



KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS



KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM

Year 7

2026

**Mathematics
Unit 1 Student**

2027

HGS Maths



Tasks



Dr Frost Course



Name: _____

Class: _____

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1 Factors, Multiples and Primes

1.1 Types of Numbers

FIRST 15 SQUARE NUMBERS

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Square	1	4	9	16	25	36	49	64	81	100	121	144	169	225

FIRST 10 CUBE NUMBERS

Number	1	2	3	4	5	6	7	8	9	10
Cube	1	8	27	64	125	216	343	512	729	1000

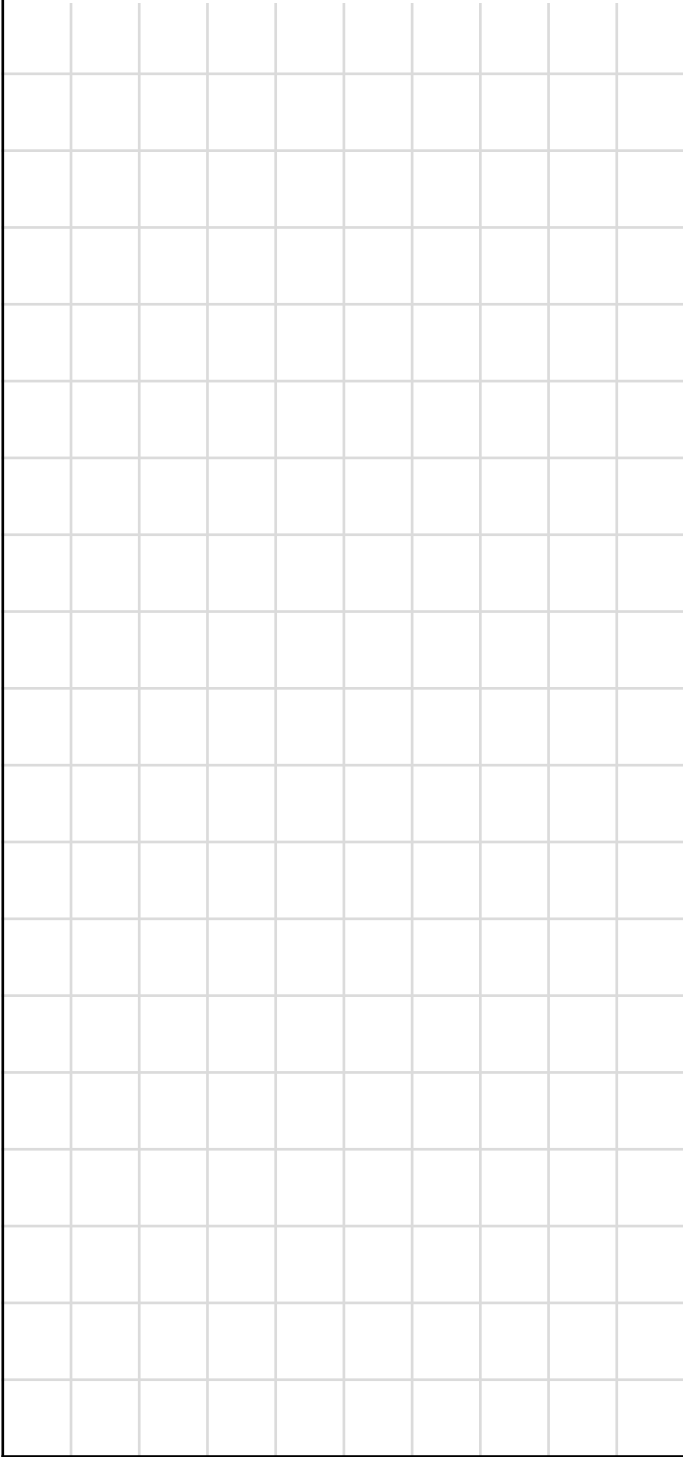
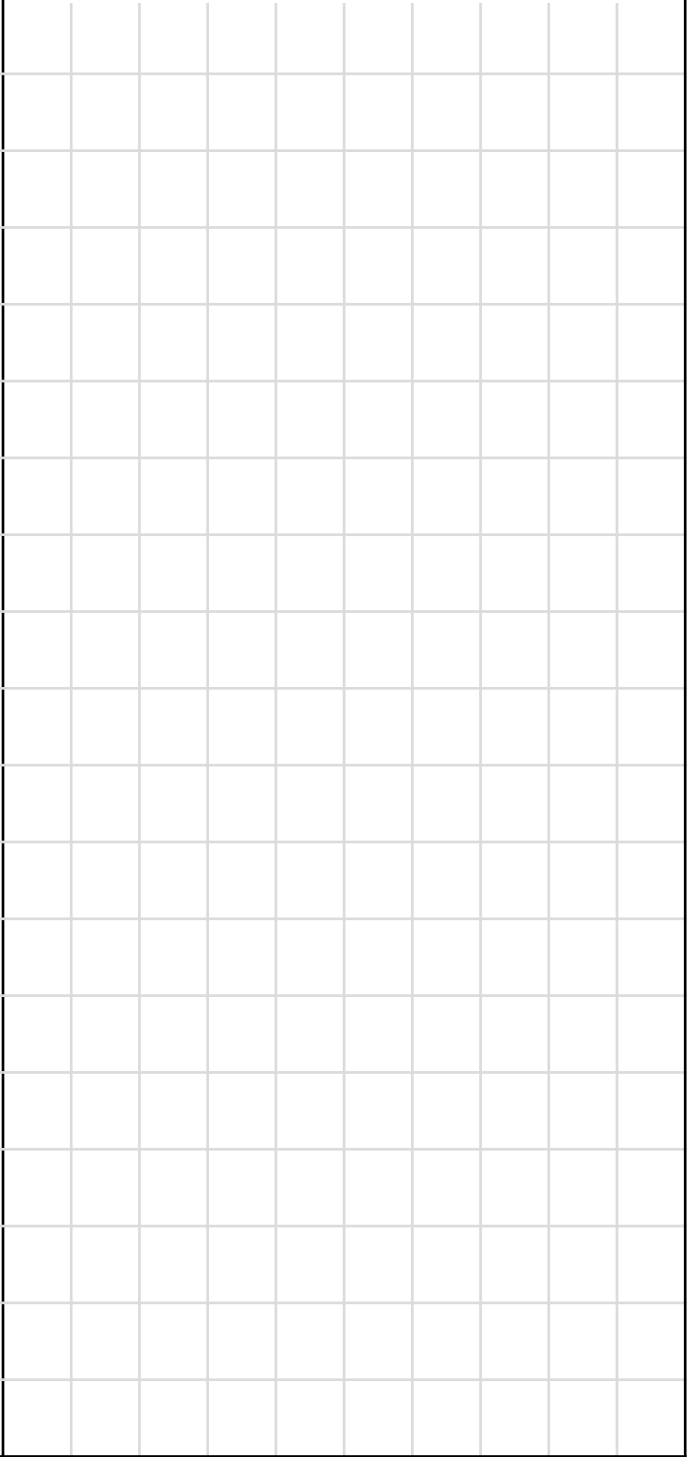
FIRST 10 TRIANGULAR NUMBERS

Number	1	2	3	4	5	6	7	8	9	10
Triangular	1	3	6	10	15	21	28	36	45	55

1.2 Multiples

1.3 Common Multiples

Worked Example	Your Turn
Kiaan is thinking of a number between 92 and 148. His number is a multiple of 8, 9 and 2. Write down the number he is thinking of.	Thiago is thinking of a number between 91 and 135. His number is a multiple of 9, 2 and 12. Write down the number he is thinking of.

Worked Example	Your Turn
Dr. Clark's age is a multiple of 5 and 9. His age is one away from a multiple of 7. He is younger than 100 years old. How old is Dr. Clark? 	Dr. Ross's age is a multiple of 6 and 9. Her age is one away from a multiple of 11. She is younger than 70 years old. How old is Dr. Ross? 

1.4 Lowest Common Multiple

1.5 Divisibility Tests

Divisibility Tests for 2, 5 and 10

Number	Test	Example	Non-Example
2	Number ends in 0, 2, 4, 6 or 8	1246	3273
5	Number ends in 0 or 5	3825	1011
10	Number ends in 0	4890	3568

Divisibility Tests for 4 and 8

Number	Test	Example	Non-Example
4	Last two digits divisible by 4	7356	9382
8	Last three digits divisible by 8	4512	8148

Divisibility Tests for 3 and 9

Number	Test	Example	Non-Example
3	Sum of digits divisible by 3	1353	4567
9	Sum of digits divisible by 9	1458	3057

Divisibility Test for 11

Number	Test	Example	Non-Example
11	Sum of odd-positioned digits subtract sum of even-positioned digits and see if the result is divisible by 11	2761 8261	5476

Divisibility Tests for 6 and 12

Number	Test	Example	Non-Example
6	Divisible by both 2 and 3	4728	7352
12	Divisible by both 3 and 4	3576	1222

