Prime Factorisation: Tree and Division Methods

Unit: Playing with Numbers - Student Practice Worksheet

Overview: Ms. Rao wrote 60 on the board and asked for its "prime building blocks" — the smallest prime numbers that multiply together to make it. Kabir drew branches splitting 60 into smaller and smaller pieces, like a family tree. Anaya divided 60 by primes one after another, straight down a column. Two completely different-looking methods — and they landed on the exact same four numbers.

Practice Questions (30 Total)

Section A - Easy

Q1. The tree leaves are 2, 3, 2 and 5. What is 60 as a product of primes?

60

6 10

2 3 2 5

- [ ] **A.** 2 x 2 x 3 x 5
- [ ] **B.** 2 x 3 x 5
- [ ] **C.** 2 x 3 x 3 x 5
- [ ] **D.** 2 x 2 x 5 x 5

Q2. What is prime factorisation?

- [ ] **A.** Writing a number as a product of prime numbers
- [ ] **B.** Adding all the factors of a number
- [ ] **C.** Finding only the biggest factor
- [ ] **D.** Dividing a number by itself

Q3. What is the prime factorisation of 12?

- [ ] **A.** 2 x 6
- [ ] **B.** 2 x 2 x 3
- [ ] **C.** 3 x 4

- [ ] **D.** 1 x 12

Q4. The column has just divided 60 by 2 to get 30. What is the next division-method step?

2 | 60

2 | 30

? | 15

- [ ] **A.** Stop here
- [ ] **B.** Multiply 30 by 2 again
- [ ] **C.** Add 30 and 2
- [ ] **D.** Divide 30 by the next fitting prime

Q5. In the division method, what do you divide by first?

- [ ] **A.** Any number you like
- [ ] **B.** The largest prime possible
- [ ] **C.** The smallest fitting prime
- [ ] **D.** The number 1

Q6. What is the prime factorisation of 20?

- [ ] **A.** 4 x 5
- [ ] **B.** 2 x 2 x 5
- [ ] **C.** 2 x 10
- [ ] **D.** 1 x 20

Q7. The maroon mark is 2 on the line 0, 1, 2, 3. Which is the smallest prime?

- [ ] **A.** 0
- [ ] **B.** 1
- [ ] **C.** 2

- ☐ **D.** 3

Q8. In a factor tree, when do you stop splitting a branch?

- ☐ **A.** When you feel like it
- ☐ **B.** After exactly 3 splits
- ☐ **C.** When the number becomes 1
- ☐ **D.** When the branch reaches a prime number

Q9. What is the prime factorisation of 18?

- ☐ **A.** 2 x 9
- ☐ **B.** 2 x 3 x 3
- ☐ **C.** 3 x 6
- ☐ **D.** 1 x 18

Q10. 1 divides every number, yet it is left out of prime factorisations. Why?

- ☐ **A.** No, since 1 is not prime
- ☐ **B.** Yes, always
- ☐ **C.** Only for even numbers
- ☐ **D.** Only for odd numbers

Section B - Medium

Q11. The tree splits 45 into 9 and 5, then 9 into 3 and 3. What is the prime factorisation?

45

9 5

3 3

- ☐ **A.** 3 x 3 x 5
- ☐ **B.** 5 x 9
- ☐ **C.** 3 x 15
- ☐ **D.** 1 x 45

Q12. In the division method, why must you always divide by a PRIME number, not just any factor?

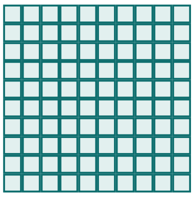
- ☐ **A.** It makes no real difference either way

- [ ] **B.** Because non-prime divisors are illegal in maths
- [ ] **C.** So the final list of divisors is itself the prime factorisation
- [ ] **D.** To make the working longer

Q13. Find the prime factorisation of 72.

- [ ] **A.** 2 x 2 x 3 x 3
- [ ] **B.** 2 x 2 x 2 x 3 x 3
- [ ] **C.** 2 x 3 x 3 x 3
- [ ] **D.** 2 x 2 x 2 x 9

Q14. The 10-by-10 grid is 100 cells. Which prime factorisation is that?



