Edexcel GCSE

Mathematics

Foundation/Higher Tier

Number: Primes, factors, multiples

Information for students

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 9 questions in this selection.

Advice for students

Show all stages in any calculations.
Work steadily through the paper. Do not spend too long on one question.
If you cannot answer a question, leave it and attempt the next one.
Return at the end to those you have left out.

Information for teachers

The questions in this document are taken from the 2009 GCSE Exam Wizard and include questions from examinations set between January 2003 and June 2009 from specifications 1387, 1388, 2540, 2544, 1380 and 2381.

Questions are those tagged as assessing "Primes, factors, multiples" though they might assess other areas of the specification as well. Questions are those tagged as "Foundation/Higher" so could have (though not necessarily) appeared on either a Foundation, Intermediate or Higher tier paper.

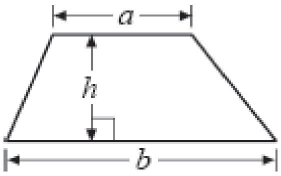
GCSE Mathematics

Formulae: Foundation Tier

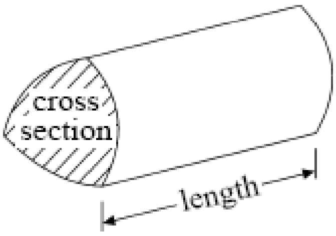
You must not write on this formulae page.

Anything you write on this formulae page will gain NO credit.

Area of trapezium = $(a + b)h$



Volume of prism = area of cross section × length



1. (a) Express the following numbers as products of their prime factors.

(i) 60,

....

(ii) 96.

....

(4)

(b) Find the Highest Common Factor of 60 and 96.

....

(1)

(c) Work out the Lowest Common Multiple of 60 and 96.

....

(2)
(Total 7 marks)

2. (a) Express 120 as the product of powers of its prime factors.

....

(3)

(b) Find the Lowest Common Multiple of 120 and 150.

....

(2)
(Total 5 marks)

3. (a) Use the information that

$$13 \times 17 = 221$$

to write down the value of

(i) 1.3×1.7

....

(ii) $22.1 \div 1700$

....

(2)

(b) Use the information that

$$13 \times 17 = 221$$

to find the Lowest Common Multiple (LCM) of 39 and 17

....

(2)

(Total 4 marks)

4. (a) Express 108 as the product of powers of its prime factors.

....

(3)

(b) Find the Highest Common Factor (HCF) of 108 and 24

....

(1)
(Total 4 marks)

5. $3x^2 = 108$

(a) Find the value of x.

x = ...

(2)

(b) Express 108 as a product of its prime factors.

....

(3)
(Total 5 marks)

6. Sophie says, 'For any whole number, *n*, the value of $6n - 1$ is always a prime number'.

Sophie is wrong.
Give an example to show that Sophie is wrong.

(Total 2 marks)

7. Jill says

"If you multiply any two prime numbers together, the answer will always be an odd number".

Write down an example to show that Jill is **wrong**.

(Total 2 marks)

8. (a) Express 56 as the product of its prime factors.

....

(2)

(b) Find the Highest Common Factor (HCF) of 56 and 98

....

(1)
(Total 3 marks)

9. (a) Write 126 as a product of its prime factors.

....

(2)

(b) Find the Highest Common Factor (HCF) of 84 and 126

....

(2)
(Total 4 marks)

10. Seejal says

"If a and b are prime numbers greater than 2, then $a \times b$ is always an odd number."

Is Seejal correct? ....

Give reasons for your answer.

....

....

....

(Total 2 marks)

11. (a) Work out the Highest Common Factor (HCF) of 24 and 64

....

(2)

(b) Work out the Lowest Common Multiple (LCM) of 24 and 64

....

(2)

(Total 4 marks)

12. Write 720 as a product of its prime factors.

....

(Total 2 marks)

13. Express 252 as a product of its prime factors.

....

(Total 3 marks)

14. (a) Express 252 as a product of its prime factors.

....

(3)

James thinks of two numbers.
He says "The Highest Common Factor (HCF) of my two numbers is 3
The Lowest Common Multiple (LCM) of my two numbers is 45"

(b) Write down two numbers that James could be thinking of.

.... and ....

(3)
(Total 6 marks)

15. Find the Lowest Common Multiple (LCM) of 24 and 36

....

(Total 2 marks)

16. (a) Express 84 as a product of its prime factors.

....

(3)

(b) Find the Highest Common Factor (HCF) of 84 and 35

....

(2)

(Total 5 marks)

17. $2x^2 = 72$

(a) Find a value of x.

....

(2)

(b) Express 72 as a product of its prime factors.

....

(2)
(Total 4 marks)

18. Find the Highest Common Factor of 108 and 180.

....
(Total 2 marks)

19. Find the highest common factor of 54 and 72.

....
(Total 2 marks)

20. Find the highest common factor of 36 and 54.

....

