

• Analysis •

1. Correct Answer: 9,983

- ⊕ The student was expected to know how to multiply multiple-digit numbers using the traditional method. The student needed to demonstrate he could regroup or (carry) as necessary to find the product.

$$\begin{array}{r}
 \overset{2}{3} \quad \overset{5}{6} \\
 149 \\
 \times 67 \\
 \hline
 1043 \\
 8940 \\
 \hline
 9,983
 \end{array}$$

SKILL: Multiply three-digit numbers by two-digit numbers with regrouping.

2. Correct Answer: 42 R9 or $R = \frac{9}{39} = \frac{3}{13}$

- ⊕ The student needed to perform long division to solve the problem and write a remainder to show that he was unable to divide evenly.

$$\begin{array}{r}
 42 \text{ R}9 \text{ or } R\frac{3}{13} \\
 39 \overline{)1,647} \\
 \underline{156} \\
 87 \\
 \underline{78} \\
 9
 \end{array}$$

SKILL: Divide a three-digit dividend by a two-digit divisor.

3. Correct Answer: $\frac{3}{8}$

- ⊕ The student needed to simplify the fraction to lowest terms. The student could have solved this problem in one of three ways:

- ⊕ **Solution A:** Find the prime factors of the numerator and denominator.

- » Example: prime factors for 12: $2 \cdot 2 \cdot 3$; prime factors for 32: $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
- » Next, the student needed to divide (or cancel) any common factors and multiply the remaining factors.

$$\frac{\cancel{2} \cdot \cancel{2} \cdot 3}{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot 2 \cdot 2} = \frac{3}{8}$$

- ⊕ **Solution B:** Identify the Greatest Common Factor (GCF) of the numerator and denominator. Then divide the numerator and denominator by the GCF.

$$\frac{12}{32} \div \frac{4}{4} = \frac{3}{8}$$

- ⊕ **Solution C:** Identify a common factor of the numerator and denominator. Then divide until it is simplified to lowest terms.

$$\frac{12}{32} \div \frac{2}{2} = \frac{6}{16} \div \frac{2}{2} = \frac{3}{8}$$

SKILL: Simplify a fraction to lowest terms.

4. Correct Answer: $x = 13$

➤ The student could have solved this problem in one of two ways:

➤ **Solution A:**

» Multiply both sides of the equation by $\frac{1}{7}$ because it is the reciprocal (opposite) of 7.

$$\begin{array}{l}
 7x = 91 \\
 \frac{1}{7} \cdot 7x = 91 \cdot \frac{1}{7} \\
 \frac{1}{\cancel{7}} \cdot \cancel{7}^1 = \cancel{91}^1 \cdot \frac{1}{\cancel{7}_1} \\
 x = 13
 \end{array}
 \qquad
 \begin{array}{l}
 7x = 91 \\
 \frac{1}{7} \cdot 7x = 91 \cdot \frac{1}{7} \\
 \frac{7}{7}x = \frac{91}{7} \\
 x = 13
 \end{array}$$

➤ **Solution B:**

» Divide both sides by 7 because division is the inverse (opposite) operation of multiplication.

$$\begin{array}{l}
 7x = 91 \\
 \frac{7}{7}x = \frac{91}{7} \\
 x = 13
 \end{array}$$

SKILL: Solve for an unknown factor.

5. Correct Answer: $\frac{1}{3}$

➤ The student needed to multiply the fractions and express the answer in lowest terms. In Zeta, students should be able to work comfortably with fractions and be able to apply efficient problem solving strategies. The student could have solved this problem in one of three ways:

➤ **Solution A:**

1. Divide (cancel) common factors.

$$\frac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{5}}} \times \frac{\overset{5^1}{\cancel{5}}}{\underset{3}{\cancel{6}}} = \frac{1}{3}$$

2. Multiply the fractions.

➤ **Solution B:**

1. Multiply the fractions.

$$\frac{2}{5} \times \frac{5}{6} = \frac{10}{30}$$

2. Divide the answer by the Greatest Common Factor (GCF) to simplify the answer.

$$\frac{10}{30} \div \frac{10}{10} = \frac{1}{3}$$

➔ **Solution C:**

1. Multiply the fractions.

$$\frac{2}{5} \times \frac{5}{6} = \frac{10}{30}$$

2. Divide by several common factors to simplify the answer.

$$\frac{10}{30} \div \frac{5}{5} = \frac{2}{6} \div \frac{2}{2} = \frac{1}{3}$$

SKILL: Multiply fractions and simplify the answer to lowest terms.