100 = 2 x 2 x 5 x 5

- [ ] **A.** 2 x 50
- [ ] **B.** 4 x 25
- [ ] **C.** 10 x 10
- [ ] **D.** 2 x 2 x 5 x 5

Q15. Two students find different-looking factor trees for the same number, 48. Will their final prime factorisations differ?

- [ ] **A.** Yes, trees always give different final answers
- [ ] **B.** No — the set of prime factors is always the same regardless of tree shape
- [ ] **C.** Only if one tree has more branches
- [ ] **D.** It depends on which student starts first

Q16. Anaya's division-method table for a number shows divisors 2, 2, 2, 5. What is the original number?

- [ ] **A.** 20
- [ ] **B.** 10
- [ ] **C.** 40
- [ ] **D.** 80

Q17. Four leaf-boxes show 2, 3, 3 and 5. What is 90 as a product of primes?

2	3	3	5

- [ ] **A.** 2 x 3 x 5
- [ ] **B.** 2 x 9 x 5
- [ ] **C.** 3 x 3 x 10
- [ ] **D.** 2 x 3 x 3 x 5

Q18. Which of these is NOT a valid prime factorisation of 24?

- [ ] **A.** 2 x 3 x 4
- [ ] **B.** 2 x 2 x 2 x 3
- [ ] **C.** 3 x 2 x 2 x 2
- [ ] **D.** 2 x 2 x 6 broken further into 2x2x2x3

Q19. Find the prime factorisation of 50.

- [ ] **A.** 2 x 25
- [ ] **B.** 2 x 5 x 5
- [ ] **C.** 5 x 10
- [ ] **D.** 1 x 50

Q20. Use a tree or the division column for 36, then check they match. What is the prime factorisation?

- [ ] **A.** 2 x 2 x 3 x 3
- [ ] **B.** 2 x 2 x 9
- [ ] **C.** 4 x 9
- [ ] **D.** 6 x 6

Section C - Challenge

Q21. Seven boxes of 2 stand in a row. What is the prime factorisation of 128?

2	2	2	2	2	2	2

- [ ] **A.** 2 x 2 x 2 x 2 x 8

- [ ] **B.** 4 x 4 x 8
- [ ] **C.** 2 x 64
- [ ] **D.** 2 x 2 x 2 x 2 x 2 x 2 x 2

Q22. Why is prime factorisation called 'unique' for every number?

- [ ] **A.** Every number has one fixed set of prime factors
- [ ] **B.** Because no two numbers can share any prime factors
- [ ] **C.** Because only prime numbers can be factorised
- [ ] **D.** It isn't actually unique

Q23. A number's prime factorisation is 2 x 2 x 3 x 7. What is the number?

- [ ] **A.** 42
- [ ] **B.** 84
- [ ] **C.** 56
- [ ] **D.** 168

Q24. The two rows are primes of 60 and 90. Which shared primes should Anaya multiply for the HCF?

60: 2, 2, 3, 5

90: 2, 3, 3, 5

keep one 2, one 3, one 5

- [ ] **A.** 2 x 3 x 5
- [ ] **B.** 2 x 2 x 3 x 3 x 5
- [ ] **C.** 2 x 3
- [ ] **D.** 3 x 5

Q25. Kabir claims a prime number's own prime factorisation is just itself, with no other factors. Is he right?

- [ ] **A.** No, two prime factors are required
- [ ] **B.** Only true for 2
- [ ] **C.** Yes, itself is its only prime factor
- [ ] **D.** Prime numbers cannot be factorised at all

Q26. A number has prime factorisation 2^3 x 3^2 (meaning 2x2x2x3x3). What is the number?

- [ ] **A.** 72
- [ ] **B.** 36
- [ ] **C.** 48
- [ ] **D.** 108

Q27. The maroon card shows 5 x 13 = 65. Which starting split of 60 is wrong?

