SHSAT Practice Questions

Synergy Prep

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Work Rate Problems

1. If Worker A can complete a job in 5 hours and Worker B can complete the same job in 3 hours, how long will it take for both Worker A and Worker B to complete the job working together?

2. A pump can fill a tank in 4 hours. When a leak is present, the tank is filled in 6 hours. How long will it take for the tank to empty if only the leak is present?

3. Two workers are working together to complete a job. Worker A is three times as efficient as Worker B. Working together, they can complete the job in 6 hours. How long would it take for each worker to complete the job individually?

Order of Operations Problems

1. Evaluate the expression: $15 \div 3 \cdot (2 + 3)^2 - 10$.

2. What is the value of: $6^2 \div 2^3 \cdot (5 - 3) + 4$?

3. Calculate the result of: $\frac{8 \cdot 4 + 9 - 3^2}{1 + 2 \cdot (3+1)}$.

Scientific Notation Problems

1. If $a = 4.5 \times 10^6$ and $b = 3.0 \times 10^4$, what is the value of $a \cdot b$ expressed in scientific notation?

2. Given that the speed of light is approximately 3×10^8 meters per second, calculate the distance light travels in 3×10^4 seconds, expressed in scientific notation.

3. If a cell divides every 3×10^2 seconds, how many times will it have divided after 1.2×10^4 seconds? Express your answer as a power of ten.

Answer Key and Explanations

Work Rate Problems

1. The rate of Worker A is $\frac{1}{5}$ and the rate of Worker B is $\frac{1}{3}$ per hour. The combined rate is $\frac{1}{5} + \frac{1}{3} = \frac{3+5}{15} = \frac{8}{15}$. Therefore, it will take $\frac{15}{8}$ **hours** or **1.875 hours** to complete the job working together.

2. If the pump fills the tank in 4 hours, its rate is $\frac{1}{4}$. With the leak, the combined rate is $\frac{1}{6}$. The leak's rate is $\frac{1}{6} - \frac{1}{4} = -\frac{1}{12}$ (negative since it's emptying). So, it will take $\frac{1}{\frac{1}{12}} = $ **12 hours** for the tank to empty.

3. Let x be the time it takes Worker B alone. Worker A's time is $\frac{x}{3}$. Their combined rate is $\frac{1}{x} + \frac{3}{x} = \frac{4}{x}$. Since they can complete the job in 6 hours, $\frac{4}{x} = \frac{1}{6}$. Solving for x gives $x = 24$. Therefore, Worker B takes **24 hours**, and Worker A takes **8 hours**.

Order of Operations Problems

1. Following order of operations (PEMDAS): $15 \div 3 \cdot 5^2 - 10 = 5 \cdot 25 - 10 = 125 - 10 = \mathbf{115}$.

2. Execute operations: $6^2 \div 2^3 \cdot 2 + 4 = 36 \div 8 \cdot 2 + 4 = 9 \cdot 2 + 4 = 18 + 4 = \mathbf{22}$.

3. Compute the expression: $\frac{8 \cdot 4 + 9 - 9}{1 + 2 \cdot 4} = \frac{32 + 0}{1 + 8} = \frac{32}{9} = \mathbf{3.56}$ (rounded to two decimal places).

Scientific Notation Problems

1. Multiplying a and b: $(4.5 \cdot 3.0) \times 10^{6+4} = 13.5 \times 10^{10} = \mathbf{1.35 \times 10^{11}}$.

2. The distance light travels: $(3 \times 10^8) \cdot (3 \times 10^4) = 9 \times 10^{12}$ meters, so $\mathbf{9 \times 10^{12}}$ meters.

3. Number of divisions: $\frac{1.2 \times 10^4}{3 \times 10^2} = \frac{12}{3} \times 10^2 = 4 \times 10^2$, thus $\mathbf{4 \times 10^2}$ times.