KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS

KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM

Year 7
2025 Mathematics 2026
Unit 1 Booklet

HGS Maths

Tasks

Dr Frost Course

Name: _____

Class: _____

Contents

1 Factors, Multiples and Primes

1.1 Types of Numbers

Worked Example	Your Turn
1) Write down the fifth square number	1) Write down the eighth square number
2) Write down the second cube number	2) Write down the third cube number
3) Square 12	3) Square 9
4) Cube 8	4) Cube 5
5) Write down the fifth triangular number	5) Write down the eighth triangular number

Dr Frost 88b and 88c

1.2 Multiples

Worked Example	Your Turn
a) Write down the first six multiples of 6 b) Write down the first six multiples of 23	a) Write down the first six multiples of 8 b) Write down the first six multiples of 37

Dr Frost 52a, 52b, 52c and 52d

1.3 Common Multiples

Worked Example	Your Turn
a) Find the first three common multiples of 6 and 15 b) Find the first three common multiples of 21 and 24	a) Find the first three common multiples of 8 and 20 b) Find the first three common multiples of 32 and 36

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

Worked Example	Your Turn
a) Find the LCM of 6 and 15 b) Find the LCM of 21 and 24	a) Find the LCM of 8 and 20 b) Find the LCM of 32 and 36

Worked Example	Your Turn
Find the LCM of 6, 12 and 15	Find the LCM of 6, 8 and 20

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

Worked Example	Your Turn
a) Find which possible digit(s) could go in the box to make $958\square$ divisible by 6.	a) Find which possible digit(s) could go in the box to make $159\square 8$ divisible by 4.
b) Find which possible digit(s) could go in the box to make $16\square 24$ divisible by 8.	b) Find which possible digit(s) could go in the box to make $1\square 854$ divisible by 6.

Worked Example	Your Turn
a) Find which possible digit(s) could go in the box to make $53\square 2$ divisible by 24.	a) Find which possible digit(s) could go in the box to make $41\square 0$ divisible by 30.
b) Find which possible digit(s) could go in the box to make $1584\square$ divisible by 72.	b) Find which possible digit(s) could go in the box to make $1075\square$ divisible by 45.

1.6 Factors

Worked Example	Your Turn
a) Find all the factors of 44 b) Find all the factors of 120	a) Find all the factors of 88 b) Find all the factors of 180

Dr Frost 53a, 53b and 53c

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			

Worked Example	Your Turn
Write down the prime numbers between 1 and 50.	Write down the prime numbers between 50 and 100.

Dr Frost 97a, 97b, 97c and 97d

1.8 Common Factors

Worked Example	Your Turn
a) Find the common factors of 6 and 15 b) Find the common factors of 84 and 96	a) Find the common factors of 8 and 20 b) Find the common factors of 42 and 98

Worked Example	Your Turn
List all the common factors of 28, 35 and 84.	List all the common factors of 63, 84 and 98.

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

Worked Example	Your Turn
a) Find the HCF of 6 and 15 b) Find the HCF of 84 and 96	a) Find the HCF of 8 and 20 b) Find the HCF of 42 and 80

Worked Example	Your Turn
Find the HCF of 18, 24 and 30	Find the HCF of 28, 84 and 98

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 ∅

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 = {prime numbers between 10 and 20}	A = {11, 13, 17, 19}
B = {factors of 24}	B = {1, 2, 3, 4, 6, 8, 12, 24}
C = {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 = {prime numbers between 10 and 20}, F = {factors of 24} and V = {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 {integers less than 10}, then {prime numbers} would be limited to {2, 3, 5, 7}.

Likewise if the Universal set was {even numbers}, then {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

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

Worked Example

a) ξ = {odd numbers less than 15}
A = {prime numbers}
B = {multiples of 3}
List:

i) A

ii) B

b) ξ = {first 10 letters of the alphabet}
X = {vowels}
Y = {letters in the word 'ENGLISH'}
List:

i) X

ii) Y

c) ξ = {factors of 24}
P = {prime numbers}
E = {even numbers}
O = {odd numbers}
List:

i) P

ii) E

iii) O

Your Turn

a) ξ = {even numbers less than 15}
A = {prime numbers}
B = {multiples of 3}
List:

i) A

ii) B

b) ξ = {first 10 letters of the alphabet}
X = {vowels}
Y = {letters in the word 'FRENCH'}
List:

