

There are 13 problems on this exam. Show work and explain in order to receive full credit. Those problems that require explanations are clearly indicated. Answers that require explanations will be given at most half credit if work appears with no explanation. Be sure to follow all directions.

1. Use the vertical line format (VLF) to determine the prime factorization of 119952.

2. Determine the prime power representation of 119952.

3. How many factors does 119952 have? Explain.

4. Use a tree diagram to find all of the factors of $306 = 2^1 \cdot 3^2 \cdot 17^1$. Label each terminal branch of your tree with the factor of 306 that it determines.
5. Use the tests for divisibility to determine the value(s) of d such that the following holds. Explain how each test must be applied.
- (a) $3128d4$ is a multiple of 4
 - (b) $3128d4$ is divisible by 8
 - (c) $31284d$ is divisible by 6
 - (d) 9 is a factor of $7128d4$

The following problems on this exam are all in BASE SIX.

6. Determine the missing digit in each of the following calculations performed in BASE SIX. Explain.

$$\begin{array}{r} \text{(a)} \quad 3 _ 1 \\ + 2 4 5 \\ \hline 1 0 2 0 \end{array}$$

$$\begin{array}{r} \text{(b)} \quad _ 4 \\ \times 3 5 \\ \hline 1 4 1 2 \end{array}$$

7. Starting with 0, list the first eight multiples of 3 in BASE SIX.

8. Based on your answer to the previous problem how can you quickly determine if a number in BASE SIX is a multiple of 3.

In problems 9-12 draw a model with your BASE SIX blocks to determine the result of the specified calculation.

9.
$$\begin{array}{r} 324 \\ + 433 \\ \hline \end{array}$$

10.
$$\begin{array}{r} 433 \\ - 345 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \quad 23 \\ \times 34 \\ \hline \end{array}$$

$$12. \quad 425 \div 3$$

