

# Compare Mass through Hefting.

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### Differentiate and Assess

Not every student will be ready to investigate this concept at this Level and so we will need to differentiate to ensure every student is learning at their leading edge. Select the Differentiate button on this screen.

### Integrate

Every mathematical concept is integrally related to other mathematical concepts. Teaching and learning related concepts simultaneously develops deep relational understanding. Select the Integrate button on this screen.

### Intervene

Some students may not yet be ready to investigate this concept at any Level, and so we will need to provide some intervention. Select the Intervention button on this screen.

# COMPARE MASS THROUGH HEFTING.

## EXPLICIT TEACHING PLAN OVERVIEW PAGE

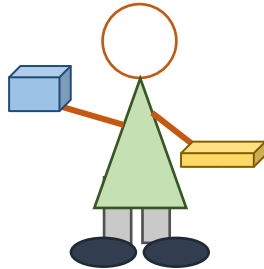
THIS PAGE IS A SUMMARY OF THE EXPLICIT TEACHING PLAN, INCLUDING STRATEGIC QUESTIONS, AND DESCRIBING THE SEQUENCE WHICH WILL OCCUR OVER MULTIPLE LESSONS.

RESOURCES: OBJECTS TO COMPARE THE MASS OF, PENCIL, PAPER

WHAT COULD WE DO?

Children:

- compare the mass of two objects through hefting, for example,



- describe one object as heavy and heavier
- describe one object as light and lighter

WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

Children

- ask one another questions about comparing mass through hefting, for example:
  - ▶ What is mass?
  - ▶ Can we see mass?
  - ▶ How could we compare the mass of these objects?
  - ▶ How could we heft the objects?
  - ▶ Which object is heavy?
  - ▶ Which object is light?
  - ▶ Which object is heavier?
  - ▶ Which object is lighter?

# COMPARE MASS THROUGH HEFTING.

## EXPLICIT TEACHING PLAN

FULL EXPLICIT TEACHING PLAN, EMBEDDING DEEP RELATIONAL UNDERSTANDING, METALANGUAGE, AND QUESTIONS THAT MAY BE USED OVER MULTIPLE LESSONS.

### WHAT COULD WE DO?

Children think about, talk and listen to a friend about, then have the opportunity to share what they already know.

Record, for example, mass

*Technically, mass and weight are not the same. Mass refers to a measure of the matter in an object, while weight refers to a force caused by the gravitational attraction between 2 objects. The magnitude of this force depends on the masses of the objects.*

*For example, on Earth, the object and the Earth, on the moon, the object and the moon.*

*Weight changes if gravity changes, but mass remains the same.*

*Weight is measured in Newtons – named after Sir Isaac Newton who developed his theory of gravitation when he was only 23 years old.*

Display a box with something heavy inside.

*Understanding that we cannot see mass is conceptual – it may take a few lessons for some children to develop this understanding.*

### WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

- ▶ Today brings an investigation about mass.
- ▶ What do you know about mass?
- ▶ Talk about mass with a friend.
- ▶ Is anyone ready to share what they are thinking about mass?
  
- ▶ Today we're going to investigate mass
- ▶ Have you ever heard of mass before?
  
- ▶ When we measure mass, we are measuring how heavy or how light an object is.
- ▶ Sometimes we say we are measuring something's weight.
- ▶ Can we see mass?
- ▶ Can we see how heavy or light an object is?
- ▶ Can you tell how heavy or light this box is without knowing what is inside?
- ▶ Do you think this box is heavy?
- ▶ Do you think this box is light?
- ▶ Does the mass of this box depend on what is inside the box?
- ▶ If this box is empty, would it be light?
- ▶ If this box has a rock in it would it be heavy?

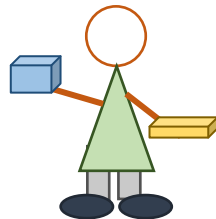
Display 2 objects with noticeably different masses, for example, a book and an empty tissue box.

*Some children may think the box is heavier because it has a larger volume!*

Allow children to hold the book in one hand and the box in the other.

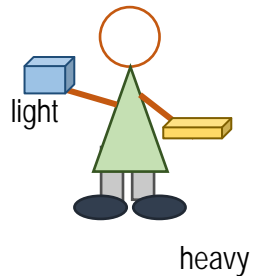
Child hold the book lower and the box higher. for example,

*Some children may hold the heavy object higher and the light object lower!*



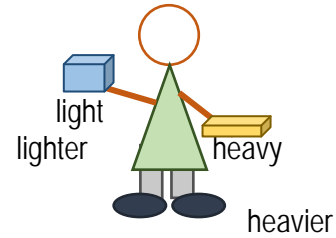
Record, for example, hefting

Record a child with a book in one hand and a box in the other hand, with the hand holding the book lower than the hand holding the box, and label it 'light' and heavy', for example,



- ▶ Here we have 2 objects, a book and a box.
- ▶ Which one do you think will be heavy?
- ▶ Which one do you think will be light?
- ▶ Why do you think that?
  
- ▶ How could we compare which one is heavier?
- ▶ Could we hold the book in one hand and the box in the other hand?
- ▶ Let's try!
- ▶ Which object is heavy, the book or the box?
- ▶ Let's hold the heavy object, the book, lower.
- ▶ Which object is light, the book or the box?
  
- ▶ Let's hold the light object, the box, higher.
- ▶ When we compare the mass of objects like this, we say we are hefting.
- ▶ How could we record this?
- ▶ Could we draw a child holding the book and the box?
- ▶ How can we make it look like the book is heavier?
- ▶ Could we draw the hand with the book down low?
- ▶ Could we record that the book is heavy?
- ▶ How can we make it look like the box is lighter?
- ▶ Could we draw the hand with the box up higher?
- ▶ Could we record that the box is light?

Label 'lighter' and heavier', for example,



Children identify that the box has a larger volume.

Children identify that the book has a smaller volume.

Children identify that a heavy object may not be large.

Children identify that a light object might not be small.

- ▶ Is the book heavier than the box?
- ▶ Could we record that the book is heavier?
- ▶ Is the box lighter than the book?
- ▶ Could we record that the box is lighter?

- ▶ Which object has a larger volume?
- ▶ Does the box have a larger volume?
- ▶ Which object is lighter?
- ▶ Is the box lighter?
- ▶ Is the box larger and lighter?
- ▶ Which object has a smaller volume?
- ▶ Does the book have a smaller volume?
- ▶ Which object is heavier?
- ▶ Is the book heavier?
- ▶ Is the book smaller and heavier?
- ▶ If an object is heavy, does that mean it will be large?
- ▶ No, a heavy object may not be large!
- ▶ If an object is light, does that mean it will be small?
- ▶ No, a light object might not be small!