Patterns in Products and Real-World Applications of Large Numbers

A. Fill in the Blanks

1. To multiply a whole number by 1,000, you add _____ zeros to the end of it.
2. One trillion is written as a 1 followed by _____ zeros.
3. Using the pattern for multiplying by 99, 43 x 99 = 43 x 100 - _____.
4. Based on the pattern for squaring numbers ending in 5, the product 85 x 85 will end in the digits 25 and begin with the number _____.
5. 1,000,000 (one million) is equal to 1,000 x _____.

B. Match the problem in Column A with the correct answer or solution method in Column B.

Column A (Problem)	Column B (Answer / Method)
1. 64 x 99	A. 812
2. 95^2	B. One Trillion
3. 74 x 11	C. Multiply by 100, then subtract 64
4. 1,000,000,000,000	D. 60,000,000
5. 300 x 200,000	E. Starts with 9x10 (90) and ends in 25

C. Use patterns and properties of multiplication to solve these problems. Show your thinking where possible.

1. Calculate 34 x 99. (Hint: Think of 99 as 100 - 1)
2. Calculate 52 x 11. (Hint: For ab x 11, the answer is a | a+b | b)
3. Calculate 18 x 999.
4. Calculate 83 x 11.
5. Calculate 45^2.

D. Solve these problems as quickly as you can. Look for the patterns!

1. 45 x 100 = _____
2. 7 x 800 = _____
3. 123 x 1,000 = _____

4. 50 x 60 = _____

5. 8 x 99 = _____

E. These problems require multiple steps or a deeper understanding of number patterns.

1. Calculate 14 x 16 using the pattern $(a-b)(a+b) = a^2 - b^2$. (Hint: Let a = 15)
2. The product of two numbers is 5,400,000. If one number is 900, what is the other number?
3. Calculate 99 x 102.
4. A sequence of products is shown below: 15 x 11 = 165 25 x 11 = 275 35 x 11 = 385 Without calculating, predict the answer to 45 x 11. Explain the pattern.
5. What is half of one billion?

F. Read each problem carefully and show your work. Use your knowledge of large numbers.

1. The population of a country is approximately 80 million. If the government wants to give each person a grant of $1,500, what is the total cost of this program?
2. The distance from the Earth to the Sun is about 150 million kilometers. A space probe travels at an average speed of 50,000 km per hour. How many hours would it take for the probe to travel from the Earth to the Sun?
3. A company manufactures 20,000 laptops per day. Each laptop has a hard drive with 500 gigabytes (GB) of storage. How many total gigabytes of storage does the company install in its laptops in a 5-day work week?
4. The Amazon rainforest is estimated to have 390 billion trees. If, due to deforestation, 1/1000th of these trees are lost in a year, how many trees are lost?
5. A single terabyte (TB) is 1,000,000,000,000 bytes. A large data center has 4,000 TB of storage. If a single email with an attachment is 2,000,000 bytes, how many such emails can the data center store?

G. True or False

1. 350 x 20 is the same as 35 x 2 x 10. _____
2. To multiply 58 by 11, you add 5+8=13 and place the 13 between 5 and 8 to get 5138. _____
3. A billion is one thousand times larger than a million. _____
4. 999 x 7 is equal to (1000 x 7) + 7. _____
5. If a company's revenue s 600 million and it has 3,000 employees, there venueper employee is 600 million and it has 3,000 employees, there venueper employee is20,000. _____