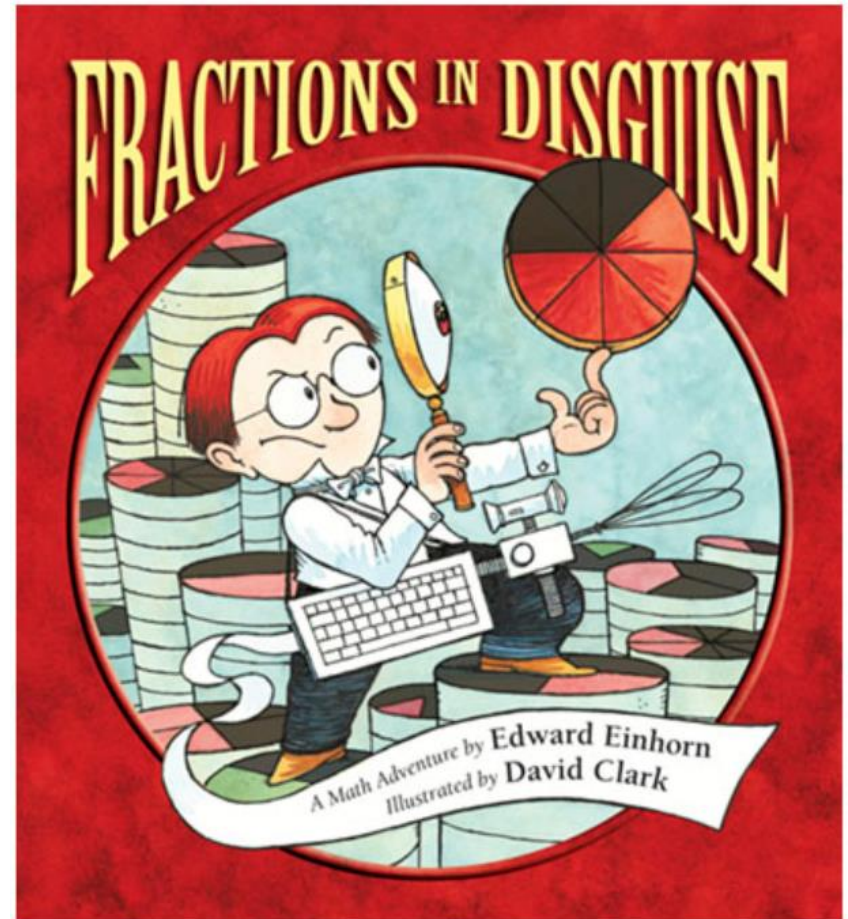
Standards

Math:

4.NF.A.1- Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{a \times n}{b \times n}$ or $\frac{a \div n}{b \div n}$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. For example, $\frac{3}{4} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8}$.

Science:

4.LS2.4- Develop and use models to determine the effects of introducing a species to, or removing a species from, an ecosystem and how either one can damage the balance of an ecosystem.



Sources:

Einhorn, E. (2014). *Fractions in disguise: A math adventure*. Watertown, Massachusetts: Charlesbridge.

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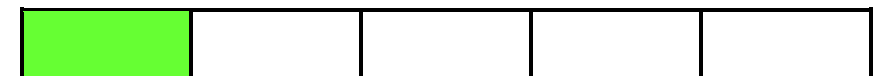
The teacher will either read the book aloud to the students or show the class the YouTube video of the book being read. Once the reading is over, the teacher will connect the mention of equivalent fractions and the methods used for finding them in the book to this lesson.

YouTube link to the book reading:

<https://www.youtube.com/watch?v=GhVE6FJiGOI>

Explore – Fraction Find It!

