**Grade 6 | Unit 5, Lesson 5**

**Intellectual Preparation Cover Sheet**

**Directions: Complete the IPP Cover Sheet for every lesson due for submission.**

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| **Step** | **Action:** |
| 1. Understand the concept and/or big ideas at play in the lesson and be able to articulate them clearly and crisply. | * Read the entire Lesson Plan and identify the key concepts/big ideas students need to understand. Create a **lesson summary** annotation that describes, in your own words, the purpose of the lesson (why), the key concepts students need to understand (big ideas/what), and how they will come to understand these within the lesson. |
| 1. Do the core tasks of the lesson to develop/refine exemplar work and clear CFS for anticipated strategies. | * Print the classwork and complete this step directly in the student packet for the TAI, INM/TTC problem (include exemplar annotations), and all GP/IP problems. |
| 1. Anticipate misconceptions and create questions/supports to address these misconceptions. | * For each core task, annotate to describe expected errors on the tasks and back pocket questions to respond to these errors * Identify the questions in the TAI debrief and INM/TTC that elicit the most important understandings and annotate with the following:   + The exemplar student responses   + 1-2 misconceptions or errors that could surface in response to these questions   + BPQs and/or the instructional strategy to address these misconceptions. |
| 1. Optional/As needed: Adjust the plan for any individualized AOTY or intellectual preparation goals. | * As determined with coach, you might:   + Script MVP directions into lesson plans   + Script in additional planned investment moves   + Create rapid & batched feedback forms to capture data   + Determine additional points for differentiation (especially for very high and very low performance during the lesson) * If you will meet in person to scrimmage this lesson, your coach may also ask you to submit a proposed practice objective and identify the lesson segment to practice. |
| **Submit annotated plans and any additional work as per IPP expectations in soft copy of LPs to your coach weekly (and at least 48 hours in advance of the IPP meeting). Implement any feedback from coach prior to the phase 2 meeting.** | |
| 1. Rehearse and Refine:    1. Meet with coach to further internalize and practice executing the plan. Refine plan as needed.    2. Refine plan as needed based on practice and/or student exit ticket data.    3. If possible, prior to teaching the day of, analyze student work from TAI administered at end of CR block; select S work to show call to drive TAI debrief discussion to land Fence Posts and key point. | |