5 x 13	= 65, not 60

- [ ] **A.** 60 = 6 x 10
- [ ] **B.** 60 = 4 x 15
- [ ] **C.** 60 = 5 x 13
- [ ] **D.** 60 = 2 x 30

Q28. A number's factor tree has a branch that mistakenly stops at 4 (not fully split). What is wrong with the resulting factorisation?

- [ ] **A.** Nothing is wrong, 4 can be a final leaf
- [ ] **B.** It's incomplete — 4 is not prime, so it must be split further into 2x2
- [ ] **C.** The whole tree must be redrawn from a different starting split
- [ ] **D.** The final number will be too small

Q29. Why does the division method always divide by primes in increasing order (2, then 3, then 5...)?

- [ ] **A.** It's just a habit with no mathematical reason
- [ ] **B.** Larger primes never divide any number
- [ ] **C.** The order must always be reversed
- [ ] **D.** Testing smallest primes first is an efficient, systematic way to make sure none are missed

Q30. 1 divides every number, but prime factorisation never includes it. Which reason matches the definition of a prime?

- [ ] **A.** 1 actually IS included, always
- [ ] **B.** 1 has only one factor, failing the definition
- [ ] **C.** Because 1 is too small to matter
- [ ] **D.** There is no real reason

Answer Key

Q1: (A) (a) 2 x 2 x 3 x 5, rearranging the tree's leaves in order.

Q2: (A) (a) Writing a number as a product of prime numbers.

Q3: (B) (b) 2 x 2 x 3 — all prime factors.

Q4: (D) (d) Divide 30 by the next smallest prime that fits, continuing the process.

Q5: (C) (c) The smallest prime that divides it exactly.

Q6: (B) (b) 2 x 2 x 5.

Q7: (C) (c) 2 — the smallest and only even prime number.

Q8: (D) (d) When the branch reaches a prime number.

Q9: (B) (b) 2 x 3 x 3.

Q10: (A) (a) No, since 1 is not prime, it is never included.

Q11: (A) (a) 3 x 3 x 5.

Q12: (C) (c) So the final list of divisors is itself the prime factorisation — dividing by non-primes would leave composite numbers in the answer.

Q13: (B) (b) 2 x 2 x 2 x 3 x 3 = 72.

Q14: (D) (d) 2 x 2 x 5 x 5 = 100.

Q15: (B) (b) No — the set of prime factors is always the same regardless of tree shape, because prime factorisation is unique.

Q16: (C) (c) 40. 2x2x2x5 = 40.

Q17: (D) (d) 2 x 3 x 3 x 5 = 90.

Q18: (A) (a) 2 x 3 x 4 — 4 is not prime, so this is not a full prime factorisation.

Q19: (B) (b) 2 x 5 x 5 = 50.

Q20: (A) (a) 2 x 2 x 3 x 3 = 36.

Q21: (D) (d) 2 x 2 x 2 x 2 x 2 x 2 x 2 — seven 2s, since 128 = 2^7.

Q22: (A) (a) Because every number has exactly one set of prime factors, regardless of method used, this is called the Fundamental Theorem of Arithmetic.

Q23: (B) (b) 84. 2x2x3x7 = 84.

Q24: (A) (a) 2 x 3 x 5 = 30 — take each prime at its LOWEST shared power across both factorisations.

Q25: (C) (c) Yes — a prime number's only prime factor is itself, since it has no smaller factors besides 1.

Q26: (A) (a) 72. 2x2x2x3x3 = 8x9 = 72.

Q27: (C) (c) 60 = 5 x 13 — since 5 x 13 = 65, not 60, this split is simply arithmetically wrong.

Q28: (B) (b) It's incomplete — 4 is not prime, so it must be split further into 2x2 before the tree is done.

Q29: (D) (d) Testing smallest primes first is an efficient, systematic way to make sure none are missed, though any valid order that only uses primes would still work.

Q30: (B) (b) Because 1 has only one factor (itself), not two, so it fails the definition of a prime number and is excluded by convention.

You've got this! Keep learning and shining! - Ruchi Math Coaching