1. Make copies (one for each student in the class) and cut out each fraction strip. Place each set of fraction strips in a small bag or paperclip them together.
2. Give one set of fraction strips to each student.
3. Give the students the following instructions:
 - Lay out all of your fraction strips on your desk.
 - Find the ones that have the same amount colored in by comparing their lengths.
 - Once you find all of the matches, write them down on a piece of paper and see if you can find a connection between the two fractions and the numbers that they are made of.
4. Provide the students with an example match. Ask them to find their $\frac{2}{3}$ and $\frac{4}{6}$ and compare the lengths of their colored portions.
5. Provide the students with an example of a mismatch. Ask them to find their $\frac{1}{8}$ and $\frac{3}{15}$ and compare the lengths of their colored portions.

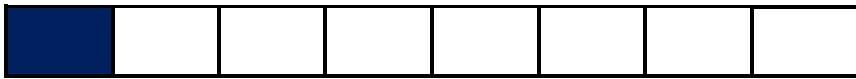


Explore – Fraction Find It!

Materials:

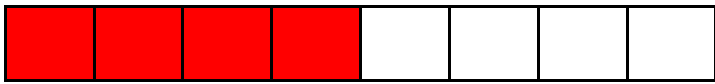
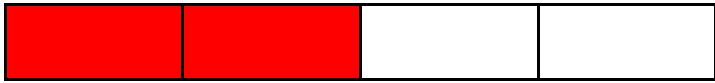
- The fraction strips on the previous two pages (1 set for each student)
- A piece of paper (1 for each student)
- A pencil (1 for each student)

These materials will allow the students to investigate the concept of equivalent fractions in a hands-on and interesting way. The use of the fraction strips will show students that while the fractions may not look the same in their numerical notation, they do look the same when drawn out. Getting to use and see how these visual fraction models work will provide the students with a new strategy that they can use to solve problems in the future that include fractions.

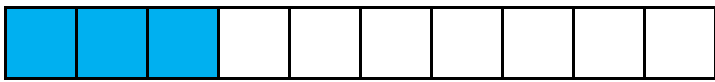


Explain (Math) – Student Version

Equivalent fractions are fractions that look _____ but have the same _____.



$\frac{2}{4}$ and $\frac{4}{8}$ _____ equivalent fractions



$\frac{3}{5}$ and $\frac{3}{10}$ _____ equivalent fractions

The models above are called “visual fraction models”. They are used to compare fractions and their values.

Sources:

Definition of Equivalent Fractions. (2018). Retrieved from Maths is Fun: <https://www.mathsisfun.com/definitions/equivalent-fractions.html>

Explain (Math) – Student Version

When making equivalent fractions, you can either _____ or _____. Adding and subtracting will not work.

What you do to the _____ must also be done to the _____ and vice versa.

Numerator
Denominator

$$\frac{2 \times \underline{\quad}}{3 \times \underline{\quad}} = \frac{8}{12}$$

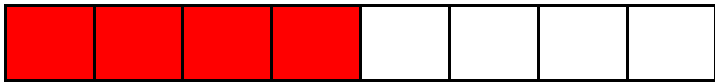
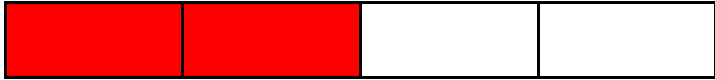
$$\frac{10 \div \underline{\quad}}{15 \div \underline{\quad}} = \frac{2}{3}$$

It is important to remember that a larger denominator does not necessarily mean a larger fraction.

When comparing two fractions, the size of the models/drawings must be the same size.

Explain (Math) – Teacher Version

Equivalent fractions are fractions that look **different** but have the same **value**.



$\frac{2}{4}$ and $\frac{4}{8}$ **are** equivalent fractions



$\frac{3}{5}$ and $\frac{3}{10}$ **are not** equivalent fractions

The models above are called “visual fraction models”. They are used to compare fractions and their values.

Explain (Math) – Teacher Version

When making equivalent fractions, you can either **multiply** or **divide**. Adding and subtracting will not work.

What you do to the **numerator** must also be done to the **denominator** and vice versa.

Numerator
Denominator

$$\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

$$\frac{10 \div 5}{15 \div 5} = \frac{2}{3}$$

It is important to remember that a larger denominator does not necessarily mean a larger fraction.

