Movement

Name: ____________________________
Overall Expectations
- describe the position and movement of objects, and demonstrate an understanding of how simple mechanisms enable an object to move
- design and make simple mechanisms, and investigate their characteristics
- recognize that different mechanisms and systems move in different ways, and that the different types of movement determine the design and the method of production of these mechanisms and systems.

Specific Expectations
* All specific expectations are covered by this unit and are mentioned at the end of each activity. The following are specific expectations that are met throughout the unit but are not specifically mentioned:
  LS7: plan investigations to answer some of these questions or solve some of these problems, and describe the steps involved

<table>
<thead>
<tr>
<th>Materials Box</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LARGE paper clips (class set)</td>
<td>straight pins (enough for four per student)</td>
</tr>
<tr>
<td>small paper clips (class set)</td>
<td>hole punch</td>
</tr>
<tr>
<td>wheels (for demonstration)</td>
<td>hammer</td>
</tr>
<tr>
<td>tops (for demonstration)</td>
<td>metre stick</td>
</tr>
<tr>
<td>balls (for demonstration)</td>
<td>carpeted floor</td>
</tr>
<tr>
<td>pager/cellphone or something that vibrates (for demonstration)</td>
<td>tiled floor</td>
</tr>
<tr>
<td>a toy that swings (for demonstration)</td>
<td>sand box (or an eaves trough with sand in it)</td>
</tr>
<tr>
<td>construction paper</td>
<td></td>
</tr>
<tr>
<td>junk box (a box with collected treasures)</td>
<td></td>
</tr>
<tr>
<td>scissors</td>
<td></td>
</tr>
<tr>
<td>glue</td>
<td></td>
</tr>
<tr>
<td>tennis ball</td>
<td></td>
</tr>
<tr>
<td>baseball</td>
<td></td>
</tr>
<tr>
<td>wooden plank</td>
<td></td>
</tr>
<tr>
<td>textbooks</td>
<td></td>
</tr>
<tr>
<td>film canisters</td>
<td></td>
</tr>
<tr>
<td>marbles</td>
<td></td>
</tr>
<tr>
<td>tissue boxes (class set)</td>
<td></td>
</tr>
<tr>
<td>a thick nail</td>
<td></td>
</tr>
<tr>
<td>straws (enough for 2 per student)</td>
<td></td>
</tr>
</tbody>
</table>
Dear Parent or Guardian,

We are beginning our next Science and Technology Unit, Structures and Mechanisms: Movement. By the end of this unit, your child will:
- describe the position and movement of objects, and demonstrate an understanding of how simple mechanisms enable an object to move
- design and make simple mechanisms, and investigate their characteristics
- recognize that different mechanisms and systems move in different ways, and that the different types of movement determine the design and the method of production of these mechanisms and systems.


Home Links:
To help your child further their understanding of this science unit, here are some fun activities for you and your family:
- Go to an auto show to see new concept cars.
- Visit the Ontario Science Centre in Toronto or online at www.ontariosciencecentre.ca.
- Take a car ride, subway ride, train ride, bus ride, boat ride or bicycle ride as a family and talk about movement.
- Play games with tops or balls and discuss their movements.

Happy Adventures,

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Movement
Our Science Words

Method:
1) Place the **LARGE** paper clip in the middle of your desk.
2) Place the **small** paper clip over the **LARGE** paper clip. This is drawn in the chart below for you.
3) Place the **small** paper clip under the **LARGE** paper clip. Draw what it looks like in the chart below.
4) Place the **small** paper clip to the left of the **LARGE** paper clip. Draw what it looks like in the chart below.
5) Place the **small** paper clip to the right of the **LARGE** paper clip. Draw what it looks like in the chart below.

<table>
<thead>
<tr>
<th>Over</th>
<th>Under</th>
<th>To the Right</th>
<th>To the Left</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Over" /></td>
<td><img src="image" alt="Under" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6) Move the small paper clip upwards. The drawing in the chart on the next page shows you how you can draw this movement.
7) Move the small paper clip downwards. Draw this movement in the chart below.

Materials
1) a **LARGE** paper clip
2) a **small** paper clip
8) Move the small paper clip to the right. Draw this movement in the chart below.
9) Move the small paper clip to the left. Draw this movement in the chart below.