i) X

ii) Y

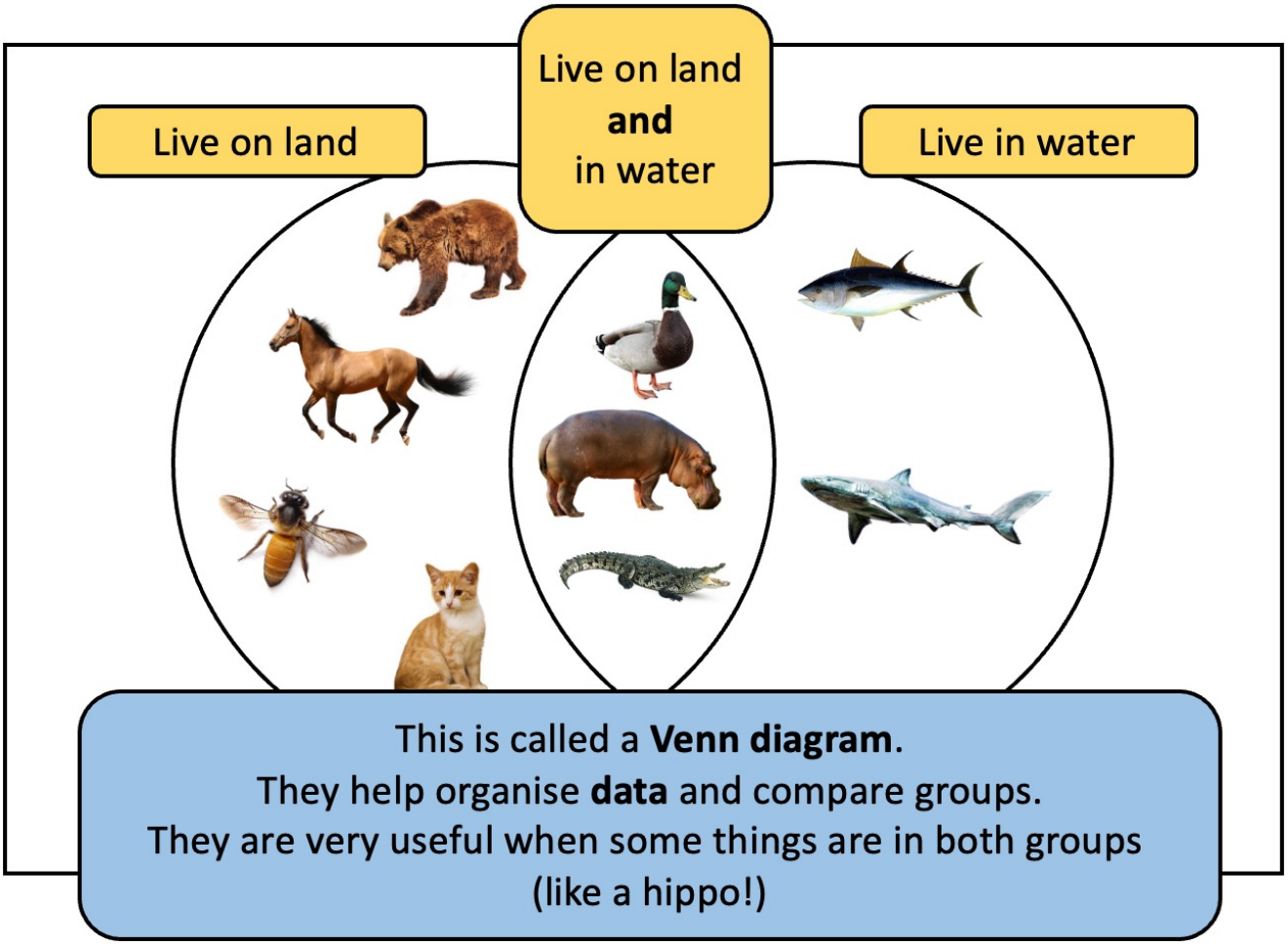
c) ξ = {factors of 30}
P = {prime numbers}
E = {even numbers}
O = {odd numbers}
List:

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.

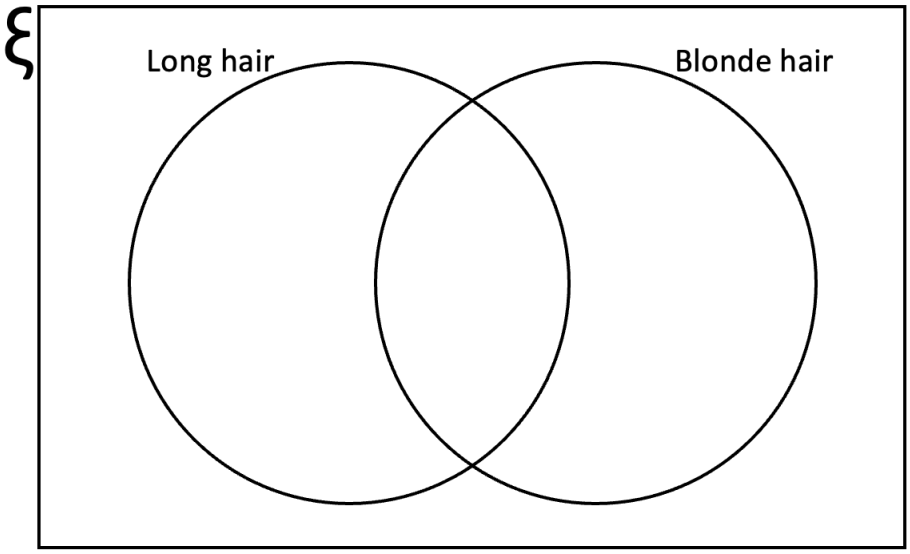
Worked Example

Complete the Venn Diagram:

