Prime Detectives to 100

Teacher		**Class**	Year 5
Subject	Maths	**Topic**	Prime numbers
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Pupils learn prime, composite and prime factor words. They sort numbers and test for primes to 100.

Curriculum links

- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers [1]
- establish whether a number up to 100 is prime and recall prime numbers up to 19 [1]
- identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers [1]

Learning objectives

- Students will use prime, composite and prime factor words correctly.
- Students will test numbers up to 100 and recall primes to 19.
- Students will break composites into a product of prime factors.

Success criteria

- I can sort numbers into prime, composite and neither.
- I can recall the prime numbers up to 19.
- I can write a composite as a product of prime factors.

What students already know

On mini whiteboards, ask pupils to write all the factors of 6 and 10. Check they know factor means a whole number that divides exactly.

Key words

prime number	a counting number greater than 1 with exactly two divisors, 1 and itself [6]
composite number	a counting number greater than 1 with more than two divisors [6][12]
prime factor	a building-block number greater than 1 with only two divisors that multiplies to make another number [3][6]
factor	a whole number that goes into another number exactly with nothing left over [6]
multiple	the answer you get when you multiply a number by a counting number [5]

Materials

- set of number cards 1–20
- three hoops or sorting trays
- interactive whiteboard with Slides 1–12
- printed 1–100 grids and coloured pencils
- Worksheet Task D printed
- mini whiteboards, pens and pencils

Before the lesson

- Print number cards 1–20, factor lists for 1–20 and 1–100 grids, and copies of Worksheet Task D
- Set out three hoops or trays labelled prime, composite and neither, plus sentence stems
- Test Slide 6 with Video clip 1 (0:00–2:25) for sound and picture
- Prepare extra cards for 21, 27 and 49 for stretch

Created with LessonDino.com · AI lesson planner with checkable sources

Lesson outline

0–5 min **Starter** 5 min · Whole class

Recall factor pairs and spark debate about where 1 belongs.

YOU DO

1. Show Slides 1–2 and share that today we are Prime Detectives learning prime, composite and prime factor words.
2. Ask pupils to write factors of 6 on mini whiteboards to recall that a factor divides exactly [6].
3. Show Slide 5 vote and ask which test they would try first for a mystery number.
4. Pose the hook for partner talk: where does 1 belong.

STUDENTS DO

1. Write factors of 6 on whiteboards and show them.
2. Vote on Slide 5 and discuss with a partner where 1 belongs.

Say: Where does 1 belong? Is it prime, composite, or is it tricking us? Talk to your partner and be ready to explain. Today we will sort numbers using the right maths words and test if numbers are prime.

Ask: What are the factors of 6? (1, 2, 3 and 6.) · What do we mean by a factor? (A whole number that divides another number exactly with no remainder [6].)

Check understanding: Scan whiteboards for 1, 2, 3, 6. If many miss pairs, model 6 as 1 x 6 and 2 x 3 before moving on.

Support: Show 6 as two arrays so pupils see 1 x 6 and 2 x 3. **Stretch:** Ask pupils to give all factor pairs of 12 quickly from times-table facts.

Use: Slides 1–2, 5

5–15 min **Teaching** 10 min · Whole class

Explain prime, composite and neither and model testing with factors.

YOU DO

1. Show Slide 3 clubs and explain in own words that prime has exactly two factors, composite has more than two [6][12].
2. Show Slide 11 with 7 dots and model that 7 only makes 1 x 7, so it is prime.
3. Model 9 as 1 x 9 and 3 x 3, so it has three factors and is composite.
4. Model Slide 7 steps: set 1 aside, check even, then multiples of 3, 5 and 7.

STUDENTS DO

1. Chant the rule with actions: two fingers for prime, many fingers for composite, one star hand for 1.
2. Copy the three clubs and worked tests for 7, 9, 12 and 1 into books.