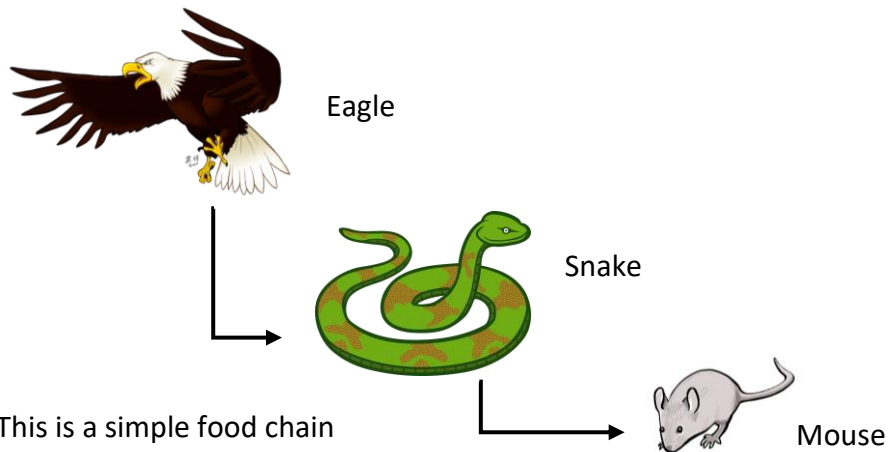
When comparing two fractions, the size of the models/drawings must be the same size.

Explain (Science) – Student Version

An _____ contains plants, animals, and other organisms that work together to form a cohesive system of life.

Ecosystems need to have _____ because all the components depend on each other.

Ecosystems have a hierarchy of predators and prey. To show the flow of energy through them, we use _____ or food webs.



This is a simple food chain showing that eagles eat snakes and snakes eat mice

Sources:

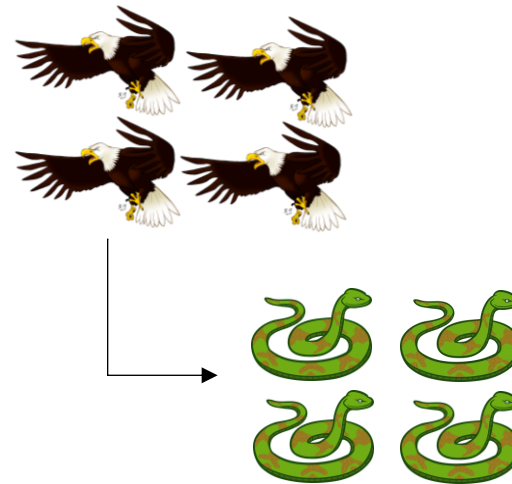
Rutledge, K., Ramroop, T., Boudreau, D., McDaniel, M., Teng, S., Sprout, E., . . . Hunt, J.

(2011, August 15). *Ecosystem*. Retrieved from National Geographic:

<https://www.nationalgeographic.org/encyclopedia/ecosystem/>

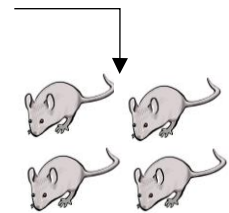
Explain (Science) – Student Version

If one component of an ecosystem changes, the affected species will either _____, _____, or _____.



If $\frac{1}{2}$ of the snakes in this ecosystem were removed, the populations of the mice and eagles would change. The mice would grow in number because there aren't as many predators hunting them. The eagles would decrease in number because their food supply is lower.

If the number of the snakes in this ecosystem doubled, the populations of the mice and eagles would change. The mice would decrease in number because more predators would be hunting them. The eagles would increase in number because their food supply is higher.