5 students were picked from Year 7

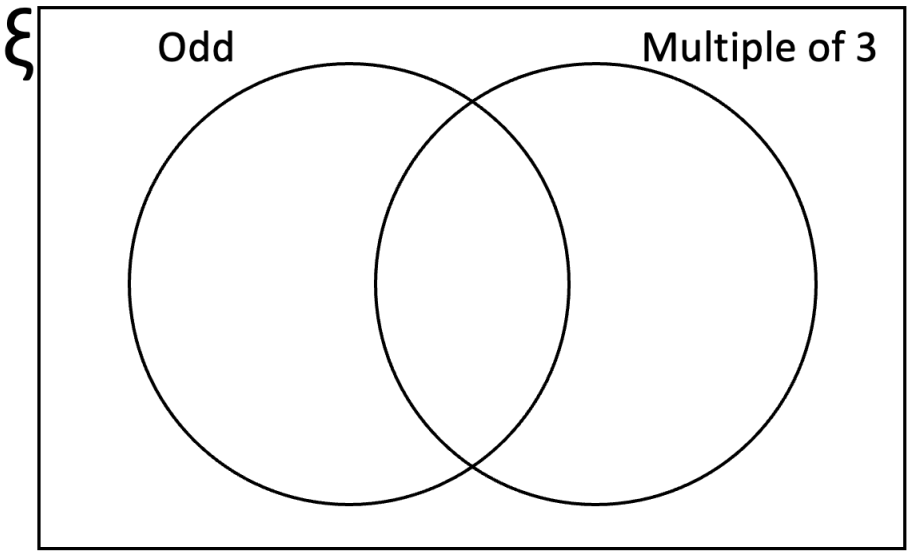
$\xi = \{$  $\}$

Anna Tom Mary Jack Beth



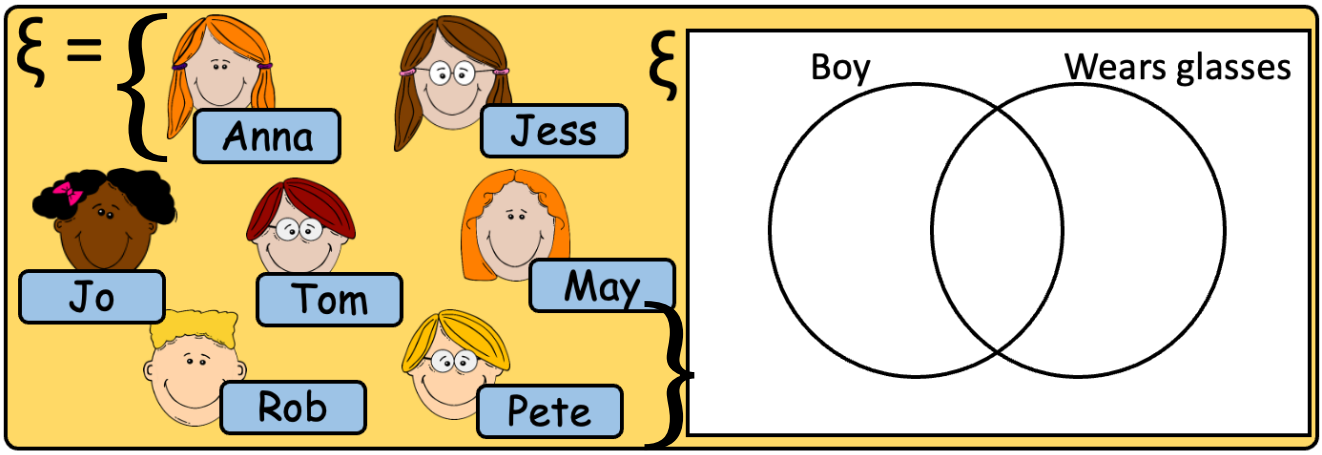
We want to sort the numbers 1 to 10.

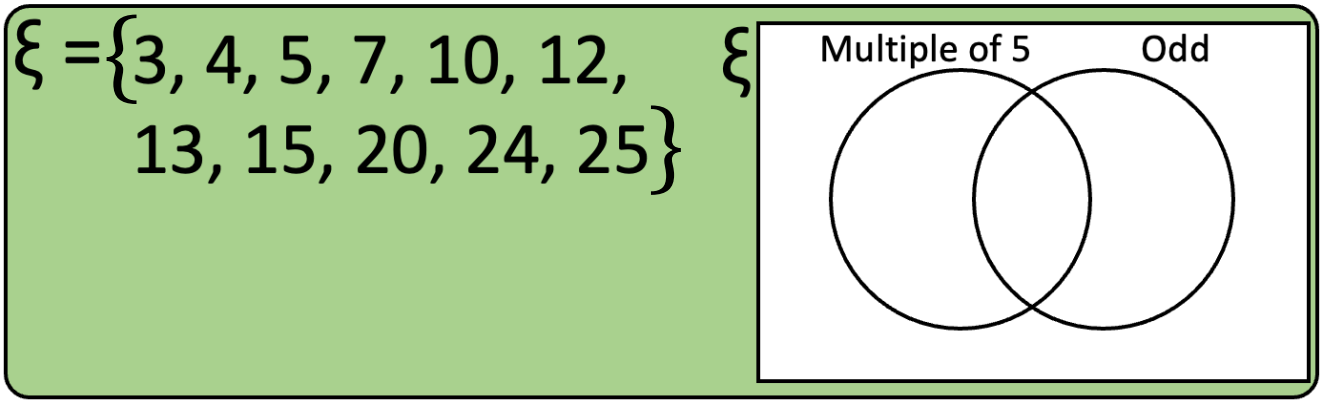
$\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$