1.6 Factors

1.7 Prime Numbers

Activity

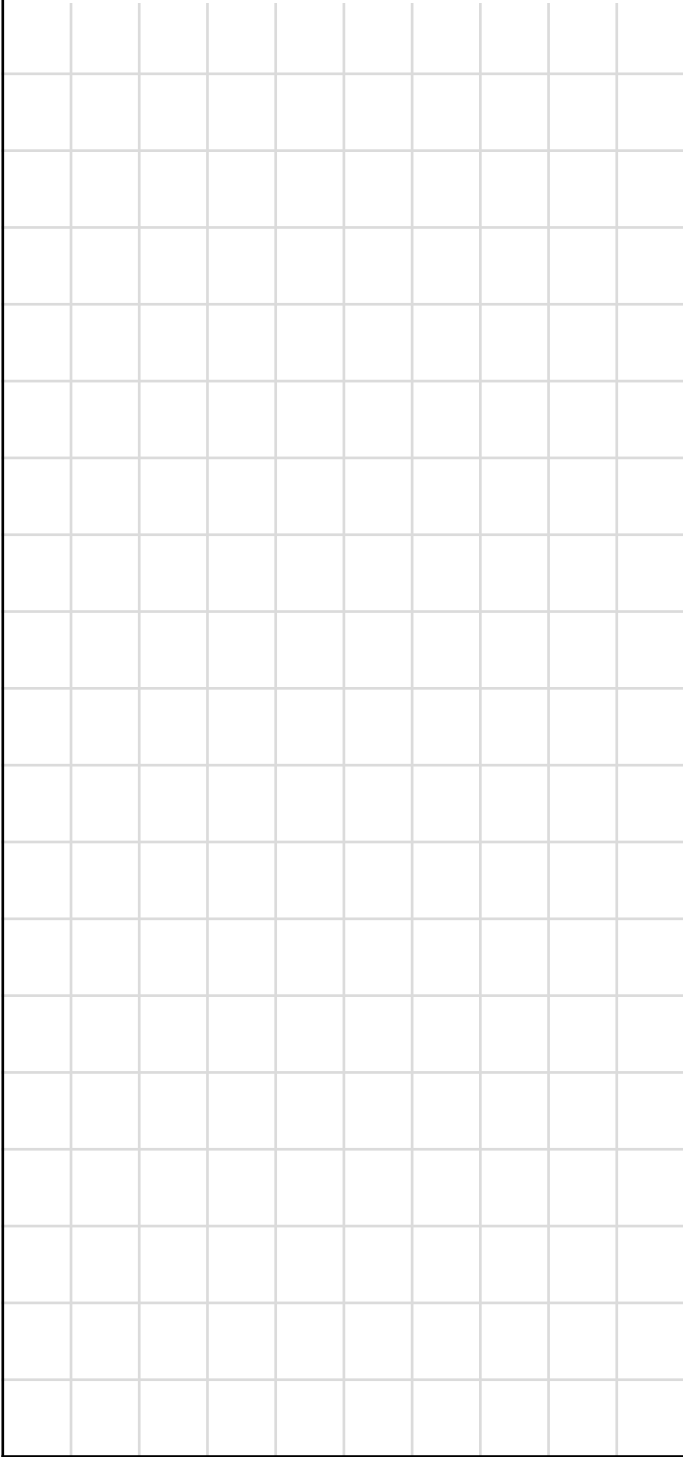
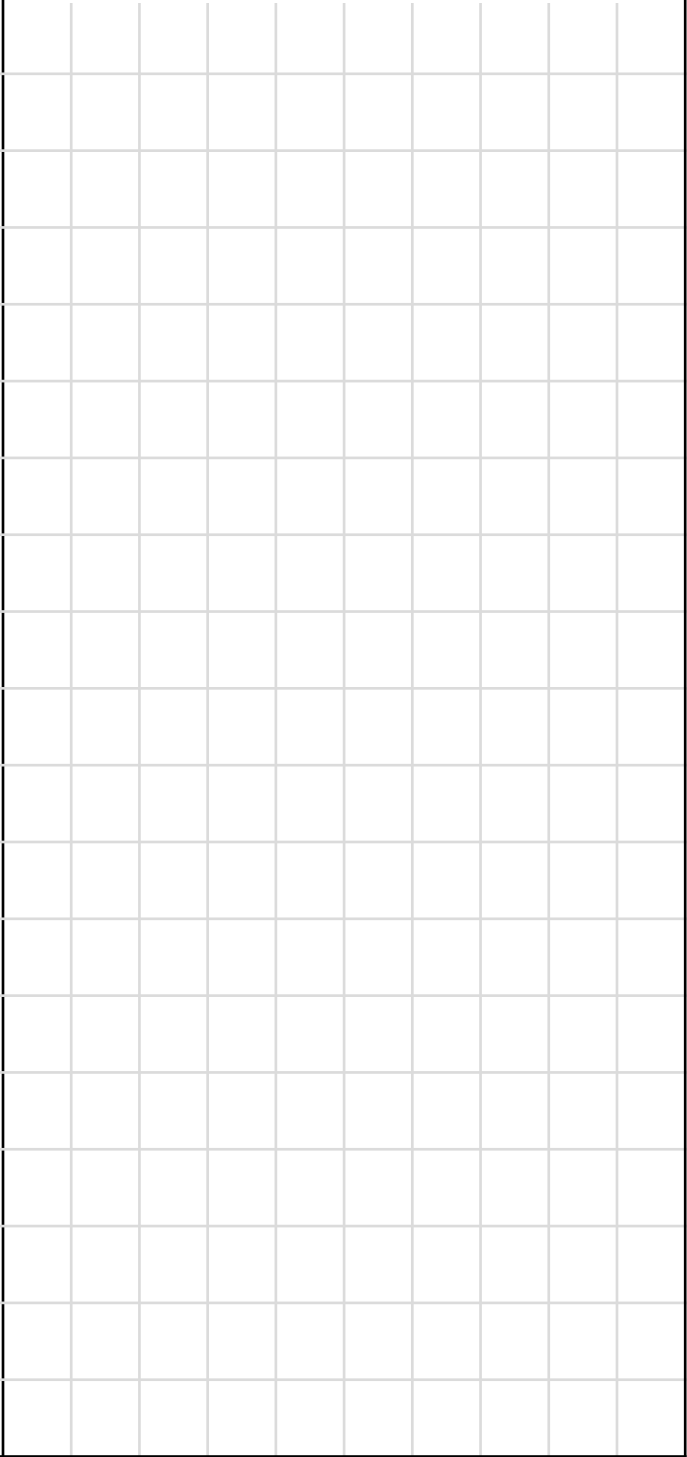
1	2	3	4	5	6	7
	8	9	10	11	12	13
	14	15	16	17	18	19
	20	21	22	23	24	25
	26	27	28	29	30	31
	32	33	34	35	36	37
	38	39	40	41	42	43
	44	45	46	47	48	49
	50	51	52	53	54	55
	56	57	58	59	60	61
	62	63	64	65	66	67
	68	69	70	71	72	73
	74	75	76	77	78	79
	80	81	82	83	84	85
	86	87	88	89	90	91
	92	93	94	95	96	97
	98	99	100			

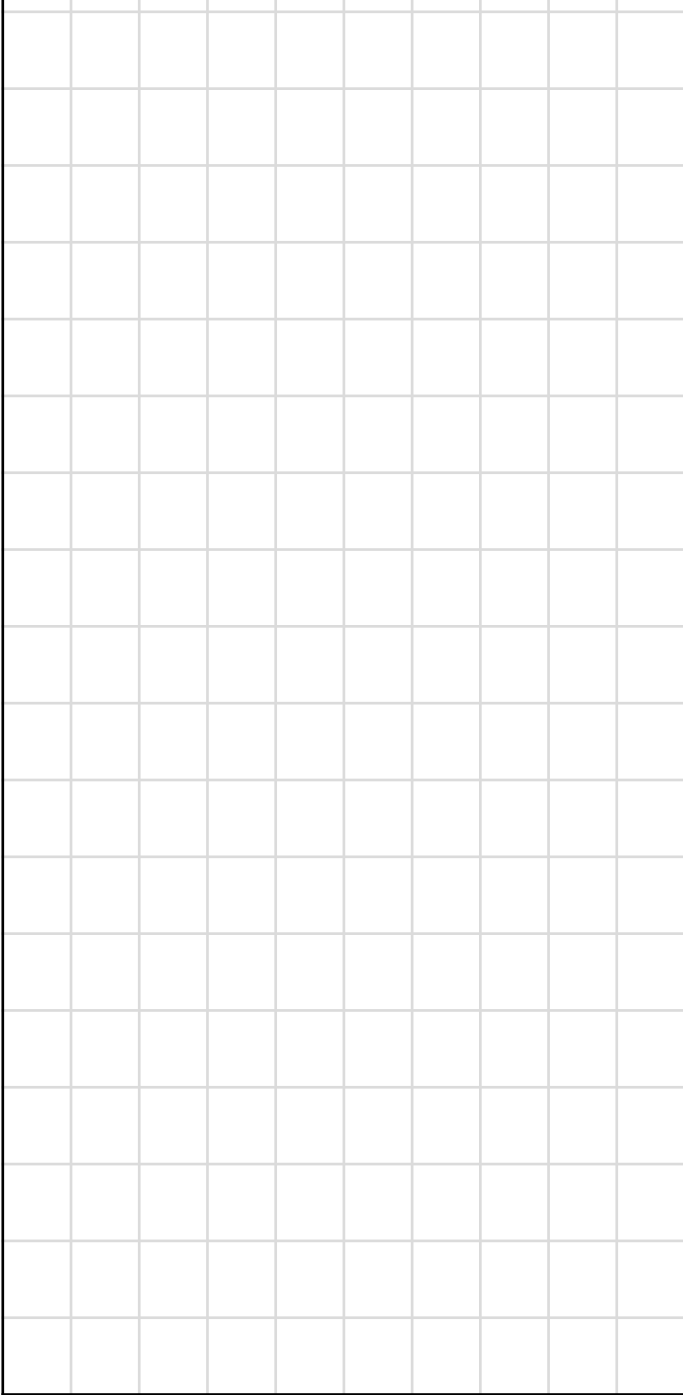
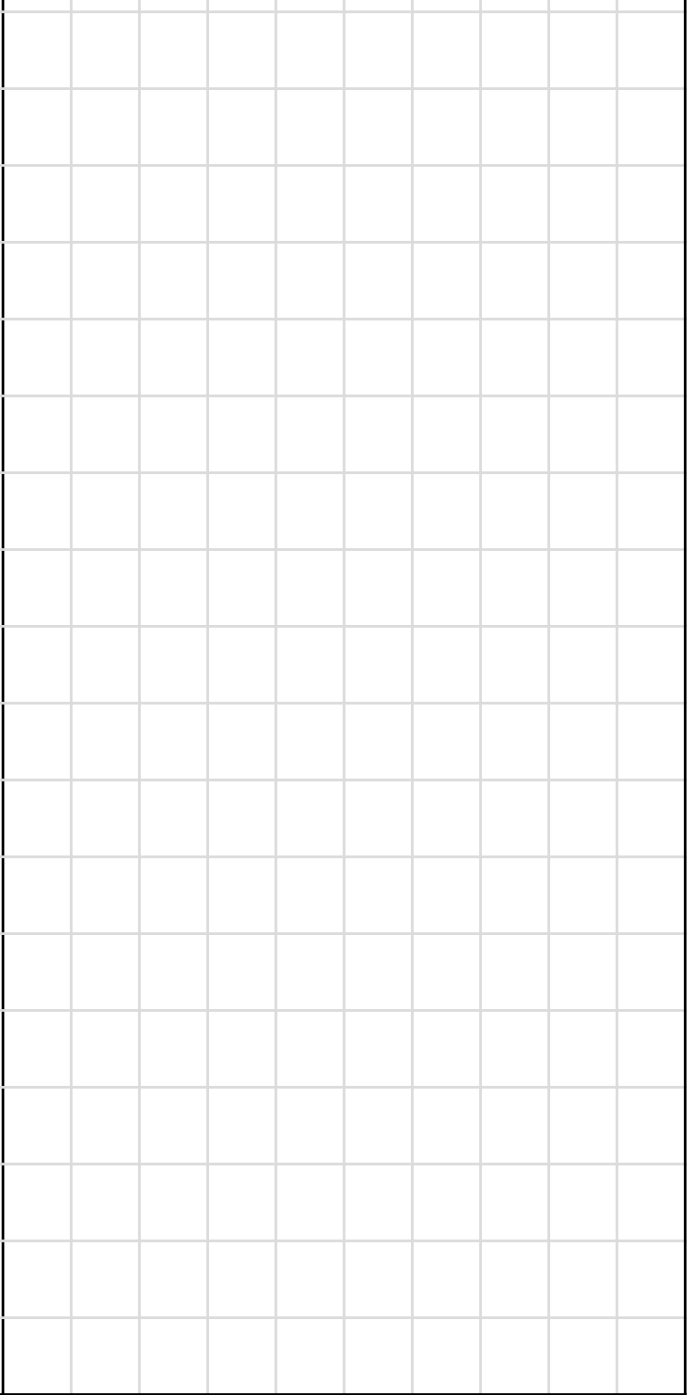
1.8 Common Factors