(Total 2 marks)

21. Find the Highest Common Factor (HCF) of 32 and 80

....

(Total 2 marks)

22. Find the highest common factor (HCF) of 72 and 120.

....

(Total 2 marks)

23. Write 140 as the product of its prime factors.

....

(Total 2 marks)

24. Find the Highest Common Factor (HCF) of 84 and 180

....

(Total 2 marks)

25. Express 108 as a product of its prime factors.

…………………….

(Total 3 marks)

26. Sophie says 'For any whole number, *n*, the value of $6n - 1$ is always a prime number'.

Sophie is wrong. Give an example to show that Sophie is wrong.

(Total 2 marks)

27. (a) Find the Highest Common Factor (HCF) of 24 and 36

....
(1)

(b) Write 96 as a product of its prime factors.

....
(2)
(Total 3 marks)

28. Work out the Highest Common Factor (HCF) of 30 and 72.

2	3	6	30	360
A	**B**	**C**	**D**	**E**

(Total 1 mark)

29. Express 300 as a product of its prime factors.

3×100	$2^2 \times 3 \times 25$	$4 \times 3 \times 25$	$2^2 \times 3 \times 5^2$	$4 \times 3 \times 5^2$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

30. The Highest Common Factor (HCF) of 16 and 36 is

4	144	576	8	72
A	**B**	**C**	**D**	**E**

(Total 1 mark)

31. What is 225 written as a product of its prime factors?

9×25	$3^3 \times 5^3$	5×45	$3 \times 5 \times 15$	$3 \times 3 \times 5 \times 5$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

32. The Lowest Common Multiple (LCM) of 30 and 48 is

720	8	240	6	1440
A	**B**	**C**	**D**	**E**

(Total 1 mark)

33. The Lowest Common Multiple (LCM) of 8 and 12 is

4	96	12	24	2
A	**B**	**C**	**D**	**E**

(Total 1 mark)

34. What is 180 written as a product of its prime factors?

$2^4 \times 3 \times 5$	$2 \times 2 \times 3 \times 5 \times 5$	$20 \times 3 \times 3$	$2 \times 2 \times 5 \times 9$	$2 \times 2 \times 3 \times 3 \times 5$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

35. The Highest Common Factor (HCF) of 42 and 72 is

6	7	12	3	504
A	**B**	**C**	**D**	**E**

(Total 1 mark)

36. (a) Find the Highest Common Factor (HCF) of 44 and 77

....

(2)

(b) Write 200 as a product of its prime factors.

....

(2)
(Total 4 marks)

37. Find the Lowest Common Multiple (LCM) of 20 and 36

....

(Total 2 marks)

38. What is the Lowest Common Multiple (LCM) of 20 and 35?

700	70	350	140	5
A	**B**	**C**	**D**	**E**

(Total 1 mark)

39. What is the Lowest Common Multiple (LCM) of 24 and 60?

2	120	12	1440	240
A	**B**	**C**	**D**	**E**

(Total 1 mark)

40. What is 210 when written as a product of its prime factors?

2×105	2, 3, 5, 7	$2 \times 3 \times 35$	$2 \times 3^2 \times 7$	$2 \times 3 \times 5 \times 7$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

41. What is 72 written as a product of its prime factors?

8×9	$1 \times 2 \times 2 \times 2 \times 3 \times 3$	$2 \times 4 \times 9$	$2 + 2 + 2 + 3 + 3$	$2 \times 2 \times 2 \times 3 \times 3$
A	**B**	**C**	**D**	**E**

(Total 1 mark)

01. (a) (i) $2 \times 2 \times 3 \times 5$ 4

2×30

M1 for systematic method, eg division, factor trees (at least one prime)
A1 cao

(ii) $2^5 \times 3$

2×48

M1 for systematic method, eg division, factor trees (at least one prime)
A1 cao

(b) 12 1

B1 cao

(c) 480 2

$2^5 \times 3 \times 5$

B2 cao
B1 for $2^5 \times 3 \times 5$ or any correct common multiple

[7]

02. (a) $2^3 \times 3 \times 5$ 3

e.g.

$$\begin{array}{r|r} 2 & 120 \\ \hline 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

M2 for a full systematic method of at least 4 divisions by prime numbers oe factor trees, condone 1 calculation error.
(M1 for 120 written as either 2×60 or 3×40 or 5×24 or equivalent division or a full process with 2 calculation errors)
A1 for $2^3 \times 3 \times 5$ (accept $2 \times 2 \times 2 \times 3 \times 5$)

(b) 600 — 2

e.g. $150 = 2 \times 3 \times 5^2$

$\text{LCM} = 2^3 \times 3 \times 5^2$

B2 cao
(B1 for either a multiple of 600 or numerical expression which equals 600)

[5]