Your Turn

Complete the Venn Diagram:

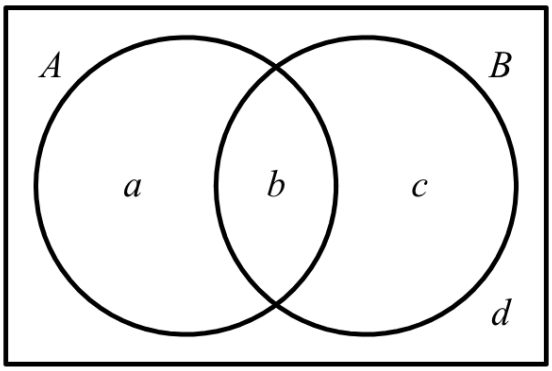




Worked Example

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.

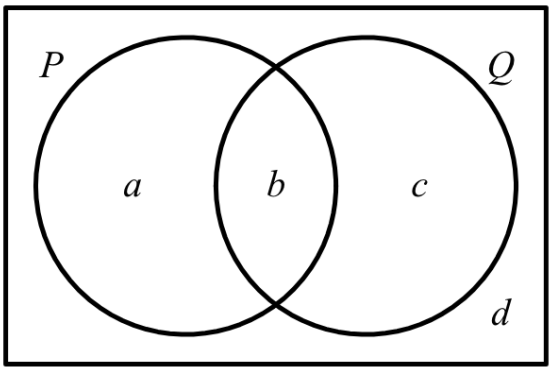
b) Identify the regions that, together, represent people who do not have a dog.

c) Identify the regions that, together, represent people who have a cat or a dog or both.