<table>
<thead>
<tr>
<th>Upwards</th>
<th>Downwards</th>
<th>Moving to the Right</th>
<th>Moving to the Left</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="" /></td>
<td><img src="image2.png" alt="" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Our New Science Words

Here’s a place to keep all of the new science words we learn during our adventures.

Grade 2 SMactivity001 covers:
SM3: describe, using their observations, the position of an object in relation to other objects or to a specific area (e.g., use such words as over, under, beside, behind)
SM4: identify changes in the position of an object in relation to other objects (e.g., movement upward or to the left)
SM8: use appropriate vocabulary to describe their investigations, explorations, and observations (e.g., use words such as rotate, turn, faster, and slower to describe the motion of wheels and axles)
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Movement

How do things move?

As a class let’s make a list of things that move in different ways. Write lists in the chart below:

<table>
<thead>
<tr>
<th>Things that turn</th>
<th>Things that spin</th>
<th>Things that swing</th>
<th>Things that bounce</th>
<th>Things that vibrate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grade 2 SMactivity002 covers:
SM5: describe, using their observations, the pattern of movement of objects (eg. turning, spinning, swinging, bouncing, vibrating)
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# Simple Machines

<table>
<thead>
<tr>
<th>Simple Machine</th>
<th>Movement</th>
<th>Where do we find it?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image.png" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image.png" alt="Diagram" /></td>
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<tr>
<td></td>
<td><img src="image.png" alt="Diagram" /></td>
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<td></td>
<td><img src="image.png" alt="Diagram" /></td>
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</tr>
<tr>
<td></td>
<td><img src="image.png" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>
Let’s Make a Hinge!

As a class let’s make a list of things that use hinges:

______________________________
______________________________
______________________________

Materials:
1) a piece of construction paper
2) junk from the junk box
3) scissors
4) glue

Method:
1) Pick an object from the list above to build.
2) Draw a plan of your creation.
3) Make your creation with the construction paper, junk from the junk box, scissors and glue.
4) Draw an after picture of your creation.
5) Share HOW you made your creation with the class.

My plan: The final product:

Grade 2 SMactivity003 covers:
SM1: describe different mechanisms through observation and investigation (eg. hinge, inclined plane), and identify the components that are simple machines (eg. lever, wedge)
SM2: describe, using their observations the characteristics and movements of simple mechanisms (eg. hinge, wheels and axle)
SM10: communicate the procedures and results of investigations and explorations for specific purposes, using drawings, demonstrations, and oral and written descriptions (eg. draw a sketch of an object they plan to make and another sketch of the object after it is made; tell the class the procedures they followed in making a vehicle or a container with a hinged lid)
SM14: identify, through observation, the mechanical parts of objects (eg. hinges on doors) and describe the motion of these parts

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**Movement**  
**Changing Motions**

Circle which ball you think will bounce better.

Let’s try it!  
Which one bounced better? ____________________________

Why did it bounce better?  
________________________________________________________________
________________________________________________________________

Purpose: _______________________________________________________

<table>
<thead>
<tr>
<th>Method:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Place the wooden plank on top of two text books.</td>
<td></td>
</tr>
<tr>
<td>2) Place an empty film canister at the top, let it go and let it roll down.</td>
<td></td>
</tr>
<tr>
<td>3) Measure how far the film canister travelled and fill out the chart below.</td>
<td></td>
</tr>
<tr>
<td>4) Place the wooden plank on top of four text books.</td>
<td></td>
</tr>
<tr>
<td>5) Place a film canister at the top, let it go and let it roll down.</td>
<td></td>
</tr>
<tr>
<td>6) Measure how far the film canister travelled and fill out the chart below.</td>
<td></td>
</tr>
<tr>
<td>7) Continue adding 2 text books at a time until the chart is complete.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) wooden Plank</td>
<td></td>
</tr>
<tr>
<td>2) textbooks</td>
<td></td>
</tr>
<tr>
<td>3) film canister (the ones where the tops don’t have a lip)</td>
<td></td>
</tr>
<tr>
<td>4) marbles</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2 books</th>
<th>4 books</th>
<th>6 books</th>
<th>8 books</th>
<th>10 books</th>
</tr>
</thead>
<tbody>
<tr>
<td>distance travelled in centimetres</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8) Place the wooden plank on top of 4 text books.
9) Fill one film cannister with two marbles.
10) Place the film canister at the top, let it go and let it roll down.
11) Measure how far the film cannister travelled and fill out the chart below.
12) Continue adding 2 marbles to the film cannister until the chart is complete.