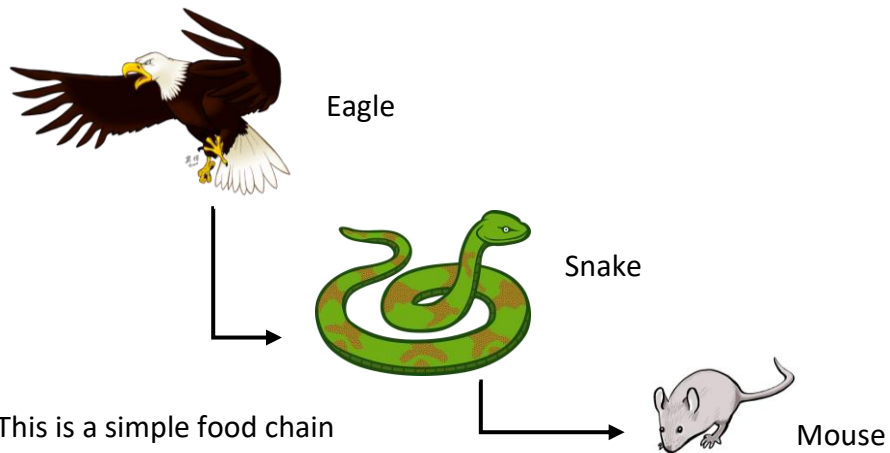


Explain (Science) – Teacher Version

An **ecosystem** contains plants, animals, and other organisms that work together to form a cohesive system of life.

Ecosystems need to have **balance** because all the components depend on each other.

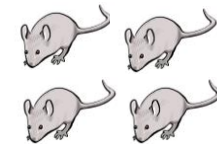
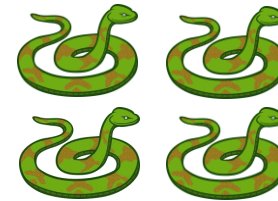
Ecosystems have a hierarchy of predators and prey. To show the flow of energy through them, we use **food chains** or food webs.



This is a simple food chain showing that eagles eat snakes and snakes eat mice

Explain (Science) – Teacher Version

If one component of an ecosystem changes, the affected species will either **adapt**, **move**, or **perish**.



If $\frac{1}{2}$ of the snakes in this ecosystem were removed, the populations of the mice and eagles would change. The mice would grow in number because there aren't as many predators hunting them. The eagles would decrease in number because their food supply is lower.

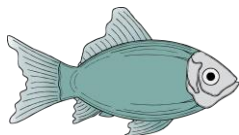
If the number of the snakes in this ecosystem doubled, the populations of the mice and eagles would change. The mice would decrease in number because more predators would be hunting them. The eagles would increase in number because their food supply is higher.

Elaborate – What’s the Worst That Could Happen?

1. Group the students into groups of 3-5.
2. Present each group with some form of manipulatives that symbolize the animals being used for this activity (the Explain and Evaluate pages use eagles, snakes, and mice and sharks, seals, and fish but any three-animal food chain will work). Ask the students to lay out all of their animals and group the like ones together.
3. Use the prompts on the next page to walk the students through the activity. While going through the prompts, the teacher should use his/her own set of manipulatives either magnetized to or projected onto the board to keep all of the groups on the same page.

Please Note:

- The manipulatives can be anything from print outs of the animals, plastic animals, mini stuffed animals, and/or an electronic version of them. Anything will work as long as the individual pieces can be moved around.
- The following clipart pictures can be copied and used as the groups’ manipulatives.



Elaborate – What’s the Worst That Could Happen?

Once the students have laid out all of their animals and grouped them together by type, explain to the students that the animals are all a part of the same ecosystem and food chain and right now there is a balance in the ecosystem. Tell the students that they are going to see how the balance of this ecosystem could change if something were to happen to one of the animal’s populations. Use the following prompts to walk the students through the activity.