Your Turn

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

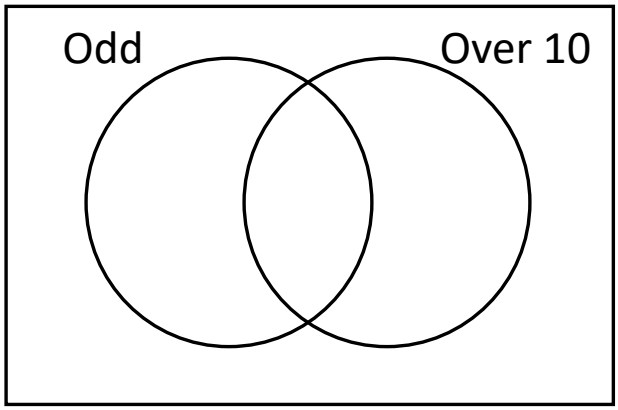
Venn Diagrams

1

Complete each Venn Diagram

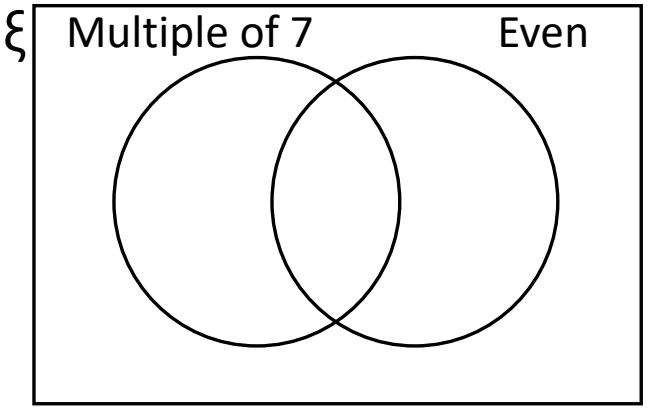
A) ξ =

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



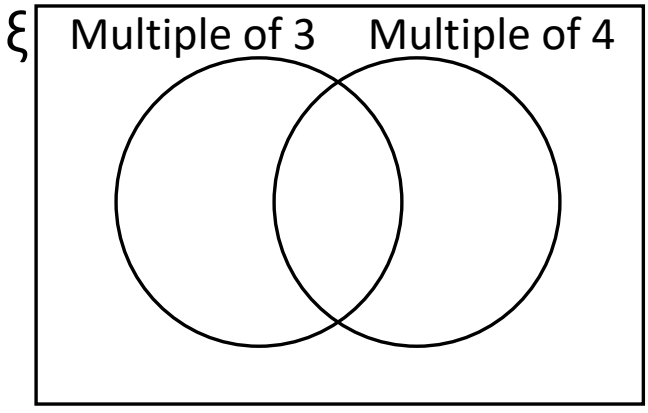
B) ξ =

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



C) ξ = Numbers from 1 to 25

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



Fluency Practice

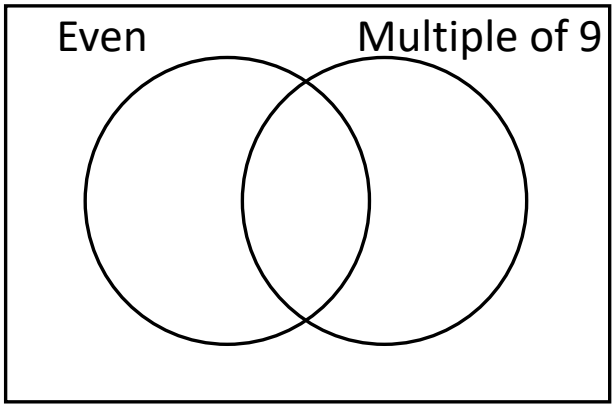
Venn Diagrams

2

Complete each Venn Diagram

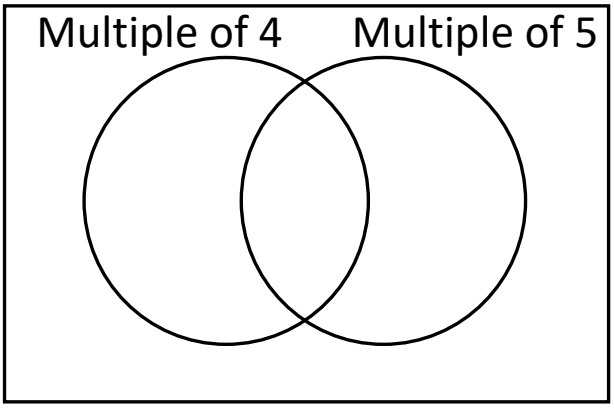
A) ξ =

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



B) ξ = 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

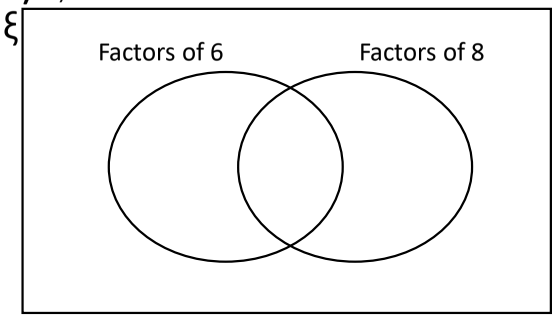
E) ξ = Multiples of 5 up to 50 inclusive

F) ξ = Multiples of 8 up to 40 inclusive

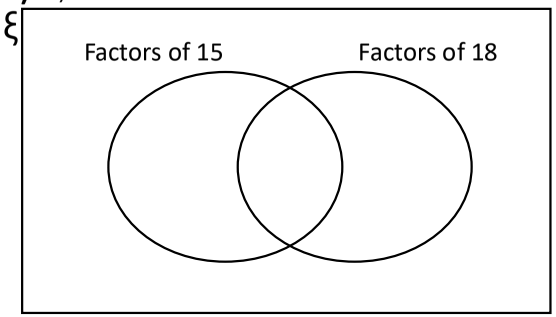
G) ξ = Multiples of 6 up to 60 inclusive

