4.3 Prime Factors, HCF and LCM: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

Prime Factors, HCF and LCM: Fluency and Exam Drill

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This drill pack builds fluency in writing numbers as a product of their prime factors, and in using prime factorisation to find the highest common factor (HCF) and lowest common multiple (LCM) of two or more numbers. It then moves into exam-style problem-solving questions, including reasoning questions that ask you to explain or show your answer. This pack complements the main Topic 4.3 practice pack and does not share any questions with it. Show all of your working - method marks are available even when a final answer is wrong. Calculators are not allowed for this pack.

1 Which of the following numbers is a prime number? 15, 17, 21

- ☐ 15
- ☐ 17
- ☐ 21

(Total for Question 1 is 1 mark)

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2 Sam has 30 red sweets and 18 blue sweets. She wants to make identical small bags with no sweets left over and each bag must contain sweets of only one colour. What is the largest possible number of sweets in each bag? Explain your reasoning.

(Total for Question 2 is 2 marks)

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3 Find the smallest positive integer k such that 2016 x k is a square number.

(Total for Question 3 is 3 marks)

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4 Two bus routes start from the same stop at 08:15. Route A buses leave every 35 minutes and route B buses leave every 30 minutes.
At what time will a bus from each route next leave the stop together?

(Total for Question 4 is 3 marks)

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5 Write 18 as a product of its prime factors.

(Total for Question 5 is 2 marks)

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6 Complete the prime factorisation and then use it to find the HCF of 48 and 72.
Prime factorisation: 48 = ___, 72 = ___

(Total for Question 6 is 3 marks)

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7 Work out the largest three-digit number that is divisible by both 18 and 28.

(Total for Question 7 is 2 marks)

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8 Express 200 as a product of its prime factors, giving your answer in index form.

(Total for Question 8 is 2 marks)

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9 Find the LCM of 8 and 12.

(Total for Question 9 is 2 marks)

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10 Use prime factorisation to find the HCF of 90 and 126. Show the prime factorisations you use.

(Total for Question 10 is 3 marks)

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11 Work out the highest common factor (HCF) of 378 and 630.

(Total for Question 11 is 2 marks)

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12 Tom read that 84 out of 126 students in his year group play a musical instrument. By finding the HCF of 84 and 126, write the fraction 84/126 in its simplest form.

(Total for Question 12 is 3 marks)

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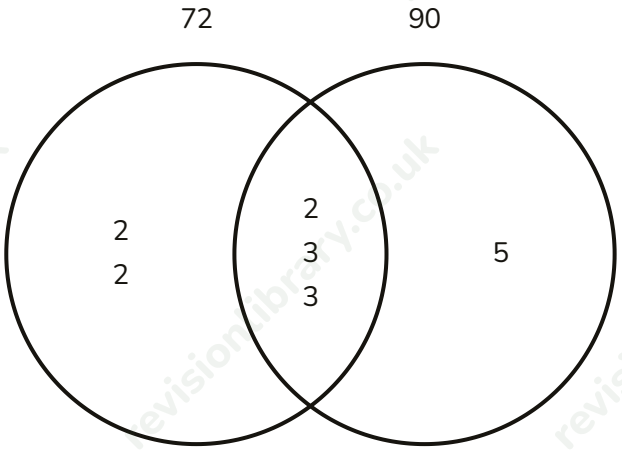
13 Find the smallest positive integer n such that 360 x n is a perfect cube.

(Total for Question 13 is 3 marks)

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14 The Venn diagram below shows the prime factors of 72 and 90. In the region for 72 only, the numbers 2 and 2 are listed. In the overlapping region, the numbers 2, 3 and 3 are listed. In the region for 90 only, the number 5 is listed.

Diagram NOT accurately drawn



(a) Use the Venn diagram to write down the HCF of 72 and 90. **(2)**

.....

(b) Use the Venn diagram to write down the LCM of 72 and 90. **(2)**

.....

(Total for Question 14 is 4 marks)

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15 Show that HCF(48, 180) x LCM(48, 180) = 48 x 180.

(Total for Question 15 is 3 marks)

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16 $n = 2^3 \times 3^2 \times 5$. State, with a reason, whether each of the following is a factor of n: (i) 6 (ii) 20 (iii) 25

(Total for Question 16 is 3 marks)

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17 $a = 2^p \times 3^4$ and $b = 2^3 \times 3^q$, where p and q are positive integers. Given that HCF(a, b) = $2^2 \times 3^2$ and LCM(a, b) = $2^3 \times 3^4$, find the value of p and the value of q.