Activity Prompts:

- Take away/Add (insert fraction here) of the (insert animal here). What is an equivalent fraction that could also represent the amount you took away/added?
 - Example: Take away $\frac{5}{10}$ of the sharks. What is an equivalent fraction that could also represent the amount you took away? (Target Response: $\frac{1}{2}$)
- Since you took away/added (insert fraction here) of the (insert animal here), how will that affect the populations of the other animals in the ecosystem?
 - Example: Since you took away $\frac{1}{2}$ of the sharks, how will that affect the populations of the other animals in the ecosystem? (Target Response: The seal population would increase because they have less predators hunting them. The fish population would decrease because they would have more predators hunting them.)
- Since you took away/added (insert fraction here) of the (insert animal here), what fraction can be used to represent the amount of (insert same animal here) you have left?
 - Example: Since you took away $\frac{3}{5}$ of the sharks, what fraction can be used to represent the number of sharks you have left? (Target Response: $\frac{2}{5}$ and $\frac{4}{10}$)

CER (Elaborate Activity)

Claim (Write a sentence that describes what affects the balance of an ecosystem.)

I claim that the balance of an ecosystem can be affected by the _____ or _____ of an animal's population.

Evidence (Write a few sentences defending your claim. Include information about the populations of the different animals in the food chain you looked at earlier.)

When the population of the seals decreased, the population of the sharks _____, and the population of the fish _____.

When the population of the seals increased, the population of the sharks _____, and the population of the fish _____.

Reasoning (Write a few sentences explaining how your evidence supports your claim. Describe why the populations of the animals in the food chain either increase or decrease.)

When the population of the middle animal in a three-animal food chain decreases, the population of the animal on top decreases because _____. The population of the animal on the bottom increases because _____.

Answer Key CER (Elaborate Activity)

Claim (Write a sentence that describes what affects the balance of an ecosystem.)

I claim that the balance of an ecosystem can be affected by the **increase** or **decrease** of an animal's population.

Evidence (Write a few sentences defending your claim. Include information about the populations of the different animals in the food chain you looked at earlier.)

When the population of the *seals decreased, the population of the *sharks **decreased**, and the population of the *fish **increased**.

When the population of the *seals increased, the population of the *sharks **increased**, and the population of the *fish **decreased**.

*Animals can be changed to which ever animals were used during the activity

Reasoning (Write a few sentences explaining how your evidence supports your claim. Describe why the populations of the animals in the food chain either increase or decrease.)

When the population of the middle animal in a three-animal food chain decreases, the population of the animal on top decreases because **their food supply has decreased**. The population of the animal on the bottom increases because **they do not have as many predators hunting them**.

Elaborate – What’s the Worst That Could Happen?

Materials:

- Animal manipulatives (10 of each animal, 1 set of each animal per group)
- Magnetized manipulatives (1 set for the teacher)
- White board (optional)
- Projector (optional)
- Smartboard (optional)

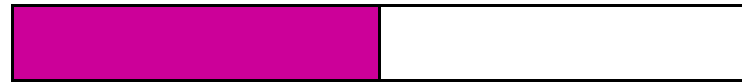
*Please note: The teacher will need to use either the magnetized manipulatives and a white board or the manipulatives, projector and Smartboard to show to the whole class how their animal populations should look after each step.

The use of the manipulatives will make exploring this concept fun and exciting for the students. Being able to physically see the changes being made to each of the animals’ populations will allow the students to better understand the importance of ecosystem balance and how the animals in an ecosystem rely on each other to survive.

Evaluate (Math)

1. What kind of fractions look different but have the same value?

2. Which of the following fractions are equivalent?



3. Find two equivalent fractions for $\frac{3}{10}$ using multiplication.

Sources:

Definition of Equivalent Fractions. (2018). Retrieved from Maths is Fun:
<https://www.mathsisfun.com/definitions/equivalent-fractions.html>

Evaluate (Math)

4. Find two equivalent fractions for $\frac{20}{100}$ using division.

5. Find two equivalent fractions for $\frac{5}{20}$ using multiplication and division.

6. Create a visual fraction model comparing two fractions (the fractions must be equivalent).

7. Explain what makes equivalent fractions similar and different.

Evaluate (Math - Key)