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| **Lesson Type: Exercise-Based Lesson** |
| **Aim** |
| * SWBAT use ratio reasoning to real world and multi-step measurement conversions (between different systems). |
| **Key point** |
| * When converting between units of measurement using a conversion factor, we use the context of the problem to determine the best conversion factor to use. |
| **Standard** |
| **Understand ratio concepts and use ratio reasoning to solve problems**  6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.   * 1. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. |
| **State Test Alignment** |
| *From 2016 NYSE*  Fei Yen’s dog eats 8 ounces of dog food each day. Fei Yen bought a 28-pound bag of dog food. How many 8-ounce servings are in a 28-pound bag of dog food?   1. 14 2. 56 3. 224 4. 448   *From 2015 NYSE*  A high speed elevator can rise 480 feet in 30 seconds. Which expression represents the rate, in feet per minute, of the elevator?   1. 480 x 30 2. 480 ÷ 30 3. 480 x 2 4. 480 ÷ 2 |
| **Assessment** |
| **Exit Ticket:**  1. A cow weighs 123.2 pounds. How many kilograms does the cow weigh?  2. Which is a faster speed limit, 65 miles per hour or 100 km per hour and how do you know?  **Student Work:**   1. The cow weighs 55.53 kilograms   Conversion: 1 lb. = 0.45kg or 1kg = 2.2 pounds   |  |  |  | | --- | --- | --- | | Pounds | 1 (x123.2) | 123.2 | | Kilograms | 0.45 (x123.2) | 55.53 |   2) Conversion: 1 m = 1.609km or 1 km = 0.62 m     |  |  |  | | --- | --- | --- | | Miles | 1 (x 65) | 65 | | Kilometers | 1.609 (x 65) | 160.115 |  |  |  |  | | --- | --- | --- | | Miles | 0.62 (x 100) | 62 | | Kilometers | 1 (x 100) | 100 |   65 miles is a faster speed limit because 65 miles per hour is the same as 160.115 kilometers per hour which is faster than 100 kilometers per hour (OR because 100 km/hr is the same as 62 miles which is less than 65 miles). |
| **Connection to learning** |
| * How does this lesson connect to previous lessons?   + In the previous lesson, students used a conversion factor to create equivalent ratios and convert between measurements in the same system. In this lesson they will do exactly the same thing, but they will be converting between different systems of measurement (metric to customary and vice-versa)      * What do we want every student to take away or do as a result of this lesson? How will a teacher know if students have met this goal?   + Understand: As a result of this lesson, we want every student to understand that a conversion factor represents a unit rate, and therefore problems involving conversions between units of measurement can be solved by using ratio reasoning, specifically equivalent ratios. (Review). We also want them to apply their understanding from lesson 3 to choose the best unit rate given the context (When converting between units of measurement using a conversion factor, we use the context of the problem to determine the best conversion factor to use.)   + Do: As a result of this lesson, students are able to convert units between different measurement systems by identifying the conversion factor and creating equivalent ratios. |
| **How** |
| * Key Strategy/ies for plotting and identifying coordinate pairs   + Annotate the problem with margin notes   + Represent the conversion factor as a ratio in a table or DNL   + Calculate equivalent ratio   + Write answer statement * CFS for top quality work   + Problem is annotated with margin notes to provide additional meaning   + Ratio table or double number line diagram is drawn accurately and are clearly labeled   + Conversion factor and equivalent ratio are clearly identified   + Answer statement is written |
| **Anticipated Misconceptions and Errors** |
| * Ss may get stuck when the multiplier or divisor to create an equivalent ratio is not immediately apparent. |
| **Key Vocabulary** |
| * **Conversion factor**- a ratio (or fraction) which represents the relationship between two different units. A **conversion factor** is ALWAYS equal to 1. |
| **Materials** |
| * Handout * Reference sheets (attached as last page of handout) * Calculators recommended to increase pacing   ***Planner’s Note: Provide students either with a visual anchor or a separate handout with conversion facts for the metric system as these will not be on their reference sheet and they will have to memorize them. Other facts they have to memorize (not an exhaustive list):***   * + - * ***1 ft = 12 in***       * ***3 ft = 1 yd*** |