Say: A prime has only 1 and itself as factors. A composite has more than two factors. The number 1 is special because it has only one factor, so it is neither [6][14]. To test, we look for any other factor pair using times tables we know [5].

Worked example: Test 12: factors are 1, 2, 3, 4, 6, 12, so more than two, so composite [6]. 12 = 2 x 2 x 3, so its prime building blocks are 2 and 3 [3]. Test 7: only 1 x 7 works, so prime. Test 1: only one factor, so neither [6].

Ask: How many factors does a prime number have? (Exactly two: 1 and itself [6].) · Why is 9 not prime? (It can be divided by 3 as well as 1 and 9, so it has more than two factors [9].) · What is a prime factor? (A factor which is also prime, like 2 and 3 are prime factors of 12 [6].)

Check understanding: Cold-call: is 11 prime or composite, and why. If unsure, remake arrays for 11 and 12 with counters.

Support: Keep a 10 x 10 multiplication grid visible to check if a number appears in another times table [6].
Stretch: Ask why 2 is the only even prime number, listening for every other even divides by 2 [6].

Use: Slides 3, 7, 11

15–35 min **Main activity** 20 min · Groups

Sort numbers 1–20 into prime, composite and neither using correct vocabulary.

YOU DO

1. Give each group number cards 1–20 and three hoops or trays for prime, composite and neither.
2. Show Slide 9 task and model sorting 13 and 15 with the stem It is ___ because its factors are ___.
3. Ask groups to write factors for 12, circle its primes, and check primes to 19: 2, 3, 5, 7, 11, 13, 17, 19 [1] [6].
4. Circulate, ask for factor-pair proof and correct 1 into neither.

STUDENTS DO

1. Sort cards 1–20 into hoops and record each number with its factors as prime, composite or neither.
2. Write factors for 12, circle 2 and 3, and explain one placement using the sentence stem.
3. Compare with another group and agree the primes to 19 list.

Say: Sort all cards 1 to 20 into the three hoops. For each card say the full factor list. Write the factors for 12 and circle its primes. Check you have found all the primes to 19.

Worked example: 13 has only factors 1 and 13, so it is prime [6]. 15 has factors 1, 3, 5, 15, so it is composite. 1 has one factor, so it is neither [6]. 12 = 2 x 2 x 3, so 2 and 3 are its prime factors [3][6].

Ask: Why did you put 17 in prime? (Because its only factors are 1 and 17.) · What are the prime factors of 12? (2 and 3, because 12 = 2 x 2 x 3 [3].)

Check understanding: Visit each group to hear one explanation with factors. If factors are missing, give the printed factor list to count from.

Support: Give a factor list for each number so students can count the factors instead of working them out.
Stretch: Add cards for 21, 27 and 49 and ask students to prove the placement with a factor pair.

Use: Slide 9

35–50 min **Practice** 15 min · Pairs

Use times tables to trap primes to 100 and practise prime factors.

YOU DO

1. Show Slide 4 and explain only 25 numbers remain between 1 and 100 when multiples are crossed out [5].
2. Play Video clip 1 on Slide 6 and pause to spot crossing multiples of 2, 3, 5 and 7 using times tables [5].
3. Model on a 1–100 grid: circle 2 and cross its multiples, then circle 3 and cross its multiples [22].
4. Hand out Worksheet Task D and ask pairs to sort primes and composites and find prime factors.

STUDENTS DO

1. Watch the clip and cross out multiples on own 1–100 grids with coloured pencils.
2. Complete Worksheet Task D in pairs, writing factor pairs as proof for composites.

Say: We trap primes by crossing out multiples, starting with the smallest numbers and working up [5]. Leave 1 alone because it is neither prime nor composite [14]. After crossing multiples of 2, 3, 5 and 7, what is left is prime.

Worked example: Circle 2, cross 4, 6, 8 and all evens, so no other even is prime [5][6]. Circle 3, cross 6, 9, 12 and 51 = 3 x 17, so 51 is composite. 18 = 2 x 3 x 3, so its prime factors are 2 and 3.

