**Grade 7 | Unit 6, Lesson 2**

**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: Conjecture Based Lesson** |
| **Aim** |
| * SWBAT find a percent of a number by using a double number line to set up a proportion and solve using an algebraic approach. |
| **Conjecture** |
| * We can find a percent of a number by writing an equation and determining the unknown terms algebraically. |
| **Standard** |
| 7.RP.3  Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, and percent error. |
| **State Test Alignment** |
| *Taken from EngageNY 2014 Released Items – Note: This item is much higher than the assessment limit of this lesson. This lesson assesses the ability of a scholar to complete the first step of find 150% of $12 assuming they are given 150% instead of the language of “50% more than the purchase price”.* |
| **Assessment** |
| **Exit Ticket:**   1. Part A: Draw a double numberline that you could use to find 140% of 60.   Part B: Which equations could be used to find 140% of 60? Select all that apply.  Part C: Use your double numberline and equation to find 140% of 60.  **Student Work:**    1.  2. c, d, e  3. |
| **Connection to learning And Conceptual Understanding** |
| * How does this lesson connect to previous lessons?   + In the previous lesson, students converted fractions, decimals, and percents like they have before in 6th grade with the added task of doing this with percents that are less than 1% or greater than 100%. In this lesson, students continue to build upon their 6th grade knowledge of percents by solving for a percent of a number by first modeling the situation with a double number line. In 6th grade, students would only use the visual of the double number line and the idea of benchmark fractions to determine the percent of a number. In this lesson, students apply their knowledge of ratios and proportions to set up an equation and solve for the unknown value. This lesson sets students up to derive the general percent equation in the next lesson. Students should simplify the percent /fraction to a decimal value before the final step of multiplying by the whole as to mimic the process scholars will go through in the next lesson. * 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: Students understand that a percent is a ratio of a part to a whole where the whole is 100. Students understand that equivalent ratios can be written as an equation which is known as a proportion. Students understand that a proportion can be solved using rules for solving equations with inverse operations.   + Do: Students represent straight forward and basic conceptual percent problems using a double number. Students write an equation based off their double number line and solve it for the missing value (part). |
| **How** |
| * Key Strategy   + Identify and annotate the percent, part, and whole in the problem   + Draw a double number line representing the percent, part, and whole.   + Set up an equation of two equal ratios   + Solve the ratio for the missing quantity * CFS for top quality work   + Problems are annotated for percent, part, and whole   + Double number line is drawn   + Equation is written from double number line   + Equation is solved using inverse operations |
| **Anticipated Misconceptions and Errors** |
| * Students might mistake the whole for the part in context * Students might not draw a correct DNL when percents are greater than 100 * Students might not convert percents to decimals correctly * Students might not set up a correct equation from the double number line |
| **Key Vocabulary** |
| * **Percent**: A ratio comparing a number and 100.   + - * **Ratio**: A comparison of two quantities by division.       * **Proportion**: An equation that states that two ratios are equivalent. |
| **Materials** |
| * Handout |

