



KS3.M-N6 Factors, Multiples, HCF and LCM

AQA KS3.M-N6 · Calculators not allowed · about 60 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

1 Write down all the factors of each number.

(a) Write down all the factors of 12. (1)

(b) Write down all the factors of 15. (1)

(c) Write down all the factors of 9. (1)

(d) Write down all the factors of 20. (1)

2 State whether each number is a multiple of 7. Write yes or no.

(a) Is 42 a multiple of 7? (1)

(b) Is 50 a multiple of 7? (1)

3 Write each number as a product of prime factors.

(a) Write 18 as prime factors. (1)

(b) Write 28 as prime factors. (1)

(c) Write 45 as prime factors. (1)

4 Use prime factorisation to find the highest common factor (HCF).

(a) Find the HCF of 12 and 18 using prime factors. (2)

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5 Find the highest common factor (HCF) by listing factors.

(a) Find the HCF of 16 and 24 by listing factors. (2)

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(b) Find the HCF of 14 and 35 by listing factors. (1)

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6 Find the lowest common multiple (LCM) by listing multiples.

(a) Find the LCM of 4 and 6 by listing multiples. (2)

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- 7** Use prime factorisation to find the lowest common multiple (LCM). (3)
- (a) Find the LCM of 8 and 12 using prime factors.
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- 8** Decide whether each statement is true or false. Tick the correct box. (1)
- (a) If a divides b , then a is a factor of b . True or false? (1)
- (b) All prime numbers are odd. True or false? (1)
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- 9** Use a Venn diagram to find the HCF and LCM. (4)
- (a) Use a Venn diagram to show the prime factors of 30 and 45. Then find the HCF and LCM.
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- 10** Solve the problem. Show your reasoning. (3)
- (a) Three teachers set out chairs in rows for an assembly. One teacher arranges them in rows of 6, another in rows of 8, the third in rows of 9. What is the smallest number of chairs that allows all three arrangements with no spare chairs?
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11 Find the missing number given it shares factors with another number.

- (a) The HCF of 12 and n is 4. One possible value of n is 20. Verify that 20 gives HCF 4 and give another possible value of n between 1 and 30. (2)

12 Find two numbers with a given HCF and LCM.

- (a) Find two different numbers whose HCF is 3 and whose LCM is 36. Give one pair and show the check. (2)

13 Apply knowledge of factors to solve a word problem.

- (a) A class of 30 pupils are split into equal groups so that each group has the same number of pupils and there are at least 3 groups. What are all the possible group sizes? (3)

14 Find prime factors and use them to decide divisibility.

- (a) Is 390 divisible by 5 and by 13? Use prime factors to justify your answer. (3)

15 Stretch: multi-step problem using HCF and LCM.

- (a) Three lights flash every 6 seconds, 10 seconds and 15 seconds respectively. (4)
After how many seconds will they next flash together? Show your working.
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16 Stretch: reasoning with prime factors in context.

- (a) Explain why the product of two consecutive integers is always even. Use (3)
factors and primes in your explanation.
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17 Reasoning with common multiples in a scheduling context.

- (a) Buses on route A arrive every 12 minutes and buses on route B arrive every (3)
18 minutes. If both buses arrive at 09:00, at what times will both buses
arrive together before 10:00? Show your working.
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18 Challenge: combine HCF and LCM properties.

- (a) Two numbers have HCF 4 and LCM 48. One number is 12. Find the other (4)
number and show your working.
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Question 1

- (a) **B1** 1, 2, 3, 4, 6, 12 **cao**
- (a) Answer: **1, 2, 3, 4, 6, 12**
- (b) **B1** 1, 3, 5, 15 **cao**
- (b) Answer: **1, 3, 5, 15**
- (c) **B1** 1, 3, 9 **cao**
- (c) Answer: **1, 3, 9**
- (d) **B1** 1, 2, 4, 5, 10, 20 **cao**
- (d) Answer: **1, 2, 4, 5, 10, 20**

Question 2

- (a) **B1** Yes; $42 = 7 \times 6$ **cao**
- (a) Answer: **Yes**
- (b) **B1** No; 50 not divisible by 7 **cao**
- (b) Answer: **No**

Question 3

- (a) **B1** $2 \times 3 \times 3$ or 2×3^2 **cao**
- (a) Answer: **$2 \times 3 \times 3$**
- (b) **B1** $2 \times 2 \times 7$ or $2^2 \times 7$ **cao**
- (b) Answer: **$2 \times 2 \times 7$**
- (c) **B1** $3 \times 3 \times 5$ or $3^2 \times 5$ **cao**
- (c) Answer: **$3 \times 3 \times 5$**