1. What kind of fractions look different but have the same value?

Equivalent fractions

2. Which of the following fractions are equivalent?



$\frac{1}{2}$ and $\frac{4}{8}$

3. Find two equivalent fractions for $\frac{3}{10}$ using multiplication.

EX. (students could have various answers)

$$\frac{6}{20}, \frac{9}{30}, \frac{30}{100}, \frac{15}{50}, \frac{60}{200}$$

4. Find two equivalent fractions for $\frac{20}{100}$ using division.

$$\frac{10}{50}, \frac{5}{25}, \frac{4}{20}, \frac{2}{10}, \frac{1}{5}$$

Evaluate (Math - Key)

5. Find two equivalent fractions for $\frac{5}{20}$ using multiplication and division.

EX. (students could have various answers)

$$\frac{1}{4}, \frac{10}{40}, \frac{15}{60}, \frac{50}{200}, \frac{30}{120}$$

6. Create a visual fraction model comparing two fractions (the fractions must be equivalent).

EX. (students could have various answers)



7. Explain what makes equivalent fractions similar and different.

Equivalent fractions are similar in their values. They are different in the way they look visually (number of pieces per whole and number of shaded pieces) and numerically.

Evaluate (Science)

1. What contains plants, animals, and other organisms that work together to form a cohesive system of life?

2. Why do ecosystems need to have balance?

3. What kind of diagram can you use to show the flow of energy through animals in an ecosystem?

4. What 3 things can happen to the affected species if one component of an ecosystem changes?

Sources:

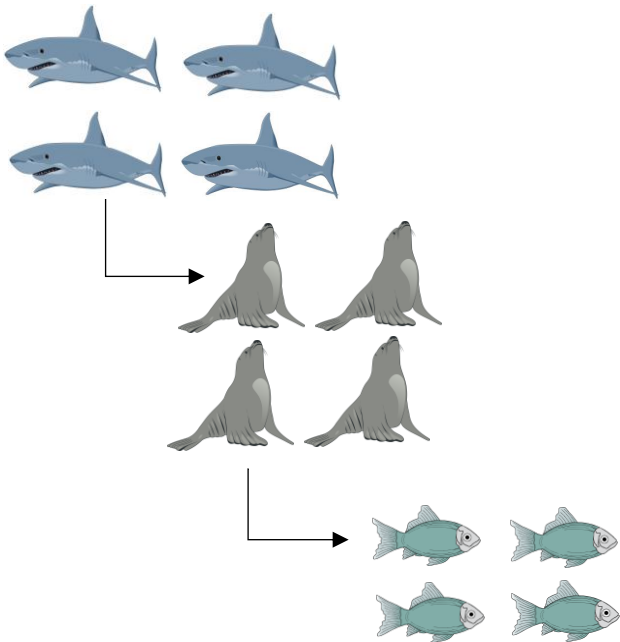
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Evaluate (Science)

5. What would happen to the sharks and fish if $\frac{3}{4}$ of the seals shown below were removed? What would happen if the seal population doubled?



Evaluate (Science - Key)

1. What contains plants, animals, and other organisms that work together to form a cohesive system of life?

An ecosystem

2. Why do ecosystems need to have balance?

Ecosystems need to have balance because all of the components in an ecosystem depend on each other.

3. What kind of diagram can you use to show the flow of energy through animals in an ecosystem?

Food chain or food web

4. What 3 things can happen to the affected species if one component of an ecosystem changes?

The affected species will either adapt, move, or perish

Evaluate (Science - Key)

5. What would happen to the sharks and fish if $\frac{3}{4}$ of the seals shown below were removed? What would happen if the seal population doubled?

If the seals population decreased, the population of the sharks would decrease because they would be losing the majority of their food supply. The fish population would increase because they wouldn't be hunted by so many predators.

If the seal population increased, the population of the sharks would increase because their food supply would be greater. The fish population would decrease because they would have more predators hunting them.