03. (a) (i) 2.21 — 2

B1 for 2.21

(ii) 0.013

B1 for 0.013

(b) 663 — 2

$\text{LCM} = 3 \times 13 \times 17 = 3 \times 221$

M1 for 3 × 13 × 17 oe
A1 for 663

[4]

04. (a) $2^2 \times 3^3$ — 3

eg

2	108
2	54
3	27
3	9
	3

M2 for full systematic method of at least 4 divisions by prime numbers oe factor trees; condone 1 calculation error
(M1 for 108 written as a correct product with only one non-prime or equivalent division or a full process with 2 calculation errors.)
A1 for $2^2 \times 3^3$ (accept 2 × 2 × 3 × 3 × 3)

(b) 12 — 1

B1 for 12

[4]

05. (a) $x^2 = \frac{108}{3}$

6 — 2

M1 $(x^2 =)\frac{108}{3}$ *(=36) or 36 seen*

A1 cao 6 or – 6 or both. Also accept $\sqrt{36}$

(b) 2 × 54 = 2 × 2 × 27

2 × 2 × 3 × 3 × 3 — 3

M1 for attempt at continual prime factorisation (at least 2 correct steps); could be shown as a factor tree.

A1 all 5 correct prime factors and no others

A1 2 × 2 × 3 × 3 × 3 or $2^2 \times 3^3$ *oe*

[5]

06. No because when n = 6

6n – 1 (= 35) is not prime — 2

B2 correctly showing when n = 6, 35 is obtained and identified oe or for correctly evaluating 6n – 1 when n is 0 or negative.

(B1 for correctly evaluating 6n – 1 for at least 3 different whole number values of n or 35 oe with no working)

[2]

07. 2 × 3 = 6 — 2

B2 for a correct example

(B1 for correctly multiplying any two prime numbers together or for 2 × prime number not evaluated)

[2]

08. (a) prime factors 2 and 7 seen — 2

2 × 2 × 2 × 7

M1 for prime factors 2 and 7 seen

A1 for 2 × 2 × 2 × 7 or $2^3 \times 7$

(b) 14 — 1

B1 for 14 cao

[3]

09. (a) e.g.

2	126
3	63
3	21
	7

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

M1 for a systematic method of at least 2 correct divisions by a prime number oe factor trees; can be implied by digits 2, 3, 3, 7 on answer line.

A1 for $2 \times 3^2 \times 7$ *or* $2 \times 3 \times 3 \times 7$

(b) $2 \times 3 \times 7 = 42$ 2

B2 cao

(B1 for 6, 14, 21 or $2 \times 3 \times 7$*)*

[4]

10. 2 is the only even prime number and the product of 2 odd numbers is odd

Yes 2

B2 for 'yes' and '2 is the only even prime number and the product of two odd numbers is odd' oe

(B1 for 'yes' and either '2 is the only even prime number' oe or 'the product of two odd numbers is odd' oe)

[2]

11. (a) 8 2

M1 for attempt at prime factors of 24 and 64

A1 for 8 or 2^3 *or* $2 \times 2 \times 2$

(b) 192 2

M1 for attempting at least one multiple of 24 and 64 or for two prime factors of 24 and 64

A1 for 192 or $2^6 \times 3$ *oe*

(SC B1 for 384 or $2^5 \times 3$ *or* $2^7 \times 3$*)*

[4]

12. 2 × 360, 2 × 2 × 180, 2 × 2 × 2 × 90, 2 × 2 × 2 × 2 × 45,

= 2 × 2 × 2 × 2 × 3 × 3 × 5 — 2

M1 at least two correct steps to find 720 as a product of its prime factors or sight of factors 2, 3, 5 on a factor tree oe

A1 cao accept $2^4 \times 3^2 \times 5$

[2]

13. 2)252
2)126
3) 63 or factor trees
3) 21
7) 7
1

2 × 2 × 3 × 3 × 7 — 3

M1 for attempt at continual prime factorisation (at least 2 correct steps); or two stages of a factor tree with the first step completely correct and the following step at least partially correct, OR sight of at least one each of 2, 3, 7 as factors of 252.

A1 Fully correct factor tree of a list of 2,2,3,3,7 which may include 1 but no other numbers. ×

A1 2 × 2 × 3 × 3 × 7 or $2^2 \times 3^2 \times 7$ *oe*

[3]

14. (a) 2)252
2)126
3) 63 or factor trees
3) 21
7) 7
1

2 × 2 × 3 × 3 × 7 — 3

M1 for attempt at continual prime factorisation (at least 2 correct steps); could be shown as a factor tree

OR sight of at least one each of 2, 3, 7 as factors of 252

A1 for a fully correct factor tree or 2, 2, 3, 3, 7 which may include 1, but no other numbers

A1 2 × 2 × 3 × 3 × 7 or $2^2 \times 3^2 \times 7$ *oe*

(b) HCF: The numbers must be $3n$ and $3m$ where n and m are coprime and at most one is a multiple of 3
LCM: Factors of 45 are 1, 3, 5, 9, 15, 45
9 and 15 or 3, 45 — 3

B3 cao
(B2 for 2 numbers with HCF of 9 or LCM of 15)
(B1 for any attempt to list any 4 factors of 45 or any 4 multiples of 3).

