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EDEXCEL INTERNATIONAL GCSE MATHS: QUESTIONS BY TOPIC

Number Operations & Properties (N1)

International GCSE Mathematics A (4MA1) · Higher tier

45 questions · 149 marks · Mark schemes included

Past papers June 2018 - June 2025 · 4 sub-topics

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HOW TO USE THIS BOOKLET

Questions are grouped by sub-topic and run from the lowest to the highest mark tariff, then oldest paper first.

Click any row below to jump straight to that sub-topic or question.

On every question page, click ANSWER in the top-right corner to jump to its mark scheme; < QUESTION brings you back.

A gold bar in the left margin marks exactly where the question sits on the original page.

Diagrams, graphs, grids and tables are printed exactly as they appear in the original papers.

Each question is filed under its main topic; longer questions may also test skills from other topics.

QUESTION	SOURCE	MARKS	PAGE
N1a PLACE VALUE, ORDERING & THE FOUR OPERATIONS			
No questions on this sub-topic in the available past papers.			
N1b FACTORS, MULTIPLES & PRIMES		31 Qs · 98 marks	3
1. Q5	IGCSE Paper 1HR June 2018	2	4
2. Q10	IGCSE Paper 1H June 2019	2	5
3. Q2	IGCSE Paper 1H January 2020	2	6
4. Q9	IGCSE Paper 2H January 2021	2	7
5. Q7	IGCSE Paper 1H November 2023	2	8
6. Q3	IGCSE Paper 1H June 2024	2	9
7. Q6	IGCSE Paper 1H November 2024	2	10
8. Q1	IGCSE Paper 1HR June 2025	2	11
9. Q1	IGCSE Paper 2HR January 2020	3	12
10. Q10	IGCSE Paper 1H November 2020	3	13
11. Q2	IGCSE Paper 2HR November 2020	3	14
12. Q1	IGCSE Paper 2H June 2021	3	15
13. Q7	IGCSE Paper 1H November 2021	3	16
14. Q7	IGCSE Paper 2H January 2022	3	17
15. Q12	IGCSE Paper 1HR June 2022	3	18
16. Q2	IGCSE Paper 2HR June 2022	3	19
17. Q1	IGCSE Paper 1HR June 2023	3	20
18. Q1	IGCSE Paper 2HR June 2024	3	21
19. Q2	IGCSE Paper 2HR June 2025	3	22
20. Q8	IGCSE Paper 1H June 2018	4	23
21. Q6	IGCSE Paper 2H January 2019	4	24
22. Q5	IGCSE Paper 1HR June 2019	4	25
23. Q8	IGCSE Paper 2HR June 2019	4	26
24. Q9	IGCSE Paper 1HR January 2021	4	27
25. Q6	IGCSE Paper 1HR January 2022	4	28
26. Q3	IGCSE Paper 1H June 2022	4	29
27. Q7	IGCSE Paper 2HR January 2023	4	30
28. Q8	IGCSE Paper 1H June 2023	4	31
29. Q2	IGCSE Paper 2HR June 2023	4	32
30. Q11	IGCSE Paper 1HR June 2024	4	33
31. Q9	IGCSE Paper 1HR January 2019	5	34



QUESTION	SOURCE	MARKS	PAGE
N1c COUNTING & SYSTEMATIC LISTING			
No questions on this sub-topic in the available past papers.			
N1d SETS & VENN DIAGRAMS (SET NOTATION)		14 Qs · 51 marks	35
32. Q13	IGCSE Paper 1HR June 2019	2	36
33. Q4	IGCSE Paper 1H January 2021	2	37
34. Q14	IGCSE Paper 1H June 2019	3	38
35. Q3	IGCSE Paper 1HR June 2019	3	39
36. Q4	IGCSE Paper 1HR January 2020	3	40
37. Q3	IGCSE Paper 2HR January 2021	3	41
38. Q4	IGCSE Paper 2H June 2021	3	42
39. Q4	IGCSE Paper 1H November 2024	3	43
40. Q3	IGCSE Paper 2H June 2019	4	44
41. Q5	IGCSE Paper 1HR June 2025	4	45
42. Q4	IGCSE Paper 2HR June 2022	5	46
43. Q7	IGCSE Paper 1H June 2024	5	47
44. Q4	IGCSE Paper 2HR June 2024	5	48
45. Q14	IGCSE Paper 2H November 2020	6	49



QUESTIONS

45 questions · 149 marks · 2 sub-topics

SUB-TOPIC N1b

FACTORS, MULTIPLES & PRIMES

Sub-topic N1b · 31 questions · 98 marks · lowest tariff first



- 4 Anna and Lionel share \$675 in the ratio 4 : 5

Lionel gives $\frac{3}{5}$ of his share of the money to his mother.

How much money does Lionel give to his mother?

\$.....

(Total for Question 4 is 3 marks)

- 5 $E = n^2 + n + 5$

Ali thinks that the value of E will be a prime number for any whole number value of n .

Is Ali correct?

You must give a reason for your answer.

(Total for Question 5 is 2 marks)



10 $A = 2^n \times 3 \times 5^m$

Write $8A$ as a product of powers of its prime factors.

(Total for Question 10 is 2 marks)

11 $C = b - a$

$a = 6$ correct to the nearest integer

$b = 15$ correct to the nearest 5

Work out the upper bound for the value of C
Show your working clearly.

(Total for Question 11 is 3 marks)



2 Find the lowest common multiple (LCM) of 28 and 105

(Total for Question 2 is 2 marks)



..... cm²

(Total for Question 8 is 5 marks)**9**

$$A = 2^3 \times 3^2 \times 5^2 \times 11$$

$$B = 2^4 \times 3 \times 5^4 \times 13$$

Find the lowest common multiple (LCM) of A and B .
Give your answer as a product of powers of prime numbers.

(Total for Question 9 is 2 marks)

7 $A = 5^3 \times 7^3 \times 11^6$ and $B = 5^6 \times 7^2 \times 11^4$

Find the highest common factor (HCF) of A and B
Give your answer as a product of powers of its prime factors.

(Total for Question 7 is 2 marks)



- 3 Find the highest common factor (HCF) of 72 and 108
Show your working clearly.

.....
(Total for Question 3 is 2 marks)

- 4 Ava records the number of kilometres she drives each month.
In April, Ava drove 943 kilometres.
This is 15% more than the number of kilometres she drove in March.
Work out the number of kilometres Ava drove in March.

..... kilometres
(Total for Question 4 is 3 marks)



6 $A = 2^3 \times 5^4 \times 7 \times 11$

$$B = 2^2 \times 5^2 \times 7^2$$

$$C = 2^2 \times 5^3 \times 7^4$$

Find the highest common factor (HCF) of A , B and C
Write your answer as a product of prime factors.

(Total for Question 6 is 2 marks)



Answer ALL TWENTY SIX questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** Find the lowest common multiple (LCM) of 45 and 70

.....
(Total for Question 1 is 2 marks)



Answer ALL TWENTY SIX questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** (a) Write $5^{17} \times 5^2$ as a single power of 5

.....
(1)

- (b) Write 800 as a product of its prime factors.
Show your working clearly.

.....
(2)

(Total for Question 1 is 3 marks)



10 $A = 2 \times 3^{43}$
 $B = 16 \times 3^{37}$

(a) Find the highest common factor (HCF) of A and B .

.....
(1)

(b) Express the number $A \times B$ as a product of powers of its prime factors.
Give your answer in its simplest form.

.....
(2)

(Total for Question 10 is 3 marks)



Answer ALL TWENTY SIX questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** The probability that a spinner will land on blue is 0.4

Rayyan is going to spin the spinner 280 times.

Work out an estimate for the number of times the spinner will land on blue.

.....
(Total for Question 1 is 2 marks)

- 2** Write 880 as a product of powers of its prime factors.
Show your working clearly.

.....
(Total for Question 2 is 3 marks)



Answer ALL TWENTY THREE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** Write 600 as a product of powers of its prime factors.
Show your working clearly.

.....
(Total for Question 1 is 3 marks)



- 6 Alison buys 5 apples and 3 pears for a total cost of \$1.96
Greg buys 3 apples and 2 pears for a total cost of \$1.22

Michael buys 10 apples and 10 pears.

Work out how much Michael pays for his 10 apples and 10 pears.
Show your working clearly.

\$.....

(Total for Question 6 is 5 marks)

- 7 Write 3.6×10^3 as a product of powers of its prime factors.
Show your working clearly.

.....

(Total for Question 7 is 3 marks)



- 7 Find the lowest common multiple (LCM) of 28, 42 and 63
Show your working clearly.

.....
(Total for Question 7 is 3 marks)



12 $P = 3^3 \times 5^2 \times 7$
 $Q = 3^2 \times 5 \times 7^2$

(a) Write down the highest common factor (HCF) of P and Q

.....
(1)

$P = 3^3 \times 5^2 \times 7$
 $Q = 3^2 \times 5 \times 7^2$

(b) Work out the value of $P^3 \times Q$
Give your answer in the form $3^x \times 5^y \times 7^z$ where x , y and z are positive integers.

.....
(2)

.....
(Total for Question 12 is 3 marks)



- 2 Write 1200 as a product of powers of its prime factors.
Show your working clearly.

(Total for Question 2 is 3 marks)



Answer ALL TWENTY FIVE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** Write 2250 as a product of powers of its prime factors.
Show your working clearly.

.....
(Total for Question 1 is 3 marks)



Answer ALL TWENTY SIX questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** Write 1400 as a product of powers of its prime factors.
Show your working clearly.

.....
(Total for Question 1 is 3 marks)



- 2 Write 1400 as a product of powers of its prime factors.
Show your working clearly.

(Total for Question 2 is 3 marks)

- 3 Solve the simultaneous equations

$$3x + 2y = 10$$

$$3x - 4y = 16$$

Show clear algebraic working.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

(Total for Question 3 is 3 marks)



8 $A = 3^5 \times 5 \times 7^3$
 $B = 2^3 \times 3 \times 7^4$

(a) (i) Find the Highest Common Factor (HCF) of A and B .

(ii) Find the Lowest Common Multiple (LCM) of A and B .

(2)

$A = 3^5 \times 5 \times 7^3$
 $B = 2^3 \times 3 \times 7^4$
 $C = 2^p \times 5^q \times 7^r$

Given that

the HCF of B and C is $2^3 \times 7$

the LCM of A and C is $2^4 \times 3^5 \times 5^2 \times 7^3$

(b) find the value of p , the value of q and the value of r .

$p = \dots\dots\dots$

$q = \dots\dots\dots$

$r = \dots\dots\dots$

(2)

(Total for Question 8 is 4 marks)



- 6 (a) Find the highest common factor (HCF) of 96 and 120

(2)

$$A = 2^3 \times 5 \times 7^2 \times 11$$

$$B = 2^4 \times 7 \times 11$$

$$C = 3 \times 5^2$$

- (b) Find the lowest common multiple (LCM) of A , B and C .

