HCF and LCM by Prime Factorisation

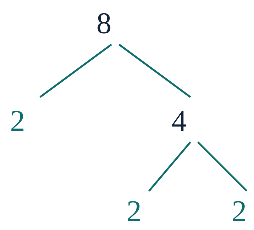
Unit: Playing with Numbers - Student Practice Worksheet

Overview: Ms. Rao asked for the LCM and HCF of 8 and 20 — without long division. Kabir started listing multiples. Anaya broke each number into prime factors instead. By the time Kabir reached 40 on his list, Anaya had already found both answers.

Practice Questions (30 Total)

Section A - Easy

Q1. Read the factor tree down to the circled primes. What is the prime factorisation of 8?



- [ ] **A.** 2 × 2 × 2
- [ ] **B.** 2 × 4
- [ ] **C.** 4 × 2
- [ ] **D.** 1 × 8

Q2. For HCF using prime factorisation, you take:

- [ ] **A.** Every prime from either number
- [ ] **B.** The product of both numbers
- [ ] **C.** Only the common prime pairs
- [ ] **D.** The largest prime in either list

Q3. The prime factorisation of 20 is:

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

Q4. Three boxes of 2 are stacked as 2^3. What does the 3 mean?

$\boxed{2}\ \boxed{2}\ \boxed{2} = 2^3 = 8$

- [ ] **A.** 2 is multiplied by itself 3 times
- [ ] **B.** 2 divided by 3
- [ ] **C.** 2 plus 3
- [ ] **D.** There are 3 different primes

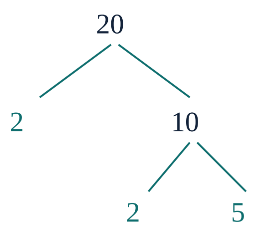
Q5. For LCM using prime factorisation, you:

- [ ] **A.** Use only the common prime pairs
- [ ] **B.** Always multiply the two numbers directly
- [ ] **C.** Add the two numbers together
- [ ] **D.** Write common pairs once, then multiply in any extras left over

Q6. 8 and 20 share two pairs of 2. What is their HCF?

- [ ] **A.** 2
- [ ] **B.** 4
- [ ] **C.** 8
- [ ] **D.** 40

Q7. This splitting diagram breaks 20 into primes. What is this tool called?



- [ ] **A.** Number line
- [ ] **B.** Bar graph
- [ ] **C.** Venn diagram
- [ ] **D.** Factor tree

Q8. If a prime appears in only ONE of the two numbers, is it included in the HCF?

- [ ] **A.** No, only shared primes count for HCF

- ☐ **B.** Yes, always
- ☐ **C.** Only if it's the number 2
- ☐ **D.** Only if it's the number 3

Q9. 8 = 2 × 2 × 2 and 20 = 2 × 2 × 5. What is the LCM?

- ☐ **A.** 4
- ☐ **B.** 20
- ☐ **C.** 40
- ☐ **D.** 160

Q10. 60 and 90 both include the prime 5. Is 5 part of their LCM?

- ☐ **A.** No — exclude any prime from 60
- ☐ **B.** Yes — include every prime from either
- ☐ **C.** Only if 5 appears twice
- ☐ **D.** No — 5 is HCF-only here

Section B - Medium

Q11. The two cards show 8 and 20. Using only the common prime pairs, what is the HCF?

$8 = 2 \times 2 \times 2$	$20 = 2 \times 2 \times 5$

common pairs: two 2s → HCF = 4

- ☐ **A.** 4
- ☐ **B.** 2
- ☐ **C.** 40
- ☐ **D.** 8

Q12. Why is prime factorisation better than listing all factors for very large numbers?

- ☐ **A.** Prime factorisation always gives a wrong answer for large numbers
- ☐ **B.** Listing factors is always faster
- ☐ **C.** There is no real difference either way
- ☐ **D.** Listing every factor takes too long for big numbers

Q13. $60 = 2 \times 2 \times 3 \times 5$ and $90 = 2 \times 3 \times 3 \times 5$. What is the HCF?

- [ ] **A.** 180
- [ ] **B.** 12
- [ ] **C.** 30
- [ ] **D.** 6

Q14. The LCM cards are 2■=16 and $3^2=9$. What is the LCM of 48 and 18?