[6]

15. 24 48 72
36 72

72 — 2

M1 for listing at least 1 multiple of 24 AND 1 multiple of 36
A1 cao
OR
M1 for 2, 2, 2, 3 (prime factors of 24)
OR 2, 2, 3, 3 (prime factors of 36)
(may be seen in factor tree or in repeated division)
A1 cao

[2]

16. (a)

2 | 84
2 | 42
3 | 21
| 7

84
/ \
2 42
/ \
2 21
/ \
3 7

$2 \times 2 \times 3 \times 7$ — 3

M2 for a full systematic method of at least 3 divisions by prime numbers oe factor trees, condone one calculation error.
(M1 for 84 written as either 2×42 or 3×28 or 7×12 oe or equivalent division or a full process with 2 calculation errors)
A1 for $2 \times 2 \times 3 \times 7$ (accept $2^2 \times 3 \times 7$ but not 2, 2, 3, 7)
[Note: $1 \times 2 \times 2 \times 3 \times 7$ gets M2A0]

(b) 7 — 2

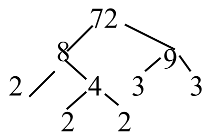
M1 for listing factors of 35 and 84 (at least 3 correct for each, condoning one error. This could be in factor trees or factor pairs, etc)
A1 cao

[5]

17. (a) $x^2 = 72 \div 2$
6 — 2

M1 for 72 ÷ 2 or 36 seen
A1 6 or –6 or ± 6

(b) $72 = 2 \times 36 = 2 \times 2 \times 18$
$= 2 \times 2 \times 2 \times 9$



$2 \times 2 \times 2 \times 3 \times 3$ — 2

M1 for a systematic method of at least 2 correct divisions by a prime number oe factor tree or a full process with one calculation error; can be implied by digits 2, 2, 2, 3, 3 on answer line
A1 for 2 × 2 × 2 × 3 × 3 or $2^3 \times 3^2$ oe
[Note 1 × 2 × 2 × 2 × 3 × 3 gets M1 A0]

[4]

18. 36 — 2

$108 = 2 \times 2 \times 3 \times 3 \times 3$
$180 = 2 \times 2 \times 3 \times 3 \times 5$
HCF $= 2 \times 2 \times 3 \times 3$

M1 for 5 prime factors of 108 or 180
OR M1 for at least 3 factors in each list (factors must be > 1, condone 1 incorrect factor in each list)
A1 cao

[2]

19. 18 — 2

M1 for the prime factors (2, 3, 3, 3) of 54 or the 5 prime factors (2, 2, 2, 3, 3) of 72
(Alternative: M1 for at least 3 factors (> 1) in each list. Condone one error in each list)
A1 cao

[2]

20. 18 — 2

36 = 2 × 2 × 3 × 3
54 = 2 × 3 × 3 × 3

M1 for 3 factors of each numbers (not inc. 1), condone one error
A1 cao
[or M1 for either 36 = 2 × 2 × 3 × 3 or 54 = 2 × 3 × 3 × 3]

[2]

21. 16 — 2

32 = 2 × 2 × 2 × 2 × 2
80 = 2 × 2 × 2 × 2 × 5

M1 for the 5 prime factors (2, 2, 2, 2, 2) of 32
OR the 5 prime factors (2, 2, 2, 2, 5) of 80
(Alt: M1 for at least 3 factors of each number listed; not equal to 1, condone one error in each list)
A1 cao
(sc B1 for 8 with or without working if Mo scored)

[2]

22. 24 — 2

72 = 2 × 2 × 2 × 3 × 3
120 =2 × 2 × 2 × 3 × 5

M1 for the 5 prime factors (2, 2, 2, 3, 3) of 72
OR the 5 prime factors (2, 2, 2, 3, 5) of 120
(Alt: M1 for at least 3 factors of each number listed: not equal to 1, condone one error in each list)
A1 cao
[SC: B1 for 12 with or without working if MO scored]

[2]

23. 2 × 2 ×5 × 7 — 2

M1 for a valid method which shows evidence of 2 successive divisions or 2, 2, 5, 7 identified
A1 cao

[2]

24. 84 = 2 × 2 × 3 × 7
180 = 2 × 2 × 3 × 3 × 5

Factors of 84: 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84
Factors of 180: 2, 3, 4, 5, 6, 10, 12, 15, 18, 30, 36, 45, 60, 90, 180
12 — 2