(2)

(Total for Question 6 is 4 marks)



- 5 (a) Write 720 as a product of its prime factors.
Show your working clearly.

.....
(3)

- (b) Find the smallest whole number that 720 can be multiplied by to give a square number.

.....
(1)

(Total for Question 5 is 4 marks)



8

$$A = 3^2 \times 5^4 \times 7 \quad B = 3^4 \times 5^3 \times 7 \times 11$$

(a) Find the highest common factor (HCF) of A and B .

.....
(2)

(b) Find the lowest common multiple (LCM) of A and B .

.....
(2)

(Total for Question 8 is 4 marks)

9 (a) Write 840 000 in standard form.

.....
(1)

(b) Work out $(6 \times 10^7) \div (8 \times 10^{-2})$
Give your answer in standard form.

.....
(2)

(Total for Question 9 is 3 marks)



9 $A = 2^8 \times 3^5 \times 11^4$ $B = 2^6 \times 3 \times 11^8$

(a) Find the highest common factor (HCF) of A and B .

.....
(2)

(b) Find the lowest common multiple (LCM) of $2A$ and $3B$.
Give the LCM as a product of powers of its prime factors.

.....
(2)

.....
(Total for Question 9 is 4 marks)



- 6 (a) Work out the lowest common multiple (LCM) of 36 and 120

.....
(2)

$$A = 5^2 \times 7^4 \times 11^p$$
$$B = 5^m \times 7^{n-5} \times 11$$

m , n and p are integers such that

$$m > 2$$

$$n > 10$$

$$p > 1$$

- (b) Find the highest common factor (HCF) of A and B
Give your answer as a product of powers of its prime factors.

.....
(2)

(Total for Question 6 is 4 marks)

- 3 (a) Find the highest common factor (HCF) of 56 and 84
Show your working clearly.

.....
(2)

- (b) Find the lowest common multiple (LCM) of 60 and 72
Show your working clearly.

.....
(2)

(Total for Question 3 is 4 marks)



- 7 (a) Find the highest common factor (HCF) of 200 and 420

.....
(2)

$$A = 2^3 \times 3 \times 5 \times 7^2$$

$$B = 2 \times 3^2 \times 7$$

$$C = 3 \times 5^2 \times 11$$

- (b) Find the lowest common multiple (LCM) of A , B and C
Write your answer as a product of powers of prime factors.

.....
(2)

(Total for Question 7 is 4 marks)



- 8 (a) Write 300 as a product of its prime factors.
Show your working clearly.

.....
(2)

$$A = 2 \times 2 \times 2 \times 3 \times 3 \times 5$$

$$B = 2 \times 2 \times 3 \times 3 \times 3 \times 5$$

- (b) Find the lowest common multiple (LCM) of $5A$ and $7B$
Show your working clearly.

.....
(2)

(Total for Question 8 is 4 marks)



- 2 Sandeep wants to buy some packets of pens and some boxes of pencils for his stationery shop.

Each packet of pens contains 9 pens.

Each box of pencils contains 12 pencils.

Each packet of pens costs £7.60

Each box of pencils costs £4.80

Sandeep can only buy full packets of pens and full boxes of pencils.

He wants to buy exactly the same number of pens as pencils.

Work out the minimum amount Sandeep needs to pay.

£.....

(Total for Question 2 is 4 marks)



11 $A = 2^5 \times 5 \times 7^2$

$$B = 2^3 \times 5^3 \times 7^4$$

- (a) Write down the highest common factor (HCF) of $5A$ and $2B$
Give your answer as a product of prime factors.

.....
(2)

$$A = 2^5 \times 5 \times 7^2$$

$$B = 2^3 \times 5^3 \times 7^4$$

- (b) Work out the value of $(AB)^2$
Give your answer as a product of prime factors.

.....
(2)

(Total for Question 11 is 4 marks)



9 $N = 480 \times 10^9$

(a) Write N as a number in standard form.

(1)

(b) Write N as a product of powers of its prime factors.
Show your working clearly.

(3)

(c) Find the largest factor of N that is an odd number.

(1)

(Total for Question 9 is 5 marks)



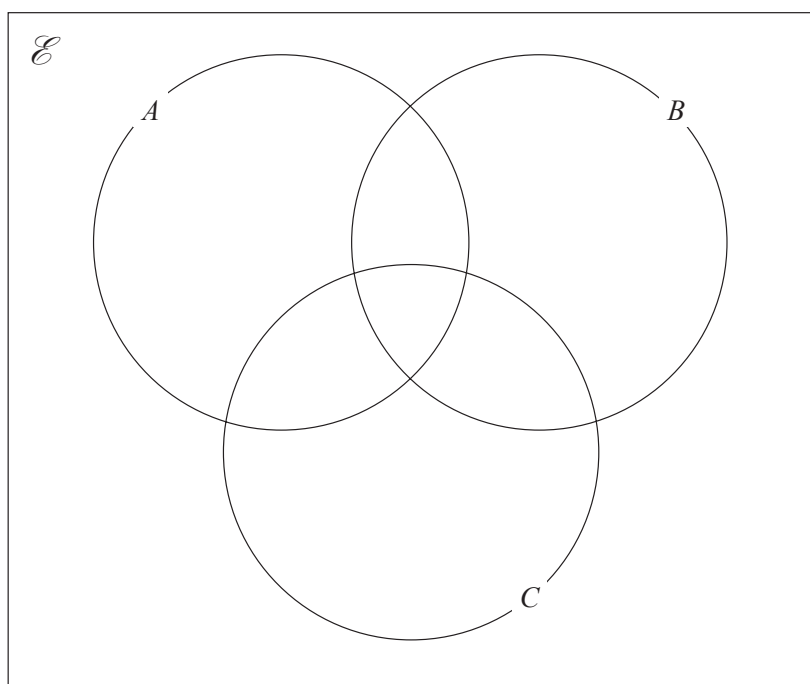
SUB-TOPIC N1d

SETS & VENN DIAGRAMS (SET NOTATION)

Sub-topic N1d · 14 questions · 51 marks · lowest tariff first

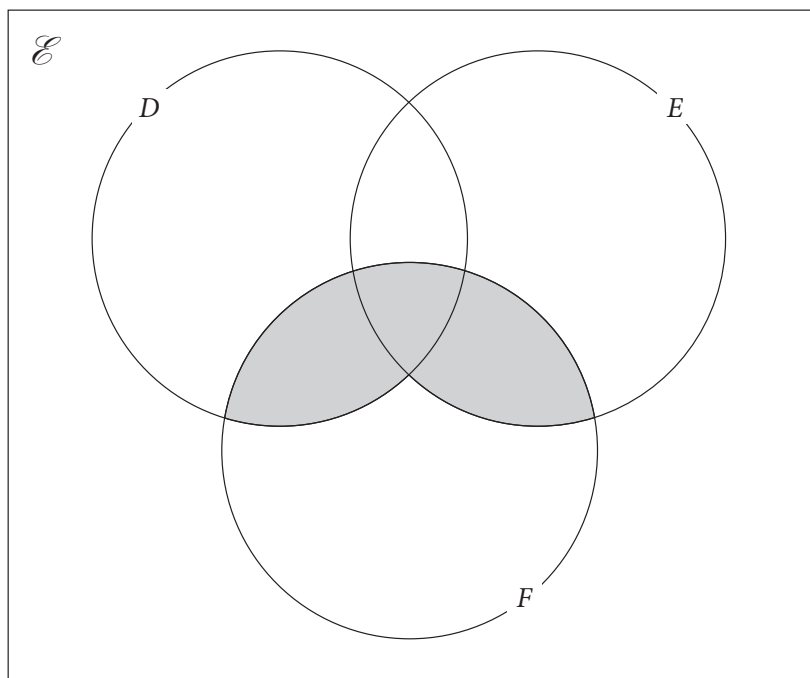


13 (a) On the Venn diagram, shade the set $(A \cup B)' \cap C$



(1)

(b) Use set notation to describe the shaded region in the Venn diagram below.



(1)

(Total for Question 13 is 2 marks)

4 $\mathcal{E} = \{20, 21, 22, 23, 24, 25, 26, 27, 28, 29\}$

$$A = \{\text{odd numbers}\}$$

$$B = \{\text{multiples of 3}\}$$

List the members of the set

(i) $A \cap B$

.....
(1)

(ii) $A \cup B$

.....
(1)

(Total for Question 4 is 2 marks)



After the first team has been picked, a second team is picked.
One child is picked at random from the children left in group **C** and one child is picked at random from the children left in group **D**.

(c) Work out the probability that there are two boys in each of the two teams.

.....
(3)

(Total for Question 13 is 7 marks)

14 $\mathcal{E} = \{\text{positive integers less than } 20\}$

$$A = \{x : x < 12\}$$

$$B = \{x : 7 \leq x < 16\}$$

(a) List the members of $A \cap B$

.....
(2)

C is a set such that $C \subset A$ and $n(C) = 3$

Given that all members of C are even numbers,

(b) list the members of one possible set C .

.....
(1)

(Total for Question 14 is 3 marks)



3 $\mathcal{E} = \{11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

$A = \{\text{even numbers}\}$

$B = \{\text{multiples of 3}\}$

List the members of the set

(i) $A \cap B$

(ii) $A \cup B$

(iii) A'

(Total for Question 3 is 3 marks)

4 Solve $4x - 13 = 17 + 8x$

$x =$

(Total for Question 4 is 2 marks)



4 $B = \{b, l, u, e\}$

$G = \{g, r, e, y\}$

$W = \{w, h, i, t, e\}$

(a) List all the members of the set

(i) $B \cup G$

(ii) $W \cap G'$

(2)

Serena writes down the statement $B \cap G \cap W = \emptyset$

(b) Is Serena's statement correct?

You must give a reason for your answer.

(1)

(Total for Question 4 is 3 marks)



- 3 $\mathcal{E} = \{21, 22, 23, 24, 25, 26, 27, 28, 29, 30\}$
 $A = \{22, 24, 26, 28, 30\}$
 $B = \{21, 24, 27, 30\}$

(a) List the members of the set

(i) $A \cap B$

.....

(ii) A'

.....

(2)

$C = \{23, 25, 29\}$

(b) Using set notation, find an expression for C in terms of A and B .

.....

(1)

(Total for Question 3 is 3 marks)

- 4 (a) Simplify $(3k^2)^4$

.....

(2)

(b) Simplify $(21m^4n) \div (3n^{-5})$

.....

(2)

(Total for Question 4 is 4 marks)



4 $\mathcal{E} = \{\text{letters of the alphabet}\}$

$$B = \{\text{b, r, a, z, i, l}\}$$

$$I = \{\text{i, r, e, l, a, n, d}\}$$

(a) List the members of the set

(i) $B \cup I$

(ii) $B \cap I'$

(2)

$$K = \{\text{k, e, n, y, a}\}$$

Cody writes down the statement $B \cap K = \emptyset$

Cody's statement is wrong.