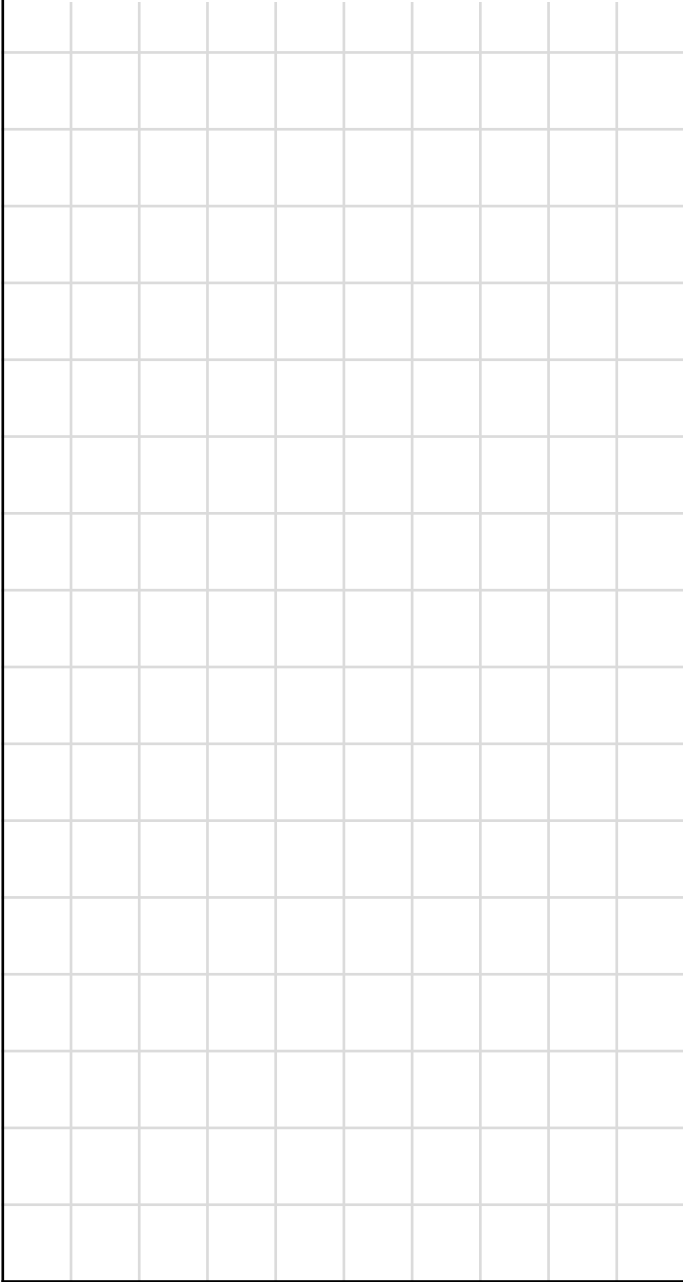
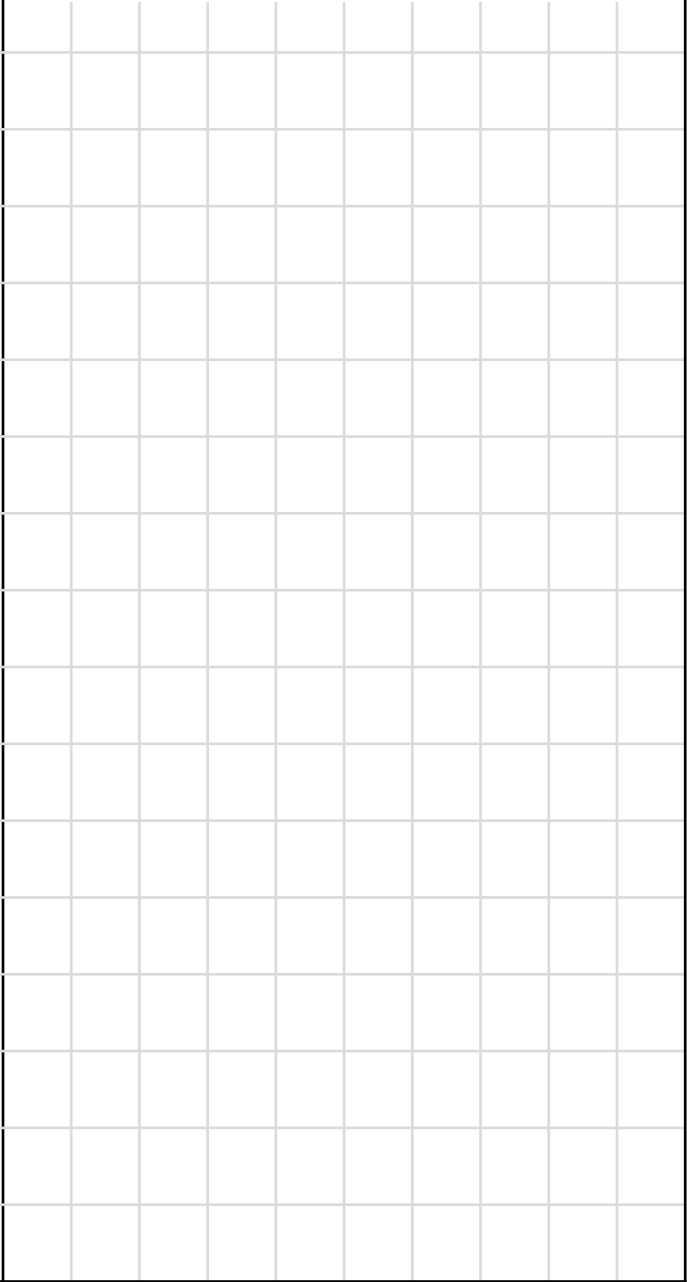
Worked Example	Your Turn
Dave has some counters. The number of counters he has is a factor of 35 and a factor of 98. Dave has more than 4 counters. Find out how many counters Dave has.	Amina is thinking of a number which is a factor of 63 and a factor of 56. Amina's number is more than 3. Find out what number Amina is thinking of.

1.9 Highest Common Factor

1.10 HCF and LCM Worded Problems

Worked Example	Your Turn
Two strings of different lengths, 15 cm and 24 cm are to be cut into equal integer lengths. What is the greatest possible length of each piece? 	Two strings of different lengths, 18 cm and 30 cm are to be cut into equal integer lengths. What is the greatest possible length of each piece? 

Worked Example	Your Turn
Two lighthouses flash their lights every 15 s and 24 s respectively. They both flash at the same time. After how many seconds will they next flash at the same time. 	Two lighthouses flash their lights every 18 s and 30 s respectively. They both flash at the same time. After how many seconds will they next flash at the same time. 

Worked Example	Your Turn
Mary is organising a charity hot dog sale. There are 18 bread rolls in each packet. There are 15 hot dogs in each packet. Mary buys the same number of bread rolls as hot dogs. What is the smallest number of each packet that Mary can buy? 	Mary is organising a charity hot dog sale. There are 30 bread rolls in each packet. There are 24 hot dogs in each packet. Mary buys the same number of bread rolls as hot dogs. What is the smallest number of each packet that Mary can buy? 

2 Sets and Venn Diagrams

2.1 Sets

A set is a collection of numbers, or letters, or symbols, or objects, etc., which are related in some way.

The items in a set are called '**members**' or '**elements**'

Curly brackets (often called 'braces') are usually used when listing or describing sets – this helps to distinguish sets from lists of unrelated items.

The elements within a set are usually described in words or listed

Examples:

Description in words	List of elements
{even numbers less than 11}	{2, 4, 6, 8, 10}
{the first five prime numbers}	{2, 3, 5, 7, 11}
{multiples of three between 10 and 20}	{12, 15, 18}
{factors of 27 which are even}	{ } or $\emptyset$

More examples of sets:

Description in words	List of elements
{quadrilaterals with four equal length sides}	{square, rhombus}
{vowels}	{a, e, i, o, u}
{letters in the word 'banana'}	{a, b, n}
{yellow fruit}	{grapefruit, banana, lemon, ...}

Notes:

Elements are only ever included once – as shown with {letters in the word 'banana'} = {a, b, n}

{yellow fruits} is an imprecise description and the list of elements contains only examples.

Worked Example

List the following sets:

- a) {factors of 15}
- b) {the first four square numbers}
- c) {letters in the word LONDON}
- d) {possible outcomes when an ordinary coin is thrown}

Your Turn

List the following sets:

- a) {the first four multiples of 15}
- b) {the first four cube numbers}
- c) {letters in the word BIRMINGHAM}
- d) {possible outcomes when an ordinary dice is thrown}

2.2 Multiple Sets and The Universal Set

When we have more than one set, capital letters are usually used to represent them.

Examples:

Description in words	List of elements
$A = \{\text{prime numbers between 10 and 20}\}$	$A = \{11, 13, 17, 19\}$
$B = \{\text{factors of 24}\}$	$B = \{1, 2, 3, 4, 6, 8, 12, 24\}$
$C = \{\text{vowels}\}$	$C = \{a, e, i, o, u\}$

Note that it is often convenient to use letters that are in some way connected to the description of the set.

e.g. $P = \{\text{prime numbers between 10 and 20}\}$, $F = \{\text{factors of 24}\}$ and $V = \{\text{vowels}\}$

The Universal set is the set of all elements under consideration.

Elements that can be in other sets are restricted to those within the Universal set. For example, if the Universal set was $\{\text{integers less than 10}\}$, then $\{\text{prime numbers}\}$ would be limited to $\{2, 3, 5, 7\}$.

Likewise if the Universal set was $\{\text{even numbers}\}$, then $\{\text{factors of 18}\}$ would be $\{2, 6, 18\}$

Notation

In Britain the special symbol ‘ $\mathcal{E}$ ’ is used to represent the Universal set but in some countries, such as America, the letter ‘ U ’ is used.

Thus we could write

$\mathcal{E} = \{\text{integers less than 10}\}$ or $\mathcal{E} = \{\text{prime numbers}\}$

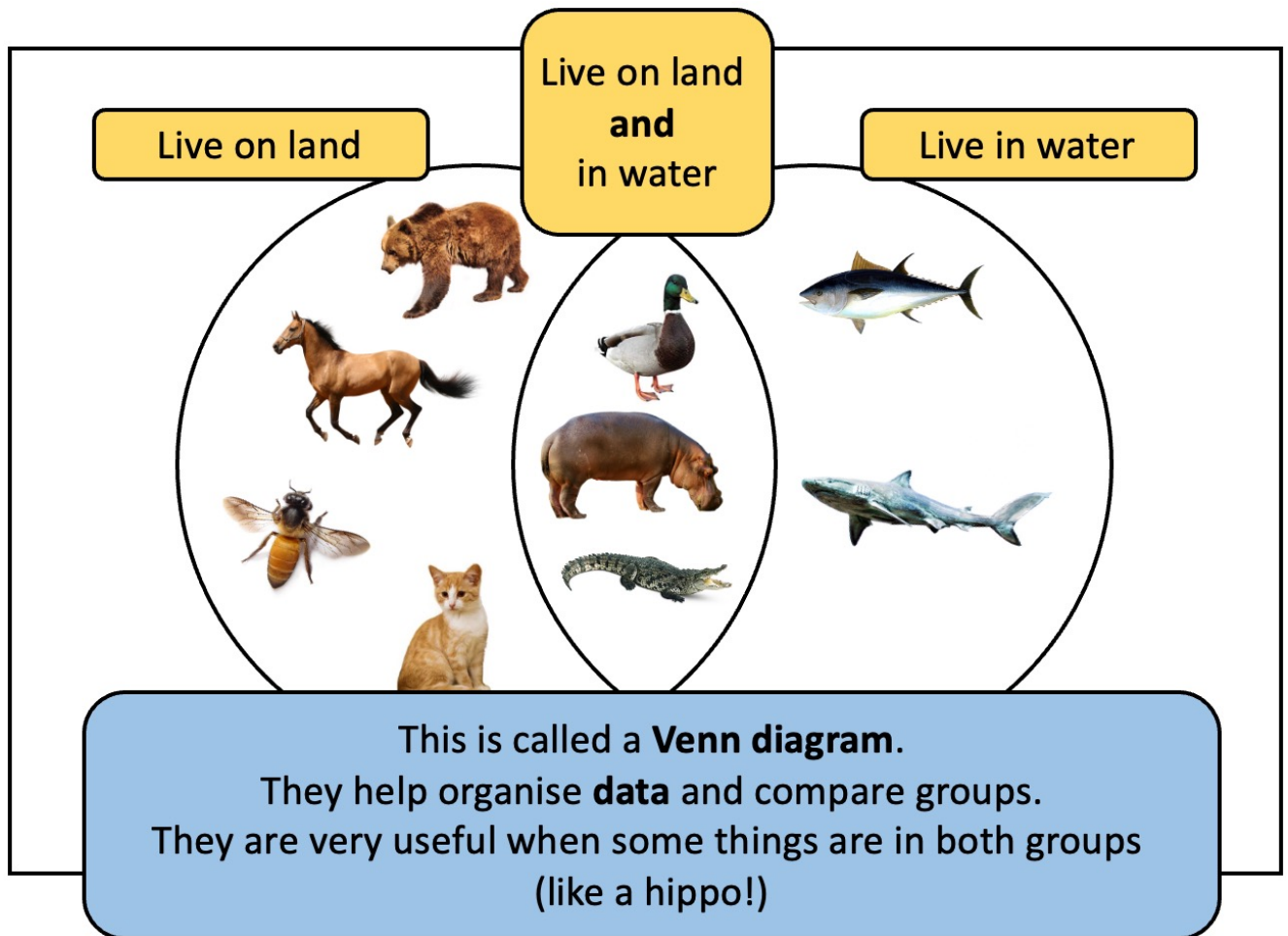
Worked Example

- a) $\xi = \{\text{odd numbers less than 15}\}$
 $A = \{\text{prime numbers}\}$
 $B = \{\text{multiples of 3}\}$
List:
- i) A
- ii) B
- b) $\xi = \{\text{first 10 letters of the alphabet}\}$
 $X = \{\text{vowels}\}$
 $Y = \{\text{letters in the word 'ENGLISH'}\}$
List:
- i) X
- ii) Y
- c) $\xi = \{\text{factors of 24}\}$
 $P = \{\text{prime numbers}\}$
 $E = \{\text{even numbers}\}$
 $O = \{\text{odd numbers}\}$
List:
- i) P
- ii) E
- iii) O