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| **Opening – Prompt for work time, Circulate, Debrief, Synthesis, & Frame – 12-15 min** |
| **THINK ABOUT IT!**  Use the problem “what is 25% of 60” to complete the following steps:  Step A: Complete the double number line to represent and solve the problem  Step B: Write an equation that represents your double number line and solve it for the unknown |
| **Prompt for Work Time (<30 sec)**  *T sets timing for work and sets work expectations.*  **Circulate (≤ 5 min)**  While circulating, collect data on the following:   |  |  | | --- | --- | | **Scholar thinking (correct and erroneous)** | **Scholar Initials - Work to show call** | | S work correctly sets up a DNL to solve for the part = 15 |  | | S work writes the equation 25/100=n/60 and solves using ratio reasoning. |  | | S work incorrectly draws a DNL without one of the key pieces of info (part, total, percent) |  | | S sets up an incorrect equation that does not result in a part = 15 |  |   **Debrief (≤ 8-10 min)**  **Fencepost 1:**  *A double number line helps make sense of and solve percent problems.*  ***[Planner’s Note: Ss learned how to use DNLs to find a % of a number in 6th grade so this should not be completely new to them. If Ss are struggling significantly in using the DNL here, then guide them through this quickly. It is very important that they can ground themselves in the numberline so that they resolidfy that P/T = %/100, but you do not want to spend the majority of the opening going over how to make the DNL.]***  Show Call: S correctly sets up double number line to find the part as 15  **Do you agree with this work? Vote. CC.** SMS: I agree because the scholar labelled the top (or bottom) with 0%, 25%, and 100% and the other number line with 0, p, and 60 where 100% and 60 were in the same place because they are the totals and 25% and p were in the same place because they both represent the part in the part to total ratio, and we don’t yet know what part of 60 25% is equivalent to. The scholar split the double number line into four equal parts and divided 60 by 4 to determine that each part is worth 15 so 15 is 25% of 60.  **What ratios are present in the double number line?** **CC.** SMS: There are two ratios of parts to whole. 25% is the ratio 25/100 where 25 is the part and 100 is the whole. There is another ratio of the unknown part (p) to the total 60 which can be represented as p/60.  **BPQ – What ratios of part/whole are present?**  **Name the fencepost: What did we use our double number line for?** SMS: A double number line helps make sense of and solve percent problems  **Conjecture:** We can find a percent of a number by writing an equation and determining the unknown terms algebraically. Show Call: S work sets up a correct equation of two ratios  **Do you agree with this scholar’s equation? Vote. CC.** SMS: I agree because the scholar set the two ratios equal to each other because they represent the same quantity in the form of a proportion.  **BPQ – Why are the two ratios equal?**  **BPQ – What is an equation with two ratios set equal to each other called?**  **Why does this equation or proportion make sense? CC. Discuss.** SMS: The proportion makes sense because you can see that the 100 and 60 correspond with each other because they are the whole or total. The 25 and the variable correspond with each other because they are the parts.  **How could we solve for the variable?** **CC.** SMS: We could convert the percent of 25/100 to a decimal to get 0.25 = x/60 and then multiply both sides by 60 to get x = 0.25 x 60.  ***[Planner’s Note: Most students are going to write the equation but solve using ratio reasoning (i.e. they will simplify 25/100 to ¼ and then find a scale factor to get 15). You will likely have to prepare this work and ask them: could we solve the equation in this way? How is this different from solving using a scale factor? What would we call this approach? Then stamp that solving using inverse operations is an algebraic approach.]***  **Key Learning Synthesis (≤ 2 min)**  **CONJECTURE**:*We can find a percent of a number by writing an equation and determining the unknown terms algebraically.*  **Let’s form our conjecture for today. With your partner, come up with a conjecture about how we can solve percent problems. TT. CC.**  **Frame (≤ 30 sec) –**  You have just formed our conjecture for today. Last year in 6th grade, you solved percent problems by setting up a double number line and using benchmark fractions to determine your answer. This year, we are using an algebraic approach to solving problems with percents. |
| **Test the Conjecture – 10 min** |
| **Post the Conjecture in visible place for student reference:** *We can find a percent of a number by writing an equation and determining the unknown terms algebraically.*  Let’s go ahead and test our conjecture to make sure that it is a true statement all the time!  **What will we be able to do if our conjecture is true? TT. CC.**  We will be able to write equations from equivalent ratios and solve them using inverse operations to isolate and determine the value of the variable.  **TEST THE CONJECTURE #1**  **What is 120% of 40?**   * Take 30 seconds to read and annotate the problem. * **What is the question asking us to do? CC.** SMS: The question is asking us to find 120% of 40. * **How can we apply our conjecture to solve the problem? CC.** SMS: We can write an equation of equivalent ratios and solve it algebraically. * **What equation can we write? CC.** SMS: We can write the ratio of the percent as the part to the whole which is 120/100. We can also write the ratio of p/40 since we don’t know the part but we know the whole is 40.We know that the ratios are equivalent so we can write an equation in the form of a proportion as p/40=120/100 * **How can we solve the problem?** SMS: We can simplify 120/100 to 1.2 which is the decimal equivalence and then multiply both sides of the equation by 40 to isolate the variable. *Note to teacher – Students need to simplify the percent to the decimal equivalent to set up the work they will do in the next lesson*. * With your partner, determine the value of p. *Teacher can walk through this with scholars if they are struggling.* * **Do you agree with this work? Vote. CC.** SMS. I agree because 1.2 x 40 = 48. * **Why does 48 make sense? CC.** SMS: 120% is greater than 100% so the answer has to be greater than whole which is 40. * **How can we prove that our conjecture worked? CC.** SMS: We can draw a double number line and use it to determine what 120% of 40 is. * Model this for students as proof. * **So far, does our conjecture hold up? Vote. CC.** SMS: Yes our conjecture holds up. We were able to find a percent of a number by writing an equation and solving algebraically.   **TEST THE CONJECTURE #2**  **Margo is practicing her free throws for basketball tryouts. To make the team she has to make at least 80% of her free throws. How many free throws does she have to make if she attempts 20 shots?**   * Take 30 seconds to read and annotate the problem. * **What is the question asking us to do? CC.** SMS: The question is asking us to find how many free throws she has to make out of 20 to make 80%. * **How can we apply our conjecture to solve the problem? CC.** SMS: We can write an equation of equivalent ratios and solve it algebraically. * **What equation can we write? EW. CC.** SMS: We know that we can write a ratio equal to another ratio. One ratio is the percent of 80% which is a part to whole as 80/100. The other ratio is the ratio of baskets made to total attempts. We don’t know the baskets made but we do know the whole is 20 so the ratio is p/20 so the equation is 80/100=p/20 * **How can we solve the problem?** SMS: We can simplify 80/100 to 0.8 and multiply 20 on both sides to isolate the variable. * Independently determine 80% of 20. *Show call exemplar*: **Do you agree with this work? CC.** SMS: Yes I agree with this work because 0.8 x 20 = 16. * **How can we prove that our conjecture worked?** **CC.** SMS: We can draw a double number line and use it to determine what 80% of 20 is. * *Have students do this independently. Show-call exemplar.* * **So far, does our conjecture hold up? CC.** Yes our conjecture holds up. We were able to find a percent of a number by writing an equation and solving algebraically.   **Stamp the Learning**  Point to the written conjecture. **Did our conjecture hold up against the two problems we just did? How do you know?** **TT. CC.** SMS: Yes our conjecture holds up. We were able to find a percent of a number by writing an equation and solving algebraically.  **STAMP THE CONJECTURE**    **Frame for PP/IP**  For the next 5 minutes, you’ll be working with your partner applying the conjecture that we just stamped. While working, make sure that you are meeting our CFS for top quality work. I’m also leaving up the exemplar work for the second TTC example we completed for your reference.  CFS for top quality work   * + Problems are annotated for percent, part, and whole   + Double number line is drawn   + Equation is written from double number line   + Equation is solved using inverse operations |