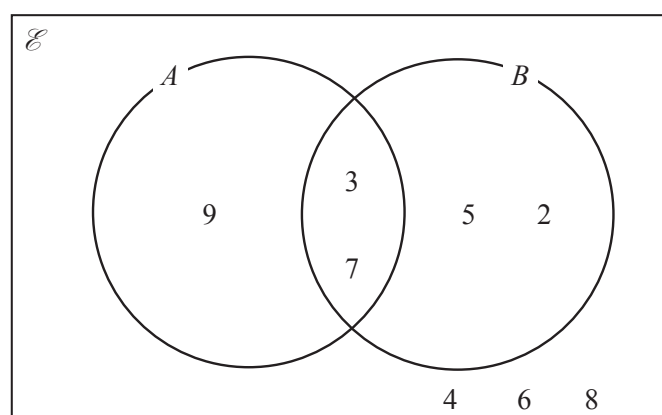
(b) Explain why.

(1)

(Total for Question 4 is 3 marks)



4 Here is a Venn diagram.



(a) List the members of the set B

.....
(1)

(b) List the members of the set $A \cap B$

.....
(1)

(c) List the members of the set A'

.....
(1)

(Total for Question 4 is 3 marks)

3 $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$$A = \{2, 3, 5, 7\}$$

$$B = \{4, 6, 8, 10\}$$

(a) Explain why $A \cap B = \emptyset$

.....

.....

.....

(1)

$$x \in \mathcal{E} \text{ and } x \notin A \cup B$$

(b) Write down the **two** possible values of x .

....., ...

(1)

Set C is such that

$$A \cup B \cup C = \mathcal{E}$$

$$A \cap C = \{2\}$$

$$B \cap C' = \{4, 6, 10\}$$

(c) List all the members of set C .

.....

(2)

(Total for Question 3 is 4 marks)



5 $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

$$A = \{2, 4, 6, 8, 10, 12\}$$

$$B = \{3, 6, 9, 12\}$$

$$C = \{1, 3, 5, 7, 9, 11\}$$

(a) List the members of the set

(i) $A \cup B$

(ii) B'

(2)

$$\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

$$A = \{2, 4, 6, 8, 10, 12\}$$

$$B = \{3, 6, 9, 12\}$$

$$C = \{1, 3, 5, 7, 9, 11\}$$

$\mathcal{E}$ $\cap$ $\cup$ $\emptyset$ $\in$ $\notin$

(b) Write a symbol from the box on each dotted line to make each of the following a true statement.

(i) $A \cap C = \dots\dots\dots$

(ii) $13 \dots\dots\dots \mathcal{E}$

(2)

(Total for Question 5 is 4 marks)



4 $\mathcal{E} = \{9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

$A = \{\text{multiples of 3}\}$

$B = \{\text{odd numbers}\}$

(a) List the members of the set

(i) $A \cap B$

(1)

(ii) $A \cup B$

(1)

(b) Is it true that $24 \in A$?

Tick one of the boxes below.

Yes

No

☐
☐

Give a reason for your answer.

(1)

Set C has 4 members such that $C \cap B' = \{10, 18\}$

(c) List the members of one possible set C

(2)

(Total for Question 4 is 5 marks)



7 $\mathcal{E} = \{23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34\}$

$A = \{\text{even numbers}\}$

$B = \{23, 29, 31\}$

$C = \{\text{multiples of 3}\}$

(a) List the members of the set

(i) $B \cup C$

(1)

(ii) $A' \cap C$

(1)

(b) Is it true that $B \cap C = \emptyset$?

Tick (✓) one of the boxes below.

Yes

☐

No

☐

Give a reason for your answer.

(1)

The set D has 4 members and is such that $D \cap (A \cup C) = \emptyset$

(c) List the members of set D

(2)

(Total for Question 7 is 5 marks)



- 4 $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 $A = \{\text{factors of } 6\}$
 $B = \{\text{prime numbers}\}$

(a) List the members of the set

(i) $A \cup B$

.....
 (1)

(ii) A'

.....
 (1)

Harpreet states that $A \cap B = \emptyset$

Harpreet is incorrect.

(b) Explain why.

.....
 (1)

C is a set with 4 members such that

the set $A \cap C$ has 2 members
 the set $B \cap C$ has 2 members

Set $A \cap C$ and set $B \cap C$ have no members in common.

(c) List the 4 members of set C

.....
 (2)

(Total for Question 4 is 5 marks)



14 $\mathcal{E} = \{\text{integers } x \text{ such that } 10 \leq x \leq 25\}$

$$A = \{x : x < 18\}$$

$$B = \{x : 13 \leq x < 22\}$$

(a) Write down $n(A)$

.....
(1)

(b) List the members of the set $(A \cup B)'$

.....
(2)

(c) List the members of the set $A' \cap B$

.....
(2)

$C \subset A$, $C \subset B$ and $n(C) = 5$

(d) List the members of the set C

.....
(1)

(Total for Question 14 is 6 marks)



MARK SCHEMES

official mark schemes, in the same order as the questions



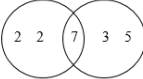
5	For example,	No + reason	2	M1 for evaluating E correctly for any value of n
	n			
	1			
	2			
	3			
	4			
	5			A1 for No with E evaluated correctly as a non-prime number
				Total 2 marks

6	Angle $EBG = 180 - 2 \times 65 (= 50)$ or Angle $ABE = 180 - (38 + 65) (= 77)$	27	3	M1
	Angle $ABE = 180 - (38 + 65) (= 77)$ and Angle $ABG = "77" - "50"$			M1 for a complete method to find angle ABG
				A1
				Total 3 marks
	Alternative scheme 1			
	Angle $EBG = 180 - 2 \times 65 (= 50)$ or Angle $EBC = 103$			M1
	Angle $EBC = 103$ and Angle $ABG = 180 - (103 + "50")$			M1 for a complete method to find angle ABG
				A1
				Total 3 marks

9		$0.5 \times 6 \times 6 (=18)$		5	M1 For area of triangle, or may use $\frac{1}{2} \times 6 \times 6\sqrt{2} \sin 45$ or $\frac{1}{2} \times 6\sqrt{2} \times 3\sqrt{2}$ oe
		$(d^2 =) 6^2 + 6^2 (=72)$ or $\frac{AC}{(\sin 90)} = \frac{6}{\sin 45}$			M1
		$\sqrt{6^2 + 6^2} (= \sqrt{72} = 6\sqrt{2} = 8.4(85\dots))$ or 8.5) or $AC = \frac{6(\sin 90)}{\sin 45} = 6\sqrt{2} = 8.4(85\dots)$ or 8.5) oe			M1
		$0.5 \times \pi \times \left(\frac{8.48\dots}{2}\right)^2 (= 9\pi$ or 28....)			M1
			46.3		A1 for 46.2 – 46.3
					Total 5 marks

10		$(8 =) 2 \times 2 \times 2$ or 2^3 or 2^{3+n}		2	M1 For clearly writing 8 as a product of prime factors or as 2^3
			$2^{n+3} \times 3 \times 5^m$		A1
					Total 2 marks



Question	Working	Answer	Mark	Notes
Apart from questions (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method				
1	(a) $\frac{5+13}{2}$ or $\frac{-4+1}{2}$		2	M1 for a correct method to find one coordinate or for one coordinate correct or for $(-1.5, 9)$
		$(9, -1.5)$		A1 oe
	(b)	-3	1	B1
	(c)	No with reason	1	B1 No (oe) and e.g. line goes through $(100, -298)$ or $(101.3(3..), -302)$ or $\left(\frac{304}{3}, -302\right)$ or $(3 \times 100) - 302 = -2$ not $(+)$ 2
Total 4 marks				
2	28, 56, 84, 112... and 105, 210, 315, 420... or 2, 2, 7 and 3, 5, 7 or  or $\frac{28 \times 105}{7}$ or 2, 2, 3, 5, 7 oe		2	M1 for any correct valid method e.g. for starting to list at least four multiples of each number or 2, 2, 7 and 3, 5, 7 seen (may be in a factor tree and ignore 1) or a fully correct Venn diagram
		420		A1 cao
Total 2 marks				

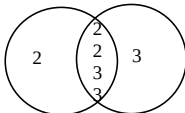
8		$8^2 + 15^2 (= 289)$	167	5	M1
		$\sqrt{8^2 + 15^2} (= 17)$			M1
		$\pi \times \left(\frac{17}{2}\right)^2 (= 226.98\dots)$ or $0.5 \times 15 \times 8 (= 60)$			M1
		$\pi \times \left(\frac{17}{2}\right)^2 - 0.5 \times 15 \times 8$ (“226.98” – “60”)			M1
					A1 Accept answers which round to 167
					Total 5 marks
9			$2^4 \times 3^2 \times 5^4 \times 11 \times 13$	2	B2 (B1 for 12 870 000 or correct unsimplified product or $2^m \times 3^n \times 5^p \times 11 \times 13$ with at least 1 of m, n or p correct or for $2^4 \times 3^2 \times 5^4$)
					Total 2 marks

7		$5^3 \times 7^2 \times 11^4$	2	B2 Accept $5^3, 7^2, 11^4$ allow 89 676 125 with $5^3 \times 7^2 \times 11^4$ seen If not B2 then award B1 for $5^p \times 7^q \times 11^r$ with two of $p = 3, q = 2$ and $r = 4$ (or omission of one with others fully correct) or for 89 676 125 without $5^3 \times 7^2 \times 11^4$ seen or for $5 \times 5 \times 5 \times 7 \times 7 \times 11 \times 11 \times 11 \times 11$ or for an answer of $5^3 + 7^2 + 11^4$ or $5^3, 7^2, 11^4$
				Total 2 marks



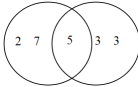
2	$1 - (0.20 + 0.26)$ oe or 0.54 oe or $x + 2x + 0.26 + 0.20 = 1$ oe or $x + 2x = 0.54$ oe or		4	M1 showing clear understanding that the total of probabilities is 1 If probabilities are given as percentages then % sign must be seen
	$\frac{0.54}{3} (= 0.18)$ or $\frac{2}{3} \times "0.54" (= 0.36)$ oe or " 0.54 " $\times 450 (= 243)$			M1 for a correct method to find x or $2x$
	$(2 \times) "$ 0.18" $\times 450$ oe or 81 or " 0.36 " $\times 450$ oe			M1 or for $\frac{81}{450}$ or $\frac{162}{450}$
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	162		A1
				Total 4 marks

2 ALT	$(0.2 \times 450) + (0.26 \times 450) (= 207)$ oe or $90 + 117 (= 207)$ or $0.46 \times 450 (= 207)$		4	M1
	$450 - "207" (= 243)$			M1
	$\frac{1}{3} \times "243"$ or 81 or $\frac{2}{3} \times "243"$			M1 or for $\frac{81}{450}$ or $\frac{162}{450}$
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	162		A1
				Total 4 marks