2■=16 x $3^2=9$

- [ ] **A.** 6
- [ ] **B.** 864
- [ ] **C.** 48
- [ ] **D.** 144

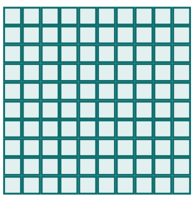
Q15. A number's prime factorisation is 2×7. What is the number?

- [ ] **A.** 14
- [ ] **B.** 9
- [ ] **C.** 16
- [ ] **D.** 21

Q16. Find the HCF of $2^3 \times 5$ and $2^2 \times 5^2$.

- [ ] **A.** $2^3 \times 5^2 = 200$
- [ ] **B.** $2^2 \times 5 = 20$
- [ ] **C.** $2 \times 5 = 10$
- [ ] **D.** $2^3 \times 5 = 40$

Q17. The 10-by-10 grid is 100 cells. Which prime factorisation is that?



100 cells = $2^2 \times 5^2$

- [ ] **A.** $2^2 \times 5^2$
- [ ] **B.** 2×5^3
- [ ] **C.** 4×25
- [ ] **D.** 10×10

Q18. 15 is a factor of 45. Without full factorisation, what are the LCM and HCF?

- [ ] **A.** LCM = 15, HCF = 45
- [ ] **B.** LCM = 45, HCF = 15
- [ ] **C.** LCM = 675, HCF = 1
- [ ] **D.** LCM = 30, HCF = 30

Q19. Find the LCM of $2^3 \times 5$ and $2^2 \times 5^2$.

- [ ] **A.** 20
- [ ] **B.** 40
- [ ] **C.** 200
- [ ] **D.** 100

Q20. From $60 = 2 \times 2 \times 3 \times 5$ and $90 = 2 \times 3 \times 3 \times 5$, what is the LCM?

- [ ] **A.** 30
- [ ] **B.** 180
- [ ] **C.** 60
- [ ] **D.** 540

Section C - Challenge

Q21. Compare the two factor rows. Shared lowest powers give which HCF?

$2^2 \times 3^3 \times 5$

$2^3 \times 3^2 \times 7$

- [ ] **A.** $2^2 \times 3^2 = 36$
- [ ] **B.** $2^3 \times 3^3 = 216$
- [ ] **C.** $2 \times 3 = 6$
- [ ] **D.** $2^2 \times 3^2 \times 5 \times 7$

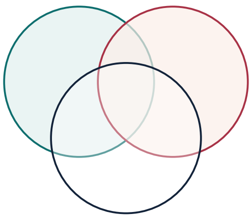
Q22. Anaya claims: 'The HCF of two numbers can never be bigger than their LCM.' Is this true?

- [ ] **A.** No, the HCF is sometimes bigger
- [ ] **B.** Only true for prime numbers
- [ ] **C.** Only true for even numbers
- [ ] **D.** Yes — the HCF is always less than or equal to the LCM

Q23. Using the same numbers, find the LCM of $2^2 \times 3^3 \times 5$ and $2^3 \times 3^2 \times 7$.

- [ ] **A.** $2^2 \times 3^2 = 36$
- [ ] **B.** $2^3 \times 3^3 \times 5 \times 7 = 7560$
- [ ] **C.** $2^2 \times 3^3 \times 5 = 540$
- [ ] **D.** $2^3 \times 3^2 \times 7 = 504$

Q24. Three circles overlap on primes 2 and 3 only. What is the combined HCF of $2^2 \times 3$, 2×3^2 and $2^2 \times 3^2$?



all three share 2 and 3

- [ ] **A.** $2^2 \times 3^2 = 36$
- [ ] **B.** $2^2 \times 3 = 12$
- [ ] **C.** $2 \times 3 = 6$
- [ ] **D.** $2 \times 3^2 = 18$

Q25. 14 = 2 × 7 and 25 = 5 × 5. How many common prime pairs are there?

- [ ] **A.** None — the numbers are co-prime
- [ ] **B.** One pair of 2
- [ ] **C.** One pair of 5
- [ ] **D.** Two pairs

Q26. 14 and 25 are co-prime. What is their LCM?

- [ ] **A.** 1
- [ ] **B.** 39
- [ ] **C.** 350

- [ ] **D.** 14

Q27. The smaller exponent of 2 is a, of 3 is d. What is the HCF of N and M?

2^a vs 2^c with a smaller

3^b vs 3^d with d smaller

HCF keeps the smaller exponent each time

- [ ] **A.** 2^a × 3^d
- [ ] **B.** 2^c × 3^b
- [ ] **C.** 2^a × 3^b
- [ ] **D.** 2^c × 3^d

Q28. Kabir wants to find the HCF of 2 large 7-digit numbers by listing every factor of each. Is this a practical approach?