M1 for at least 2 correct divisions in the decomposition of either 84 or 180
(or M1 for listing 3 factors of 84 and 3 factors of 180, not including 1, condone one error in each list)
A1 cao
[SC: B1 for 4 or 6 with no working]

[2]

25. 2 × 54 = 2 × 2 × 27
2 × 2 × 3 × 3 × 3 — 3

M1 for attempt at continual prime factorisation (at least 2 correct steps); could be shown as a factor tree.
A1 all 5 correct prime factors and no others
A1 2 × 2 × 3 × 3 × 3 or $2^2 \times 3^3$ *oe*

[3]

26. No because when $n = 6$
$6n - 1$ is not prime — 2

B2 for correctly showing that when n = 6 35 is obtained and identified oe.
(B1 for correctly evaluating 6n – 1 for at least 3 different whole number values of n or for 35oe with no working)

[2]

27. (a) 12 — 1

B1 accept $2^2 \times 3$ *oe*

(b) 96 = 2 × 2 × 2 × 2 × 2 × 3 — 2
$2^5 \times 3$

M1 for attempting to split 96 into a product of at least 2 correct factors
or listing at least 3 correct factors
or a factor tree with at least 2 correct factors
or 2^5 *with 3*
or 2, 2, 2, 2, 2, 3
A1 for $2^5 \times 3$ *or 2 × 2 × 2 × 2 × 2 × 3 oe*

[3]

28. C **[1]**

29. D **[1]**

30. A **[1]**

31. E **[1]**

32. C **[1]**

33. D **[1]**

34. E **[1]**

35. A **[1]**

36. (a) $2 \times 2 \times 11$
7×11
11 2

M1 for listing factors of each number (could be in factor trees)
– condone one error in each list (tree)
or for $2 \times 2 \times 11$ and 7×11
A1 cao

(b) eg

2	200
2	100
2	50
5	25
	5

$2 \times 2 \times 2 \times 5 \times 5$ 2

M1 for a systematic method of at least 2 correct divisions by a prime number oe factor tree; can be implied by digits 2,2,2,5,5 on answer line
A1 for $2^3 \times 5^2$ or $2 \times 2 \times 2 \times 5 \times 5$

[4]

37. 20, 40, 60, ..., 180, ...
36, 72, 108, ..., 180, ...
180 2

M1 for 20, 40, 60... and 36, 72, 108, ...
A1 for 180 cao
Alternative:
M1 for $2 \times 2 \times 5$ and $2 \times 2 \times 3 \times 3$
A1 for 180 cao

[2]

38. D

[1]

39. B

[1]

40. E

[1]

41. E

[1]

01. Paper 4

In part (a) some did attempt repeated division by prime numbers (and often by factors rather than primes) or drew factor trees. Answers were often given as a list of factors or prime factors. Many candidates, however, did not know what was required in this question. As few candidates achieved full marks in part (a) the connection between parts (a) and (b) was rarely noticed. However, lack of success in part (a) was sometimes followed by the correct answer in part (b) and, to a lesser extent, part (c). More candidates seemed familiar with the HCF than the LCM. Some confused the two.

Paper 6

Part (a) proved straightforward for those that used a systematic method, by either systematic division by small primes or by using some sort of factor tree. Some candidates thought that 1 is a prime.

Many candidates did not understand the term ‘product of its prime factors’ and gave as an answer a list of all of the factors of the numbers.

Part (b) was done well by those who understood the term ‘highest common factor’’ although the lowest common multiple in part (c) proved to be more difficult to find. Many candidates showed some awareness of what was required by multiplying numbers 60 and 96 together.

02. Paper 3

This question was answered poorly. Factor trees were used more than repeated division in part (a) but candidates frequently made calculation errors or stopped before reaching a prime number. Some candidates showed a correct method but then listed the prime factors instead of writing them as a product. Those that did not understand the concept of prime factors often listed factors of 120 or factor pairs that multiplied together to give 120. In part (b) many candidates found a common factor (quite often ‘3’) of the two numbers instead of the LCM. Candidates who gave the correct answer had usually found it by listing multiples of each number.

Paper 5

Although this question on prime factors, a familiar topic in the ‘new’ specification, was answered more successfully than in the summer, there still remains a significant minority of the candidature who just list a set of factors. Those who started by dividing 120 by either 2 or 3 or 5 generally obtained the correct answer to part (a), although some basic errors in division were seen. A common wrong answer to part (b) was 30. Clearly candidates had mixed up the terms ‘Lowest Common Multiple’ and ‘Highest Common Factor’.

03. Mathematics A

Paper 3

Many candidates wrote down the correct value of 1.3 × 1.7 in part (a). Relatively few, however, gave the correct answer to 22.1 ÷ 1700 and a significant number of candidates actually tried to work it out using a division method and made a mess of it. In part (b) most candidates did not realise the significance of the information given to them, resulting in a small number of fully correct responses. Many wrote out lists of multiples using repeated addition. A common error was for candidates to mix up LCM and HCF and give an answer of 1.