(Total for Question 17 is 3 marks)

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Mark scheme · 4.3 Prime Factors, HCF and LCM: Test Pack

Question 1

17 cao **B1**

Answer: 17

Question 2

method to find HCF of 30 and 18, e.g. factors or prime factors 30 = 2 * 3 * 5, 18 = 2 * 3^2 **M1**

6 cao with explanation **A1**

Answer: 6 (HCF of 30 and 18 is 6; so each bag can have 6 sweets)

Question 3

2016 = 2^5 x 3^2 x 7 **M1**

identifies the primes with odd powers **M1**

k = 14 **A1**

Answer: k = 14

Question 4

uses multiples or the LCM method **M1**

LCM = 210 **A1**

11:45 **B1**

Answer: 11:45

Question 5

correct first split of 18 shown, e.g. 2 x 9, or a factor tree with at least one prime factor correct **M1**

2 x 3^2 oe, fully correct in index form **A1**

Answer: 2 x 3^2

Question 6

correct prime factorisations, e.g. 48 = 2^4 * 3 and 72 = 2^3 * 3^2 (or equivalent shown) **M1**

use factors to identify common prime powers, e.g. common 2^3 and 3^1 **M1**

HCF = 2^3 * 3 = 8 * 3 = 24 cao **A1**

Answer: 48 = 2^4 * 3, 72 = 2^3 * 3^2, HCF = 24

Question 7

find LCM(18,28) = 2^2 x 3^2 x 7 = 252 **M1**

largest three-digit multiple is 252 x 3 = 756 cao **A1**

Answer: 756

Question 8

at least two correct prime factors identified, e.g. 2, 2, 2, 5, 5 **M1**

2^3 x 5^2 oe, fully correct in index form **A1**

Answer: 2^3 x 5^2

Question 9

8 = 2^3 and 12 = 2^2 x 3, or a correct list of multiples of each number **M1**

24 cao **A1**

Answer: 24

Question 10

correct prime factorisations, e.g. 90 = 2 * 3^2 * 5 and 126 = 2 * 3^2 * 7 **M1**

identify common prime powers, here 2 and 3^2 **M1**

HCF = 2 * 3^2 = 18 cao **A1**

Answer: 18

Question 11

correct prime factorisation or identification of common prime powers, e.g. 378 = 2 x 3^3 x 7, 630 = 2 x 3^2 x 5 x 7 **M1**

HCF = 2 x 3^2 x 7 = 126 cao **A1**

Answer: 126

Question 12

84 = 2^2 x 3 x 7 and 126 = 2 x 3^2 x 7, leading to HCF = 42 **M1**

84 and 126 both divided by 42 (or their stated HCF) **M1**

2/3 oe, fully simplified **A1**

Answer: 2/3

Question 13

prime factorise 360 = 2^3 x 3^2 x 5^1 **M1**

choose multipliers to make exponents multiples of 3: need 3^1 and 5^2 **M1**

n = 3 x 25 = 75 cao **A1**

Answer: 75

Question 14

(a) the numbers in the overlapping region multiplied together, 2 x 3 x 3 **M1**

(a) 18 cao **A1**

(a) Answer: 18

(b) all of the numbers in the whole diagram multiplied together, 2 x 2 x 2 x 3 x 3 x 5 **M1**

(b) 360 cao **A1**

(b) Answer: 360

Question 15

48 = 2^4 x 3 and 180 = 2^2 x 3^2 x 5 used to find HCF = 12 **M1**

48 = 2^4 x 3 and 180 = 2^2 x 3^2 x 5 used to find LCM = 720 **M1**

12 x 720 = 8640 and 48 x 180 = 8640 both evaluated and shown to be equal, with a concluding statement **A1**

Answer: 12 x 720 = 8640 = 48 x 180, so the statement is true

Question 16

(i) yes, with reason that n contains both 2^1 and 3^1 (since n has 2^3 and 3^2) **B1**

(ii) yes, with reason that n contains both 2^2 and 5^1 (since n has 2^3 and 5^1) **B1**

(iii) no, with reason that n only contains 5^1, but 25 needs 5^2 **B1**

Answer: (i) yes (ii) yes (iii) no

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Question 17

the power of 2 in the HCF used correctly: min(p, 3) = 2, leading to p = 2	**M1**
the power of 3 in the HCF (or LCM) used correctly: min(4, q) = 2, leading to q = 2	**M1**
p = 2 and q = 2 both stated, with the LCM powers checked as consistent	**A1**

Answer: p = 2, q = 2

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