3	1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72 and 1, 2, 3, 4, 6, 9, 12, 18, 27, 36, 54, 108 or 2 2 2 3 3 oe and 2 2 3 3 3 oe or <table data-bbox="579 967 753 1041"><tr><td>12</td><td>72</td><td>108</td></tr><tr><td>3</td><td>6</td><td>9</td></tr><tr><td></td><td>2</td><td>3</td></tr></table>	12	72	108	3	6	9		2	3		2	M1 for any correct valid method and no errors eg for starting to list at least four different factors of each number and no errors or 2 2 2 3 3 and 2 2 3 3 3 seen or 4 2 3 3 and 4 3 3 3 seen or 2 2 2 9 and 2 2 3 9 seen or 4 2 9 and 4 3 9 seen or 2 36 and 3 36 etc (may be in a factor tree or a ladder diagram with no errors and ignore 1) or a fully correct Venn diagram or other clear method, eg table
12	72	108											
3	6	9											
	2	3											
	Working required	36		A1 dep on M1 Accept $2^2 \times 3^2$ oe									
				Total 2 marks									



6	B1 for $2^2 \times 5^2$ oe or $2 \times 2 \times 5 \times 5$ oe or $2^2 \times 7$ oe or $2 \times 2 \times 7$ oe or $5^2 \times 7$ oe or $5 \times 5 \times 7$ oe or $2^2 \times 5 \times 7$ oe or $2 \times 2 \times 5 \times 7$ oe or $2 \times 5^2 \times 7$ oe or $2 \times 5 \times 5 \times 7$ oe or $2^2 \times 5^2 \times 7 \times 11$ or $2 \times 2 \times 5 \times 5 \times 7 \times 11$ oe or 700 or $2^p \times 5^q \times 7^r$ where two of p or q or r are correct	$2^2 \times 5^2 \times 7$	2	B2 Allow $2 \times 2 \times 5 \times 5 \times 7$ Answers must be a product of prime factors Can be in any order (allow $2^2 \cdot 5^2 \cdot 7$) Do not allow 1 in the final answer $2 \times 2 \times 5 \times 5 \times 7$ in working space and 700 on answer line award B2 $2^2 \times 5^2 \times 7$ in working space and 700 on answer line award B2 (B1 for $2^p \times 5^q \times 7^r$ where two of p or q or r are correct or one mistake in their product (see working on the left for examples) or for 700)
				Total 2 marks

International GCSE Maths										
Values in quotation marks must come from a correct method previously seen unless clearly stated otherwise.										
Q	Working	Answer	Mark	Notes						
1	45, 90, 135, 180... and 70, 140, 210, 280... or 2, 5, 7 and 3,3,5 or  or $\frac{45 \times 70}{5}$ or 2, 3, 3, 5, 7 oe or <table border="1" data-bbox="384 1034 657 1093"><tr><td>5</td><td>45</td><td>70</td></tr><tr><td></td><td>9</td><td>14</td></tr></table> or 5, 9, 14 oe	5	45	70		9	14		2	M1 for any correct valid method eg for starting to list at least four multiples of each number or 2, 5, 7 and 3, 3, 5 seen (may be in a factor tree, ignore 1) or a fully correct Venn diagram or 5, 9, 14 oe (could be in a table)
5	45	70								
	9	14								
	Correct answer scores full marks (unless from obvious incorrect working)	630		A1 Allow $2 \times 3^2 \times 5 \times 7$ oe eg $5 \times 9 \times 14$						
				Total 2 marks						

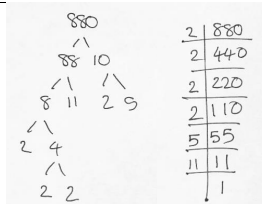
2	(i)	142.75	1	B1
	(ii)	142.85	1	B1 accept 142.8499... or 142.849
				Total 2 marks

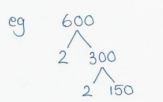
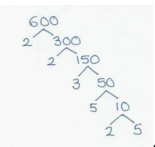
International GCSE Maths A January 2020 – Paper 2HR Mark scheme					
Apart from Questions 1b, 7, 16c, 19a, 21b, 24 and 25 where the mark scheme states otherwise, the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.					
Question	Working	Answer	Mark	Notes	
1 (a)		5^{19}	1	B1	
(b)			2	M1 A factor tree / division ladder of 3 or more factors ($\neq 1$), multiplying to 800, which must include 2 and 5. Condone 1 error when product $\neq 800$	
		$2 \times 2 \times 2 \times 2 \times 5 \times 5$		A1 dep on M1 oe eg $2^5 \times 5^2$	
				Total 3 marks	
2	$10 \times 5 + 30 \times 11 + 50 \times 8 + 70 \times 19 + 90 \times 9$ ($50 + 330 + 400 + 1330 + 810$)		3	M2 Correct products using midpoints (allowing one error) with intention to add. M1 for products using frequency and a consistent value within the range (allowing one error) with intention to add. or correct products using midpoints without addition (allow 1 error)	
		2920		A1 N.B. $2920 \div 52 (=56.2...)$ scores M2A0	
				Total 3 marks	
3	$4x$ or $x - 7$ $x + 4x + x - 7 = 137$ oe $x = 144 \div 6 (=24)$ or $6x = 144$ or $6x - 144 = 0$		4	M1 Correct expression for B or C	
				M1 Correct equation	
				M1 Gathering up the x's and numbers Dep on previous M1	
		17		A1	
				Total 4 marks	



10	(a)		2×3^{37}	1	B1
	(b)	$2 \times 3^{43} \times 2^4 \times 3^{37}$ or $2^5 \times 3^p$ ($p \neq 80$) or $2^q \times 3^{80}$ ($q \neq 5$)		2	M1
			$2^5 \times 3^{80}$		A1
					Total 3 marks



International GCSE Maths				
Apart from questions 2, 6, 15, 18 and 26, the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.				
Q	Working	Answer	Mark	Notes
1	0.4×280 oe		2	M1
		112		A1 cao SC B1 for 168
				Total 2 marks
2	 Factor tree for 880: $880 \rightarrow 88 \times 10 \rightarrow 8 \times 11 \times 2 \times 5 \rightarrow 2 \times 2 \times 2 \times 11 \times 5$ Division table for 880: $\begin{array}{r} 2 \overline{) 880} \\ 2 \overline{) 440} \\ 2 \overline{) 220} \\ 2 \overline{) 110} \\ 5 \overline{) 55} \\ 11 \overline{) 11} \\ \downarrow \\ 1 \end{array}$		3	M1 for continual prime factorisation (at least two correct steps anywhere) or at least two stages of a factor tree, or table, correct. eg if first stage wrong, 800×80 then $800 = 80 \times 10$ and $80 = 40 \times 2$ would count as 2 correct steps.
				M1 dep M1 for a fully correct factor tree or a list (2,2,2,2,5,11) condone inclusion of 1's on branch ends. or $2 \times 2 \times 2 \times 2 \times 5 \times 11$
		$2^4 \times 5 \times 11$		A1 dep M2 for $2^4 \times 5 \times 11$ (with working seen)
				Total 3 marks

International GCSE Maths																		
Apart from questions 1, 2, 4b, 5, 8, 12d, 19, 21, 23 (where the mark scheme states otherwise) the correct answer, unless clearly obtained from an incorrect method, should be taken to imply a correct method.																		
Question	Working	Answer	Mark	Notes														
1	eg $2 \times 2 \times 150$ or $3 \times 5 \times 40$ or $2 \times 3 \times 100$ or $5^2 \times 24$ or eg  or <table border="1"><tr><td>2</td><td>600</td></tr><tr><td>2</td><td>300</td></tr><tr><td></td><td>150</td></tr></table>	2	600	2	300		150		3	M1 for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 150 (see LHS for examples of the amount of work needed for the award of this mark, allow no more than one mistake ft (eg one mistake with 2 prime factors ft: $600 = 200 \times 30 = 2 \times 100 \times 5 \times 6$))								
2	600																	
2	300																	
	150																	
	eg $2 \times 2 \times 2 \times 3 \times 5 \times 5$  oe <table border="1"><tr><td>2</td><td>600</td></tr><tr><td>2</td><td>300</td></tr><tr><td>2</td><td>150</td></tr><tr><td>3</td><td>75</td></tr><tr><td>5</td><td>25</td></tr><tr><td>5</td><td>5</td></tr><tr><td></td><td>[1]</td></tr></table> oe	2	600	2	300	2	150	3	75	5	25	5	5		[1]			M1 for 2, 2, 2, 3, 5, 5 (ignore 1s) (may be a fully correct factor tree or ladder)
2	600																	
2	300																	
2	150																	
3	75																	
5	25																	
5	5																	
	[1]																	
	Working required and note that the answer must be given as a product of powers of prime factors	$2^3 \times 3 \times 5^2$		A1 dep on M2 can be any order (allow $2^3 \cdot 3 \cdot 5^2$)														
				Total 3 marks														



7	E.g. $2 \times 2 \times 900$ or $2^2 \times 900$ or $2 \times 3 \times 600$ or $2 \times 5 \times 360$ or $3 \times 3 \times 400$ or $3^2 \times 400$ or $3 \times 5 \times 240$ or $5 \times 5 \times 144$ or $5^2 \times 144$ E.g. <table><tr><td>2</td><td>3600</td></tr><tr><td>2</td><td>1800</td></tr><tr><td></td><td>900</td></tr></table> E.g. <pre> 3600 / \ 2 1800 / \ 2 900</pre>	2	3600	2	1800		900	3	M1 for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 900 (see LHS for examples of the amount of work needed for the award of this mark, allow no more than one mistake ft in factor tree or table (eg one mistake with 2 prime factors ft: $3600 = 1800 \times 20 = 2 \times 900 \times 4 \times 5$ or $360 = 2 \times 2 \times 90$)												
2	3600																				
2	1800																				
	900																				
	E.g. $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$ E.g. <table><tr><td>2</td><td>3600</td></tr><tr><td>2</td><td>1800</td></tr><tr><td>2</td><td>900</td></tr><tr><td>2</td><td>450</td></tr><tr><td>3</td><td>225</td></tr><tr><td>3</td><td>75</td></tr><tr><td>5</td><td>25</td></tr><tr><td>5</td><td>5</td></tr><tr><td></td><td>(1)</td></tr></table> E.g. <pre> 3600 / \ 2 1800 / \ 2 900 / \ 2 450 / \ 2 225 / \ 3 75 / \ 3 25 / \ 5 5</pre>	2	3600	2	1800	2	900	2	450	3	225	3	75	5	25	5	5		(1)		M1 for 2, 2, 2, 2, 3, 3, 5, 5 or $2^4, 3^2, 5^2$ or $2^4 + 3^2 + 5^2$ (ignore 1s) (may be a fully correct factor tree or ladder)
2	3600																				
2	1800																				
2	900																				
2	450																				
3	225																				
3	75																				
5	25																				
5	5																				
	(1)																				
	Working required	$2^4 \times 3^2 \times 5^2$	A1 dep on M2 can be any order (allow $2^4 \cdot 3^2 \cdot 5^2$) (SCB1 for $3.6 \times 2^3 \times 5^3$)																		
			Total 3 marks																		