Paper 5

In this place value question most candidates answered the first part correctly but in the division in part (ii) there was less success. Although the question said 'write down' this should not stop candidates from finding the position of the decimal point by considering, for example, the answer to "17 ÷ 1700". Many attempted to find the LCM in part (b) by multiplying 39 by 17, with varying degrees of success, instead of recognising the link with the given information.

Mathematics B Paper 16

Part (a) 67% correctly wrote down the value of 1.3 × 1.7 whilst only 8.5% were able to write down the value of 22.1/1700
The concept of Lowest Common Multiples is not widely known, or understood, at this level. The majority of candidates attempting this question were actually thinking in terms of HCF and an answer of 1 was often seen.

04. Paper 3

The responses to part (a) were mixed but it was encouraging that the topic appeared familiar to more candidates this year. Factor trees were used more than repeated division and many good attempts were seen, although some candidates were handicapped by poor arithmetic skills. It was disappointing that a number of those with a correct method did not know what to do with the prime factors and wrote '$2^2 + 3^3$' or '2, 2, 3, 3, 3'. In part (b) about 30% of candidates identified 12 as the HCF of 24 and 108. Other even numbers less than 24 were commonly seen as was 24. Some candidates did not understand that they were looking for just one number.

Paper 5

There was a significant improvement in understanding the methods required to write a number as the product of its prime factors although, once again, arithmetical errors were not uncommon. Some candidates failed to write their final answers clearly in terms of products. In part (b) the HCF was required as a single value for the award of the mark rather than any numerical expression which equates to 12.

05. Intermediate Tier

In part (a) about a half of candidates knew what to do, and most of those gave the correct answer, though some found division of 108 by 3 quite difficult. The most common error was to divide by 2 instead of finding a correct square root, giving 18 as the final answer. Where students attempted to find the square root of 108 first, they often did so by dividing by 2 to get 54, then by 3 to get 18. In part (b) very few candidates knew anything of prime factors. The most common method demonstrated was a factor tree method, but candidates failed to divide the numbers up correctly into their factors. As a result there were usually some 2s and 3s, but not necessarily the correct number of either. There were a significant number of cases where candidates obtained the correct numbers of 2s and 3s but then transcribed these incorrectly on the answer line. It was not uncommon to see candidates spoil their answer by writing $2^2 + 3^3$.

Higher Tier

This question was done well by the majority of the candidates. In part (a), the most common errors included mixing up the order of operations, so that the square root was taken first, and incorrect division of 108 by 3 (common answers being 16 and 96). In part (b), factor trees and long division (seen in equal numbers) were the principal methods used to find the prime factors. Candidates did not always combine these as a product in their final answer, common errors being 2, 2, 3, 3, 3 and 22 + 33. Common errors in method included incomplete prime factorisation, such as $2 \times 2 \times 27$ and $3 \times 3 \times 3 \times 4$; the splitting of 108 to 8 and 100, followed by the prime factorisation of each of part; the listing of factor pairs, 2×54, 3×36, …

06. Intermediate Tier

It was good to see many correct counter-examples given and about 45% of candidates gained both marks. The most common correct answers used $n = 6$ to show $6n - 1 = 35$ but others used $n = 11$ or $n = 13$. A few used much higher values of n. Candidates who failed to give a correct counterexample rarely wrote down enough trials to gain a mark. Some did not understand what a prime number is. Incorrect responses included statements such as $6n - 1 = 5n$.

Higher Tier

This produced some interesting answers. Most candidates recognised that 35 was not prime and showed $6 \times 6 - 1 = 35$. As they had a calculator some candidates went to town and looked for bigger examples (which, if correct, also gained full marks).

07. Many candidates obtained the two marks available by correctly multiplying 2 by another prime number. 2×2 and 2×3 were seen often. Errors arose when candidates did not use 2 as one of their prime numbers. Some used numbers that were prime but too large for them to multiply correctly. Some used 1 as a prime number.

08. Most candidates drew a factor tree in part (a). Of those who did, many failed to gain the final mark as they were unable to express the factors as a product. In part (b) there were many attempts to list factors, or find the common multiples. A minority obtained the correct answer.

09. **Higher Tier**

Many candidates were able to score at least 1 mark in each of the parts (a) and (b). Some scored both marks in part (b) without having scored any marks in part (a). In part (a), most candidates used continuous division or factor trees to obtain the required factors, and most were than able to express these as a produced on the answer line. The answer $2 \times 3^2 \times 7$ was as popular as $2 \times 3 \times 3 \times 7$ In part (b), many candidates were able to find the highest common factor 42, but 21 was a common incorrect final answer which was awarded 1 mark.

