Lesson: **2-1** **Systems of Measurement**

Concept/Topic: SI & Imperial Systems of Measurement

**General Outcome(s):** Develop spatial sense through direct and indirect measurement.

**Specific Outcome(s):** Measurement #1 & 2 – Demonstrate an understanding of the SI & Imperial system by describing relationships for length, area, volume, etc. and applying strategies to convert units.

**Required Materials:** Access to smart board and enough yard sticks for the class to work in partners.

**Corresponding Text:** *Lesson 3.1 Systems of Measurement* Page 94 – 105

**Procedures**

***Day 1***

1. Introduce the new unit to students by asking them to open to the table of contents. Unit 2 is actually chapter 3 in the text. To discuss the key terms for the unit (page 92) in partners. Ask them if any of the topics they already know about. Write what students know on the board as they give you the ideas. Use the rest of this time to have students construct the unit foldable. [15 min]
2. In partners, have the students turn to page 95 and read through the *Discuss the Ideas*. Assign one student to be a recorder and one to be a reporter. Ask a few groups to report back to the class what they discovered. Guide the class discussion to focus on the students’ strategy and replicate it on the board rather than just giving an answer. [8 min]
3. Have students examine the short diagram entitled *Some Common Imperial Units* from the smart lesson. Tell them to copy the diagram into their foldable as shown here. [6 min]

|  |  |  |
| --- | --- | --- |
| **Length (Common Imperial Units)** | | |
| **Unit** | **Abbreviation** | **Conversion Factors** |
| Inch | *in* or |  |
| Foot | *ft* or ́ |  |
| Yard | *yd* |  |
| Mile | *mi* |  |

1. In their partners, have students examine the yard stick and explain where the increments indicate inch, foot and yard. Ask them to relate the number of inches per foot and the number of feet per yard to the diagram from step 3. [5 min]
2. Demonstrate how to complete imperial unit conversions using the examples included in the smart lesson (shown here). [5 min]

ex. Convert 5 yards to feet.



ex. Convert 2.5 feet to inches.



ex. Convert 32 inches to feet.



ex. Convert 372 feet to yards.

1. Have students input examples into their foldable. They may use the given examples or make their own. [3 min]
2. Have students complete the first drill & practice section of the unit entitled *Imperial Unit Conversions*. [10 min]
3. Using the smart lesson ask students to count the number of *equal sized pieces* each inch is broken into. Tell the students that most yardsticks will either do  or  although some will use . Show the examples in the smart lesson of using the ruler to find the reduced fractional measurement. [5 min]
4. Have students measure the height of two objects that are less than 1 inch in your class i.e. the thickness of a graphing calculator or IPod, length of a small paper clip, etc. [3 min]
5. Show students how to complete imperial unit conversions on the smart board using the examples included in the smart lesson (shown here). [6 min]

ex. Convert 6.375 inches to inches with a fraction.



ex. Add  .



1. Have students complete the second drill & practice section of the unit entitled *Fractions of an Inch* [10 min]

***Day 2***

1. Recap the previous day’s learning by putting up the 2 questions of unit conversions (1 decimal and 1 fractional) from the smart lesson. Have students solve independently and then discuss in partners. [5 min]
2. Tell students that converting units to a common one is an important first step to solving problems. Using the following problems as examples, have students discuss in partners how to solve the problem. Ask students to share their ideas/solutions with the class before showing them your own solution. Have students enter their solution into their foldables.

[25 min]

1. Jason is trying to determine how many rows of boards he needs to buy in order to replace the top of his deck. The deck is 12 *ft* wide. Each board is  wide. There must be a  gap between each board.

***Possible Solution:***

 of deck width.

*Each board and gap have a width of *

*The total number of rows will have to be *

*Jason must purchase 21 rows of boards.*

1. Jennifer is trying to choose which table to use for a wedding. There are 80 people attending and each of them must have of the table’s edge. Two choices are available. The small round tables have a diameter of 6 *ft* while the larger ones have a diameter of 8 *ft*. How many round tables would be needed for all 80 guests? How many if she used the large tables?

