**The Factors and Multiples Game – Probing Questions**

Ideas for Simplification

For those pupils who require support for this task, you could create a 1-50 grid instead which means the calculations aren’t as big and they are able to access the maths all the same. Questions to ask these pupils could be;  
• If your partner chooses the number 15 to start with, what numbers could you choose? What if they choose 7? What if they choose 37?  
• How many prime numbers had been chosen once the game had finished?

Have a multiplication table next to students

Give each students a “calculator check” token

Have a rule where students can only add or subtract 3, 5 and 7

Let the students choose their own rules

Modifying the Rules

Play the game without using prime numbers

What if when you played the game you had to take it in turns to pick a factor, multiple, factor, multiple and you didn’t get to choose which one each time, now what is the best number to start with?

Number Properties

If I start with 20, how many different numbers can you choose?

How about starting with 64?

If I start with… how many following moves are there?

Which number gives you the biggest choice for your next move? Which gives you the smallest choice?

Which number has the most factors?

What is the smallest number of turns before you can choose a number which is neither a factor nor a multiple of the original number?

How many prime numbers will automatically end the game when 1 has been removed from play?  
Also what is the smallest prime number that will end the game when you have removed 1?

Which number between 10 and 20 gives you the biggest choice for your next move? Which gives you the smallest choice?

Find two numbers that give you the same amount of choices

Do bigger numbers give you more choices or smaller numbers? Explain your answer

Which numbers only have two factors? Why?

Which two digit number under 20 has the most factors?

Can you find a number with 8 factors?

Which numbers have an odd number of factors? Why?

Do odd numbers have more or less factors than even numbers? Explain your answer

Which number/numbers have…

The most/least number of factors?

The most/least number of multiples?

The most/least combined factors and multiples?

Winning Strategy

**Going First**

Is there a winning strategy if you go first? Explain why it works

What is the lowest number you can choose and still win?

How would this strategy change if the grid was 1 – 50? How about 1 – 200? How about 100 – 200?

What if the grid was only made on even numbers – is the best starting number still the same for your winning strategy?

How many ways can you win the game in only 2 goes (p1, p2, p1)?

What if you couldn’t use a number on the same line of the 100 grid, is it any harder to win?

How does the winning strategy change if 1 is removed BUT you can’t start on a prime?

**Going Second**

Is there a winning strategy if you go second? Why or why not?

If I go first, what number would you like me to choose so you can beat me?... And if 1 is not an option!?

How many different numbers are there that I could pick 1st and you could win?

If I start with the number 27, is it better for you to then choose a factor or a multiple?

How would this strategy change for different grid sizes? 1 – 50? 1 – 200? 100 – 200?

Creating Number Chains

How long can you go by avoiding all the prime numbers?  
• How far can you get by avoiding multiples of 10?  
• What is the longest string of numbers you can get?  
• Is it possible to get past 73? (the highest score recorded on the N-Rich website)  
• Can you prove what the highest score attainable is?  
• Is it possible to cross out all 100 numbers?

What is the most primes you can cross off in a game?

What is the longest sequence of numbers you can make alternative between odd and even?

What is the longest bigger-smaller-bigger-smaller-bigger-etc sequence you can make?  
e.g. 2, 10, 5, 30, 6, 42…

What is the longest sequence you can make avoiding numbers in the top row?

Try to make a horizontal / vertical / diagonal pattern with the numbers you cross off

How many numbers from the 90s row can you clear?