Intermediate Tier

The most common method used in part (a) involved a factor tree, although it was often used with limited success. Many candidates started with repeated division by 2 and gained no marks. Others attempted to find factor pairs, or just factors, of 126 and also scored no marks. Some of those who did identify the correct prime factors simply listed them rather than write them as a product and some included 1 is a prime factor. There were a surprisingly large number of correct answers to part (b), although the frequent lack of any working suggests that a standard, or even a correct, method was not used. Some candidates drew factor trees for 126 and 84 but could not use them to find the HCF. Common answers were 6 and 7. A significant number of candidates found the LCM and gained no marks.

10. There were essentially 2 steps in the solution of this. Firstly, candidates had to state that all prime numbers greater than 2 are odd. Secondly, they had to point out that the product of two odd numbers is odd. Many candidates certainly did do this, but many omitted the first point.

11. Part (a) of this question was generally done well, but some candidates confused HCF for LCM and visa versa in part (b). Factor trees and Venn diagrams were popular approaches to part (a), but the HCF was often identified as 2. Factor trees and lists of multiples were popular methods in part (b), but errors in arithmetic did not always lead to the final answer 192. A common mistake in this part was to evaluate 64×24, which was perhaps a simple misunderstanding between the words multiple and multiply.

12. Higher Tier

Most candidates had the correct idea of using a factor tree, with a few using repeated division as an alternative. A few candidates completed a correct factor tree, but then wrote down a list of factors or wrote $5 + 3 + 2^4$.

Intermediate Tier

Factor tree methods generally lead to marks being awarded whereas other lists or methods did not. Having found the factors some spoilt their answers by adding.

13. It was disappointing to see that so many candidates did not know what was expected of them in this question. There were some attempts using factor trees or continued division that usually resulted in some credit. Fully correct factor trees were sometimes spoiled by incorrect statements on the answer line eg 2 + 2 + 3 + 3 + 7 or 2, 2, 3, 3, 7. It was not uncommon for 9 or 63 to be left as prime factors.

14. Most candidates had a clear idea what to do on part (a) this question. Factor trees or repeated division were much in evidence. These were mostly correct as candidates could use a calculator. Most went on to write their answer as a product although there were a few who wrote them as a comma separated list or as a sum.

Part (b) proved to be more of a challenge as the candidates were faced with a demand that was unusual. The answer 9 and 15 was seen much more often than 3 and 45. However, just as common was 3 and 15, possibly coming from 3 × 15 = 45, identifying a correct HCF of 3 but failing to spot that the LCM was 15. Many candidates were confused over LCM in particular and gave values in the answer as multiples of 45, so 45 and 90 was a common pair as was 90 and 135.

15. Foundation

Many candidates understood that factors of 24 and 36 could be used. Those that just listed all the factors of the two numbers scored no marks. However, those that could break down 24 or 36 into 2, 2, 2, 3 or 2, 2, 3, 3 were able to access one mark, but then lost the final mark by not knowing how to use them, generally writing 2 or 12 as their final answer. Only a few candidates provided any multiples of either of the two numbers. Those that did generally went on to score 1 or 2 marks. However, over ¾ of the candidates failed to score on this question.

Higher

The correct answer was obtained by approximately 30% of candidates. A further 24% gained one mark usually by breaking down one of the numbers into the product of its prime factors. The most common error was to give the HCF rather than the LCM.

16. Errors in simple arithmetic computation were often the cause for loss of marks in part (a), even when appropriate methods were employed. Prime factors 2, 2, 3 and 7 were often left in a list (or at the ends of branches) with no attempt to write in the required product form. Part (b) was answered well, however some candidates attempted to find the LCM instead of the required HCF.

17. Foundation

It is true to say that performance in part (a) was better than that in part (b), however this question was, in general, not well answered. In part (a), one .mark could be gained by correctly finding a half of 72; many failed to get any further than this, usually dividing 36 by 2 to give 18 as their final answer. Some tried to find the square root of 72 and then divide the result by 2

Many candidates simply did not know where to start in part (b), often simply quoting factors of 72. Any attempts at drawing a factor tree often resulted in the award of one mark, but few completed the process to a correct conclusion. Answers of 2 × 2 × 2 × 9 and 2, 2, 2, 3, 3 and 2 + 2 + 2 + 3 + 3 were seen on a number of occasions.

Higher

In part (a) the majority of candidates divided 72 by 2 and then found the square root, usually just giving the positive solution which was sufficient for full marks. The common error was for candidates to try to find the square root of 72 and then divide by 2. A few divided by 2 twice and gave an answer of 18. Part (b) was generally answered well with the most common method being the use of a factor tree. Many fully correct answers were seen and most candidates were comfortable with index notation. Some made errors in their factor tree (often 6 = 3 × 3) and some who found the correct prime factors listed them on the answer line or wrote $2^3 + 3^2$.

