Prime Factors, HCF and LCM

GCSE Mathematics • **Foundation Tier** • Grades 3–5 • Non-calculator

WORKED SOLUTIONS

Name: worked example Class: _____ Total: 54 / 54

Show all your working. Marks are given for correct method as well as the final answer.

1. Write down all the factors of 24. **[2 marks]**

work in PAIRS: 1×24, 2×12, 3×8, 4×6
pairs stop you missing any

Answer: 1, 2, 3, 4, 6, 8, 12, 24

2. Write down the first five multiples of 7. **[1 mark]**

the 7 times table

Answer: 7, 14, 21, 28, 35

3. Write down all the prime numbers between 20 and 30. **[2 marks]**

$21 = 3\times 7$, 22 even, 24 even, $25 = 5\times 5$
26 even, $27 = 3\times 9$, 28 even
23 and 29 have no factors but 1 and themselves

Answer: 23, 29

4. Explain why 1 is not a prime number. **[1 mark]**

a prime has EXACTLY two factors
1 has just itself

Answer: it has only one factor

5. Write 60 as a product of its prime factors, in index form. **[3 marks]**

$60 = 2\times 30$
$30 = 2\times 15$
$15 = 3\times 5$
so $2\times 2\times 3\times 5$

Answer: $2^2\times 3\times 5$

6. Write 84 as a product of its prime factors, in index form. **[3 marks]**

$84 = 2\times 42$
$42 = 2\times 21$
$21 = 3\times 7$

Answer: $2^2\times 3\times 7$

7. Write 180 as a product of its prime factors, in index form. **[3 marks]**

$180 = 2\times 90 = 2\times 2\times 45$
$45 = 9\times 5 = 3\times 3\times 5$

Answer: $2^2\times 3^2\times 5$

8. Write $2^3\times 5^2$ as an ordinary number. **[2 marks]**

8×25
$= 200$

Answer: 200

9. Work out the HCF of 18 and 24. **[2 marks]**

18: 1 2 3 6 9 18
24: 1 2 3 4 6 8 12 24
biggest in both is 6

Answer: 6

10. Work out the LCM of 6 and 8. **[2 marks]**

6: 6 12 18 24
8: 8 16 24
NOT 48 -- take the LOWEST one they share

Answer: 24

11. Work out the HCF of 36 and 48. **[3 marks]**

$36 = 2^2 \times 3^2$
$48 = 2^4 \times 3$
shared: $2^2 \times 3 = 12$

Answer: 12

12. Work out the LCM of 12 and 18. **[3 marks]**

$12 = 2^2 \times 3$
$18 = 2 \times 3^2$
take the HIGHEST power of each: $2^2 \times 3^2$
$= 36$

Answer: 36

13. Work out the LCM of 15 and 20. **[3 marks]**

$15 = 3 \times 5$
$20 = 2^2 \times 5$
$2^2 \times 3 \times 5 = 60$

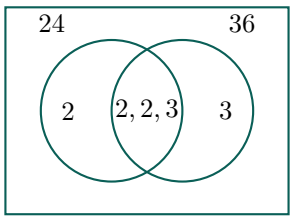
Answer: 60

14. Two numbers have HCF 6 and LCM 36. One of them is 12. Work out the other. **[3 marks]**

HCF $\times$ LCM = the product of the two numbers
$6 \times 36 = 216$
$216 \div 12 = 18$

Answer: 18

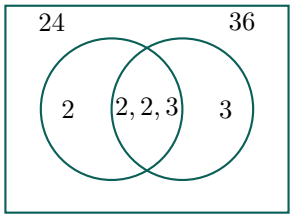
15. The Venn diagram shows the prime factors of 24 and 36. Work out the HCF. **[2 marks]**



multiply everything in the OVERLAP
$2 \times 2 \times 3 = 12$

Answer: 12

16. Using the same Venn diagram, work out the LCM. **[2 marks]**



multiply EVERYTHING in the diagram
$2 \times (2 \times 2 \times 3) \times 3 = 72$

Answer: 72

17. Two lighthouses flash every 12 and 20 seconds. They flash together at midnight. Work out when they next flash together. **[3 marks]**

this is the LCM
$12 = 2^2 \times 3$, $20 = 2^2 \times 5$
$2^2 \times 3 \times 5 = 60$

Answer: 60 seconds later

18. 48 pencils and 36 rubbers are shared into identical packs with none left over. Work out the largest number of packs. **[3 marks]**

this is the HCF
$48 = 2^4 \times 3$, $36 = 2^2 \times 3^2$
$2^2 \times 3 = 12$

Answer: 12

19. $126 = 2 \times 3^2 \times 7$ and $168 = 2^3 \times 3 \times 7$.

(a) Work out the HCF of 126 and 168. **[2 marks]**

lowest power of each shared prime
$2 \times 3 \times 7$
$= 42$

(b) Work out the LCM of 126 and 168. **[3 marks]**

highest power of each prime
$2^3 \times 3^2 \times 7$
$8 \times 9 \times 7 = 504$

Answer: 42 ; 504

20. Buses to Hampstead leave every 9 minutes and buses to Camden every 15 minutes. Both leave at 08:00.

(a) Work out when they next leave together. **[3 marks]**

LCM of 9 and 15

$9 = 3^2$, $15 = 3 \times 5$

$3^2 \times 5 = 45$

so 08:45

(b) Work out how many times they leave together between 08:00 and 11:00, not counting 08:00. **[3 marks]**

every 45 minutes

3 hours = 180 minutes

$180 \div 45 = 4$

Answer: 08:45 ; 4 times

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