Question 4

- (a) **M1** prime factors: $12 = 2^2 \times 3$, $18 = 2 \times 3^2$ or equivalent
- (a) **A1** HCF = 6 **cao**
- (a) Answer: **6**

Question 5

- (a) **M1** correct listing of factors for both numbers, e.g. 16:1,2,4,8,16 and 24:1,2,3,4,6,8,12,24
- (a) **A1** HCF = 8 **cao**
- (a) Answer: **8**
- (b) **B1** HCF = 7 **cao**
- (b) Answer: **7**

Question 6

- (a) **M1** multiples listed correctly for at least one number and common multiple identified
- (a) **A1** LCM = 12 **cao**
- (a) Answer: **12**

Question 7

- (a) **M1** prime factors: $8 = 2^3$, $12 = 2^2 \times 3$ identified
- (a) **M1** take highest powers: 2^3 and 3
- (a) **A1** LCM = 24 **cao**
- (a) Answer: **24**

Question 8

- (a) **B1** True; definition of factor/divides
- (a) Answer: **True**
- (b) **B1** False; 2 is prime and even
- (b) Answer: **False**

Question 9

- (a) **M1** correct prime factors placed: $30 = 2 \times 3 \times 5$, $45 = 3 \times 3 \times 5$ with one 3 and one 5 in intersection
- (a) **M1** HCF from Venn diagram: 3×5
- (a) **M1** LCM from Venn diagram: product of all primes $2 \times 3 \times 3 \times 5$ or equivalent
- (a) **A1** HCF = 15 and LCM = 90 cao
- (a) Answer: **HCF = 15; LCM = 90**

Question 10

- (a) **M1** correct use of LCM idea: LCM of 6,8,9 found by prime factors
- (a) **M1** correct prime powers: $6=2 \times 3$, $8=2^3$, $9=3^2$ so take 2^3 and 3^2
- (a) **A1** answer 72 cao
- (a) Answer: **72**

Question 11

- (a) **M1** correct check that $\text{HCF}(12,20)=4$ or factors listed
- (a) **A1** second value 28 or 4×7 given and justified cao
- (a) Answer: **Yes, 20 gives HCF 4; another possible value is 28**

Question 12

- (a) **M1** correct pair given with method, e.g. 3×3 and 3×4 or use prime factors
- (a) **A1** correct pair such as 9 and 12 with check $\text{HCF}=3$ and $\text{LCM}=36$ cao
- (a) Answer: **9 and 12**

Question 13

- (a) **M1** correct factors of 30 listed or considered
- (a) **M1** exclude arrangements with fewer than 3 groups (so group sizes giving 1 or 2 groups removed)
- (a) **A1** correct final list: 1, 2, 3, 5, 6, 10
- (a) Answer: **Group sizes: 1, 2, 3, 5, 6, 10**

Question 14

- (a) **M1** prime factorisation $390 = 39 \times 10 = (3 \times 13) \times (2 \times 5)$ identified
- (a) **M1** show 5 and 13 appear in factorisation
- (a) **A1** answer: divisible by both 5 and 13 cao
- (a) Answer: **Divisible by both 5 and 13**

Question 15

- (a) **M1** recognition to use LCM of 6,10,15
- (a) **M1** prime factors: $6=2 \times 3$, $10=2 \times 5$, $15=3 \times 5$ or equivalent
- (a) **M1** take highest powers: 2, 3, 5
- (a) **A1** LCM = 30 so answer 30 seconds cao
- (a) Answer: **30**

Question 16

- (a) **M1** state that consecutive integers differ by 1 so one must be even
- (a) **M1** conclude that product includes factor 2
- (a) **A1** clear explanation that having factor 2 makes product even *cao*
- (a) Answer: **Because consecutive integers differ by 1, one of them is even so the product includes a factor 2; therefore the product is even.**

Question 17

- (a) **M1** use LCM of 12 and 18 or list common multiples
- (a) **M1** LCM = 36 minutes shown
- (a) **A1** both arrive together at 09:36 and 10:12 but before 10:00 only 09:36 *cao*
- (a) Answer: **09:36 (both arrive together before 10:00)**

Question 18

- (a) **M1** use property that product of numbers = HCF $\times$ LCM when numbers are positive integers with given HCF and LCM
- (a) **M1** compute product = $4 \times 48 = 192$ or compute other number = (HCF $\times$ LCM) / given number
- (a) **M1** correct division: other number = $192 / 12$
- (a) **A1** other number = 16 *cao*
- (a) Answer: **16**