Your Turn

- a) $\xi = \{\text{even numbers less than 15}\}$
 $A = \{\text{prime numbers}\}$
 $B = \{\text{multiples of 3}\}$
List:
- i) A
- ii) B
- b) $\xi = \{\text{first 10 letters of the alphabet}\}$
 $X = \{\text{vowels}\}$
 $Y = \{\text{letters in the word 'FRENCH'}\}$
List:
- i) X
- ii) Y
- c) $\xi = \{\text{factors of 30}\}$
 $P = \{\text{prime numbers}\}$
 $E = \{\text{even numbers}\}$
 $O = \{\text{odd numbers}\}$
List:
- i) P
- ii) E
- iii) O

2.3 Venn Diagrams with Two Circles



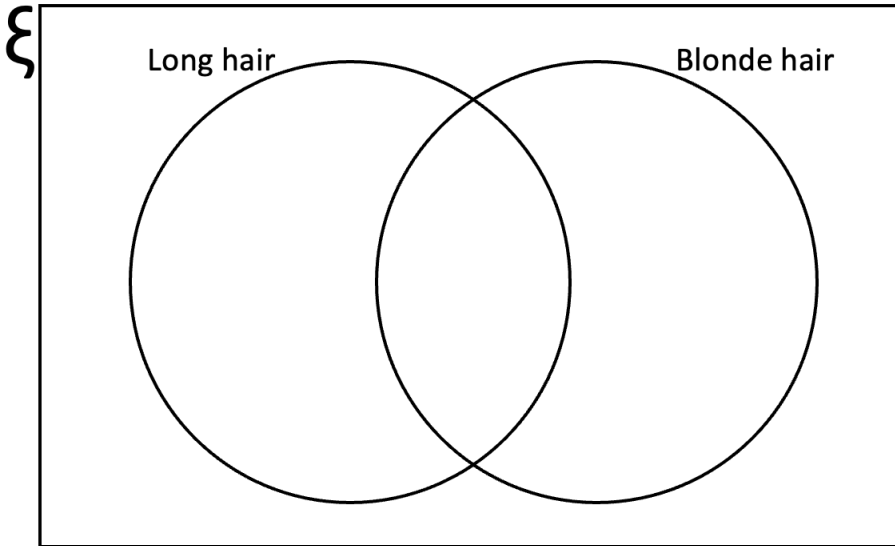
A Venn diagram ('created' by John Venn)
is a pictorial view of the relationships between sets.

A rectangle is drawn to represent the Universal set, and one or more ovals to represent the other sets.

Worked Example

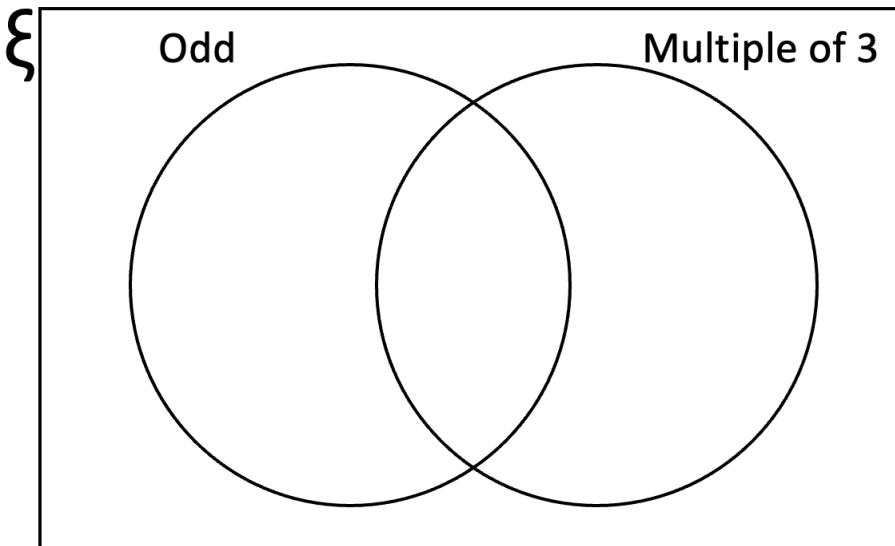
Complete the Venn Diagram:

5 students were picked from Year 7



We want to sort the numbers 1 to 10.

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



Your Turn

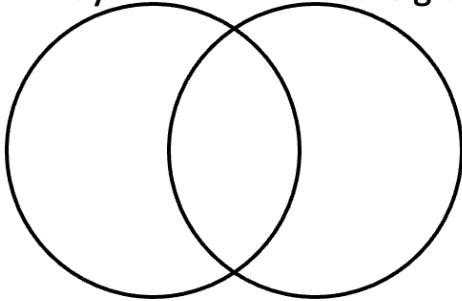
Complete the Venn Diagram:

$\xi = \{$   $\}$

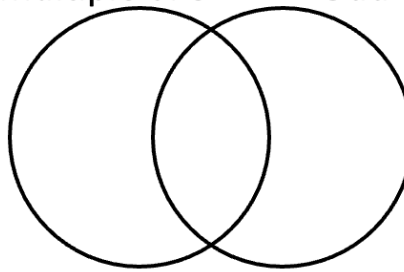
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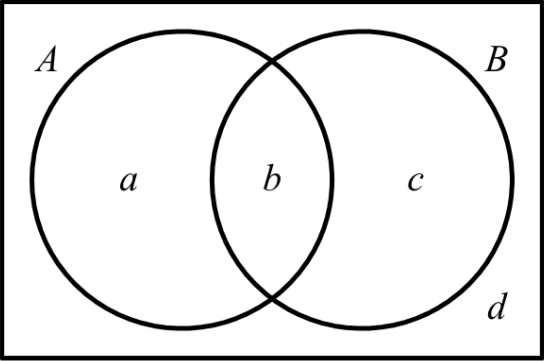
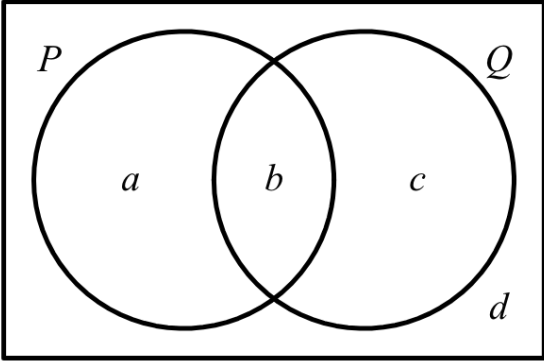
Boy Wears glasses



$\xi = \{3, 4, 5, 7, 10, 12, 13, 15, 20, 24, 25\}$ ξ

Multiple of 5 Odd



Worked Example	Your Turn
Set A represents people who have a cat. Set B represents people who have a dog.  a) Identify the region that represents people who have a cat but do not have a dog. b) Identify the regions that, together, represent people who do not have a dog. c) Identify the regions that, together, represent people who have a cat or a dog or both.	Set P represents people who own a bicycle. Set Q represents people who work from home.  a) Identify the region that represents people who do not own a bicycle and do not work from home. b) Identify the regions that, together, represent people who do not own a bicycle. c) Identify the regions that, together, represent people who work from home.

Fluency Practice

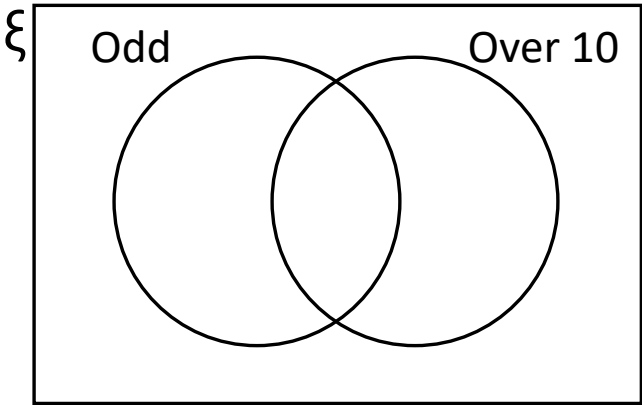
Venn Diagrams

1

Complete each Venn Diagram

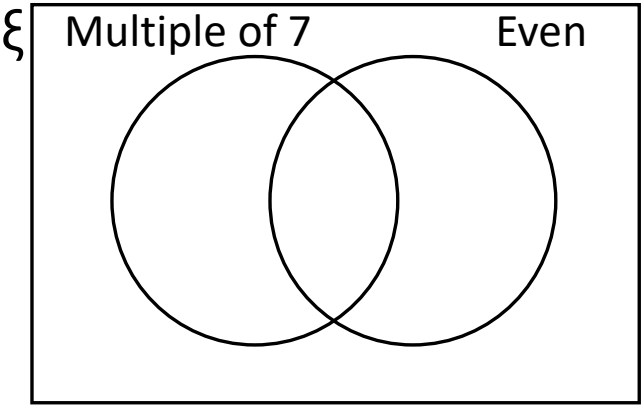
A) $\xi =$

1	2	3
7	8	9
11	12	13
16	17	18



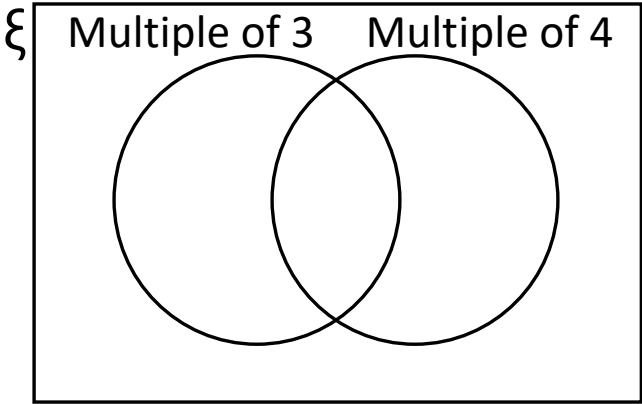
B) $\xi =$

34	14	15	28
21	70	20	13
1	25	7	16
6	35	18	41



C) $\xi =$ Numbers from 1 to 25

What fraction of the numbers are not a multiple of 3 or 4?



