**Grade 7 | Unit 6, Lesson 4**

**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.
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| 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.
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| 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.
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| **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 use the equation Part = Percent x Whole to find unknown parts, percents, and wholes.
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| **Conjecture** |
| * The Part, Percent, or Whole can be solved for using the Percent Equation.
 |
| **Standard** |
| 7.RP.3Use 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. 7.EE.2Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that “increase by 5%” is the same as “multiply by 1.05.”* |
| **State Test Alignment**  |
| *Taken from EngageNY 2013 Released Items* |
| **Assessment** |
| **Exit Ticket:**1. A tank that is 40% full contains 648 gallons of water.

Part A: Decide if you can use each equation below to solve for the maximum capacity of the tank. Choose “yes” or “no.”

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| --- | --- | --- |
| Equation | Yes | No |
| $$\frac{40}{100}=\frac{648}{p}$$ |  |  |
| $$40=\frac{p}{648}$$ |  |  |
| $$\frac{40}{100}=\frac{p}{648}$$ |  |  |
| $$\frac{40}{100}p=648$$ |  |  |
| $$648\left(.4\right)=p$$ |  |  |
| $$\frac{648}{\left(.4\right)}=p$$ |  |  |

 Part B: What is the maximum capacity of the tank? 1. Jenny’s great-grandmother is 90 years old. Jenny is 12 years old. What percent of Jenny’s great-grandmother’s age is Jenny’s age?

**Student Work:** 1. Y, N, N, N, N, Y1. Part = Percent x Whole

Part = 648 gallonsWhole = UnknownPercent = 40%648 = 0.40 x WholeWhole = 648 / 0.4 = 1620The tank can hold 1,620 gallons of water.3. Part = Percent x WholePart = Jenny’s age = 12Whole = Jenny’s great-grandmother age = 90Percent = unknown12 = Percent x 90Percent = 12/90 = 0.13333… , Jenny is 13.3% of her great-grandmother’s age |
| **Connection to learning And Conceptual Understanding** |
| * How does this lesson connect to previous lessons?
	+ In the previous lesson, students used a double number line to generalize percent problems with parts and whole in order to write an equation and solve for the part. The resulting equation, the percent equation, is Part = Percent x Whole where the percent is represented as a decimal. Students used this equation to solve basic percent problems by substituting values into the equation and evaluating. In this lesson, students continue to use the percent equation and expand their ability to solve to also finding the percent given a part and whole and finding the whole given the percent and the part using the equation and isolating the unknown using inverse operations. Given in context, students identify the percent, part, and whole in order to substitute values in to solve for the unknown.
* 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?
	+ Do: Students identify percents, parts, and whole in the context of the problem and make sense of the problem using a double number line. Students solve for the part, whole, or percent using the percent equation and solving for the unknown value.
	+ Understand: Students understand that the equation Part = Percent x Whole can be used to solve for the part, whole, or percent if the other two quantities are given. Students understand that the percent is represented in the equation as a decimal and if solving for the percent, the final answer must be multiplied by 100 to convert from a decimal back to a percent.
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| **How** |
| * Key Strategy
	+ Annotate the problem for part, whole, and percent
	+ Write the percent equation
	+ Substitute values into the percent equation
	+ Evaluate and solve for the unknown value
* CFS for top quality work
	+ Problem is annotated for part, percent, and whole
	+ DNL represents the problem
	+ General percent equation is written
	+ Values are substituted into the equation
	+ Equation is evaluated for the unknown
 |
| **Anticipated Misconceptions and Errors** |
| * Students might keep the percent as a whole number and not convert to a decimal value when evaluating or might not convert back to a percent if solving for the percent
* Students might misinterpret the context of the problem, part, whole, and/or percent.
* Students might use the incorrect inverse operation or incorrectly solve for an unknown quantity.
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| **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.
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| **Materials** |
| * Handout
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| **Opening – Prompt for work time, Circulate, Debrief, Synthesis, & Frame – 12-15 min** |
| **THINK ABOUT IT!** Solve the following percent problems by writing an equation from the corresponding double number line.45 is 15% of what number?30 is what percent of 150? |
| **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:

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| --- | --- |
| **Scholar thinking (correct and erroneous)** | **Scholar Initials - Work to show call** |
| S correctly uses the percent equation as 45=0.15n to get the whole of 300  |  |
| S incorrectly identifies 45 as the whole and gets n=0.15(45) = 6.75 |  |
| S correctly identifies the part and whole and uses it to solve for the percent as a percent (converts from a decimal) |  |
| S leaves the percent in part b as a decimal without converting to a percent. |  |