7	2×2×7 or 2×3×7 or 3 ² ×7 oe condone 1's in factor tree or showing at least 5 correct multiples across at least 2 lists (excluding 28, 42, 63) (28) 56, 84, 112, 140, 168, 196, 224, 252 (42) 84, 126, 168, 210, 252 (63) 126, 189, 252					3	M1 accept prime factors seen in factor tree or correct position in Venn diagram for at least one of the numbers given.	
	2×2×7 and 2×3×7 and 3×3×7 or showing at least 9 correct multiples across all 3 lists (excluding 28, 42, 63)						M1 accept prime factors seen in factor tree or correct position in Venn diagram for all 3 of the numbers given.	
					252		A1 or 2 ² ×3 ² ×7 oe Dep on M1	
7 alt	7	28	42	63		3	M1	For one correct row in table eg division by 7 gives 4, 6, 9
	2	4	6	9				
	3	2	3	9				
		2	1	3				
	oe							
	or							
	7	28	42	63				
	2	4	6	9				
	3	2	3	9				
	2	2	1	3				
3	1	1	3					
(1)	1	1	1					
					252		A1 or 2 ² ×3 ² ×7 oe Dep on M1	
							Total 3 marks	

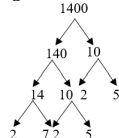
11	$(AB^2 =) 7.5^2 - 6^2 (= 20.25)$ or eg $(BAC =) \sin^{-1}\left(\frac{6}{7.5}\right) (= 53.1\dots)$ or $\cos(BCA) = \frac{6}{7.5} (= 0.8)$		6	M1	for a correct first step to find AB or a complete method to find angle BAC or a correct first step to find angle BCA
	$(AB =) \sqrt{7.5^2 - 6^2} (= 4.5)$ or $(AB =) \frac{6}{\tan "53.1"} (= 4.5\dots)$ or $(AB =) 7.5 \cos "53.1" (= 4.5\dots)$ or $(BCA =) \cos^{-1}\left(\frac{6}{7.5}\right) (= 36.8\dots)$			M1	for a complete method to find AB or angle BCA
	$(\text{Area } ABC =) \frac{1}{2} \times 6 \times "4.5" (= 13.5)$ or $(\text{Area } ABC =) \frac{1}{2} \times 6 \times 7.5 \times \sin ("36.8") (= 13.47\dots \text{ or } 13.5)$			M1	ft [their labelled AB] or [their labelled BCA] eg for $\frac{1}{2} \times 6 \times$ [their labelled AB] or $\frac{1}{2} \times 6 \times 7.5 \times \sin$ [their labelled BCA]
	$(\text{Area } DAC =) 31.5 - "13.5" (= 18)$ or $"13.5" + 0.5 \times 7.5 \times AD = 31.5$ oe			M1	ft (dep on previous M1) allow $31.5 -$ [their area]
	$(AD =) ("18" \div 7.5) \div 0.5$ oe			M1	for a complete method to find AD , dependent on correct working
				4.8	A1
				Total 6 marks	

12	(a)	$3^2 \times 5 \times 7$	1	B1	accept $3 \times 3 \times 5 \times 7$ oe or 315
	(b)	$3^{11} \times 5^7 \times 7^5$	2	B2	fully correct answer (allow $x = 11, y = 7, z = 5$)
					(B1 for an answer in the form $3^p \times 5^q \times 7^r$ where one or two of p, q or r are correct)
					Total 3 marks

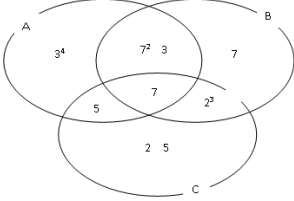


2	eg $2 \times 2 \times 300$ $2 \times 5 \times 120$ $2 \times 3 \times 200$ $3 \times 5 \times 80$ or eg 1200 2 600 3 200 or <table><tr><td>2</td><td>1200</td></tr><tr><td>3</td><td>600</td></tr><tr><td></td><td>200</td></tr></table>	2	1200	3	600		200		3	M1 for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 300 (allow no more than one mistake ft (eg <i>one mistake</i> with 2 prime factors ft $1200 = 20 \times 600 = 2 \times 10 \times 3 \times 200$))										
2	1200																			
3	600																			
	200																			
	2, 2, 2, 2, 3, 5, 5 or 1200 2 600 3 200 2 100 5 10 2 2 2 5 2 5 oe <table><tr><td>2</td><td>1200</td></tr><tr><td>3</td><td>600</td></tr><tr><td>2</td><td>200</td></tr><tr><td>5</td><td>100</td></tr><tr><td>2</td><td>20</td></tr><tr><td>5</td><td>10</td></tr><tr><td>2</td><td>2</td></tr><tr><td></td><td>(1)</td></tr></table>	2	1200	3	600	2	200	5	100	2	20	5	10	2	2		(1)			M1 for finding the correct prime factors condone inclusion of 1 (may be seen in a fully correct factor tree or ladder)
2	1200																			
3	600																			
2	200																			
5	100																			
2	20																			
5	10																			
2	2																			
	(1)																			
		$2^4 \times 3 \times 5^2$		A1 (dep on M2 as working requested) Can be in any order (allow $2^4 \cdot 3 \cdot 5^2$) but must be in index form as asked for.																
				Total 3 marks																

International GCSE Maths																		
Apart from Questions 1, 12, 15, 16 and 18 (where the mark scheme states otherwise), the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.																		
1	e.g. $2 \times 5 \times 225$ or $5 \times 5 \times 90$ or $5^2 \times 90$ $3 \times 5 \times 150$ or $3 \times 3 \times 250$ or $3^2 \times 250$ e.g. <table><tr><td>2</td><td>2250</td></tr><tr><td>5</td><td>1125</td></tr><tr><td></td><td>225</td></tr></table>	2	2250	5	1125		225	e.g. <pre> 2250 / \ 2 1125 / \ 5 225 / \ 3 75 / \ 5 15 / \ 3 5</pre>	3	M1 for 2 correct stages in prime factorisation with 0 incorrect stages or at least 3 stages in prime factorisation with no more than 1 incorrect stage. Each stage gives 2 factors – may be in a factor tree or a table or listed eg 2, 2, 225 (see LHS for examples of the amount of work needed for the award of this mark). Example of 3 stages with 1 incorrect stage: $2250 = 225 \times 100 = 3 \times 5 \times 15 \times 100$ or $225 = 3 \times 5 \times 15$								
2	2250																	
5	1125																	
	225																	
	e.g. $2 \times 3 \times 3 \times 5 \times 5 \times 5$ e.g. <table><tr><td>2</td><td>2250</td></tr><tr><td>5</td><td>1125</td></tr><tr><td>3</td><td>225</td></tr><tr><td>5</td><td>75</td></tr><tr><td>3</td><td>15</td></tr><tr><td>5</td><td>5</td></tr><tr><td></td><td>(1)</td></tr></table>	2	2250	5	1125	3	225	5	75	3	15	5	5		(1)	e.g. <pre> 2250 / \ 2 1125 / \ 5 225 / \ 3 75 / \ 5 15 / \ 3 5</pre>		M1 for 2, 3, 3, 5, 5, 5 or $2 \times 3 \times 3 \times 5 \times 5 \times 5$ or $2, 3^2, 5^3$ oe or $2 + 3^2 + 5^3$ (ignore 1s) (may be a fully correct factor tree or ladder)
2	2250																	
5	1125																	
3	225																	
5	75																	
3	15																	
5	5																	
	(1)																	
	Working required	$2 \times 3^2 \times 5^3$		A1 dep on M2 can be any order (allow $2 \cdot 3^2 \cdot 5^3$)														
Total 3 marks																		

International GCSE Maths																		
Apart from Questions 1, 6a, 10, 18, 20, 22 and 25 the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method																		
Values in quotation marks must come from a correct method previously seen unless clearly stated otherwise.																		
Q	Working	Answer	Mark	Notes														
1	eg $2 \times 2 \times 350$ or $2 \times 7 \times 100$ or $2 \times 5 \times 140$ or $5 \times 7 \times 40$ or $5 \times 5 \times 56$ or $(14 \times 100 =) 2 \times 7 \times 100$ or $(28 \times 50 = 4 \times 7 \times 50 =) 2 \times 2 \times 7 \times 50 =$ or <table border="1"><tr><td>2</td><td>1400</td></tr><tr><td>2</td><td>700</td></tr><tr><td></td><td>350</td></tr></table>	2	1400	2	700		350		3	M1 for 2 correct stages in prime factorisation with 0 incorrect stages or at least 3 stages in prime factorisation with no more than 1 incorrect stage. Each stage gives 2 factors – may be in a factor tree or a table or listed eg 2, 2, 350 (see LHS for examples of the amount of work needed for the award of this mark). Example of 3 stages with 1 incorrect stage: stage: $1400 = 10 \times 14 = 2 \times 5 \times 2 \times 7$								
2	1400																	
2	700																	
	350																	
	eg 2, 2, 2, 5, 5, 7 <table border="1"><tr><td>eg</td><td></td></tr><tr><td>2</td><td>1400</td></tr><tr><td>2</td><td>700</td></tr><tr><td>5</td><td>350</td></tr><tr><td>2</td><td>70</td></tr><tr><td>5</td><td>35</td></tr><tr><td></td><td>7</td></tr></table> eg 	eg		2	1400	2	700	5	350	2	70	5	35		7			M1 dep on M1 for $2 \times 2 \times 2 \times 5 \times 5 \times 7$ or $2^3, 5^2, 7$ or $2^3 + 5^2 + 7$ (Ignore 1's) (may be seen in a fully correct factor tree or ladder)
eg																		
2	1400																	
2	700																	
5	350																	
2	70																	
5	35																	
	7																	
		$2^3 \times 5^2 \times 7$		A1 dep on M2 (do not allow 1 in the final answer) Can be in any order (allow $2^3 \cdot 5^2 \cdot 7$) but must be in index form as asked for.														
	Working required			Total 3 marks														