<table>
<thead>
<tr>
<th>0 marbles</th>
<th>1 marbles</th>
<th>2 marbles</th>
<th>3 marbles</th>
<th>4 marbles</th>
</tr>
</thead>
<tbody>
<tr>
<td>distance travelled in centimetres</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Questions:

1) Did the empty film canister travel farther with only 2 books or with 10 books?
________________________________________________________________

2) Did the empty film canister travel faster with only 2 books or with 10 books?
________________________________________________________________

3) Why do you think it travelled faster and farther?
________________________________________________________________

4) Did the film canister travel farther with 2 marbles or with 10 marbles?
________________________________________________________________

5) Did the film canister travel faster with 2 marbles or with 10 marbles?
________________________________________________________________

Why do you think it travelled faster and farther?
________________________________________________________________

Grade 2 SMactivity004 covers:
SM16: compare the motion of similar objects made with or filled with different materials (eg. ways in which baseballs, and tennis balls bounce; ways in which film canisters containing different materials roll down a slope)
SM18: describe, using their observations, the effects of changing the slope of an inclined plane on the motion of an object that is placed on it (eg. changes in speed, changes in distance travelled)
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Purpose: _______________________________________________________

You have been hired to design a new concept car for Hot Wheels! The first step in designing a concept car is to plan it. Remember you MUST use the same materials as in the sample car, and the materials should be shown in your plans. Make a drawing of your plans below:

Concept Car Name: __________________________
Designed by: ________________________________
Materials:
1) a tissue box
2) a thick nail
3) a hammer
4) two straws
5) wheel cutouts
6) four straight pins
7) hole punch
8) scissors

Method:
1) With the long side of the tissue box facing you, measure 3 cm in from each end. Make a mark with your pencil.
2) Repeat step 1 on the other side.
3) Place the nail on your marks and nail a hole into the tissue box. You may need to enlarge the hole with a pencil.
4) Thread the two straws through the holes. These make your axles. Could you think of another way to attach your axles and still have the wheels spin?

5) Cut out the wheels.
6) Hole punch the middle of the wheel, this is so the axle can be attached to the wheel (repeat for all four wheels).
7) Cut the fringes of the wheels and fold them down in alternating directions (repeat for all four wheels).
8) Cut out the treads for the wheels.
9) Place glue on the white part of the tread.
10) Form a circle with the tread strip and attach the two ends, overlapping only on the white part (repeat for all four treads).
11) Place glue on the alternating fold fringes, then carefully place the wheel into the circular tread (repeat for all four wheels).
12) Slide axle into the middle hole of the wheel (repeat for all four wheels).
13) Place a straight pin through the straw, this keeps the wheel from falling off. Make sure there is enough room so that the wheels don’t rub on the car body (repeat for all four wheels).
14) Decorate your concept car as you planned above.

Grade 2 SMactivity005 covers:
SM10: communicate the procedures and results of investigations and exploration for specific purposes, using drawings, demonstrations, and oral and written descriptions (eg. draw a sketch of an object they plan to make and another sketch of the object after it is made, tell the class the procedures they followed in making a vehicle or a container with a hinged lid)
SM11: make simple mechanisms and use them in building a device they have designed (eg. vehicle with wheels and axles)
SM12: select and use appropriate tools, utensils, and equipment (eg. use a paper punch to make holes for the axle in cardboard wheels)
SM13: use appropriate techniques to make and fasten the components of a model that they have made (eg. bend cardboard to make hinges; glue various materials together)
SM22: identify different ways in which wheels and axles can be attached to a chassis (eg. by using an axle-holder, by placing the axle in holes drilled in the frame)
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Movement
Let’s go for a Drive!