Fluency Practice

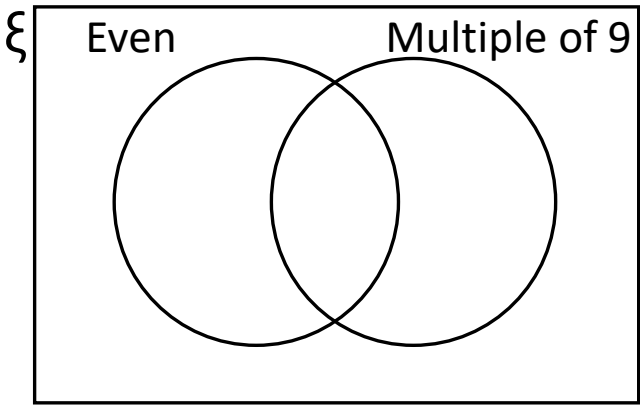
Venn Diagrams

2

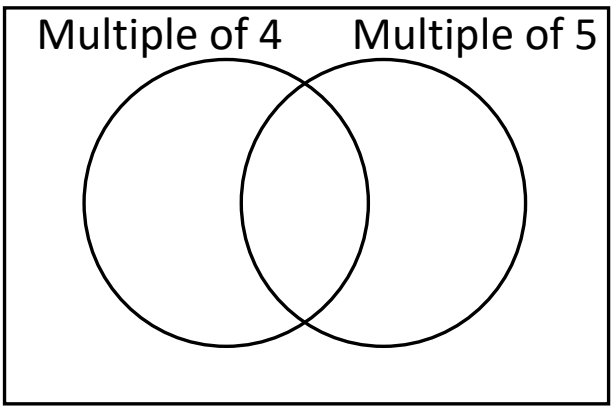
Complete each Venn Diagram

A) $\xi =$

44	90	45	88
54	27	6	26
91	16	71	9
18	13	24	33



B) $\xi =$ Even numbers from 10 to 40

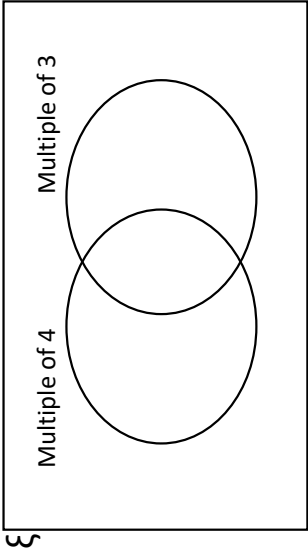


What fraction of the numbers are multiple of 4 and 5?

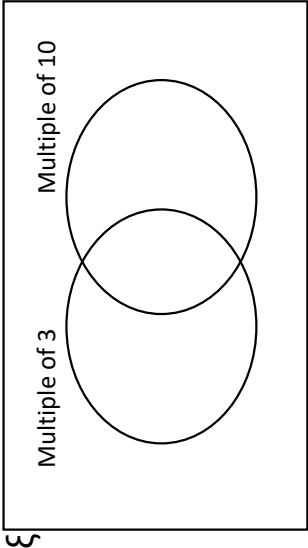
Fluency Practice

In the next questions complete the **full Venn diagram** including the numbers in ξ but not in the sets.

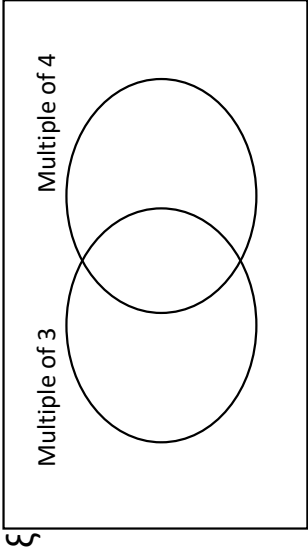
D) ξ = Multiples of 2 up to 20 inclusive



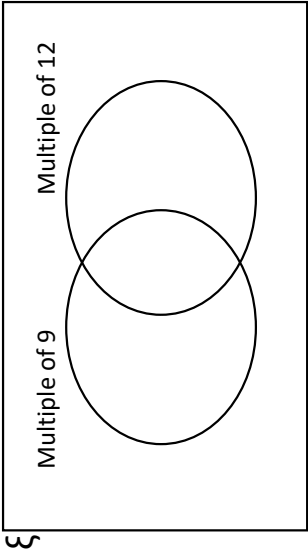
E) ξ = Multiples of 5 up to 50 inclusive



F) ξ = Multiples of 8 up to 40 inclusive



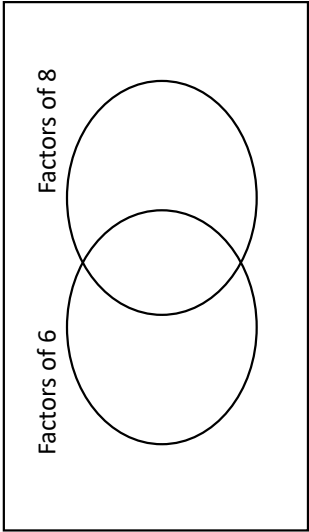
G) ξ = Multiples of 6 up to 60 inclusive



