

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, $43 \times 99 = 43 \times 100 -$ _____.
4. Based on the pattern for squaring numbers ending in 5, the product 85×85 will end in the digits 25 and begin with the number _____.
5. 1,000,000 (one million) is equal to $1,000 \times$ _____.

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

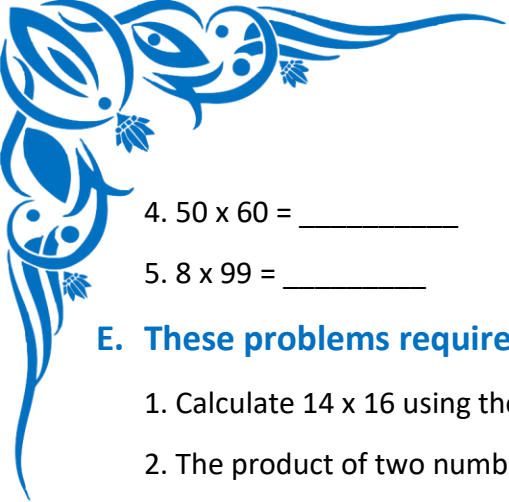
Column A (Problem)	Column B (Answer / Method)
1. 64×99	A. 812
2. 95^2	B. One Trillion
3. 74×11	C. Multiply by 100, then subtract 64
4. 1,000,000,000,000	D. 60,000,000
5. $300 \times 200,000$	E. Starts with 9×10 (90) and ends in 25

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

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

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

1. $45 \times 100 =$ _____
2. $7 \times 800 =$ _____
3. $123 \times 1,000 =$ _____



4. $50 \times 60 =$ _____

5. $8 \times 99 =$ _____

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

1. Calculate 14×16 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 99×102 .
4. A sequence of products is shown below: $15 \times 11 = 165$ $25 \times 11 = 275$ $35 \times 11 = 385$ Without calculating, predict the answer to 45×11 . 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, $1/1000$ th 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. 350×20 is the same as $35 \times 2 \times 10$. _____
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. 999×7 is equal to $(1000 \times 7) + 7$. _____
5. If a company's revenue is 600 million and it has 3,000 employees, then revenue per employee is 600 million and it has 3,000 employees, then revenue per employee is 20,000. _____