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| **Synopsis of high-quality task:**  Students compare a team’s shooting percentage from the first half of a game to the second half. They also discuss the impact of the team’s shooting percentage to the outcome of the game.  **Anticipated student time spent on task: 30-40 minutes**  **Student task structure(s):** Individual work/Group work |
| [**Math Content Standards and Practices:**](http://www.doe.mass.edu/frameworks/math/2017-06.pdf)  **6.RP.A.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.  **6.RP.A.3.c** Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.  **6.NS.B.2** Fluently divide multi-digit numbers using the standard algorithm.  **SMP 1** Make sense of problems and persevere in solving them.  **SMP 2** Reason abstractly and quantitatively.  **SMP 4** Model with mathematics.  **SMP 5** Use appropriate tools strategically.  **SMP 7** Look for and make use of structure. |
| **Prior Knowledge:**  **6.SP.A.1** Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students’ ages.  **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. |
| **Connections to the real-world:**  - Sports context  - Predominant statistics used in basketball  - Coach/teacher-athlete/student relationship  - Goal setting to improve performance/outcome |
| **Mastery Goals:**  Learning Objective:   * Students will be able to recognize a percentage of a given number as a rate out of 100 in a real-world context * Students will be able to calculate and compare percentages to identify a relevant outcome * Students will be able to reason about the variability of a percentage when one or more data points is altered   Language Objective:   * Students will discuss the relevant mathematical knowledge necessary to make sense of the task and what is required in solving it * Students will initiate and consider dialogue regarding the most practical and efficient manner of representing and solving the task’s questions |
| **Teacher instructions**  **Instructional Tips/Strategies/Suggestions:**   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Shots Made | Shots Attempted | Shooting Percentage | Result | | First Half | 8 | 20 | ? | Lead by 2 | | Second Half | 13 | 25 | ? | Lost by 2 |   The Panthers basketball team was leading by 2 points at halftime. In the first half of the game the Panthers took 20 shots and made 8 of them. Coach George told the players at halftime that they needed to improve the percentage of shots they made by 20 percent if they hoped to win the game in the second half.  In the second half of the game, neither team made a 3-point basket or a free throw, meaning all of the baskets made by both teams were worth two points. The Panthers took 25 shots and made 13 of them. At the end of the game, the Panthers lost by 2 points.    A.) What percent of its shots did the Panthers make in the first half? Explain how you got your answer using words, tables, number lines and/or diagrams.  B.) The percentage of shots made by the players is referred to as their shooting percentage. How much did the Panthers’ shooting percentage improve in the second half? Explain how you got your answer using words, tables, number lines and/or diagrams.  C.) Out of the 25 shots the Panthers took in the second half, what is the least amount of shots they needed to make in order to improve their shooting percentage by 20 percent from the first half? Explain how you got your answer using words, tables, number lines and/or diagrams.  D.) Was Coach George correct – would the Panthers have won the game if they had taken the same number of shots in the second half and improved their shooting percentage by 20 percent from the first half? Explain why or why not using words, tables, number lines and/or diagrams.  - Introduce problem to students  - Have students look at table displaying shots attempted and shots made  - Ask students what relevant knowledge will help them attend to the problem (Percent = rate out of 100)  - Discuss and list means of representing ratio reasoning to solve the problem (ratio tables, tape diagrams, double number lines)  - Brainstorm means of reasoning with ratios to preempt trial-and-error troubleshooting strategies  - Have students brainstorm methods of solving in pairs without pencils, focusing solely on the sharing of problem-solving ideas and strategies  - Task students with solving the problem independently  - Have pairs/groups consult with each other to compare and assess the reasonableness of final answers and strategies used  Extension:  E.) The Lions took 10 more shots than the Panthers in the second half. How many shots did they make and what was their shooting percentage? Show your work and explain how you got your answer. |
| **Instructional Materials/Resources/Tools:**  Include:   * Pre-arranged student groups/partners * Pencil and paper * Copy of task for each student * Scoring rubric projected and/or copy for each student * Copy of MCAS reference sheet for each student * Individual accommodations as necessary |
| **Accessibility and Supports:**  Students can be provided with a multiplication chart as needed. In addition, students may be provided with a checklist of steps for calculating percentages or equivalent fractions.  **Potential sentence starters:**  A percentage is a rate out of \_\_\_  The operation we can use to determine or check percentages is \_\_\_  **Key academic vocabulary:** Percent/percentage**,** Ratio**,** Rate |

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

**Basketball Percentages**

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| --- | --- | --- | --- | --- |
|  | Shots Made | Shots Attempted | Shooting Percentage | Result |
| First Half | 8 | 20 | ? | Lead by 2 |
| Second Half | 13 | 25 | ? | Lost by 2 |

The Panthers basketball team was leading by 2 points at halftime. In the first half of the game the Panthers took 20 shots and made 8 of them. Coach George told the players at halftime that they needed to improve the percentage of shots they made by 20 percent if they hoped to win the game in the second half.

In the second half of the game, neither team made a 3-point basket or a free throw, meaning all of the baskets made by both teams were worth two points. The Panthers took 25 shots and made 13 of them. At the end of the game, the Panthers lost by 2 points.

A.) What percent of its shots did the Panthers make in the first half? Explain how you got your answer using words, tables, number lines and/or diagrams.

B.) The percentage of shots made by the players is referred to as their shooting percentage. How much did the Panthers’ shooting percentage improve in the second half? Explain how you got your answer using words, tables, number lines and/or diagrams.

C.) Out of the 25 shots the Panthers took in the second half, what is the least amount of shots they needed to make in order to improve their shooting percentage by 20 percent from the first half? Explain how you got your answer using words, tables, number lines and/or diagrams.

D.) Was Coach George correct – would the Panthers have won the game if they had taken the same number of shots in the second half and improved their shooting percentage by 20 percent from the first half? Explain why or why not using words, tables, number lines and/or diagrams.

Extension:

E.) The Lions took 10 more shots than the Panthers in the second half. How many shots did they make and what was their shooting percentage? Show your work and explain how you got your answer.

**Student Work:**