***Possible Solution:*** *Small Table Large Table*

* *

* *

* *

*Requires 12 tables. Requires 8 tables.*

1. **Independent Practice** [50 min]

* Pg. 102 #1 – 7

1. Have students complete the section *What I Need to Practice (Lesson 1)* in their foldable.

Lesson: **2-2 Converting Measurements**

Concept/Topic: Converting between the SI & Imperial Systems

**General Outcome(s):** Develop spatial sense through direct and indirect measurement.

**Specific Outcome(s):** Measurement #1 & 2 – Applying strategies to convert SI units to Imperial units and Imperial units to SI units.

**Required Materials:** Access to smart board and enough yard & metre sticks for the class in partners.

**Corresponding Text:** *Lesson 3.2 Converting Measurements* Page 106 – 114

**Procedures**:

***Day 1***

1. In partners, ask students what was learned the previous day and then have a few groups report back to the class. [4 min]
2. Ask students which two problems from yesterday were most interesting or challenging. Take time to dialogue with the class or demonstrate a possible solution for each (Page 102 #1–8). [5 min]
3. In their partners have the students complete the following charts in their foldables by lining their yard & metre sticks up. Students should use their best estimate for the 2nd column. After the students are done give them the accurate values for the third column. Use the questions on the smart lesson to have students dialogue about the activity. [7 min]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Converting SI to Imperial** | |  | **Converting Imperial to SI** | |
| **Estimate** | **Actual Conversion** |  | **Estimate** | **Actual Conversion** |
| 1 *mm* = \_\_\_\_\_\_\_ *in* | 1 *mm* = 0.0394 *in* |  | 1 *in* = \_\_\_\_\_\_\_ *mm* | 1 *in* = 25.4 *mm* |
| 1 *cm* = \_\_\_\_\_\_\_ *in* | 1 *cm* = 0.3937 *in* |  | 1 *in* = \_\_\_\_\_\_\_ *cm* | 1 *in* = 2.54 *cm* |
| 1 *m* = \_\_\_\_\_\_\_ *ft* | 1 *m* = 3.2808 *ft* |  | 1 *ft* = \_\_\_\_\_\_\_ *m* | 1 *ft* = 0.3048 *m* |
| 1 *m* = \_\_\_\_\_\_\_ *yd* | 1 *m* = 1.0936 *yd* |  | 1 *yd* = \_\_\_\_\_\_\_ *m* | 1 *yd* = 0.9144 *m* |
| ~ | 1 *km* = 0.6214 *mi* |  | *~* | 1 *mi* = 1.6909 *km* |

1. Using examples in the smart lesson (shown here), demonstrate how to use the conversion factors to change between Metric and Imperial Measurements. Have students enter the first and last of the 4 examples into their foldable. [8 min]

ex. Convert 100 metres to the nearest foot.



ex. Convert 175 kilometres to the nearest tenth of a mile.



ex. Convert 110 yards to the nearest metre.



ex. Convert 16 inches centimetres.



1. Have students complete the third drill & practice section of the unit entitled *Converting Between SI and Imperial Units*. [16 min]
2. Using the smart lesson examples (shown here), demonstrate how to complete unit conversions that require more than one conversion. Have students enter the 2 examples into their foldable. [6 min]

ex. Convert 3.5 miles to the nearest metre.



ex. Convert 125 000 centimetres to the nearest yard.



1. Have students complete the fourth drill & practice section of the unit entitled *Multiple Conversions*. [18 min]

***Day 2***

1. Recap the previous day’s learning using a peer-quiz. In partners have students each write a conversion question. Have one student write a conversion question for an Imperial to SI unit conversion, have the other student write a question for an SI to Imperial unit. Have students complete each other’s question. Ask students to refine or write new questions in partners and share them with another group to complete. Ask students if they agree on the solutions before moving on. If necessary, go over solutions with them on the smart board. [10 min]
2. Show students how to solve problems by converting units using the following problems. Have students enter the solutions in the unit foldable. [20 min]
3. Mark is trying to set a world record for distance rolled by a tractor tire without falling. He has to beat the current record of 56 *km*. If his tire has a diameter of 4’5” then determine how many times he will have to roll the tire to beat the record.