The wheels turn clockwise when the car is going _________________.

The wheels turn counter clockwise when the car is going _________________.

Driving on different surfaces

Rub your hands together really fast. What happens? ________________

Method:
1) Take your new car to the carpet.
2) Give your car a small push.
3) Measure how far your car went and record it in the chart below.
4) Take your new car to the tiled floor.
5) Give your car a small push (the same as last time).
6) Measure how far your car went and record it in the chart below.
7) Take your car to the sand box.
8) Give your car a small push (the same as last time).
9) Measure how far your car went and record it in the chart below.

<table>
<thead>
<tr>
<th></th>
<th>Carpet</th>
<th>Tile</th>
<th>Sand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance travelled in centimetres</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Which surface let the car go furthest? ________________________________

Does that mean it has more or less friction with the car? ______________________

Which surface made the car stop the quickest? ______________________________

Does that mean it has more or less friction with the car? ______________________

Grade 2 SMactivity006 covers:
SM2: describe, using their observations, the characteristics and movements of simple mechanisms (eg. hinge, wheels and axle)
SM6: ask questions about and identify needs or problems related to structures and mechanisms, and explore possible answers and solutions (eg. investigate the effect of different floor coverings on the motion of a toy car)
SM15: compare the motion of objects on different surfaces (eg. wheels of a toy on carpet, tile, and sand)
SM17: describe, using their observations, the effect that different surfaces (eg. wood, tiles, carpet, water) have on the rate at which an object slows down
SM19: predict factors that make a load easier or more difficult to move (eg. the size of a wheel or hinge, the amount of friction)
SM21: demonstrate awareness that the wheels of a vehicle rotate clockwise or counter-clockwise depending on the direction of movement of the vehicle

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Movement
MONSTER CARS!

Purpose: _______________________________________________________

Make a prediction:
Do you think that a car with small wheels or BIG wheels would travel farther down a ramp?

Method:
1) Place the wooden plank on several textbooks to make an incline.
2) Place your car new car with 6 cm wheels at the top of the incline, let it go and let it roll down.
3) Measure the distance your car travelled and record it in the chart below.
4) Cut out the wheels.
5) Hole punch the middle of the wheel or cut the out the middle circle with scissors, this is so the axle can be attached to the wheel (repeat for all four wheels).
6) Cut the fringes of the wheels and fold them down in alternating directions (repeat for all four wheels).
7) Cut out the treads for the wheels.
8) Place glue on the white part of the tread.
9) Form a circle with the tread strip and attach the two ends, overlapping only on the white part (repeat for all four treads).
10) Place glue on the alternating fold fringes, then carefully place the wheel into the circular tread (repeat for all four wheels).
11) Remove the existing 6 cm wheels on your car and replace them with the 8cm wheels by sliding the axle through the middle hole of the wheel (repeat for all four wheels).
12) Place the straight pins back into the straw, this keeps the wheel from falling off (repeat for all four wheels).

Materials:
1) 8cm wheel cutouts
2) scissors
3) glue
4) a wooden plank
5) text books
6) a metre stick or measuring tape
13) Place your car, now with 8cm wheels on top of the incline, let it go and let it roll down.

14) Measure the distance your car travelled and record it in the chart below.

| Distance travelled by car in centimetres | 6 cm wheels | 8 cm wheels |

Did the wheel size make a difference?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

Why or why not?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

Grade 2 SMactivity007 covers:
SM9: record relevant observations, findings, and measurements, using written language, drawings, charts, and concrete materials (eg. record what happens to the movement of a vehicle released from a ramp if the size of its wheels is changed)
SM19: predict factors that make a load easier or more difficult to move (eg. the size of a wheel or hinge, the amount of friction)
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Movement Certificate

This certificate hereby certifies

______________________

as a Grade 2 Movement expert.

__________________________  ______________________
Principal  Teacher

Share your science booklet with at least one family member at home. After you have shared complete the following:

1) Cut out your Movement Certificate.
2) Get the person you shared your science booklet with to fill out the form below, detach it and bring it back to school.

C ...........................................................................................................

______________________________
shared their science booklet with the following family members:

______________________________  
Parent’s Signature

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