

Solutions: A collection of short problems on factors, multiples and primes

Q1.

You could write this problem out as $1 \times 3 \times 4 \times 6 \times 7 \times 8 \times 9 \times (2 \times 5) \times 10$. The product of the first seven numbers is not a multiple of ten, but the last part gives us 10×10 so the overall product must be a multiple of 100, but not a multiple of 1000. So the answer is two zeros.

This problem is taken from the [UKMT Mathematical Challenges](#).

(<http://nrich.maths.org/5754/solution>)

Q2.

As the product of each pair has the same value, this value must be product of the smallest and largest numbers, that is 5×72 .

So the number which is paired with 10 is $5 \times 72 \div 10$, that is 36.

This problem is taken from the [UKMT Mathematical Challenges](#).

(<http://nrich.maths.org/5759/solution>)

Q3.

Because each of the five options given is a member of the sequence, each is also a multiple of 9. So we require the third factor of the number, that is the factor consisting of several 2s followed by a single 3, to be a multiple of 9 also. This will be true if and only if the sum of its digits is a multiple of 9.

For each number in the sequence, the number of 2s in its third factor equals the number of 0s in that number. The options given have 4, 6, 8, 10 or 12 zeros, corresponding with their third factors having digit sums of 11, 15, 19, 23 and 27 respectively. Of these, only 27 is a multiple of 9 so the correct answer is 20,000,000,000,007.

This problem is taken from the [UKMT Mathematical Challenges](#).

(<http://nrich.maths.org/5765/solution>)