Ask: Why do we not need to test even numbers after 2? (Because 2 is the only even prime number, all others divide by 2 [6].) · How do you know 49 is not prime? (49 = 7 x 7, so it has more than two factors.)

Check understanding: Compare grids: pairs read out remaining primes to check they match and count 25 [5]. Reteach digit-sum test for 3 if errors cluster.

Support: Colour multiples of 2 and 5 first, as those patterns are easiest to spot on the grid [5]. **Stretch:** Predict which numbers over 100 would also fall through, such as 101 or 102, and test them with times tables.

Use: Slides 4, 6, Video clip 1 (0:00–2:25) and Worksheet Task D

50–60 min **Plenary** 10 min · Whole class

Revisit key words and check recall of primes to 19.

YOU DO

1. Show Slide 10 and ask pupils to say each word and meaning without reading: factor, prime, composite.
2. Show Slide 12 quiz and cold-call: Is 13 prime, is 1 prime, what are prime factors of 6.
3. Ask pupils to write primes to 19 from memory on whiteboards: 2, 3, 5, 7, 11, 13, 17, 19 [1][6].
4. Collect exit answers and restate 1 is neither and 2 is the only even prime [6].

STUDENTS DO

1. Answer quiz questions aloud using factors as proof.
2. Write primes to 19 and one composite as a product of primes, then self-mark.

Say: Tell your partner the three words in your own words. Then show me you can sort prime, composite and 1, and list the primes to 19. Remember to give the factor pair that proves a number is composite.

Ask: Is 13 prime? Why? (Yes, only factors 1 and 13.) · True or false: 1 is prime? (False, it has one factor [6].)

Check understanding: Whiteboard check of primes to 19. If many miss one, chant the list again and retest 17 and 19.

Support: Let pupils keep the multiplication grid on desks to check for extra factors [6]. **Stretch:** Ask the front pupil to also name one prime factor of any composite shown.

Use: Slides 10, 12

Common mistakes

Mistake	How to spot it	How to fix it
Thinking 1 is prime	Puts 1 in the prime hoop or ticks it on the 100 grid	Count its factors: 1 has one factor, a prime has exactly two, so 1 is neither prime nor composite [6][14].
Thinking all odd numbers are prime	Labels 9, 15, 21 or 25 as prime	Show 9 = 3 x 3 and 15 = 3 x 5; they are odd but have extra factors so are composite [7]. All primes except 2 are odd, but not all odds are prime [22].
Thinking 2 is not prime because it is even	Sorts 2 as composite	List factors of 2 as 1 and 2 only, so it is prime and the only even prime number [6].

Support

- Give a factor list for each number so students can count the factors instead of working them out
- Keep a 10 x 10 multiplication grid and times-table prompts on desks to test for extra factors

Stretch

- Add cards for 21, 27 and 49 and ask students to prove the placement with a factor pair
- Test tricky numbers like 49, 51 and 91 and write which prime divides them

For the LSE or teaching assistant

Stay with the sorting groups: prompt full factor lists, hand out printed factor lists where needed, and push for the sentence stem with proof.

Created with LessonDino.com · AI lesson planner with checkable sources

Check for understanding

Question	Answer
Is 19 prime? Why?	Yes, its only factors are 1 and 19.
Sort 1, 7 and 9 into prime, composite or neither.	7 prime, 9 composite, 1 neither.
What are the prime factors of 10?	2 and 5, because 10 = 2 x 5 [3].

Homework

List the primes to 19 from memory and write 20 as a product of its prime factors.