**Debrief (≤ 8-10 min)****Fencepost 1:**  *The whole can be calculated with the percent equation if the percent and part are known.*Show Call two pieces of work: S work that correctly solves for the whole and S work that misinterprets the part for the whole**Which scholar’s work do you agree with? Vote. CC.** SMS: I agree with the scholar that got the answer of 300 because the problem says that 45 is 15% so 45 is the part and 15 is the percent and we need to find what the whole is. The other scholar thought that 45 was the whole.**How did the scholar determine the whole? CC.** SMS: The scholar substituted values into the percent equation and solved for the unknown with is the whole. They did this by setting up 45=0.15Whole and dividing both sides by 0.15 to get 300.**Name the fencepost: What information was needed to find the whole and how did we find it? CC.** SMS: The whole can be calculated with the percent equation if the percent and the part are known. **Fencepost 2:** *The percent can be calculated with the percent equation if the part and the whole are known.*Show Call: S work correctly finds the percent as a percent, S work leaves the percent as a decimal.**Do you agree with how these scholars set the problem up? Vote. CC.** SMS: I agree because they used the percent equation and substituted in the known values. We don’t know the percent but we do know the part is 30 because it is some percent of 150 which is the whole.**Which scholar’s final answer do you agree with? TT. CC. Discuss.** SMS: I agree with the scholar that got 20% as their answer because the problem asks for the percent and the percent equation uses the decimal equivalent of the percent which the other scholar had as 0.2. While both are equivalent, we have to convert the decimal back into a percent by multiplying by 100 if the question asks for the percent.**Name the fencepost: What information was needed to find the percent and how did we find it? CC.** SMS: The percent can be calculated with the percent equation if the part and the whole are known.**Key Learning Synthesis (≤ 2 min)****CONJECTURE**:*The Part, Percent, or Whole can be solved for using the Percent Equation.***Let’s form our conjecture for today. With your partner, come up with a conjecture what the percent equation can be used for. TT. CC.****Frame (≤ 30 sec) –**You have just formed our conjecture for today. With our equation from yesterday, if we can identify two of the values, we can solve and evaluate for the third value. The only tricky part if when determining the percent where we must be careful to remember to convert it from a decimal back into a percent by multiplying by 100. |

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| **Test the Conjecture – 10 min** |
| **Post the Conjecture in visible place for student reference:** *The Part, Percent, or Whole can be solved for using the Percent Equation.*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 determine the part, percent, or whole in a problem if the other two quantities are known by substituting them into the percent equation and evaluating for the unknown. **TEST THE CONJECTURE #1****In Mr. Wilson’s class, 40% of the students are boys. If there are 12 boys in the class, how many total students are in the class?*** 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 determine the total number of students in the class.
* **What information can we annotate? CC.** SMS: The percent is 40 which we can annotate as 40%=0.4 because we need to use the decimal equivalent in the percent equation. We can also annotate 12 as the part because the boys only make up part of the class. We can annotate “how many total students” as the whole because this is what we are trying to determine.
* **How can we represent this problem? CC.** SMS: We can draw a double number line with the part, whole, and percent. *T can release scholars or walk them through to complete this.*
* **How can we apply our conjecture to solve the problem? CC.** SMS: We can substitute the values we annotated into the percent equation and solve for the whole.
* **What will the equation look like? EW. CC.** SMS: The equation will be 12 = 0.4 x Whole since we know the part and the percent.
* With your partner, determine the whole. *Teacher can walk scholars through this problem if needed.*
* *Show Call exemplar:* **Do you agree with this work? Vote.**
* **What does our answer of 30 make sense? CC.** SMS: 30 makes sense because it is the total of the class and 40% represents less which is 12.
* **How can we prove that our conjecture worked? CC.** SMS: We can find 40% of 30 and see if the answer is 12.
* With your partner, find 40% of 30. *Show call exemplar*: **Do you agree with this work? CC.** SMS: I agree with this work because .4 x 30 = 12.
* **So far, does our conjecture hold up? CC.** SMS: Yes our conjecture holds up because we were able to find the whole using the percent equation.

**TEST THE CONJECTURE #2****Rommi played a game of marbles with his friend. He started with 20 marbles but lost 2 marbles by the end. What percentage of marbles that Rommi started with did he end with?** * 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 create a percent that compares the marbles he started to the marbles he ended with.
* **What information can we annotate? CC.** SMS: We can annotate 20 marbles as the whole because that is the total that Rommi begins with. We can annotate “lost 2 marbles” as 20-2 which is 18 so 18 is the part because we need the percent of marbles that he ended with, not lost.
* **How can we represent this problem? CC.** SMS: We can draw a double number line with the part, whole, and percent. *T can release scholars or walk them through to complete this.*
* **What should be true about our final answer? CC.** SMS: The final answer should be a percent less than 100 because the part is less than the whole.
* **How can we apply our conjecture to solve the problem? CC.** SMS: We can substitute the values we annotated into the percent equation and solve for the whole.
* Independently determine the percent. *Show Call answer as a percent and one left as a decimal*: **Which scholar’s work do you agree with? Vote. CC.** SMS: I agree with the answer as a percent because the question is asking for the percent, not the decimal, and 0.9 represents 90%, not 0.9%.
* **How can we prove that our conjecture worked? CC.** SMS: We can calculate 90% of 20 and see if we get 18.
* Independently check that the calculated percent is correct. *Show call exemplar*: **Do you agree with this work? CC.** SMS: Yes I agree with this work because .9 x 20 = 18.
* **So far, does our conjecture hold up? CC.** SMS: Yes our conjecture holds up because we were able to find a percent using the percent equation.