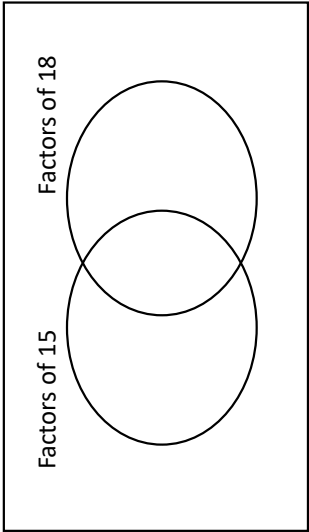
Fluency Practice

Venn Diagrams for Factors

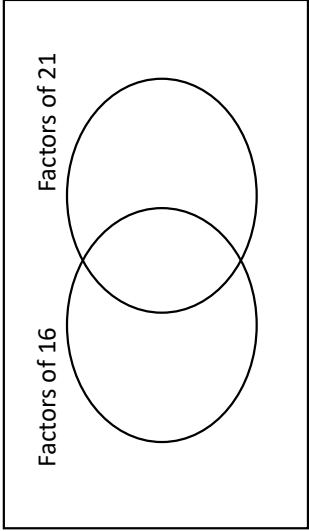
A) ξ = Factors of 24



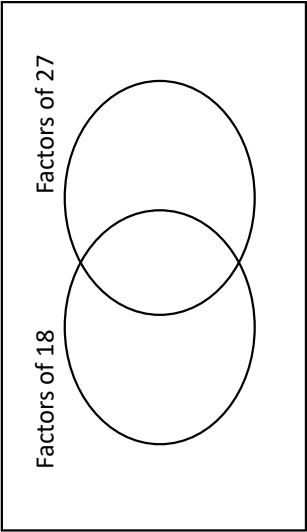
B) ξ = Factors of 36



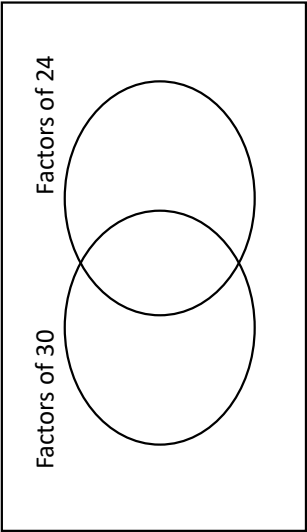
C) ξ = Factors of 28



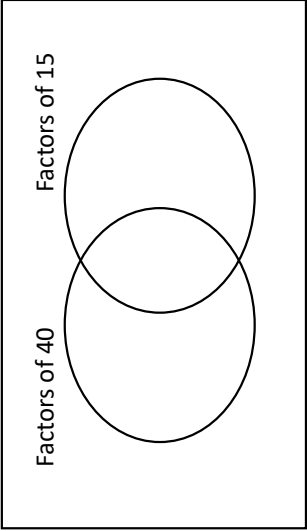
D) ξ = Factors of 54



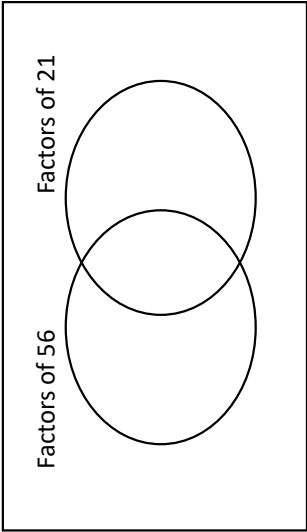
E) ξ = Factors of 60



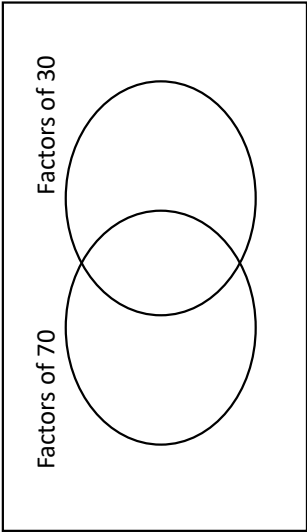
F) ξ = Factors of 90



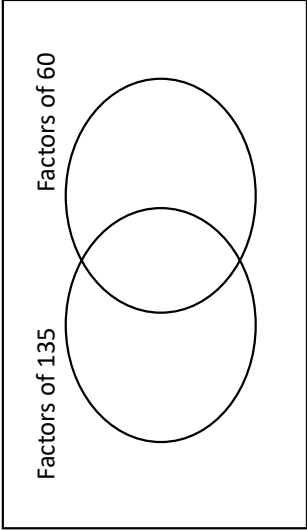
G) ξ = Factors of 42

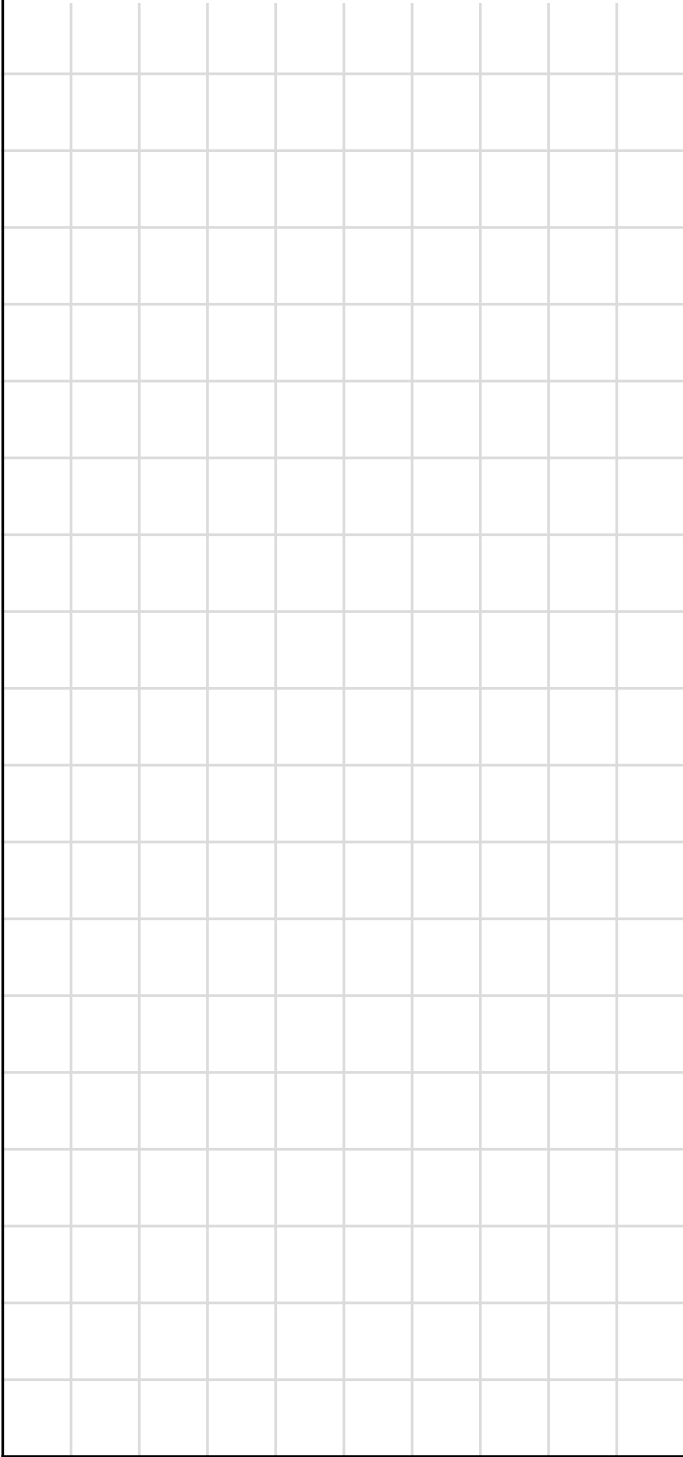
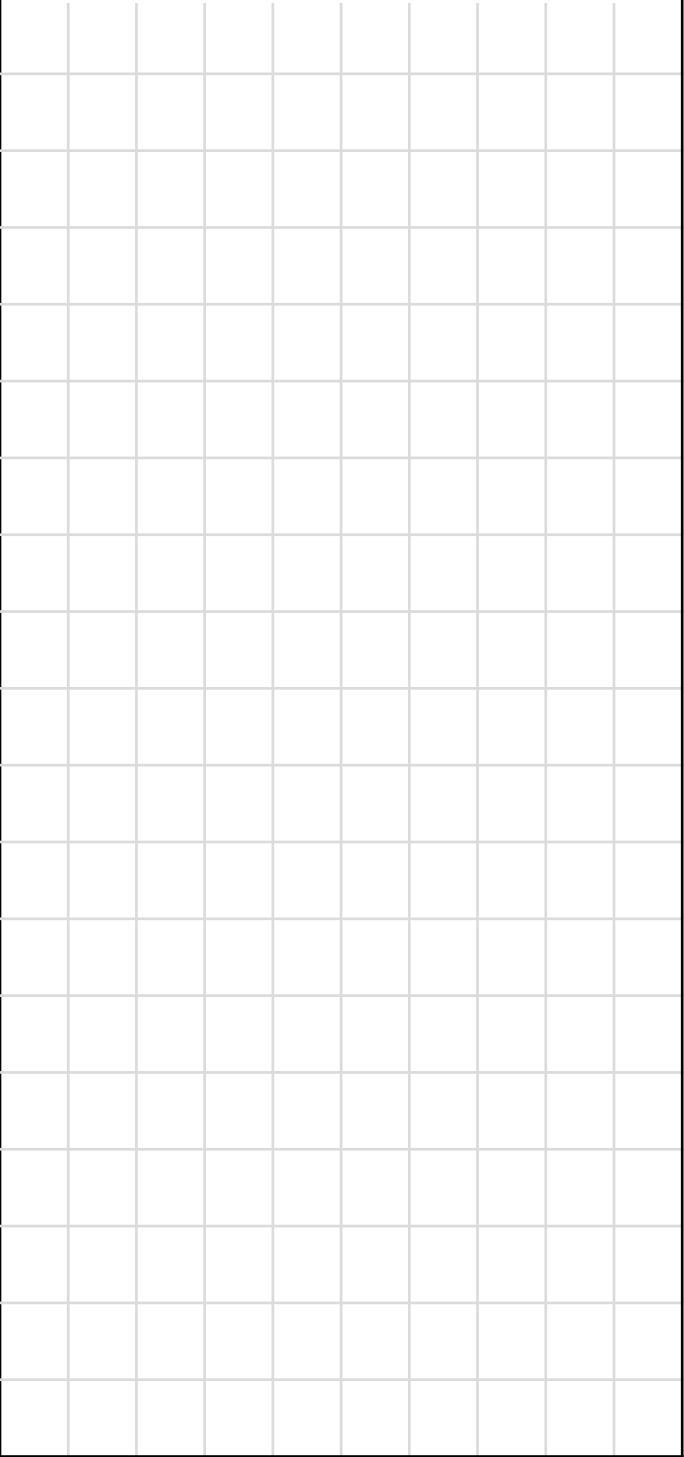


H) ξ = Factors of 140



I) ξ = Factors of 180



Worked Example	Your Turn
Represent as a Venn diagram: ξ = Positive integers between 1 and 10 inclusive $A = \{\text{Prime numbers}\}$ $B = \{\text{Even numbers}\}$ 	Represent as a Venn diagram: ξ = Integers between 0 and 5 inclusive $A = \{\text{Prime numbers}\}$ $B = \{\text{Odd numbers}\}$ 

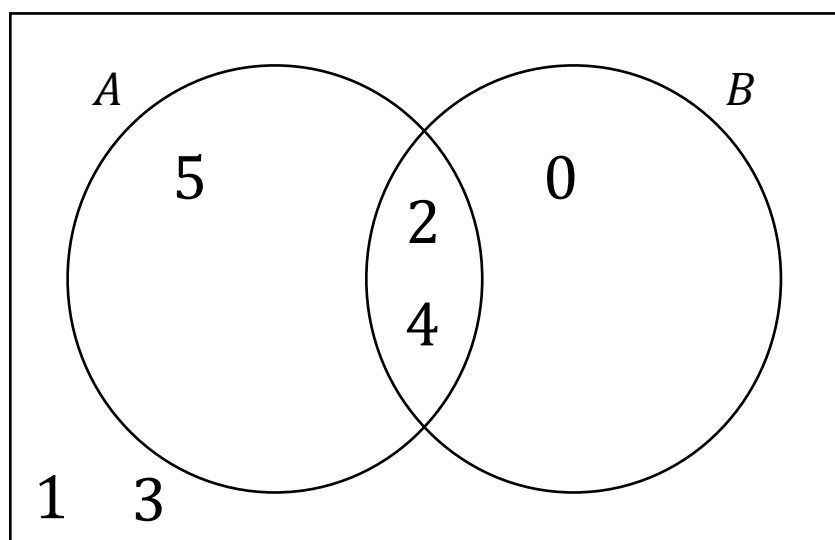
Worked Example

From the Venn diagram below, write in roster notation:

$\xi =$

$A =$

$B =$



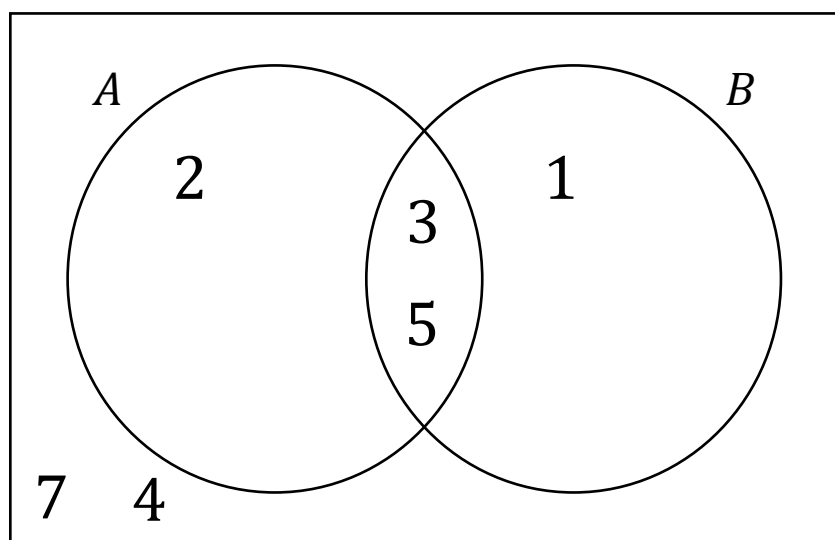
Your Turn

From the Venn diagram below, write in roster notation:

$\xi =$

$A =$

$B =$



2.4 Venn Diagrams with Three Circles

Worked Example

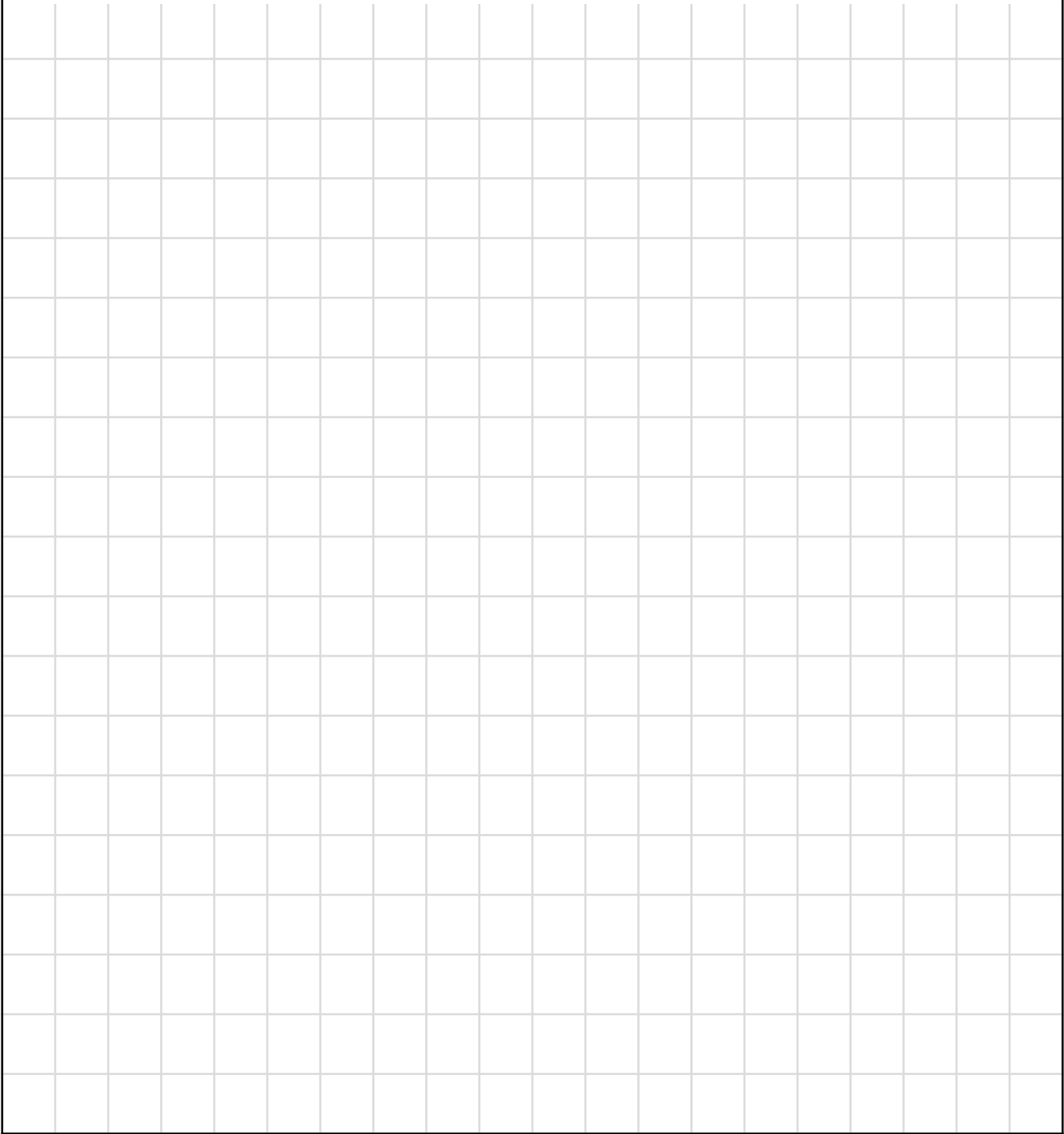
Represent in a Venn diagram:

$\xi = \{\text{Integers between 1 and 10 inclusive}\}$

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

$B = \{\text{numbers greater than 4}\}$

$C = \{\text{numbers less than 3}\}$



Your Turn

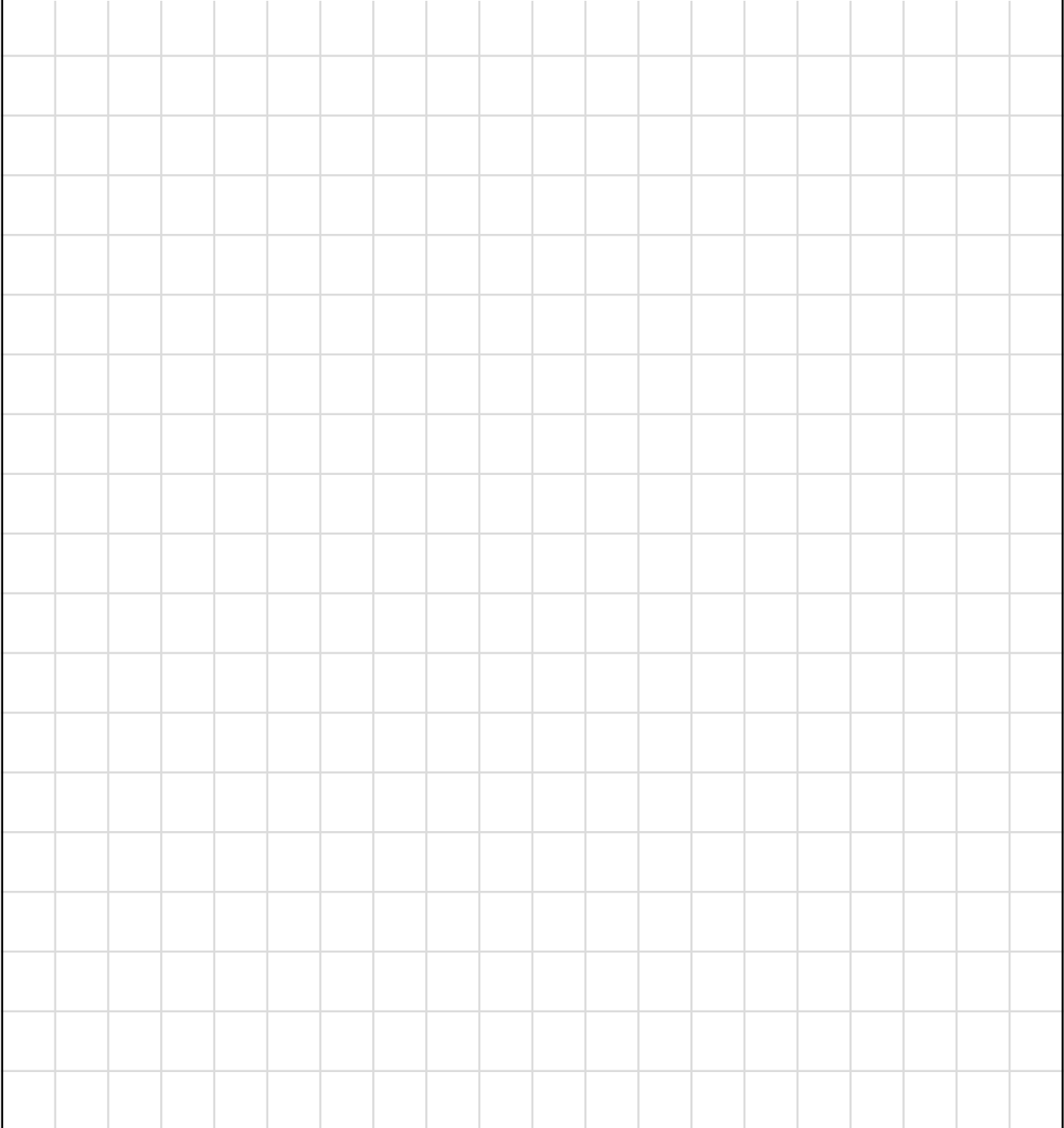
Represent in a Venn diagram:

$\xi = \{\text{Integers between 1 and 20 inclusive}\}$

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

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

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



Worked Example

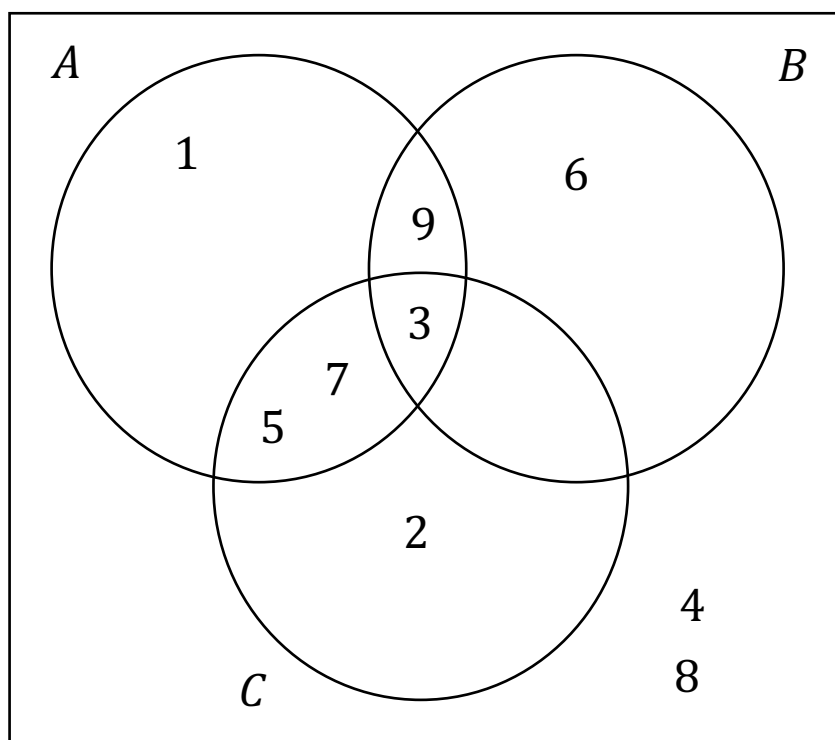
From the Venn diagram below, write in roster notation:

$\xi =$

$A =$

$B =$

$C =$



Your Turn

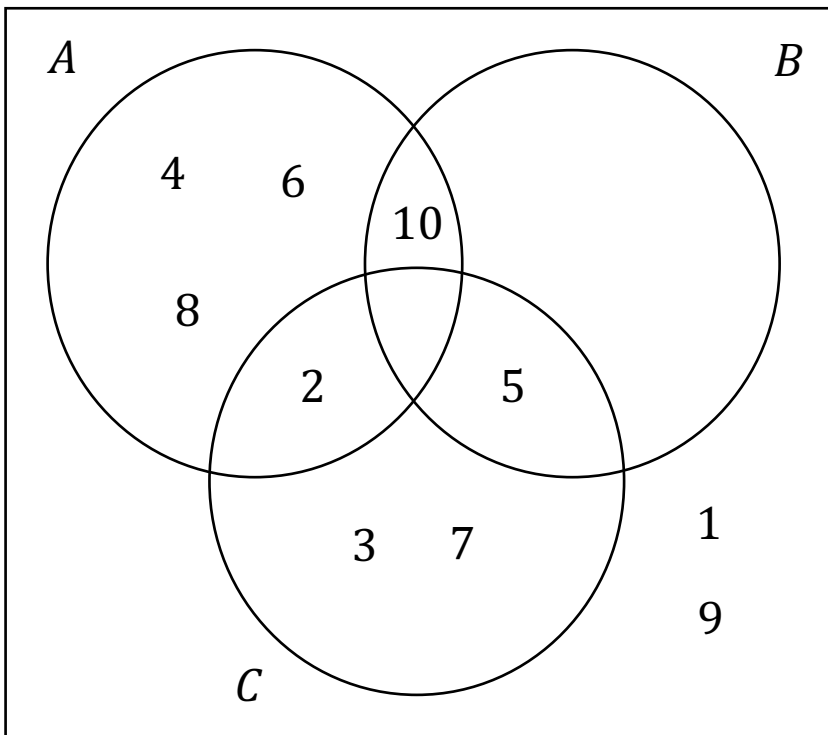
From the Venn diagram below, write in roster notation:

$\xi =$

$A =$

$B =$

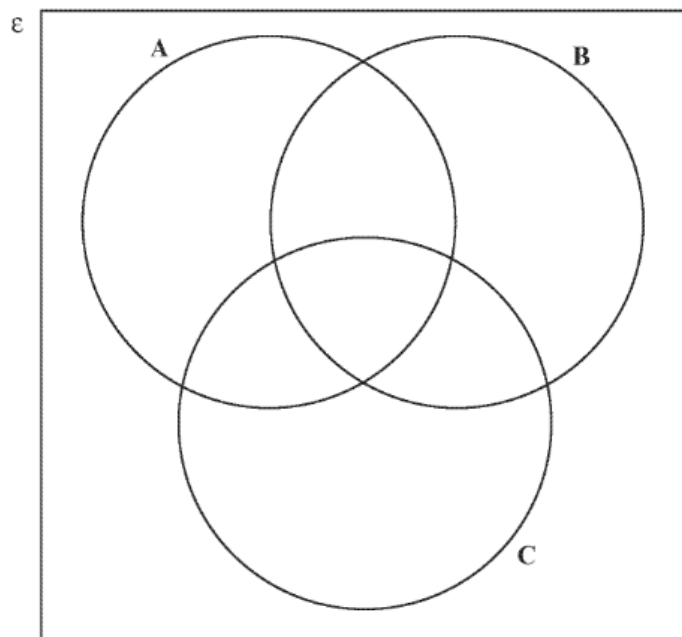
$C =$



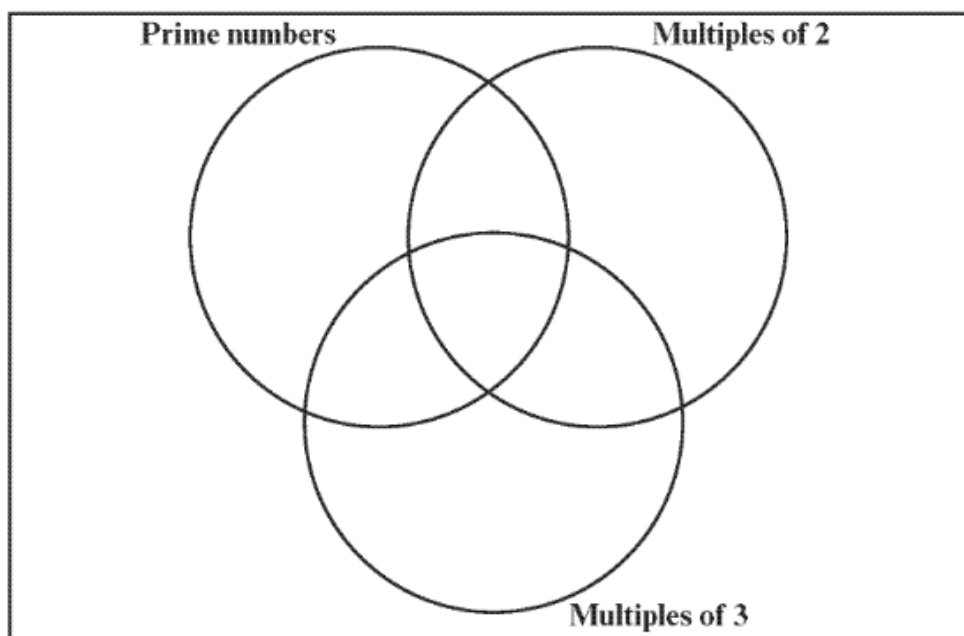
Fluency Practice

Given the following information, complete the Venn diagram shown below.

- 1.
- $\epsilon = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
 - **A** is the set of factors of 24
 - **B** is the set of multiples of 3
 - **C** is the set of common factors of 30 and 70



2. (i) Place each of the whole numbers 42, 43, 44, 45, 46, 47, 48, 49, 50 in the correct positions in the Venn diagram.