Sources

1. National curriculum in England: mathematics programmes of study · gov.uk · https://www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study/national-curriculum-in-england-mathematics-programmes-of-study
2. Year 5 Maths Curriculum map 2023-2024 · westend.lancs.sch.uk · https://westend.lancs.sch.uk/wp-content/uploads/2025/01/Year-5-Maths-curriculum-overview-24_25.pdf
3. prime numbers: FAQ and resources - University of Exeter · empslocal.ex.ac.uk · https://empslocal.ex.ac.uk/people/staff/mrwatkin/zeta/tutorial.htm
4. Prime numbers - MacTutor History of Mathematics · mathshistory.st-andrews.ac.uk · https://mathshistory.st-andrews.ac.uk/HistTopics/Prime_numbers/
5. Prime numbers from 1 - 100 - Prime numbers - 3rd level Maths ... · bbc.co.uk · https://www.bbc.co.uk/bitesize/guides/zytrf82/revision/2
6. Prime numbers - KS2 Maths resources for Year 6 - BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/z2q26fr
7. Prime Numbers | Free GCSE Maths Worksheet (PDF) | Virtus Academy · virtusacademy.co.uk · https://virtusacademy.co.uk/maths/number/prime-numbers/
8. Prime Numbers - Primary Resources · primaryresources.co.uk · https://www.primaryresources.co.uk/maths/pdfs/prime_numbers.pdf
9. What are prime numbers? - BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/zvmhpg8
10. Kids Math: Prime Numbers - Ducksters · ducksters.com · https://www.ducksters.com/kidsmath/prime_numbers.php
11. Prime number Facts for Kids · kids.kiddle.co · https://kids.kiddle.co/Prime_number
12. Explain how to identify a prime number or a composite number · thenational.academy · https://www.thenational.academy/teachers/programmes/maths-primary-ks2/units/understand-and-use-the-concept-of-factorisation-square-and-prime-numbers/lessons/explain-how-to-identify-a-prime-number-or-a-composite-number
13. Prime numbers (video) | Khan Academy · khanacademy.org · https://www.khanacademy.org/math/cc-fourth-grade-math/imp-factors-multiples-and-patterns/imp-prime-and-composite-numbers/v/prime-numbers
14. prime numbers and composite numbers - Kids - Britannica Kids · kids.britannica.com · https://kids.britannica.com/kids/assembly/view/199881
15. What is a prime? - BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/z6gtng8
16. PRIME AND COMPOSITE NUMBERS for Kids What are Prime Numbers? MATH ... · kidvideo.org · https://kidvideo.org/video/prime-and-composite-numbers-for-kids-what-are-prime-numbers-math-for-kids-i68934.html
17. Prime Numbers with Python (Example) · coderwall.com · https://coderwall.com/p/utwriw
18. What Are Prime Numbers? – Explained for Kids | SmartOnlineGames · smartonlinegames.com · https://smartonlinegames.com/learn/what-are-prime-numbers.html
19. Prime Numbers Explained for Kids - Prongo.com · prongo.com · https://prongo.com/prime-numbers/
20. Prime Numbers - Properties, Examples and Chart - FirstCry.com · firstcry.com · https://www.firstcry.com/intelli/articles/lets-learn-prime-numbers-for-kids-to-improve-math-skills/
21. Prime Numbers, LCM, and Factors Made Easy For Kids · meredithplays.com · https://www.meredithplays.com/prime-numbers-lcm-and-factors-made-easy-for-kids/
22. What are Prime Numbers 1 to 100? Definition, Chart, Examples · splashlearn.com · https://www.splashlearn.com/math-vocabulary/algebra/prime-number
23. Prime Numbers in Maths - GeeksforGeeks · geeksforgeeks.org · https://www.geeksforgeeks.org/maths/prime-numbers/
24. Prime Numbers - Prime Numbers 1 to 100, Examples | Prime ... - Cuemath · cuemath.com · https://www.cuemath.com/numbers/prime-numbers/
25. Prime Numbers Explained For Kids With Easy Examples And Mini Quiz · math-exercises-for-kids.com · https://www.math-exercises-for-kids.com/prime-numbers-explained-for-kids/