***Possible Solution*:**

*The tire has a diameter of *

*The tire rolls its circumference: *

*The current record is *

*to beat the current record.*

1. What has a greater base area, a circular hot tub with a diameter of 9 *ft* or a rectangular hot tub with dimensions ?

***Possible Solution*:** *Circular Hot Tub Rectangular Hot Tub*

**

 **

*The circular hot tub has a larger base.*

1. **Independent Practice** [45 min]

* Pg. 111 #1 – 6

1. Have students complete the section *What I Need to Practice (Lesson 2)* in their foldable.

Lesson: **2-3 Surface Area**

Concept/Topic: Surface Area of 2-D shapes & 3-D Objects

**General Outcome(s):** Develop spatial sense through direct and indirect measurement.

**Specific Outcome(s):** Measurement #4 Solve problems (and verify their solutions) that involve both SI and Imperial area measurements of regular, composite and irregular 2-D shapes and 3-D objects.

**Required Materials:** Access to smart board, handouts of net diagrams for each student, scissors, tape and string (if you want to hang the finished product in the classroom). Copies of **BLM 3.10, 3.11, 3.12, and 3.13** for each student from the *Math Works 10 Teacher Resource*.

**Procedures**:

***Day 1***

1. Pose the following challenge problem to students to open the day. A tire has a diameter of 32 inches. Another tire has a diameter of 24 inches. Determine how many times the smaller tire would have to roll in order to keep up with the large tire if it rolled 600 times. Ask students to work in partners and encourage them to try more than 1 method. [8 min]
2. Have students review the previous homework and display the answers. Survey the class for which questions need clarification. Ask students to re-tackle the question in their partners and then dialogue as a class.
3. Students will now work through a lengthy activity to investigate and understand the surface area formulae for rectangular prisms, triangular prisms, cylinders and cones. This activity should be given a good deal of time so that students can really build the connections. Note that while it is similar to the activity on page 117 it does differ in that encourages the development of the formula rather than just telling students it. [65 min]

**Rectangular Prism**

1. Have students cut out the rectangular net.
2. Have the students name all the edges with a variable and color matching edges the same. Ie: color all lengths red, widths blue, heights green, etc.
3. Have students write the formula to determine each face (shape) using the variables they have assigned for the side. Formulae: , , 
4. Have students write an expression for the total surface area by adding the different formulae they have combined and simplifying.
5. Have students write their formula in their unit foldable. 
6. Have students compute the surface area of the rectangular prism in SI units and enter into their foldable.
7. Have students assemble the net, tape it together (and hang from ceiling?)

**Triangular Prism**

1. Have students cut out the triangular net.
2. Have the students name all the edges with a variable and color matching edges the same. Ie: color all bases/widths (sides) red, the heights blue (altitudes) on each triangle, the prism height green.
3. Have students write the formula to determine each face (shape) using the variables they have assigned for the side.,
4. Have students write an expression for the total surface area by adding the different formulae they have combined and simplifying.
5. Have students write their formula in their unit foldable.
6. Have students compute the surface area of the rectangular prism in Imperial units and have students enter into their foldable.
7. Have students assemble the net, tape it together (and hang from ceiling?)

**Cylinder**

1. Have students cut out the cylindrical net.
2. Have the students name all the edges with a variable and color matching edges the same. Ie: color all circumferences (and matching edges) red, the heights blue (straight edges), the radii green.
3. Have students write the formula to determine each face (shape) using the variables they have assigned for the side. , 
4. Have students write an expression for the total surface area by adding the different formulae they have combined and simplifying. 
5. Have students write their formula in their unit foldable.
6. Have students compute the surface area of the rectangular prism in SI units and then have students enter into their foldable.
7. Have students assemble the net, tape it together (and hang from ceiling?)

**Cone**

1. Have students cut out the conical net.
2. Have the students name all the edges with a variable and color matching edges the same. Ie: color the circumference (and matching curve) red, the slant heights blue (straight edges), the radius green.
3. Have students write the formula to determine each face (shape) using the variables they have assigned for the side. ,  [give them this one]
4. Have students write an expression for the total surface area by adding the different formulae they have combined and simplifying. 
5. Have students write their formula in their unit foldable.
6. Have students compute the surface area of the rectangular prism in Imperial units and have students enter into their foldable.
7. Have students assemble the net, tape it together (and hang from ceiling?)