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| **Opening – Prompt for work time, Circulate, Debrief, Synthesis, & Frame – 12-15 min** |
| **THINK ABOUT IT!**  Jordan wants to run a 12 kilometer race. He knows how fast he can run a mile, so he wants to convert the length of the race to miles. How many miles long is the race? |
| **Prompt for Work Time (<30 sec)**  Tear out your reference sheet from the back of your packet. You may need it for the TAI and we will use it throughout the lesson. You will have 5 minutes to work on this Think About It. Please use the entire 5 minutes. Please show all of your thinking.  **Circulate (≤ 5 min)**  While circulating, collect data on the following:   |  |  | | --- | --- | | **Scholar thinking (correct and erroneous)** | **Scholar Initials - Work to show call** | | S uses the conversion factor 1:0.62 to create a correct equivalent ratio (12:7.44) |  | | S uses the conversion factor 1:1.609 and gets an incorrect ratio (12:19.308) |  | | S uses the conversion factor 1:1.609 and gets an answer close to 7.4580… |  |   **Debrief (≤ 8-10 min)**  **KEY POINT**: *When converting between units of measurement using a conversion factor, we use the context of the problem to determine the best conversion factor to use.*  Show call S work that used a ratio table to convert m to km using conversion factor of 1 mile = 1.609 km and gets the wrong answer for miles (19.308)  **Do you agree or disagree with this Ss work? Vote. TT. CC.** I disagree with this Ss work because the student did not find an equivalent ratio between miles and kilometers. S/he multiplied the number of km by 12 but that is not the correct scale factor between 1.609 and 12, so the ratios are not equivalent.  Show call two pieces of student work: S that uses the conversion factor 1:0.62 to create a correct equivalent ratio (12:7.44) and S that uses the conversion factor 1:1.609 and gets an answer close to 7.4580…  ***[Planner’s Note: if Ss do not come up with the second strategy, provide it for them. The purpose of this discussion is to bring to light a decision they are going to have to make consistently, i.e. which conversion fact to choose based on the context of the problem, and they need to understand the why behind their choice]***  **Which student do you agree with and why? Vote. TT. CC.** Both students are correct because they both used a conversion factor to make equivalent ratios, either to 1 km = 0.62 miles by multiplying both 1 and 0.62 by 12, or to 1 m = 1.609 km, dividing 12 by 1.609 to get the scale factor, and then multiplying that by 1. ***[Planner’s Note: If Ss are stuck on explaining the second strategy, do not get stuck here but either rely on a student who can quickly explain or name it for kids so they can see both strategies.]***  BPQ: Is the second conversion factor valid?  BPQ: How did the student solve using the second method? How did they get 7.458?  **Both of these students were correct even though their answers were slightly different. This is because the conversion factors that are on the reference sheet are actually non-terminating decimals that are rounded to the nearest thousandths or hundredths place, so conversion is not exact.**  **Which conversion factor was the best to use for this problem and how do you know? Vote. TT. Discuss.** SMS: The best conversion factor to use for this problem was 1 km = 0.62 miles because we knew the number of km and we were solving for the number of miles, and we know the scale factor between 1 and 12, so we can easily multiply both quantities by 12 to get the equivalent number of miles.  **Key Learning Synthesis (≤ 2 min)**  **Key Point**: *When converting between units of measurement using a conversion factor, we use the context of the problem to determine the best conversion factor to use.*  **Let’s form our key point for today. With your partner, form a key point about how we can choose the best conversion factor to convert between units of measurement.** TT. CC.  **Frame (≤ 30 sec)**  You all just came up with today’s key point. We can convert between different units of measurement by using a conversion fact (a unit rate) and creating equivalent ratios. We are going to use the same method from yesterday: choose a conversion fact and create equivalent ratios, but now we are converting between two different systems of measurement (Customary and Metric). Let’s apply our key point to a more challenging problem! |

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| **Interaction with New Material – 10 min** |
| **Post the key point in visible place for student reference:** When converting between units of measurement using a conversion factor, we use the context of the problem to determine the best conversion factor to use.  Let’s use our key point from the TAI and apply it to solve an advanced problem!  **Ex 1: Jackie’s horse, Tootsie, drinks water out of an 18-liter bucket. Tootsie drinks a gallon of water every 4 hours. How many hours will it be until Jackie has to refill the water bucket?**  **Understand**  T directs all Ss to read the prompt without making annotations.  **Without using numbers, what is happening in this problem?** SMS: Tootsie the horse drinks water at a certain rate and Jackie has to refill the bucket when it is done.  **What is our goal in this problem?** SMS: Our goal is to figure out how many hours will pass until Jackie has to refill the water bucket.  **What information is known?** SMS: We know that the bucket is 18-liters and that Tootsie drinks 1 gallon of water every 4 hours.  **What do we need to find out?** SMS: We need to find out the relationship between liters and gallons, and how many hours it will take her to finish the bucket.  **Plan**  **Based on our understanding of the problem, what is our plan for solving this problem? Why should we take each step? TT. Discuss.**  Plan:  1) Determine the conversion factor between liters and gallons  2) Convert between liters and gallons (using the conversion factor in a ratio table)  3) Determine how many hours it will take her to drink the bucket depending on how many gallons it is (new ratio table)  **Estimate/Predict**  **N/A**  **Solve**  **Which conversion facts could we possibly use?** 1 liter = 0.264 gallons or 1 gallon = 3.785 liters  **Which conversion fact would be best for this problem and how do you know?** **Vote. TT. CC.** The best conversion fact would be 1 liter = 0.264 gallons because you know that the bucket holds 18 liters and you can easily multiply by 18 to find the number of gallons in the bucket, and then use the number of gallons to find out the number of hours.  Independently determine the number of gallons in 18 liters.  *Show call exemplar student work using a ratio table, the conversion factor, and multiplication.*  **Want does our answer of 4.752? CC.** SMS: It means that there are 4.752 gallons in 18 liters/in the bucket  **What do we do next based on our plan?** SMS: Determine the number of hours it will take to finish 4.752 gallons of water.  Independently determine the number of hours it will take.  *Show call exemplar student work.*  **What does our answer of 19.008 (or 19) represent?** SMS: It represents that it will take 19 hours to finish the bucket of water.  **Check**  **How could we check our work?** SMS: We could convert grams to kilograms and see if we get the same answer. (*T either has this prepared to show Ss or already names it and moves on)*  **Key Learning Synthesis**  **How did we apply our key point for today to solve this example problem?** TT. CC. We used the context of the problem to determine the best conversion factor to use to convert between the given units of measurement.  **Frame for PP/IP**  For the next 5 minutes, you’ll be working with your partner applying the key point that we just stamped. While working, make sure that you are meeting our CFS for top quality work.  CFS for top quality work   * + Problem is annotated with margin notes to provide additional meaning   + Ratio table or double number line diagram is drawn accurately and are clearly labeled   + Conversion factor and equivalent ratio are clearly identified   + Answer statement is written |