Venn Diagrams for Factors

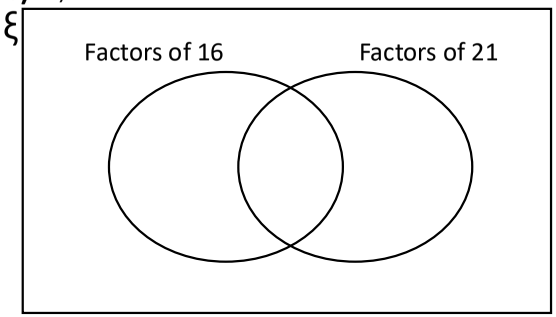
A) ξ = Factors of 24



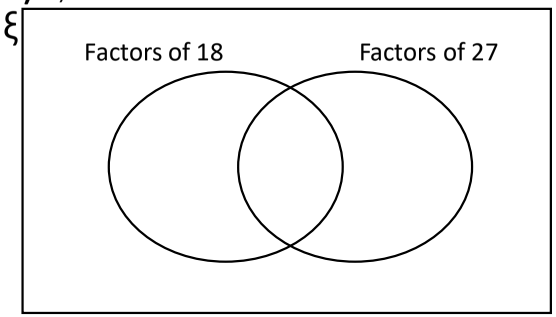
B) ξ = Factors of 36



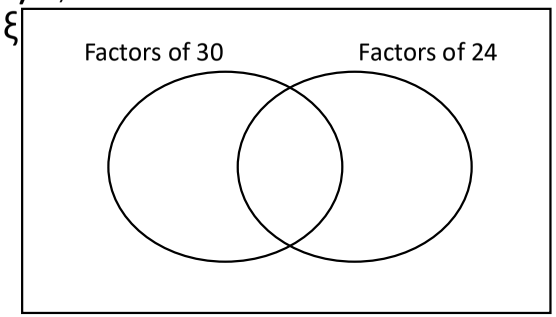
C) ξ = Factors of 28



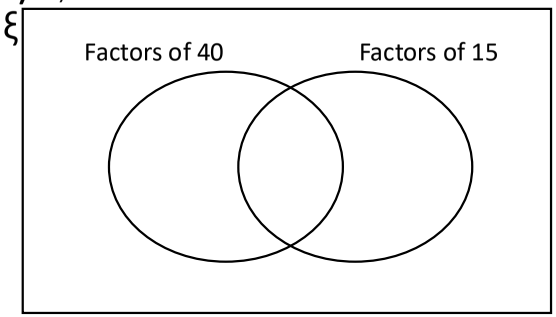
D) ξ = Factors of 54



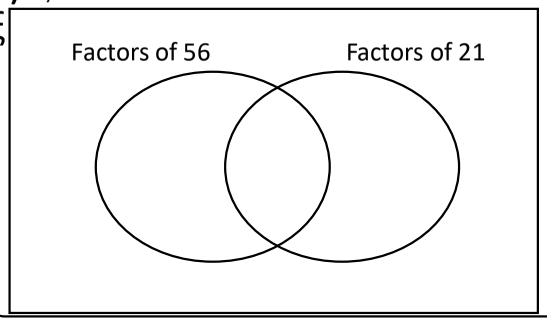
E) ξ = Factors of 60



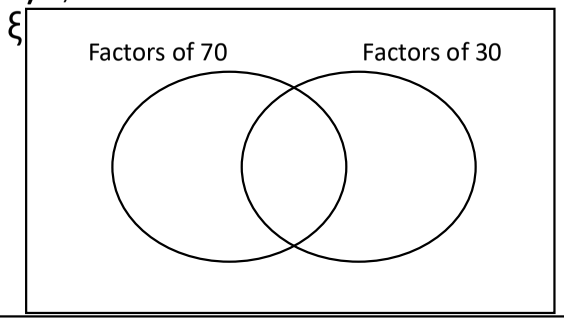
F) ξ = Factors of 90



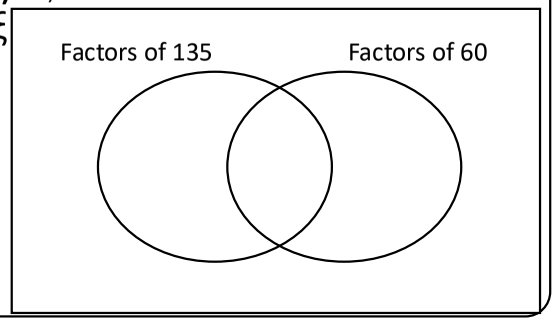
G) ξ = Factors of 42



H) ξ = Factors of 140



I) ξ = Factors of 180



Worked Example	Your Turn
Represent as a Venn diagram: $\xi = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ $A = \{0, 1, 3, 5, 8\}$ $B = \{2, 5, 8, 9\}$	Represent as a Venn diagram: $\xi = \{2, 3, 4, 5, 7, 11, 13, 17, 19\}$ $A = \{2, 3, 5, 11, 13\}$ $B = \{5, 7, 13, 17, 19\}$

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

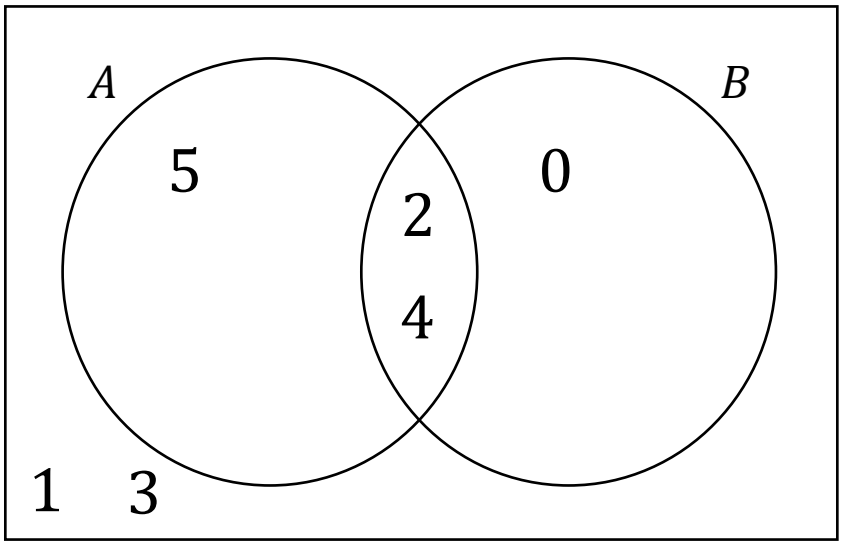
Worked Example

From the Venn diagram below, write in roster notation:

