Task: Scrap Percentages
Math Grade 7

An inspector from Company ABC is responsible for verifying if parts are acceptable. If a part is not acceptable, the part must be rejected and scrapped. The parts are scrapped for various reasons. Below is a table that shows the totals for Jimmy for his shift. A total scrap level at or above 1.5% indicates Jimmy will need to work extra.

Defect Condition	Number Rejected
Dents/Damages	6
Casting Defects	4
Machining Defects	3

Jimmy produced 967 parts during his shift.

   a) Using the table above, find the scrap percentage rate for each of the individual defect conditions. Round to the nearest tenth of a percent.
   b) Using the information from the table, find the total scrap percentage. Explain your reasoning in words. Round to the nearest tenth of a percent.
   c) Show at least one more method to find the total scrap percentage for Jimmy.
   d) Determine if Jimmy will need to work extra based on his total scrap percentage. Describe how you determined this in words.
   e) What is the minimum number of defects Jimmy can get that will cause him to work extra? Show your mathematical reasoning.

Common Core State Standards

7.RP.3 - Use proportional relationships to solve multistep ratio and percent problems.
MP1 – Make sense of problems and persevere in solving them.
MP2 – Reason abstractly and quantitatively.
MP4 – Model with mathematics.
MP5 – Use appropriate tools strategically.
MP6 – Attend to precision.
MP7 – Look and make use of structure.
MP8 – Look for and express regularity in repeated reasoning.

Essential Understandings

   • A percentage is calculated based on a part from a whole.
   • The sum of all scrap percentages is the same as the total scrap percentage.
   • Rounding to the nearest tenth of a percent is equivalent to rounding a decimal to the nearest thousandth.

Possible Solutions/Solution Paths

The students must be able to find a percentage based on a part from a whole amount. The whole amount is the number of parts Jimmy produced during his shift.

a) Dents/damages = 6/967 x 100 = 0.6%
   Casting defect = 4/967 x 100 = 0.4%
   Machining defect = 3/967 x 100 = 0.3%

b) The total scrap percentage can be found in multiple ways. One way is to find the sum of all the individual defects and divide that number by the total number of parts produced. (6 + 4 + 3 = 13 then 13/967 x 100 = 1.3%) Another way is to find the sum of all the individual scrap percentages. (0.6% + 0.4% + 0.3% = 1.3%) The students should explain either method in words.

c) See above.

d) The determining factor for Jimmy working extra or not is based on his total scrap percentage more or less than 1.5%. The students should explain that the total defect percentage was 1.3%, which is less than 1.5%. Therefore, Jimmy will not have to work extra.

e) There are various methods to find the minimum number of total defects of 15. One method is a guess-and-check method where the student tests different numbers to determine the smallest number of defects that is at or above 1.5%. (14/967 x 100 = 1.4%; 15/967 x 100 = 1.5%). Another method is to use a proportion such as $\frac{1.5}{100} = \frac{x}{967}$ where x = 14.5 parts so 15 parts is the minimum.

Additional Teacher Information

The students may need to get a brief explanation of some of the terms in the problem to avoid any confusion. Terms like defects, scrap and scrap percentage may need to be explained prior to starting.