18. Paper 9

The correct answer was rarely seen to this question. Many candidates listed factors of 108 and 180 correctly but failed to go far enough to identify the highest common factor, giving answers of 2,4 6,9,12 or 18. Listing of factors was carried out in a variety of ways, however the most success was achieved, in gaining 1 mark, by those candidates listing factor pairs.
Factor trees were also seen, but these were usually disorganised.

Paper 10

Candidates who approached this question by listing the factors of each number rarely gained the correct answer of 36. Those that reduced each number to its prime factors were more successful although, in a minority of cases, the answer was left as $2^2 \times 3^2$ instead of being evaluated.

19. A variety of methods were offered as means of finding the HCF, however the listing of factors led to a correct answer more than the alternatives of the factor tree method or using the product of prime factors. Unfortunately the listing of factors method usually did not go far enough to reach the required answer and answers of 9 and less were seen more often.
In some cases candidates appeared to get the correct answer simply by finding the difference between 72 and 54; care had to be taken in marking to ensure that this scored no marks.

20. This question was answered well with many candidates gaining at least 1 mark, most usually for lists of factors of each of the numbers. Performance in this question shows an improvement on previous years, with candidates drawing longer lists of factors and thereby identifying the highest common factor. 6 and 9 were predictable wrong answers.

21. Only 30% gained full marks in this question; 8 was the most popular answer which was credited with one mark, with or without working. Answers of 2 and 4 were also seen. It was more usual to see lists of factors of 32 and 80, often not going far enough to include 16, rather than any attempt to write the numbers as products of their prime factors. Factor tree methods usually secured one mark for identifying the required number of factors, but often subsequently failed to find the HCF. A significant number of candidates attempted to find the LCM by mistake, often with little success.

22. This type of question is becoming quite familiar and performance is improving, although fully correct solutions were only achieved by 20% of candidates. Many candidates gained one mark for quoting 12 as their answer, with or without working being shown. A significant proportion of candidates listed multiples of 72 and 120. The main reasons for the loss of the method mark, however was through a lack of organisation. Candidates often filled the working space with factors, without making it clear of which number they were factors of.

23. This was a routine question although just under 20% of candidates failed to score any marks. Most candidates used an appropriate method, a factor tree being the most popular. There were many numerical slips seen, in particular 10 written as 5×5, 14 as 7×7, 70 as 2×45 and 35 as 5×6. A number of candidates used a correct method but omitted the multiplication signs and wrote the answer simply as 2, 2, 5, 7.

24. No report available.

25. The factor tree method was probably the most common approach to this question, often leading to correct answers. Many incomplete factor trees were seen scoring one mark only. Often prime numbers 2 and/or 3 were split into products 1 × 2 or 1 × 3, with the implication of 1 as a prime number. This lost marks. It should be noted that answers of 2 × 2 × 3 × 3 × 3 as well as $2^2 \times 3^3$ gained full marks. Some candidates split 108 into 100 and 8 before continuing with the factor tree. Other common ways of losing marks were to list the factors only (i.e. 2,2, 3,3,3) and fail to notice that a product was required or add the correct factors on the final line.

26. This question was well answered. Approximately 85% of candidates were able to show that, for example, when $n = 6$ the value obtained was not a prime number. A few candidates tried a number of different substitutions for n successfully but were unable to identify a non-prime number.

27. It was disappointing to note that the mean mark for this 3 mark question was only 0.49 This mark was generally scored for an attempt to express 96 as a product of its prime factors, either by getting some correct factors in a factor tree or listing some factors or expressing 96 as a product of two numbers. Many just listed the prime numbers smaller than 96 whilst others then went on to reach 96 by using a combination of these prime numbers
e.g. 3 × 19 + 23 + 11 + 5 or (7 × 5) + 19 + 17 + 11 + 7.

28. No Report available for this question.

29. No Report available for this question.

30. No Report available for this question.

31. No Report available for this question.

32. No Report available for this question.

33. No Report available for this question.

34. No Report available for this question.

35. No Report available for this question.

36. Many candidates at this level were confused by the demands of each of the parts to this question. In part (a), those candidates with the slightest understanding of HCF often failed to quote sufficient factors of 44 and 77 to gain any credit. In part (b) many just listed product pairs of 200 (eg 100 x 2, 50 x 4, etc.). Some attempted to use a factor tree method but got confused in its construction, often using the sum of two numbers instead of the product. Many more able candidates failed to score maximum marks by failing to quote their answer in product form; 2, 2, 2, 5, 5 or 2 + 2 + 2 + 5 + 5 or $2^3 + 5^2$ were not uncommon.

37. Only about half of the candidature obtained the correct answer to this question. The most frequent mistake was to mistake the HCF for the LCM. Other candidates were able to gain one mark for finding the prime factors of 20 and 36 or for listing multiples of 20 and 36.

38. No Report available for this question.

39. No Report available for this question.

40. No Report available for this question.

41. No Report available for this question.