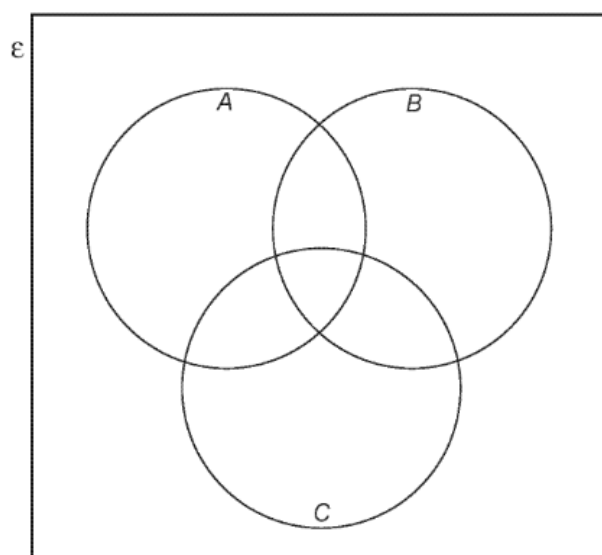
Fluency Practice

3. The universal set, $\mathcal{E} = \{22, 23, 24, 25, 26, 27, 28, 29, 30\}$.

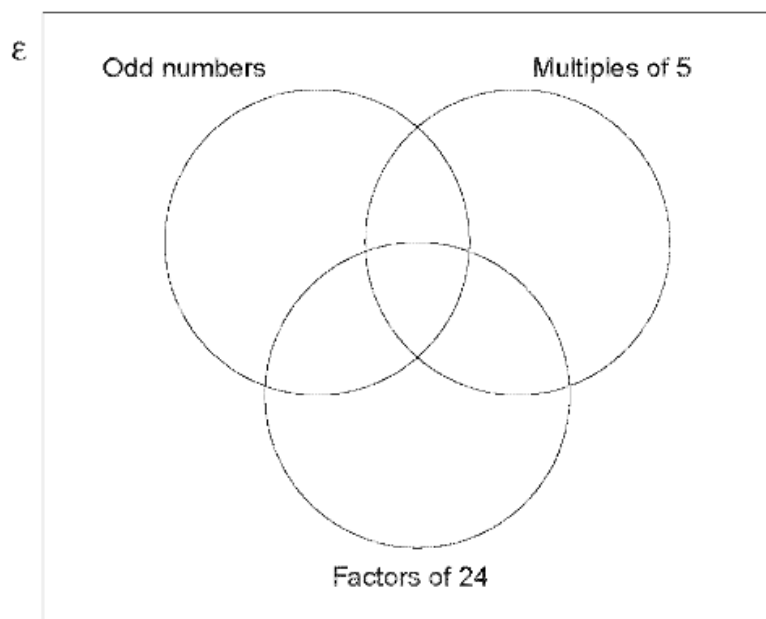
Within this universal set $\mathcal{E}$,

- set A is the multiples of 2
- set B is the multiples of 4
- set C is the multiples of 5

(a) Complete the Venn diagram.



4. Place the whole numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 in the correct positions in the Venn diagram.



3 Negative Numbers

3.1 Adding and Subtracting Negative Numbers

Worked Example	Your Turn
1) Calculate: a) $3 + (-4) =$ b) $4 + (-3) =$ c) $(-3) + (-4) =$ d) $(-4) + (-3) =$ 2) Calculate: a) $3 - (-4) =$ b) $4 - (-3) =$ c) $(-3) - (-4) =$ d) $(-4) - (-3) =$	1) Calculate: a) $(-5) + (-7) =$ b) $5 + (-7) =$ c) $(-7) + (-5) =$ d) $7 + (-5) =$ 2) Calculate: a) $(-5) - (-7) =$ b) $5 - (-7) =$ c) $(-7) - (-5) =$ d) $7 - (-5) =$

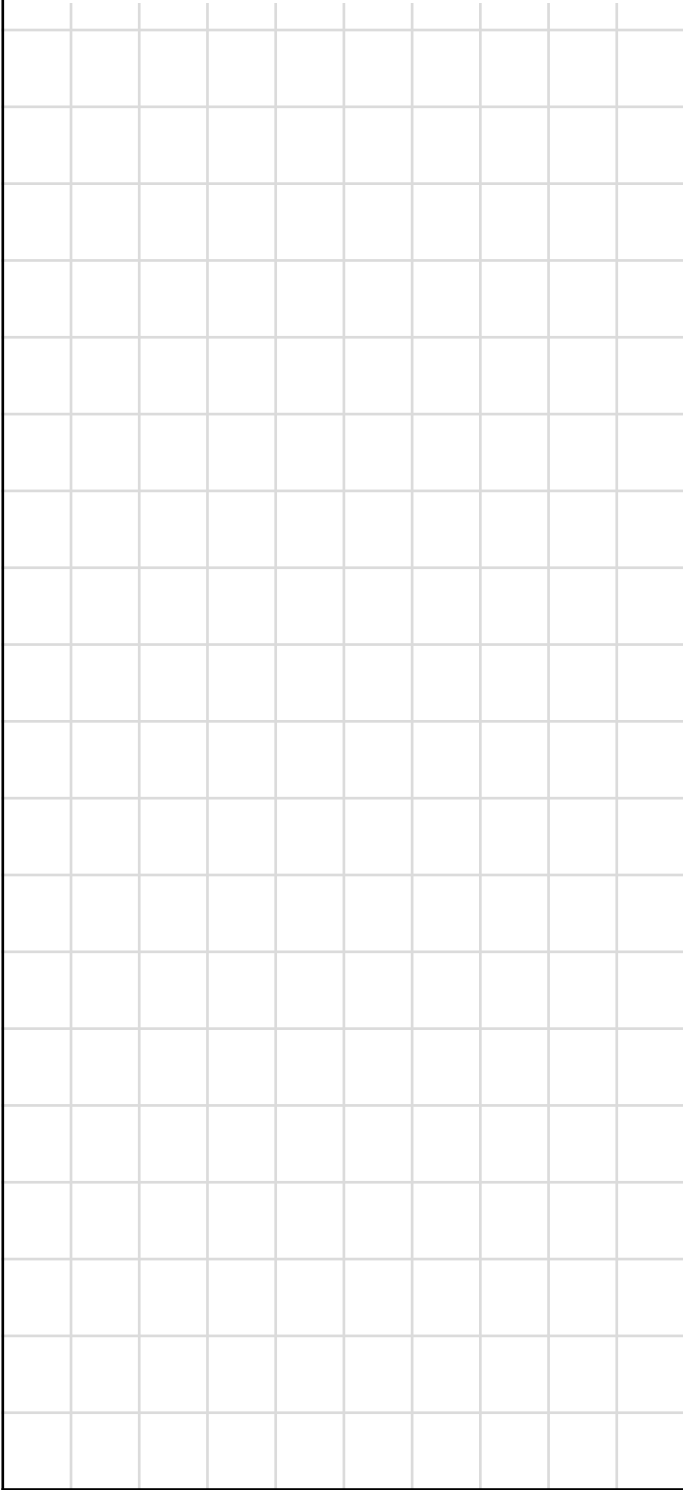
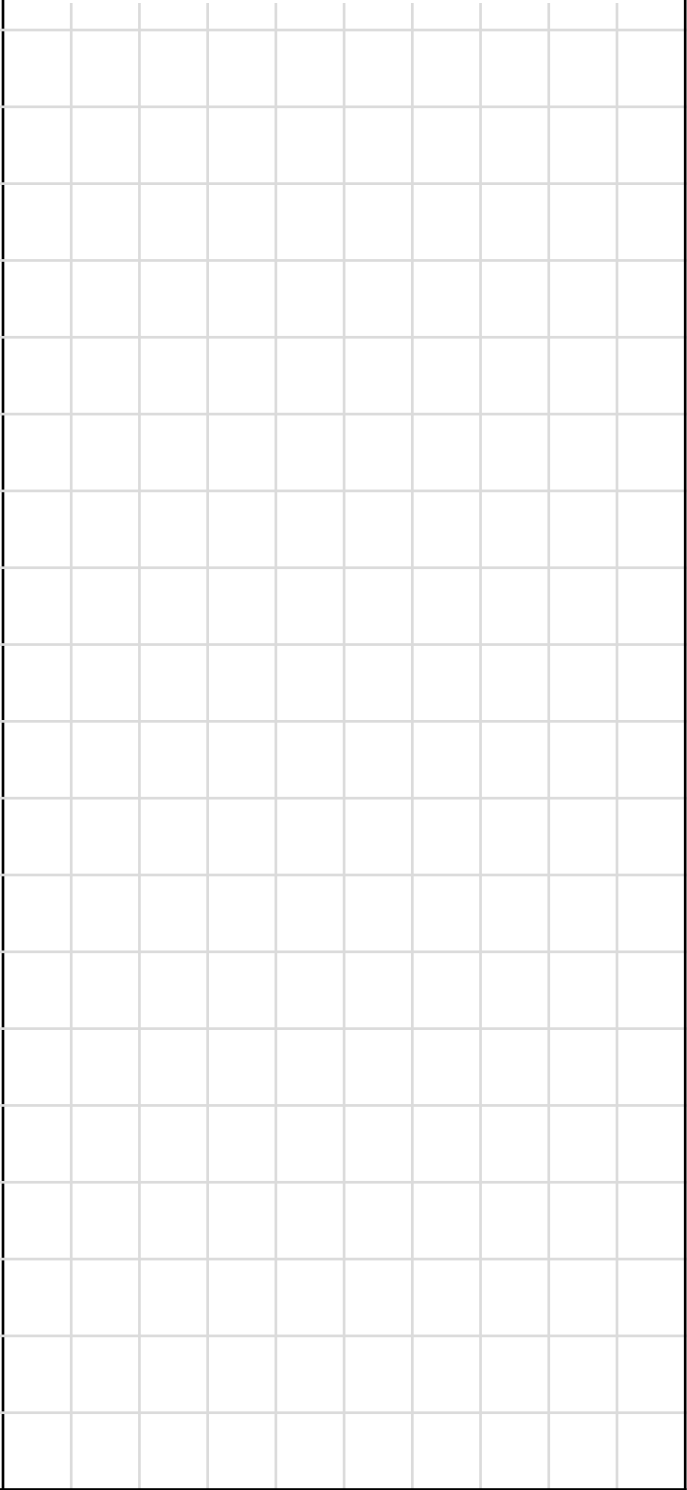
3.2 Multiplying Negative Numbers

3.3 Dividing Negative Numbers

3.4 Real Life Applications

Worked Example	Your Turn
a) The temperature in Matthew’s garden at 1 pm was 10 °C. By 1 am the temperature had fallen by 22 °C. Find the temperature at 1 am. b) Kadiatou parks their car at Level –6 of an underground carpark. They travels up 18 floors to their apartment. Find what level Kadiatou's apartment is on.	a) William is at Level 18 of an apartment block. He travels down 20 floors to the underground carpark. Find what level William is on now. b) The temperature in Isaac's garden at 4 am was –9 °C. By 2 pm the temperature was 20 °C higher. Find the temperature at 2 pm.

3.5 Mixed Operations

Worked Example	Your Turn
1) Work out: $6 - 6 + (-5) + (-2) - (-5) - 10$ 2) Calculate: $-9 \times 8 \div -4$ 	1) Work out: $4 + 6 - 10 + (-2) - (-3) + (-2)$ 2) Calculate: $70 \div -10 \times -8$ 

Worked Example

Fill in the missing number.

a) $9 - \square = 14$

b) $18 + \square = -5$

c) $\square \times -10 = -90$

d) $\square \div -10 = -7$

Your Turn

Fill in the missing number.

a) $-9 + \square = -12$

b) $\square - (-6) = 13$

c) $32 \div \square = -4$

d) $\square \times -6 = -66$