6. Correct Answer: $1\frac{1}{15}$

- ➔ The student needed to know how to divide the fractions; then he needed to convert the answer from an improper fraction to a mixed number.

➔ **Solution A:**

1. Multiply by the first factor by the reciprocal of the second factor.
2. Change the improper fraction to a mixed number.

$$\frac{2}{3} \div \frac{5}{8} = \frac{2}{3} \times \frac{8}{5} = \frac{16}{15} = 1\frac{1}{15}$$

➔ **Solution B:**

1. Find a common denominator.
2. Divide the numerators; then divide the denominators.
3. Convert the improper fraction to a mixed number.

$$\frac{16}{24} \div \frac{15}{24} = \frac{16 \div 15}{1} = 1\frac{1}{15}$$

SKILL: Divide fractions and simplify the answer to lowest terms.

7. Correct Answer: $7\frac{5}{12}$

- ➔ The student needed to know how to add mixed numbers that require regrouping by completing the following:

1. Find a common denominator for the fractions.
2. Add the fractions; then add the whole numbers.
3. Convert the improper fraction to a mixed number and regroup.

$$\begin{array}{r} 1\frac{2}{3} = \frac{8}{12} \\ + 5\frac{3}{4} = \frac{9}{12} \\ \hline 6\frac{17}{12} = 6 + 1\frac{5}{12} = 7\frac{5}{12} \end{array}$$

SKILL: Add mixed numbers with unlike denominators and simplify the answer to lowest terms.

8. Correct Answer: $1\frac{37}{40}$

↻ The student needed to know how to subtract mixed numbers that require regrouping (borrowing) by completing the following steps:

1. Find a common denominator.
2. Regroup (borrow) from the whole number.
3. Subtract the fractions; then subtract the whole numbers.

$$\begin{array}{r}
 2\cancel{3} \quad 4 = \frac{32}{40} + \frac{40}{40} = \frac{72}{40} \\
 - 1\frac{7}{8} = \frac{35}{40} \\
 \hline
 1\frac{37}{40}
 \end{array}$$

SKILL: Subtract mixed numbers with unlike denominators and simplify the answer to lowest terms.

9. Correct Answer: $\frac{55}{63}$

↻ This problem could be solved in one of three ways:

↻ **Solution A:**

1. Convert the mixed numbers to improper fractions.
2. Multiply by the reciprocal of the second factor.
3. Divide out the common factors.
4. Multiply the numerators and denominators.

$$\begin{array}{l}
 1\frac{5}{6} \div 2\frac{1}{10} = \\
 \frac{11}{6} \div \frac{21}{10} = \\
 \frac{11}{\cancel{3}6} \cdot \frac{10^{\cancel{2}}}{21} = \frac{55}{63}
 \end{array}$$

↻ **Solution B:**

1. Convert the mixed numbers to improper fractions.
2. Multiply by the reciprocal of the second factor.
3. Divide the answer by the Greatest Common Factor (GCF) or another common factor.

$$\begin{array}{l}
 1\frac{5}{6} \div 2\frac{1}{10} = \\
 \frac{11}{6} \div \frac{21}{10} = \\
 \frac{11}{6} \cdot \frac{10}{21} = \frac{110}{126} \div \frac{2}{2} = \frac{55}{63}
 \end{array}$$

➔ **Solution C:**

1. Convert the mixed numbers to improper fractions.
2. Find a common denominator.
3. Divide the numerators; then divide the denominators.

$$1\frac{5}{6} \div 2\frac{1}{10} =$$

$$\frac{11}{6} \div \frac{21}{10} = \frac{55}{30} \div \frac{63}{30} = \frac{55 \div 63}{1} = \frac{55}{63}$$

SKILL: Divide mixed numbers and simplify the answer to lowest terms.

10. Correct Answer: $1\frac{5}{8}$ inches

- ➔ The student had to identify the measure of the line and express the fraction in lowest terms.

$$1\frac{10}{16} \div \frac{2}{2} = 1\frac{5}{8}$$

SKILL: Find the measure to the nearest fraction of an inch simplified to lowest terms.

11. A student who has mastered the prerequisite concepts should be able to complete the written assessment in about 30 minutes.

12. A student who has mastered the prerequisite concepts should feel confident in his or her ability to solve the problems and should not need to ask for assistance.