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

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**

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

UNIT 6 LESSON 2

**AIM**: SWBAT determine the percent of a number.

**THINK ABOUT IT!**

Use the problem “what is 25% of 60” to complete the following steps:

Step A: Complete the double number line to represent and solve the problem

Step B: Write an equation that represents your double number line and solve it for the unknown

Test the Conjecture #1) What is 120% of 40?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**

Test the Conjecture #2) Margo is practicing her free throws for basketball tryouts. To make the team she has to make at least 80% of her free throws. How many free throws does she have to make if she attempts 20 shots?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**

Conjecture

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| We can find a \_\_\_\_\_\_\_\_\_\_ of a number by writing an equation and determining the unknown terms \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**PARTNER PRACTICE**

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| *Bachelor Level* |

1. Which equation could be used to determine 23% of 122? Select all that apply.

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**

For questions 2-3, draw a double number line, set up an equation, and solve your equation.

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**

1. What is 30% of 50?
2. What is 65% of 40?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**

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| *Master Level* |

1. A baseball pitcher won 80% of the games he pitched. If he pitched 35 ballgames, how many games did he win?
2. What is 0.2% of 300?

**INDEPENDENT PRACTICE**

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| *Bachelor Level* |

1. What percent problem could be solved using the equation ?
   1. What is 90% of 46?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**
  1. 90 is what percent of 46?
  2. 46% of 90 is what number?
  3. 46 is 90% of what number?

1. Draw a double number line and equation to determine what 150% of 42 is.

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**

1. Draw a double number line and equation to determine what 3% of 200 is.

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**

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| *Master Level* |

1. A student earned a grade of 80% on a math test that had 80 problems. How many problems on this test did the student answer correctly? Use a double number line to justify the equation you used to solve.
2. Mr. Roble’s music library in iTunes has 1,200 songs. He loves bluegrass music and 78% of his music library is bluegrass music. How many songs on Mr. Robles iTunes are bluegrass songs.
3. Wesley and Will are going on a road trip that will last for four days (96 hours). They have allotted 1/8 of their time for driving. Use percents, a double number line, and an equation to determine how many hours they can expect to drive for their trip. Explain how you used percents to solve the problem.

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1. A metal bar weighs 8.15 ounces. 93% of the bar is silver. How many ounces of silver are in the bar? (round to the nearest thousandth)

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| *PhD Level* |

1. Set up a double number line to write and solve an equation for the given problem.
   1. 40 is 80% of what number?
   2. 18 is what percent of 72?
2. How did your double number line and equation change to be able to solve these problems?

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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. Use a double number line and equation to model and determine what 140% of 60 is.

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**

1. In Ty’s math class, 20% of the class earned an A on their latest math exam. If there are 30 students in Ty’s math class, use a double number line to determine the number of kids that earned an A.

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
  + Double number line is drawn
  + Equation is **written** from double number line
  + Equation is **solved** using **inverse operations**