2	eg $2 \times 2 \times 350$ or $2 \times 7 \times 100$ or $2 \times 5 \times 140$ or $5 \times 5 \times 56$ or $7 \times 5 \times 40$ or $(14 \times 100 = 14 \times 25 \times 4 =) 2 \times 7 \times 25 \times 4$ eg<table><tr><td>2</td><td>1400</td></tr><tr><td>2</td><td>700</td></tr><tr><td></td><td>350</td></tr></table> eg<pre> 1400 / \ 2 700 / \ 2 350</pre>	2	1400	2	700		350	3	M1 for finding 2 prime factors after at least 2 stages of prime factorisation with 0 incorrect stages or for finding 2 prime factors after at least 3 stages of prime factorisation with no more than 1 incorrect stage Each stage gives 2 factors – may be in a factor tree or a table or listed (see LHS for examples of the amount of work needed for the award of this mark) but we want to see 2 prime factors. Example of finding 2 prime factors after at least 3 stages with 1 incorrect stage: $1400 = 10 \times 14 = 2 \times 5 \times 2 \times 7$						
2	1400														
2	700														
	350														
	eg $2 \times 2 \times 2 \times 5 \times 5 \times 7$ eg<table><tr><td>2</td><td>1400</td></tr><tr><td>2</td><td>700</td></tr><tr><td>2</td><td>350</td></tr><tr><td>5</td><td>175</td></tr><tr><td>5</td><td>35</td></tr><tr><td></td><td>7</td></tr></table> eg<pre> 1400 / \ 2 700 / \ 2 350 / \ 2 175 / \ 5 35 / \ 5 7</pre>	2	1400	2	700	2	350	5	175	5	35		7		M1 dep on M1 for factors 2, 2, 2, 5, 5, 7 identified with no others in any form, eg listed, multiplied, added Ignore 1s May be seen in a fully correct factor tree or ladder
2	1400														
2	700														
2	350														
5	175														
5	35														
	7														
	Working required	$2^3 \times 5^2 \times 7$	A1 dep on M2 May be in any order and allow $2^3 \times 5^2 \times 7$												
			Total 3 marks												

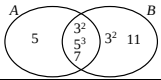
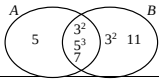
Question	Working	Answer	Mark	Notes
8 a (i)		3×7^3	1	B1 for 3×7^3 oe or 1029
(ii)		$2^3 \times 3^5 \times 5 \times 7^4$	1	B1 for $2^3 \times 3^5 \times 5 \times 7^4$ oe or 23 337 720
b		4, 2, 1	2	M1 for $r = 1$ or for $p = 4$ and $q = 2$ or correct representation of C in terms of prime factors on a Venn diagram A1

Question	Working	Answer	Mark	Notes																								
6 (a)	$2 \times 2 \times 2 \times 2 \times 2 \times 3$ or $2 \times 2 \times 2 \times 3 \times 5$ e.g. <table><tr><td>2</td><td>96</td><td>120</td></tr><tr><td>2</td><td>48</td><td>60</td></tr><tr><td>2</td><td>24</td><td>30</td></tr><tr><td>3</td><td>12</td><td>15</td></tr><tr><td></td><td>4</td><td>5</td></tr></table> <table><tr><td>6</td><td>96</td><td>120</td></tr><tr><td>4</td><td>16</td><td>20</td></tr><tr><td></td><td>4</td><td>5</td></tr></table>	2	96	120	2	48	60	2	24	30	3	12	15		4	5	6	96	120	4	16	20		4	5			M1 for one number written as product of prime factors number may be at the end of factor trees or on 'ladder' diagrams or Use of table method (allow 1 error), 2 examples shown but could have 2, 3, 4, 6, 12, 24 along the side or at least 2 factors for each (excluding 1, 96, 120)
2	96	120																										
2	48	60																										
2	24	30																										
3	12	15																										
	4	5																										
6	96	120																										
4	16	20																										
	4	5																										
(b)		24	2	A1 or $2^3 \times 3$ oe M1 for $2^m \times 3^n \times 5^p \times 7^q \times 11^r$ with at least two of $m = 4, n = 1, p = 2, q = 2, r = 1$ (or omission of one with others fully correct) NB: e.g. 2^4 could be 2×2^3 or prime numbers may be seen in a Venn diagram – if so must be correctly placed																								
		646 800	2	A1 or $2^4 \times 3 \times 5^2 \times 7^2 \times 11$ oe																								

3	(i)		12, 18	1	B1
	(ii)		12, 14, 15, 16, 18, 20	1	B1
	(iii)		11, 13, 15, 17, 19	1	B1
					Total 3 marks

4	e.g. $4x - 8x = 17 + 13$ oe		2	M1	For collecting terms in x and number terms on either side of a correct equation
		-7.5		A1	oe e.g. $-\frac{30}{4}$
					Total 2 marks

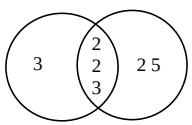
5	(a)	e.g. $720 = 2 \times 360 = 2 \times 2 \times 180$ or $720 = 3 \times 240 = 3 \times 3 \times 80$ etc		3	M1	At least 2 correct stages in prime factorisation
		2, 2, 2, 2, 3, 3, 5			M1	condone inclusion of 1 (may be a fully correct factor tree or ladder)
			$2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$		A1	dep on M2, accept $2^4 \times 3^2 \times 5$
	(b)		5	1	B1	
						Total 4 marks

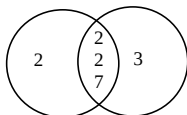
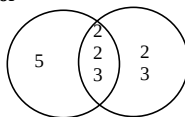
Question	Working	Answer	Mark	Notes
8	(a)		2	M1 3 ² × 5 ³ × 7 oe or correct Venn diagram
	(b)		2	M1 3 ⁴ × 5 ⁴ × 7 × 11 oe or correct Venn diagram
		7875		A1
		3 898 125		A1
				Total 4 marks
9	(a)	8.4 × 10 ⁵	1	B1
	(b)	$\frac{600000000}{0.08}$ or 750000000 oe (e.g 0.75 × 10 ⁹)	2	M1 M1 for 60000000 or 0.08
		7.5 × 10 ⁸		A1
				Total 3 marks
10		150000 × 0.82 ³	3	M2 If not M2 then M1 for 1st year e.g 150000 × 0.82 (= 123000) or 150000 × 0.18 (= 27000) SC B1 for 150000 × 1.18 (= 177000) or 150000 × 1.18 ³ (= 246454.8) or 150000 × 0.54 (= 81000) or 150000 × 0.46 (= 69000) Accept 82705.2
		82705		A1
				Total 3 marks
11		Gradient = (-)4 ÷ 2 oe	3	M1 Correct method to work out the gradient (±) accept 4 ÷ 2 oe or "m" = 2
		y = - 2x - 1 oe		A2 If not A2 then A1 for L = - 2x - 1 or - 2x - 1 or y = 2x - 1 or y = - 2x + c
				Total 3 marks

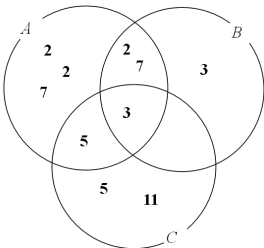
8	$(5 - 2) \times 180 \div 5 (= 108)$ or $360 \div 5 (= 72)$		5	M1	for method to find an interior or exterior angle of a pentagon
	$(6 - 2) \times 180 \div 6 (= 120)$ or $360 \div 6 (= 60)$			M1	for method to find an interior or exterior angle of a hexagon
	$360 - 108 - 120 (= 132)$ or $60 + 72 (= 132)$ or $(180 - '120') + (180 - '108')$			M1	dep on M2 for a correct method to find angle <i>EDI</i> using correct figures
	$360 - '72' - '60' - '132' (= 96)$			M1	for a complete method to find angle <i>x</i>
		96		A1	dep on correct working
					Note: Angles may be seen on diagram throughout
Total 5 marks					

9	a		$2^6 \times 3 \times 11^4$	2	B2	oe, accept 2811072
					B1	for $2^a \times 3^b \times 11^c$ oe where two of <i>a</i> , <i>b</i> and <i>c</i> are correct
	b		$2^9 \times 3^5 \times 11^8$	2	B2	cao
					B1	for $2^a \times 3^b \times 11^c$ oe where two of <i>a</i> , <i>b</i> and <i>c</i> are correct or $2.666... \times 10^{13}$ or an equivalent expression for e.g. $2^2 \times 2^7 \times 3^5 \times 11^3 \times 11^5$
Total 4 marks						

5			4	B1 for 80
	for $\frac{a+75}{2} = 74$ oe or 73			M1 for setting up an equation using the median or for 73
	for $80 - 16 (= 64)$ oe			M1 for using the range correctly or for 64
		64, 73, 80		A1 answers can be in any order
				Total 4 marks

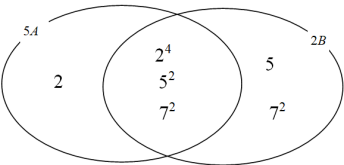
6	(a)	36, 72, 108, ... and 120, 240, 360, ... or 2, 2, 3, 3 and 2, 2, 2, 3, 5 or  <table border="1" data-bbox="604 1061 748 1151"><tr><td>2</td><td>36</td><td>120</td></tr><tr><td>2</td><td>18</td><td>60</td></tr><tr><td>3</td><td>9</td><td>30</td></tr><tr><td></td><td>3</td><td>10</td></tr></table> or $\frac{36 \times 120}{12}$ or 2, 2, 2, 3, 3, 5 oe	2	36	120	2	18	60	3	9	30		3	10		2	M1 for any correct valid method e.g. for starting to list at least three multiples of each number 2, 2, 3, 3 and 2, 2, 2, 3, 5 seen (may be in a factor tree or a ladder diagram and ignore 1) (Allow 2×2 as 4) or a fully correct “Venn” diagram
2	36	120															
2	18	60															
3	9	30															
	3	10															
			360		A1 or $2^3 \times 3^2 \times 5$ oe (allow $2^3 \cdot 3^2 \cdot 5$)												
	(b)		$5^2 \times 7^4 \times 11$	2	B2 for $5^2 \times 7^4 \times 11$ (in any order) (B1 for 660 275 or correct unsimplified product or $5^a \times 7^b \times 11^c$ where 2 of a, b and c are correct)												
					Total 4 marks												

3	(a)	1, 2, 4, 7, 8, 14, 28, 56 and 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84 or 2 2 2 7 and 2 2 3 7 or  <table data-bbox="611 871 751 943"><tr><td colspan="3">e.g.</td></tr><tr><td>28</td><td>56</td><td>84</td></tr><tr><td></td><td>2</td><td>3</td></tr></table>	e.g.			28	56	84		2	3		2	M1 for any correct valid method and no errors e.g. for starting to list at least four different factors of each number and no errors or 2 2 2 7 and 2 2 3 7 seen (may be in a factor tree or a ladder diagram and ignore 1) or a fully correct Venn diagram or other clear method, e.g, table						
e.g.																				
28	56	84																		
	2	3																		
			28		A1 dep M1 accept $2^2 \times 7$ oe															
	(b)	60, 120, 180, 240... and 72, 144, 216, 288... or 2 2 3 5 and 2 2 2 3 3 or  <table data-bbox="611 1117 751 1238"><tr><td>2</td><td>60</td><td>72</td></tr><tr><td>2</td><td>30</td><td>36</td></tr><tr><td>3</td><td>15</td><td>18</td></tr><tr><td>2</td><td>5</td><td>6</td></tr><tr><td></td><td></td><td>3</td></tr></table> or $\frac{60 \times 72}{12}$ or 2, 2, 2, 3, 3, 5 oe	2	60	72	2	30	36	3	15	18	2	5	6			3		2	M1 for any correct valid method and no errors e.g. for starting to list at least four multiples of each number or 2 2 3 5 and 2 2 2 3 3 seen (may be in a factor tree or a ladder diagram and ignore 1) or a fully correct Venn diagram or other clear method, e.g, table
2	60	72																		
2	30	36																		
3	15	18																		
2	5	6																		
		3																		
			360		A1 dep M1 accept $2^3 \times 3^2 \times 5$ oe															
					Total 4 marks															