- [ ] **A.** Yes, listing factors is always the fastest method
- [ ] **B.** It doesn't matter which method is used
- [ ] **C.** 7-digit numbers have no factors
- [ ] **D.** No, listing factors this way is far too slow

Q29. Find the HCF and LCM of $2^2 \times 3$ and $2^2 \times 3$ (identical numbers).

- [ ] **A.** HCF is 1, LCM is the number squared
- [ ] **B.** Both equal the number itself
- [ ] **C.** Both are always 1
- [ ] **D.** HCF is larger than LCM

Q30. Using ad, write the LCM of N and M from highest powers, then check against the HCF rule.

- [ ] **A.** 2^a × 3^d
- [ ] **B.** 2^c × 3^b
- [ ] **C.** 2^a × 3^b
- [ ] **D.** 2^c × 3^d

Answer Key

Q1: (A) (a) 2 × 2 × 2 = 8, all prime factors — the first step in the lesson video.

Q2: (C) (c) Only the common prime pairs — as shown for 8 and 20, where two pairs of 2 give HCF = 4.

Q3: (B) (b) 2 × 2 × 5 = 20.

Q4: (A) (a) 2 is multiplied by itself 3 times: 2×2×2=8.

Q5: (D) (d) Write common pairs once, then multiply in any extras — as for 8 and 20: common 2s once, then the remaining 2 and 5 give LCM = 40.

Q6: (B) (b) 4. Two common pairs of 2 give 2 × 2 = 4.

Q7: (D) (d) Factor tree.

Q8: (A) (a) No — only primes shared by both numbers are used to find the HCF.

Q9: (C) (c) 40. Common pairs of 2 written once, then the extra 2 and 5: 2 × 2 × 2 × 5 = 40.

Q10: (B) (b) Yes — the LCM of 60 and 90 includes 2, 3 and 5 from the common pairs plus the extra 2 and extra 3, giving 180.

Q11: (A) (a) 4. Two common pairs of 2: 2 × 2 = 4.

Q12: (D) (d) Listing every factor of a large number is impractical, while prime factorisation stays manageable regardless of size.

Q13: (C) (c) 30. Common pairs only: 2 × 3 × 5 = 30.

Q14: (D) (d) 144. Highest power of 2 is 2■=16, highest power of 3 is 3^2=9: 16×9=144.

Q15: (A) (a) 14. 2 × 7 = 14.

Q16: (B) (b) 20. Lowest power of 2 is 2^2, lowest power of 5 is 5^1.

Q17: (A) (a) $2^2 \times 5^2$ = 4 × 25 = 100.

Q18: (B) (b) LCM = 45 and HCF = 15. When one number divides the other, LCM is the larger and HCF is the smaller.

Q19: (C) (c) 200. Highest power of 2 is 2^3=8, highest power of 5 is 5^2=25: 8×25=200.

Q20: (B) (b) 180. Common 2, 3 and 5 once, then the extra 2 and extra 3: 2 × 3 × 5 × 2 × 3 = 180.

Q21: (A) (a) 36. Lowest power of 2 is 2^2, lowest of 3 is 3^2; 5 and 7 aren't shared, so excluded.

Q22: (D) (d) Yes — the HCF divides both numbers (so it's small), while the LCM is a multiple of both (so it's at least as large), meaning HCF ≤ LCM always.

Q23: (B) (b) 7560. Highest power of each: 2^3, 3^3, 5^1, 7^1 — all multiplied: 8×27×5×7=7560.

Q24: (C) (c) 6. Lowest power of 2 across all three is 2^1, lowest power of 3 is 3^1.

Q25: (A) (a) None. With no common pairs, HCF = 1 and LCM = 2 × 5 × 5 × 7 = 350.

Q26: (C) (c) 350. With HCF = 1, LCM = 14 × 25 = 350, or 2 × 5 × 5 × 7 from the prime lists.

Q27: (A) (a) 2^a × 3^d — the lowest power of 2 is a (since ad).

Q28: (D) (d) No — listing every factor of very large numbers is impractically slow; prime factorisation scales far better.

Q29: (B) (b) When two numbers are identical, both their HCF and LCM equal that same number.

Q30: (B) (b) $2^c \times 3^b$ — the highest power of 2 is c (since ad).

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