1. Find the units digit of 8^{1242}.

2. What is the units digit of 2^{63}, 2^{1568}?

3. What is the units digit of 29^{57}?

4. Which of the numbers from 1–9 has the same units digits when that number is taken to any exponent x, $x > 0$.

5. Between the digits of a two-digit square, a third digit is inserted to create a three-digit square. Find the number of three-digit squares that can be obtained by this process.

6. If $x = 2$ and $y = -3$, find the value of $x^3 - y^3$.

7. If $a = 2$, $b = 3$, and $c = 4$, find the value of bc^a.

8. Find the value of $-2^2 - 3^2$.

9. If $x = 2$ and $y = 3$, find $-x^2 + (-y)^3$.

10. When the number 4 is squared and then doubled, what must be added to the answer to have a sum of 7^2?

11. a) If the population of rabbits triples every year, how many rabbits will there be in 5 years if there are currently 2?

    b) How many in 10 years?

    c) Create a formula to calculate the population of rabbits in n years.

12. If a bacteria population starts at 100 quadruples every hour, how many bacteria will there be in 6 hours?

13. Britney Gallivan was the first person to fold a piece of paper in half 12 times, something which had previously been believed to be impossible. How many layers of paper would be in that stack?

14. Given that $2^x + 2^x + 2^x + 2^x = 128$, what is the value of $(x + 1)(x - 1)$?

15. What is the remainder when 2^{133} is divided by 5?

16. Aaron gave Levi the combination to his lock as a mystery to solve. There are three whole numbers in the locker combination. Aaron gave Levi the following clues.

- Each number is greater than 0 and less than 40.

- The first number a a prime number greater than 31

- The second number has nine distinct positive integer factors

- If you take the product of the square of 3 and the cube of 2, and then reverse the digits, you have the third number.

What is the sum of the three numbers in the combination?

Answers:

1. 4
2. 8, 6
3. 9
4. 1,5,6
5. Three numbers with this property.
6. 35
7. 48
8. -13
9. -31
10. 17
11. a) 486   b) 118 098   c) $P = 2 \times 3^n$
12. 409 600
13. 4096
14. 24
15. 2
16. 100