7	(a)	$2 \times 2 \times 2 \times 5 \times 5$ or 2, 2, 2, 5, 5 or $2 \times 2 \times 3 \times 5 \times 7$ or 2, 2, 3, 5, 7 or eg <table><tr><td>2</td><td>200</td><td>420</td></tr><tr><td>2</td><td>100</td><td>210</td></tr><tr><td>5</td><td>50</td><td>105</td></tr><tr><td></td><td>10</td><td>21</td></tr></table>	2	200	420	2	100	210	5	50	105		10	21		2	M1 for one number written as a product of prime factors or prime factors listed – numbers may be at end of factor trees or on ‘ladder diagrams’ or in a table or in a Venn diagram or at least two factors for each (excluding 1, 200, 420)
2	200	420															
2	100	210															
5	50	105															
	10	21															
		Correct answer scores full marks (unless from obvious incorrect working)	20		A1 or $2^2 \times 5$ oe												
	(b)			2	M1 for $2^m \times 3^n \times 5^p \times 7^q \times 11^r$ with at least three of $m = 3, n = 2, p = 2, q = 2, r = 1$ (all 5 terms should be seen) or omission of one term with others fully correct OR prime factors seen in a Venn diagram – if so must be fully correct												
		Correct answer scores full marks (unless from obvious incorrect working)	$2^3 \times 3^2 \times 5^2 \times 7^2 \times 11$		A1 allow 970 200 oe												
Total 4 marks																	

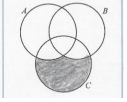
8	(a)	eg $2 \times 2 \times 75$ or $3 \times 5 \times 20$ or $2 \times 3 \times 50$ or $5^2 \times 12$ or <table border="1"><tr><td>2</td><td>300</td></tr><tr><td>2</td><td>150</td></tr><tr><td></td><td>75</td></tr></table>	2	300	2	150		75		2	M1 for 2 correct stages in prime factorisation with 0 incorrect stages or at least 3 stages in prime factorisation with no more than 1 incorrect stage. Each stage gives 2 factors – may be in a factor tree or a table or listed eg 2, 2, 75 (see LHS for examples of the amount of work needed for the award of this mark). Example of 3 stages with 1 incorrect stage: $300 = 100 \times 30 = 2 \times 50 \times 5 \times 6$
	2	300									
	2	150									
	75										
	Working required		$2 \times 2 \times 3 \times 5 \times 5$	A1 dep on M1, oe eg $2^2 \times 3 \times 5^2$							
(b)	(5A =) $2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$ oe (= 1800) or (5A =) $2^3 \times 3^2 \times 5^2$ (= 1800) or (7B =) $2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 7$ oe (= 3780) or (7B =) $2^2 \times 3^3 \times 5 \times 7$ (= 3780)		2	M1 for method to find 5A or 7B as prime factors (may be seen in factor tree, table or Venn diagram) or as an integer or for listing at least 3 multiples of each number eg 1800, 3600, 5400... and 3780, 7560, 11340... or for an answer of 1080 oe eg $2^3 \times 3^3 \times 5$							
	Working required		37800	A1 dep on M1, oe eg $2^3 \times 3^3 \times 5^2 \times 7$							
Total 4 marks											

2	9, 18, 27, 36 and 12, 24, 36 or 36 or a multiple of 36 or (9 × 12 =) 108 or 3 ² × 4 (= 36) (from Venn diagram or table)		4	M1 for at least two multiples of 9 and 12 or 36 or a multiple of 36																					
	“4” × 7.6(0) or “3” × 4.8(0) or “30.4” or “14.4” or “4n” × 7.6(0) or “3n” × 4.8(0)			M1 for a correct method to find the cost of 4 or 8 or 12 etc of packets of pens or 3 or 6 or 9 etc packets of pencils																					
	“4” × 7.6(0) + “3” × 4.8(0) or “30.4” + “14.4” or “4n” × 7.6(0) + “3n” × 4.8(0)			M1 for a correct combination of number of packets of pens × 7.6(0) + number of packets of pencils × 4.8(0) with an intention to add eg <table><tr><td>pens</td><td>pencils</td><td></td></tr><tr><td>4 × 7.60 +</td><td>3 × 4.8 =</td><td>44.8(0)</td></tr><tr><td>8 × 7.60 +</td><td>6 × 4.8 =</td><td>89.6(0)</td></tr><tr><td>12 × 7.60 +</td><td>9 × 4.8 =</td><td>134.4(0)</td></tr><tr><td>16 × 7.60 +</td><td>12 × 4.8 =</td><td>179.2(0)</td></tr><tr><td>36 × 7.60 +</td><td>27 × 4.8 =</td><td>403.2(0)</td></tr><tr><td>48 × 7.60 +</td><td>36 × 4.8 =</td><td>537.6(0)</td></tr></table>	pens	pencils		4 × 7.60 +	3 × 4.8 =	44.8(0)	8 × 7.60 +	6 × 4.8 =	89.6(0)	12 × 7.60 +	9 × 4.8 =	134.4(0)	16 × 7.60 +	12 × 4.8 =	179.2(0)	36 × 7.60 +	27 × 4.8 =	403.2(0)	48 × 7.60 +	36 × 4.8 =	537.6(0)
pens	pencils																								
4 × 7.60 +	3 × 4.8 =	44.8(0)																							
8 × 7.60 +	6 × 4.8 =	89.6(0)																							
12 × 7.60 +	9 × 4.8 =	134.4(0)																							
16 × 7.60 +	12 × 4.8 =	179.2(0)																							
36 × 7.60 +	27 × 4.8 =	403.2(0)																							
48 × 7.60 +	36 × 4.8 =	537.6(0)																							
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	44.8(0)		A1 allow 45 if 44.8(0) seen allow 4480 p or pence if £ sign crossed out M3A0 for 44.8n where n is an integer (eg 134.4(0))																					
				Total 4 marks																					

11 (a)		$2^4 \times 5^2 \times 7^2$	2	B2 for $2^4 \times 5^2 \times 7^2$ oe eg $2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7 \times 7$ (B1 for $2^m \times 5^n \times 7^p$ with 2 of $m = 4, n = 2, p = 2$ or for 19 600 without sight of the correct factorisation or a fully correct Venn diagram for 5A and 2B or an answer of $2^3 \times 5 \times 7^2$ oe)
(b)	$(AB) = 2^8 \times 5^4 \times 7^6$ or $(A^2) = 2^{10} \times 5^2 \times 7^4$ or $(B^2) = 2^6 \times 5^6 \times 7^8$ or $((AB)^2) = 3.5 \dots \times 10^{30}$ oe		2	M1 for a correct product of prime factors for AB or A^2 or B^2 or for $(AB)^2$ evaluated
	Correct answer scores full marks (unless from obvious incorrect working)	$2^{16} \times 5^8 \times 7^{12}$		A1 for $2^{16} \times 5^8 \times 7^{12}$ oe if no other marks are awarded, award SCB1 for $2^c \times 5^d \times 7^f$ with 2 of $c = 16, d = 8, f = 12$)
Total 4 marks				

Question	Working	Answer	Mark	Notes
8	eg $8x + 4y = 18 +$ $x - 4y = 9$ or $4x + 2y = 9 -$ $4x - 16y = 36$ or $4(9 + 4y) + 2y = 9$	$x = 3,$ $y = -1.5$	3	M1 correct method to eliminate x or y : coefficients of x or y the same and correct operation to eliminate the selected variable (condone any one arithmetic error in multiplication) or writing x or y in terms of the other variable and correctly substituting
	eg $4 \times "3" + 2y = 9$ or $4x + 2 \times "-1.5" = 9$ or $x = 9 + 4 \times "-1.5"$			M1 (dep) correct method to find second variable using their value from a correct method to find first variable or for repeating above method to find second variable
				A1 oe, dep first M1
9 (a)		4.8×10^{11}	1	B1
(b)		$2^{14} \times 3 \times 5^{10}$	3	B3 for the correct answer B2 for an answer in the form $2^m \times 3 \times 5^n$, where m and n are positive integers B1 for at least 2 correct steps in repeated prime factorisation (including tree diagram)
(c)		29 296 875	1	B1 Accept 3×5^{10} , 2.9296875×10^7



13	(a)			1	B1 Professional judgment required, eg allow double shading if meaning clear.
	(b)		$(D \cup E) \cap F$	1	B1 oe eg $(D \cap F) \cup (E \cap F)$
					Total 2 marks

14	(a)		0.7, 0.2, 0.8, 0.1, 0.9	2	B2 oe, all correct
	(b)	$0.3 \times "0.2" (= 0.06)$ or $0.7 \times "0.1" (= 0.07)$ oe		4	M1 ft from (a) dep on probabilities being between 0 and 1, OR $0.3 \times "0.8" (= 0.24)$ or $0.7 \times "0.9" (= 0.63)$ oe
		$0.3 \times "0.2" + 0.7 \times "0.1" (= 0.13)$ oe or $"0.06" \times 200 (= 12)$ or $"0.07" \times 200 (= 14)$			M1 ft from (a), OR $0.3 \times "0.8" + 0.7 \times "0.9" (= 0.87)$ oe or $"0.24" \times 200 (= 48)$ or $"0.63" \times 200 (= 126)$
		$"0.13" \times 200$ oe or $"12" + "14"$			M1 ft from (a), $200 - "0.87" \times 200$ oe or $(1 - "0.87") \times 200$ or $200 - "48" - "126"$
			26	A1	cao
					Total 6 marks

3	e.g. $30 \times 20 \times 125 (= 75\,000)$ or $85 \times 40 \times 125 (= 425\,000)$ or $(60 \times 30 + (85 - 30) \times 40) \times 125 (= 500\,000)$ oe		4	M1	for a method to find the volume of water already pumped out or the volume of water left or the total volume of the container
	"75 000" $\div$ 1.5 (= 50 000) or "75 000" $\div$ 90 (= 833.3... or $\frac{2500}{3}$) or "425000" $\div$ "75000" (= 5.66... or $\frac{17}{3}$) or "500000" $\div$ "75000" (= 6.66... or $\frac{20}{3}$)			M1	M2 for $\frac{"425000"}{"75000"} \times 1.5$ oe (= 8.5) or $\frac{"500000"}{"75000"} \times 1.5$ oe (= 10)
	"425 000" $\div$ "50 000" (= 8.5) or "425 000" $\div$ ("833.3..." $\times$ 60) oe (= 8.5) or "5.66..." $\times$ 1.5 (= 8.5) or "6.66..." $\times$ 1.5 (= 10)			M1	
		20 30		A1	Allow 8 30 (pm)
Total 4 marks					

