The point value of each problem is given in the margin.

(9) 1. Use tests (not long division) to determine whether $50301132$ is divisible by the following numbers. (Show how the test works.)
   a) $4 \mid 32$, so $4 \mid 50301132$.
   b) $6 \mid 3 + 1 + 0 + 1 + 3 + 2 = 15, 3 \mid 15$, so $3$ is a divisor. $2$ is a divisor since $50301132$ is even. Thus $6 \mid 50301132$.
   c) $11 \mid 5 - 0 + 3 - 0 + 1 - 1 + 3 - 2 = 9, 11 \nmid 9$, so $11 \nmid 50301132$.

(8) 2. Given that $a = 2^3 \cdot 3^1 \cdot 7^2$, $b = 3^3 \cdot 5^2$ find
   a) GCF $(a,b) = 3^1 = 3$
   b) LCM $(a,b) = 2^3 \cdot 3^3 \cdot 5^2 \cdot 7^2$
   (You may express your final answer as a product of prime powers.)

(6) 3. Use the Euclidean Algorithm to find GCF(483,529).
   \[
   \begin{align*}
   &= \text{GCF}(483, 46) \\
   &= \text{GCF}(23, 46) \\
   &= \text{GCF}(23, 0) \\
   &= 23
   \end{align*}
   \]

(7) 4. Calculate $3.3 \times .06$ using the standard algorithm for multiplication and explain how and why the rule for moving the decimal point works.
   \[
   \begin{align*}
   \text{3.3} \times .06 &= \text{33} \times .6 \\
   &= \frac{33}{10} \times \frac{6}{100} \\
   &= \frac{33 \times 6}{1000} \\
   &= \frac{198}{1000} \\
   &= .198
   \end{align*}
   \]
5. State the Fundamental Theorem of Arithmetic.

Any composite number can be expressed uniquely as a product of primes (except for the order of the primes).

6. State the rule for determining whether a fraction has a terminating decimal expansion and then circle all fractions in the list below that have terminating decimal expansions.

A reduced fraction \( \frac{a}{b} \) has a terminating decimal expansion if the only prime factors of \( b \) are 2 and/or 5.

\[
\begin{align*}
\frac{1}{5} & \quad \frac{1}{25} & \quad \frac{1}{3} & \quad \frac{1}{15} & \quad \frac{1}{7} & \quad \frac{1}{17} & \quad \frac{1}{35} & \quad \frac{2}{5} & \quad \frac{2}{5} \\
2 \cdot 3 & \quad 5 & \quad 11 & \quad 5 \cdot 3 & \quad 2 & \quad 17 & \quad 5 & \quad 2 & \quad 2
\end{align*}
\]

7. Make up a word problem for modelling \( 8 \div \frac{2}{3} \) and then solve your problem.

How many pieces of length \( \frac{2}{3} \) inch can be cut from a string of length 8 inches?

\[
\frac{8}{\frac{2}{3}} = 8 \cdot \frac{3}{2} = 12
\]

8. a) Write in expanded form \( 80050.0103 = 8 \cdot 10^4 + 5 \cdot 10 + 1 \cdot 10^{-2} + 3 \cdot 10^{-4} \)

b) Express as a decimal \( 4 \cdot 10^3 + 3 \cdot 10^{-2} = 4000.03 \)

c) Express in words 500.021 (but not in the manner "500 point 0,2,1").

Five hundred and twenty-one thousandths

9. a) Convert 2.72 to a mixed number in simplified form.

\[
2 \frac{72}{100} = 2 \frac{36}{50} = 2 \frac{18}{25}
\]

b) Convert 2.1\(\overline{5} \) = 2.151515... to an improper fraction in simplified form.

\[
x = \frac{213}{99} = \frac{71}{33}
\]

Subtract \( 99x = 213 \)
(6) 10. Determine whether the following calculations are correct or not. If wrong, give the correct answer.
(a) \( \left( \frac{2}{3} \right) \cdot 3 = \frac{6}{9} \) \( \frac{2}{3} \cdot 3 = \frac{6}{3} \cdot 3 = \frac{18}{3} = \frac{6}{3} = \frac{2}{1} \) Correct
(b) \( 3 \left( \frac{1}{5} \right) = \frac{3}{15} \) Wrong. \( 3 \left( \frac{1}{5} \right) = \frac{3}{5} \)
(c) \( 1^{-1} + 2^{-1} = 3^{-1} \) Wrong. \( 1^{-1} + 2^{-1} = \frac{1}{1} + \frac{1}{2} = \frac{2}{2} + \frac{1}{2} = \frac{3}{2} \) not \( \frac{1}{3} \)

(9) 11. Give ballpark estimates of the following. (Do not calculate exact values.)
(a) \( \frac{600}{391} \approx \frac{600}{400} = 200 \)
(b) 4.97 percent of 998 \( \approx \frac{5}{100} \) \( \cdot \) 1000 = 50
(c) \( \frac{10.5}{20} + \frac{3.3}{10} + \frac{6}{12.1} \approx 1 + 3 + 0 = 4 \)

(6) 12. Use a rectangle area model to illustrate why \( \frac{3}{7} \times \frac{2}{3} = \frac{6}{21} \)

(5) 13. A recipe calls for 2 cups of flour and 1.5 cups of milk. If you only have 1 \( \frac{1}{2} \) cups of flour, how much milk should you add? (Set up a proportion and solve it.)

\[
\frac{Milk}{Flour} = \frac{\frac{1.5}{2}}{\frac{1.5}{2}} \Rightarrow x = \frac{1.5 \cdot \frac{1.5}{2}}{2} = \frac{2.25}{2} = \frac{9}{4} \cdot \frac{1}{2} = \frac{9}{8} \] 
\[x = 1 \frac{1}{8} \text{ cups of milk.}\]

(8) 14. (a) The price of gas rose from $1.50 to $2.00 per gallon. By what percent had it gone up?

\[\frac{\$0.50}{\$1.50} = \frac{1}{3} = 0.3333 \approx 33.3\%\]

(b) A $50000 house went up in value 20% the first year and down in value 20% the second year. What is the value now?

\[\text{After 1 year: } 50000 + 0.2 \times 50000 = 50000 + 10000 = 60000\]
\[\text{After 2 years: } 60000 - 0.2 \times 60000 = 60000 - 12000 = 48000\]