**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 held up. We were able to find a percent and a whole using the percent equation. It does not just apply to finding a part!**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* + Problem is annotated for part, percent, and whole
	+ DNL represents the problem
	+ General percent equation is written
	+ Values are substituted into the equation
	+ Equation is evaluated for the unknown
 |

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

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**

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

UNIT 6 LESSON 4

**AIM**: SWBAT determine the part, whole, or percent

**THINK ABOUT IT!**

Solve the following percent problems by writing an equation from the corresponding double number line.

45 is 15% of what whole?



30 is what percent of 150?



Test the Conjecture #1) In Mr. Wilson’s class, 40% of the students are boys. If there are 12 boys in the class, how many total students are in the class?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**

Test the Conjecture #2) Rommi played a game of marbles with his friend. He started with 20 marbles but lost 2 by the end. What percentage of marbles that Rommi started with did he end with?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**

Conjecture

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| --- |
| The \_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_ can be solved for using the Percent Equation |

**PARTNER PRACTICE**

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| *Bachelor Level* |

For questions 1-3, annotate the questions with part, whole, and percent. Solve the problem using the percent equation.

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**
1. What is 30% of 90?
2. 25 is 80% of what number?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**
1. 15 is what percent of 60?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**

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| *Master Level* |

1. Matthew’s total points scored in basketball this season were 𝟏𝟔𝟖 points. He scored 𝟏𝟒𝟕 of those points in the regular season and the rest were scored in his only playoff game. What percent of his total points did he score in the playoff game?
2. About 42% of a paint mix is white. If 8.4 gallons of the total amount of paint ordered are white, how many total gallons were ordered?

**INDEPENDENT PRACTICE**

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| *Bachelor Level* |

For questions 1-3, annotate the problem with part, whole, and percent. Solve the problem using the percent equation.

1. 125% of 10 represents a certain number. What is that number?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**
1. What percent of 80 is 10?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**
1. If a number is 75% of 300, what is that number?

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**

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| *Master Level* |

1. When practicing her free throws at basketball yesterday, Shamaya made 12 out of her 30 shots. Which statements below are true? Select all that apply.

a) We can find the percent of shots that she made by dividing 12 by 30

b) We can find the percent of shots that she made by dividing 12 by 30

c) She made 0.4% of shots

d) She made 40% of shots

e) She made 60% of shots

f) She missed 60% of shots

1. The Celtics played 25 games in the month of March this year. 60% of those games were home games.

Part A: Which expression(s) below could you use to solve for the number of home games that they played? Select all that apply.

a) $\frac{60}{100}=\frac{25}{x}$

b) 0.6 (25) = x

c) $\frac{60}{100}=\frac{x}{25}$

d) $x=\frac{25}{0.6}$

Part B: How many home games did the Celtics play in March?

1. Tom Brady threw 52 completions in the Super Bowl XLL loss to the New York Giants. His completion rate of completed passes to total passes was 65%. How many total passes did Brady attempt?
2. There are 70 scholars in the senior class. The girls make up 40% of the total senior class. How many **boys** are there?

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| *PhD Level* |

1. Giana had $400 in her bank account on Monday. By Tuesday, her account had increased 15%.

Step A: What is the amount of money in her account on Tuesday?

Step B: Determine the percent of $400 that the final account balance was on Tuesday.

Step C: Rewrite the problem using the percent that you found in part B.

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

**CFS for top quality work**

* + Problems are annotated for **percent**, **part**, and **whole**
	+ **Create a DNL** representing the problem
	+ General percent equation is written
	+ Values are **substituted** into the equation
	+ Equation is **evaluated** for the **unknown**

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

**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 tank that is 40% full contains 648 gallons of water.

Part A: Decide if you can use each equation below to solve for the maximum capacity of the tank. Choose “yes” or “no.”

|  |  |  |
| --- | --- | --- |
| Equation | Yes | No |
| $$\frac{40}{100}=\frac{648}{p}$$ |  |  |
| $$40=\frac{p}{648}$$ |  |  |
| $$\frac{40}{100}=\frac{p}{648}$$ |  |  |
| $$\frac{40}{100}p=648$$ |  |  |
| $$648\left(.4\right)=p$$ |  |  |
| $$\frac{648}{\left(.4\right)}=p$$ |  |  |

 Part B: What is the maximum capacity of the tank?

2. Jenny’s great-grandmother is 90 years old. Jenny is 12 years old. What percent of Jenny’s great-grandmother’s age is Jenny’s age rounded to the nearest tenth of a percent?