***Day 2***

1. Ask 4 students to go up to the board and write the 4 formulas derived the previous day. Ask 4 other students to explain what dimension each variable represents. [5 min]
2. Have students use the formulas to complete the fifth drill and practice section *Determining Surface Area*. [12 min]
3. Have students work through the question on the smart board lesson. Do not let them see the solution in the text (page 119) until they have tried their own & conferred with a partner. Emphasize the need to switch units to feet before calculating surface area. When students have had sufficient time, ask them to open to page 119 in the text and compare the solution. Give students time to ask clarifying questions.[8 min]
4. In their partners, have students read and solve *Activity 3.8 A Redecorating Project* question 1 on page 120. This would be a good piece to collect and give feedback to students on.
5. **Independent Practice** [45 min]

* Pg. 121 #1 – 6

1. Have students complete the section *What I Need to Practice (Lesson 3)* in their foldable.

Lesson: **2-4 Capacity**

Concept/Topic: Capacity & Unit Conversions

**General Outcome(s):** Develop spatial sense through direct and indirect measurement.

**Specific Outcome(s):** Measurement #2 Demonstrate an understanding of the Imperial System by describing relationships for volume and capacity between American and British imperial units for capacity. Measurement #4 Solve problems (and verify their solutions) that involve both SI and Imperial area measurements of regular, composite and irregular 3-D objects.

**Required Materials:** Access to smart board.

**Procedures**:

1. In partners, using the *Math on the Job* activity in the yellow box at the start of the lesson. Have students reason through their understanding of the activity. You may need to prompt students to change the units to a common one. When students have worked with the problem present a solution.

***Possible Solution:***

*The box dimensions are: Number of boxes that fit each dimension:*

* 🡪 *

* 🡪 *

* 🡪 *

*Boxes are stacked in a pile of 12 by 4 by 6 there will at most be *

1. Go over the previous day’s homework by having students mark their partner’s work with the answer key (on the smart lesson). If there are questions that are worth going over take the time to investigate them.
2. Tell the students that there are different systems of measurement for capacity (amount of matter a container can hold). There are two systems commonly used in Canada, the SI system: *mL, L* (millilitres and litres) and the Imperial System: *fl oz, pt, qt, gal* (fluid ounce, pint quart, gallon).
3. In partners students will now create the comparison of *fl oz* to *mL*. To do this they will need to copy and complete the following chart (on loose leaf) with the correct ratio of fluid ounces to millilitres. The same chart is found on page 125 of the text. Model simplifying the first ratio for students then ask them to complete the chart.



1. Ask students to discuss in their partners why Canadian pop cans are manufactured in such odd sizes. Ask students to volunteer what they decided. The answer is that much more Coke is manufactured in the United States than in Canada, but that the sizes are the same. In Canada it is required that the capacity be written in *mL*.
2. Have students complete the following chart in their unit foldable. Students will need to know that there are 16 fluid ounces per pint, 2 pints in a quart, and 4 quarts per gallon.

|  |  |  |  |
| --- | --- | --- | --- |
| **Liquid Capacity Equivalent Units** | | | |
| **Unit** | **Abbreviation** | **Imperial** | **SI** |
| fluid ounce | *fl oz* | *~* | *29.6 mL* |
| pint | *pt* | *16 fl oz* | *0.47 L* |
| quart | *qt* | *2 pt* | *0.95 L* |
| gallon | *gal* | *4 qt* | *3.78 L* |

1. Go over the following unit conversions and have students enter into their foldable.

ex. Convert 12 *fl* *oz* to the nearest *mL*.



ex. Convert 3 *qt* to Litres.

ex. Convert 25*L* to the nearest tenth of a gallon.

ex. Convert 26500*mL* to the nearest quart.



1. Have students use the comparisons to complete the sixth drill and practice section *Capacity Conversions*. [10 min]
2. **Independent Practice** [35 min]

* Pg. 132 # 2–5

1. Have students complete the section *What I Need to Practice (Lesson 4)* in their foldable.