4	(i)		21, 27	1	B1
	(ii)		21, 23, 24, 25, 27, 29	1	B1
Total 2 marks					



14	(a)		7, 8, 9, 10, 11	2	B2 completely correct. (B1 for 4 or 5 correct and no more than 1 incorrect or for all terms seen correctly placed in a Venn diagram or for a correct description of the numbers in the set but not listed, eg $7 \leq x < 12$)
	(b)		eg 2, 4, 6	1	B1 for any 3 of 2, 4, 6, 8, 10
Total 3 marks					



3	a	e.g. $d - g = 2ac$ $\frac{d}{2c} = \frac{g}{2c} + a$			M1 for a correct first step e.g. subtract g from both sides OR divide all terms by 2 OR divide all terms by c OR divide all terms by $2c$
			$a = \frac{d - g}{2c}$	2	A1 oe
	b		$3f(3e - 4)$	2	B2 (B1 for $3(3ef - 4f)$ or $f(9e - 12)$ or $3f(ke - 4)$ or $3f(3e - m)$ where $k \neq 0$ and $m \neq 0$)
	c	$x^2 - 5x + 2x - 10$			M1 for any 3 correct terms or for 4 out of 4 correct terms ignoring signs or $x^2 - 3x \dots$ or for $\dots - 3x - 10$
			$x^2 - 3x - 10$	2	A1
	d	$\frac{n^{11}}{n^5}$ OR $n^{-1} \times n^7$ OR $n^4 \times n^2$ OR $n^4 \times n^7 \times n^{-5}$ OR $n^{''11''} \div n^5 = n^{(''11'' - 5)}$			M1 for simplifying two terms
			n^6	2	A1
Total 8 marks					
4	ai		b, l, u, e, g, r, y	1	B1 No incorrect or repeats
	aii		w, h, i, t	1	B1 No incorrect or repeats
	b		No with reason	1	B1 eg 'e is in all three sets' OR 'all three sets share a member' OR $B \cap G \cap W = \{\}e\{\}$
Total 3 marks					

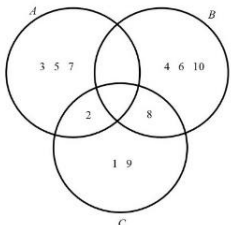


3	(a) (i)		24, 30	1	B1	No repeats, omissions or extra values
	(ii)		21, 23, 25, 27, 29	1	B1	No repeats, omissions or extra values
	(b)		$(A \cup B)'$ or $A' \cap B'$	1	B1	or $(B \cup A)'$ or $B' \cap A'$
Total 3 marks						
4	(a)		$81k^8$	2	B2	B1 for 81 or k^8 seen in their final answer.
	(b)		$7m^4n^6$	2	B2	B1 for $7m^4$ or n^6 in a product with no other terms in m or n
Total 4 marks						
5	(a)	vertices at $(-9, 6)$ $(-9, 9)$ $(-3, 9)$ $(-6, 6)$	Shape in correct position	2	B2	B1 for congruent shape in correct orientation but wrong position or quadrilateral with 2 or 3 vertices correct.
	(b)	vertices at $(7, 3)$ $(10, 6)$ $(13, 6)$ $(13, 3)$	Shape in correct position	1	B1	
	(c)		enlargement scale factor 2 centre $(-3, 3)$	3	B1 B1 B1	for enlargement, enlarge, etc so long as no mention of rotation, reflection or translation, flip, move etc. SF 2, double, two times etc. $(-3, 3)$ stated. Accept about, from etc. with no mention of line, or column vector.
Total 6 marks						

Question	Working	Answer	Mark	Notes
3	$180 + 149$ or $360 - 31$		2	M1
	<i>Working not required, so correct answer scores full marks</i>	329		A1
				Total 2 marks

Question	Working	Answer	Mark	Notes
4 (a)(i)	other seen orders of letters: a, b, d, e, i, l, n, r, z b, r, l, a, e, z, l, n, d	b, r, a, z, i, l, e, n, d	1	B1 no repeats, letters can be in any order. Condone capital letters rather than lower case letters. (no need for commas)
(ii)		b, z	1	B1 No repeats, letters can be in any order. Condone capital letters. (no need for a comma)
(b)		correct explanation that shows they know the meaning of intersection and empty set	1	B1 eg letter 'a' is in both sets $B \cap K = \{a\}$ Set B and set K have an element (or letter) in common. There is a letter that is in set B and in set K There is an intersection so it isn't the null set There is a letter in common (do not allow 'letters' or 'elements' (plural) in common) (If students mention the letter that is in common, it must be the correct one (ie a))
				Total 3 marks

4	(a)		2 3 5 7	1	B1 All numbers must be present with no repeats and no other numbers. Numbers can be in any order Allow commas, colons, etc, between the numbers
	(b)		3 7	1	B1 Both numbers must be present with no repeats and no other numbers. Numbers can be in any order Allow commas, colons, etc, between the numbers
	(c)		2 4 5 6 8	1	B1 All numbers must be present with no repeats and no other numbers. Numbers can be in any order Allow commas, colons, etc, between the numbers
					Total 3 marks

			Correct bisector with arcs	2	A1
					Total 2 marks
3	(a)	Examples There are no members that are in both A and B No members in common (in A and B) No numbers the same (in A and B) B has even numbers. A has odd numbers except 2 which is not in B Nothing in A is in B or No overlap A and B don't share any numbers	Correct statement	1	B1 for a statement which indicates correct meanings for intersection and empty set
	(b)		1 and 9	1	B1
	(c)	e.g. 	1, 2, 8, 9	2	B2 for fully correct (B1 for 3 or 4 correct with no more than one addition or a fully correct Venn diagram)

5	(a)(i)		2, 3, 4, 6, 8, 9, 10, 12	1	B1
	(ii)		1, 2, 4, 5, 7, 8, 10, 11	1	B1
	(b)(i)		$\emptyset$	1	B1
	(ii)		ϵ	1	B1
Total 4 marks					

6	(a)		$-2 < x \leq 1$	2	B2 accept $1 \geq x > -2$ or $x > -2, x \leq 1$ if not B2 then B1 for $-2 < x$ or $x \leq 1$ or $-2 \leq x < 1$ or $-2 \leq x \leq 1$ or $-2 < x < 1$ Condone use of a variable other than x but not 0
	(b)	$7a - 3a \leq 28 + 5$ or $4a \leq 33$ or $-5 - 28 \leq 3a - 7a$ or $-33 \leq -4a$		2	M1 for a terms on one side and numbers on the other. Condone = rather than $\leq$ or any other sign for this mark.
		Working required	$a \leq 8.25$		A1 (dep on M1) oe eg $a \leq \frac{33}{4}$ or $a \leq 8\frac{1}{4}$ or $8.25 \geq a$ must have correct sign on answer line (sight of correct answer in working space and just 8.25 on answer line gains M1 only).
Total 4 marks					

4	(a)(i)		9, 15	1	B1 no repeats
	(a)(ii)		9, 11, 12, 13, 15, 17, 18, 19	1	B1 no repeats or omissions
	(b)	No must be ticked along with a reason for the award of this mark	No with a correct reason	1	B1 No with eg 24/it is not in the universal set, 24/it is not between 9 and 20 (need some sort of reference that the numbers in the sets do not go beyond 20)
	(c)		10, 18 and two from 9, 11, 13, 15, 17, 19	2	B2 for 10, 18 and two from 9, 11, 13, 15, 17, 19 (B1 a set of 4 numbers of which 3 are correct or a set of 5 numbers including 10, 18, and no more than one incorrect number or a set of 3 or more numbers from {10, 18, 9, 11, 13, 15, 17, 19})
					Total 5 marks



7	(a)(i)		23, 24, 27, 29, 30, 31, 33	1	B1 in any order with no repeats
	(a)(ii)		27, 33	1	B1 in any order with no repeats
	(b)	eg 1. Yes, no members/numbers/values in common 2. Yes, nothing in common 3. Yes, no common members/numbers/values 4. Yes, they share no common members/numbers/values 5. Yes, there is not the same members/numbers/values in both sets 6. Yes, there is no intersection or there is nothing in B and C 7. Yes, as there are no members/numbers/values the same (in B and C) 8. Yes, no members/numbers/values in B are in C or vice versa 9. Yes, there are no members/numbers in B that are multiples of 3 10. Yes, there are no members/numbers/values in that empty set 11. Yes, 23, 29, 31 not in C 12. Yes, 24, 27, 30, 33 are not in B Allow sector for set This is not an exhaustive list Allow element(s) for members/numbers/values	Yes, there are no multiples of 3 in set B	1	B1 for Yes and a statement which indicates correct meanings of intersection and empty set. If no box is ticked, then the 'Yes' must be stated in the answer
	(c)		23, 25, 29, 31	2	B2 for the four correct numbers and no additions (B1 for three correct values with no more than one incorrect or for four correct values with no more than one incorrect)
Total 5 marks					

4	(a)(i)		1, 2, 3, 5, 6, 7	1	B1	in any order with no repeats
	(a)(ii)		4, 5, 7, 8, 9, 10	1	B1	in any order with no repeats
	(b)	eg 1. 2 (or 3 or 2 and 3) is in both sets oe 2. A and B have 2 (or 3 or 2 and 3) oe 3. 2 (or 3 or 2 and 3) is common oe 4. 2 (or 3 or 2 and 3) is in the intersection oe 5. $A \cap B = \{2, 3\}$ oe or $A \cap B = \{2\}$ oe or $A \cap B = \{3\}$ oe 6. They share 2 (or 3 or 2 and 3)oe 7. As 2 and/or 3 are factors of 6 and also prime numbers oe Allow sector for set This is not an exhaustive list	2 (or 3 or 2 and 3) is a member of A and B	1	B1	for identifying the element 2 or 3 or 2 and 3 with a correct explanation to show they know the meaning of intersection and empty set If students mention a number that is common, it must be correct
	(c)		1, 5, 6, 7	2	B2	for 1, 5, 6, 7 (B1 for three correct values with no more than one incorrect or for four correct values with no more than one incorrect)
						Total 5 marks

14	a		8	1	B1
	b	$A = \{10, 11, 12, 13, 14, 15, 16, 17\}$ $B = \{13, 14, 15, 16, 17, 18, 19, 20, 21\}$ or $A \cup B = \{10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21\}$			M1 may be seen in a Venn diagram (allow for example 10 – 17 for A and 13 – 21 for B or 10 – 21 for $A \cup B$) or for an answer with one missing element or one extra element
			22, 23, 24, 25	2	A1
	c	$A' = \{18, 19, 20, 21, 22, 23, 24, 25\}$ $B = \{13, 14, 15, 16, 17, 18, 19, 20, 21\}$			M1 may be seen in a Venn diagram (allow 18 – 25 for A' and 13 – 21 for B) or for an answer with one missing element or one extra element
			18, 19, 20, 21	2	A1
	d		13, 14, 15, 16, 17	1	B1
					Total 6 marks