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

UNIT 5 LESSON 5

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| AIM: | SWBAT apply unit rates to convert between different measurements. |

**THINK ABOUT IT!**

Jordan wants to run a 12 kilometer race. He knows how fast he can run a mile, so he wants to convert the length of the race to miles. How many miles long is the race?

Key Point

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**Interaction with New Material**

Ex 1) Jackie’s horse, Tootsie, drinks water out of an 18-liter bucket. Tootsie drinks a gallon of water every 4 hours. How many hours will it be until Jackie has to refill the water bucket?

**PARTNER PRACTICE**

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| *Bachelor Level* |

1) Sarah has 2 liters of milk. How many quarts of milk is this?

1. 1.6
2. 1.9
3. 2.12
4. 21.12

2) Lebron James is 80 inches tall. How tall is Lebron in meters? **Show your work.**

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| *Master Level* |

3) Kevin wants to ride a roller coaster. A sign says he must be 138 cm tall. He is 55 inches tall. (1 inch = 2.54 cm) The person in charge says that he is not tall enough to ride so he is told to go sit on a bench. Do you agree or disagree with this decision? **Explain.**

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**INDEPENDENT PRACTICE**

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| *Bachelor Level* |

1) How many inches are in 3 meters?

1. 90
2. 118.11
3. 39.37
4. 13.12

2) A marathon is 20 km. How many miles is the marathon? **Show your work.**

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| *Master Level* |

3) Mikeal convert 5 centimeters to inches and said that there are 10 inches for 5 cm. Does his answer make sense? Why or why not?

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4) Fei Yen’s dog eats 8 ounces of dog food each day. Fei Yen bought a 2 kilogram bag of dog food. If 8 ounces of dog food cost $3.50, how much did he spend on the 2-kilogram bag? **Show your work.**

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5) Which is a better deal: 4 pounds of apples for $1 or 9.534 kilograms per dollar? How do you know?

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| *PhD Level* |

6) Jimmy wants to buy 4 pounds of potatoes, but the supermarket only sells potatoes as kilograms. How many kilograms of potatoes should Jimmy buy? ( pounds=1 kilogram)

**Show your work.**

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7) A) There are 5 liters of water in a recipe for brownies. Stephanie only has measuring cups. How many 1 cup measuring cups should she use? (1 cup = liters)

**Show your work.**

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8) The recipe calls for 8 cups of sugar (yikes!). At the store, sugar is sold in liter packages. Each package costs $3.45. How much will Stephanie spend in total on sugar?

**Show your work.**

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**EXIT TICKET**

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| Self-assessment | I mastered the learning objective today. | I am almost there. | Need more practice and feedback. |
| Teacher feedback | You mastered the learning objective today. | You are almost there. | You need more practice and feedback. |

1) A cow weighs 123.2 pounds. How many kilograms does the cow weigh? **Show your work.**

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2) Which is a faster speed limit, 65 miles per hour or 100 km per hour and how do you know?

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