If a number is very large, sometimes it is difficult to tell what its factors are. Use these hints to help decide whether the first five primes are a factor:

- 2 is a factor if the number is even.

- 3 is a factor if its **digit sum** is a multiple of 3:
     $108 \rightarrow 1 + 0 + 8 = 9$ 3 is a factor of 9, so 3 is also a factor of 108

- 5 is a factor is the number ends in a 5 or a 0.

- 7 is a factor if…
  - Double the last digit and subtract it from the rest:
                  $25578 \rightarrow$ $2557 - (2 \times 8) = 2541$
  - Repeat until you recognise whether the number is a multiple of 7:
                  $254 - (2 \times 1) = 252$
                  $25 - (2 \times 2) = 21$
                  7 is a factor of 21, so 7 is also a factor of 25578.

- 11 is a factor if…
  - Perform a calculation with the digits by alternating between subtract and add. Always start with subtract: $724867 \rightarrow$ $7 - 2 + 4 - 8 + 6 - 7$
  - If the answer is a multiple of 11, including negative numbers or zero, the original number has a factor of 11.
                  $7 - 2 + 4 - 8 + 6 - 7 = 0$
                  Therefore 11 is a factor of 724867.

Use the hints to answer these questions:
  1. Is 19795 divisible by 3?
  2. Is 19767 divisible by 3?
  3. Is 489118 divisible by 7?
  4. Is 40118 divisible by 11?
  5. Is 46124 divisible by 7?
  6. Is 295641 divisible by 3?
  7. Is 60236 divisible by 11?
  8. Is 2310 divisible by 2 and 3 and 5 and 7 and 11?

Write the following numbers as products of their primes:
  9. 210
  10. 154
  11. 108
  12. 726
  13. 567
  14. 2156
  15. 1225

Answers

1. Is 19795 divisible by 3? $1 + 9 + 7 + 9 + 5 = 31$ 3 **is not** a factor

2. Is 19767 divisible by 3? $1 + 9 + 7 + 6 + 7 = 30$ 3 **is** a factor

3. Is 489118 divisible by 7?

   $48911 - (2 \times 8) = 48895$
   $4889 - (2 \times 5) = 4879$
   $487 - (2 \times 9) = 469$
   $46 - (2 \times 9) = 28$ 7 **is** a factor

4. Is 40118 divisible by 11? $4 - 0 + 1 - 1 + 8 = 12$ 11 **is not** a factor

5. Is 46124 divisible by 7?

   $4612 - (2 \times 4) = 4604$
   $460 - (2 \times 4) = 452$
   $45 - (2 \times 2) = 41$ 7 **is not** a factor

6. Is 295641 divisible by 3? $2 + 9 + 5 + 6 + 4 + 1 = 27$ 3 **is** a factor

7. Is 60236 divisible by 11? $6 - 0 + 2 - 3 + 6 = 11$ 11 **is** a factor

8. Is 2310 divisible by 2 and 3 and 5 and 7 and 11?   2 **is** a factor

   $2 + 3 + 1 + 0 = 6$ 3 **is** a factor

   $231 - (2 \times 0) = 231$
   $23 - (2 \times 1) = 21$ 7 **is** a factor

   $2 - 3 + 1 - 0 = 11$ 11 **is** a factor

9. 210 $= 2 \times 3 \times 5 \times 7$

10. 154 $= 2 \times 7 \times 11$

11. 108 $= 2^2 \times 3^3$

12. 726 $= 2 \times 3 \times 11^2$

13. 567 $= 3^4 \times 7$

14. 2156 $= 2^2 \times 7^2 \times 11$

15. 1225 $= 5^2 \times 7^2$