$\xi =$

$A =$

$B =$



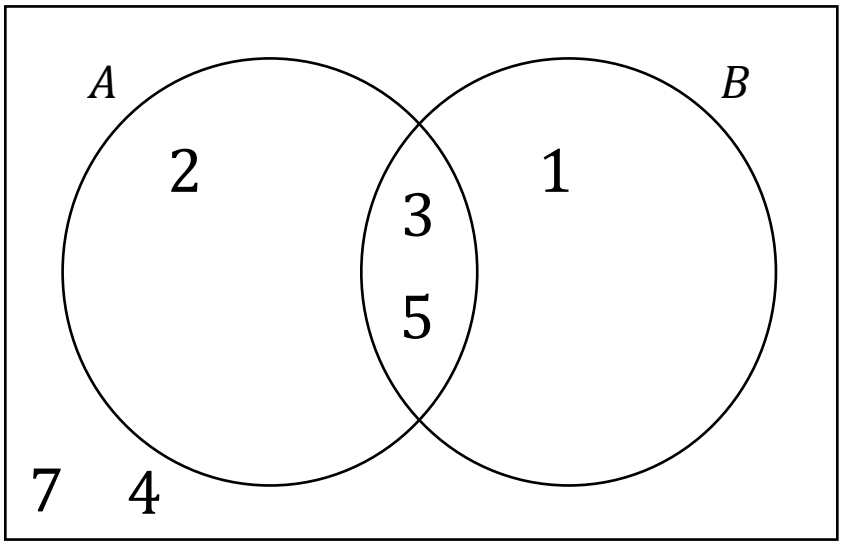
Your Turn

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:

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

$A = \{odd\ numbers\}$

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

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

Your Turn

Represent in a Venn diagram:

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

$A = \{prime\ numbers\}$

$B = \{square\ numbers\}$

$C = \{even\ numbers\}$

Worked Example

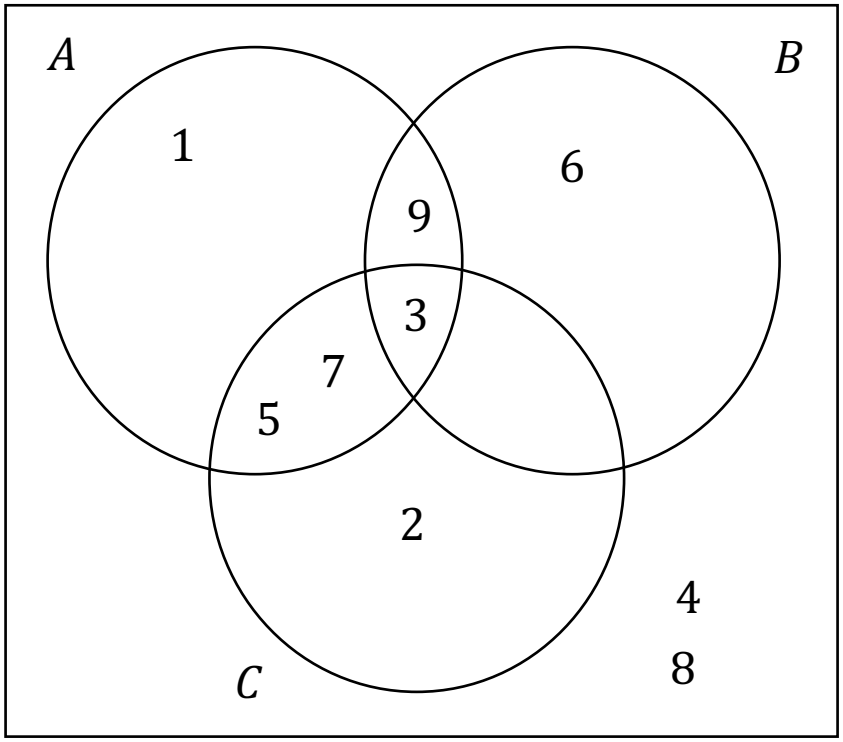
From the Venn diagram below, write in roster notation:

$\xi =$

$A =$

$B =$

$C =$



Your Turn

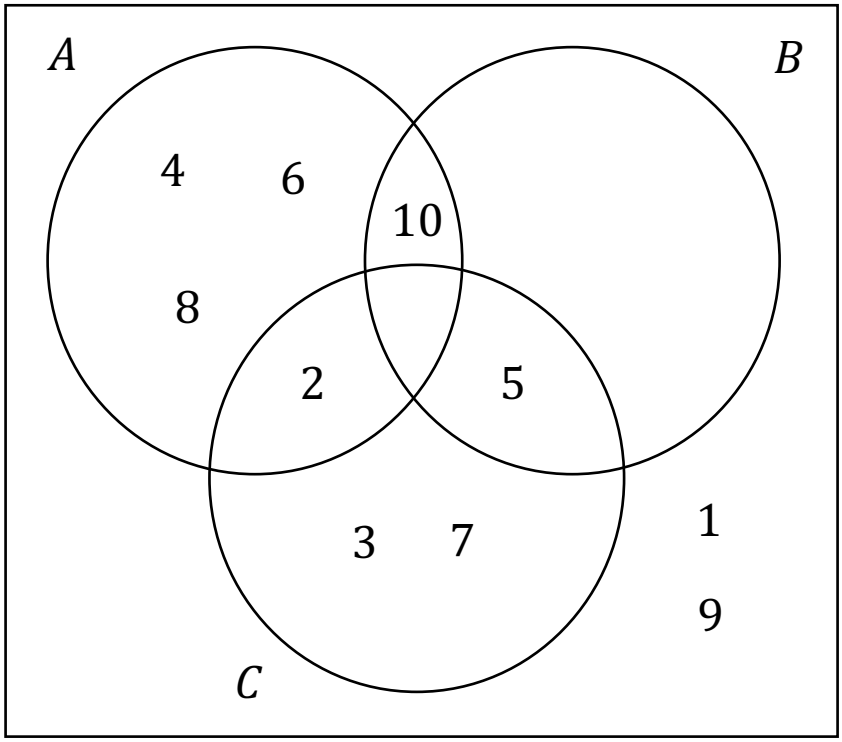
From the Venn diagram below, write in roster notation:

$\xi =$

$A =$

$B =$

$C =$

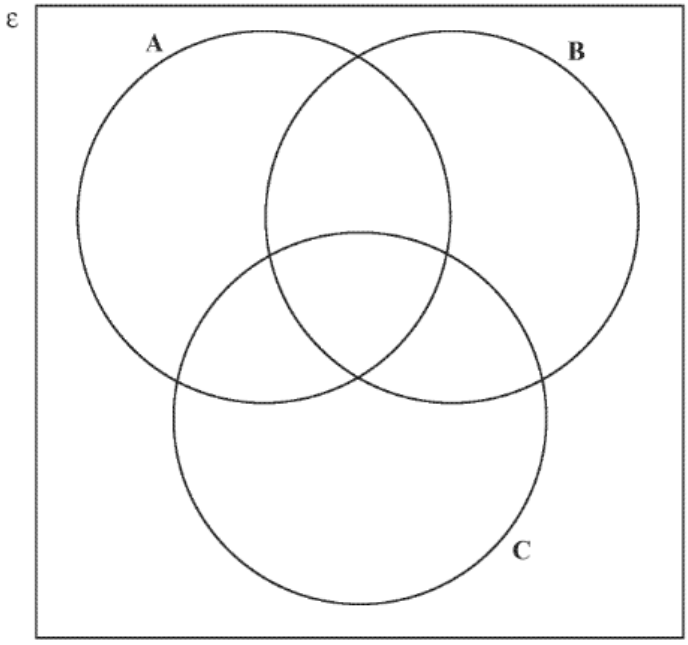


Fluency Practice

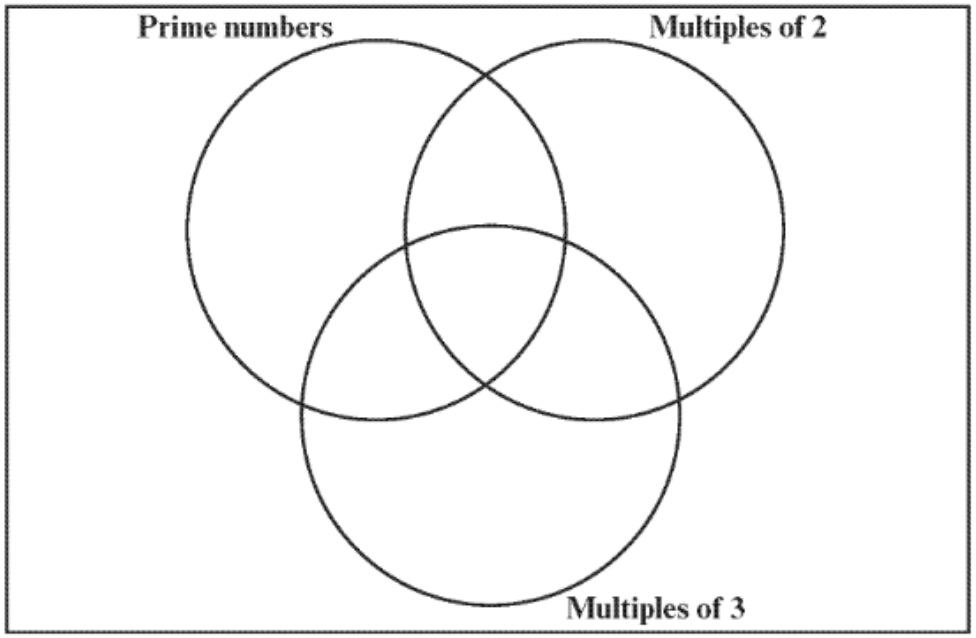
Given the following information, complete the Venn diagram shown below.

1.

- $\varepsilon = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
- **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.

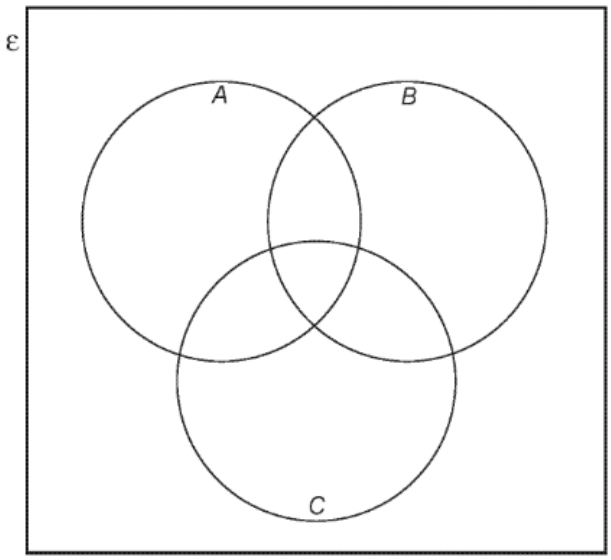


3. The universal set, ε = {22, 23, 24, 25, 26, 27, 28, 29, 30}.

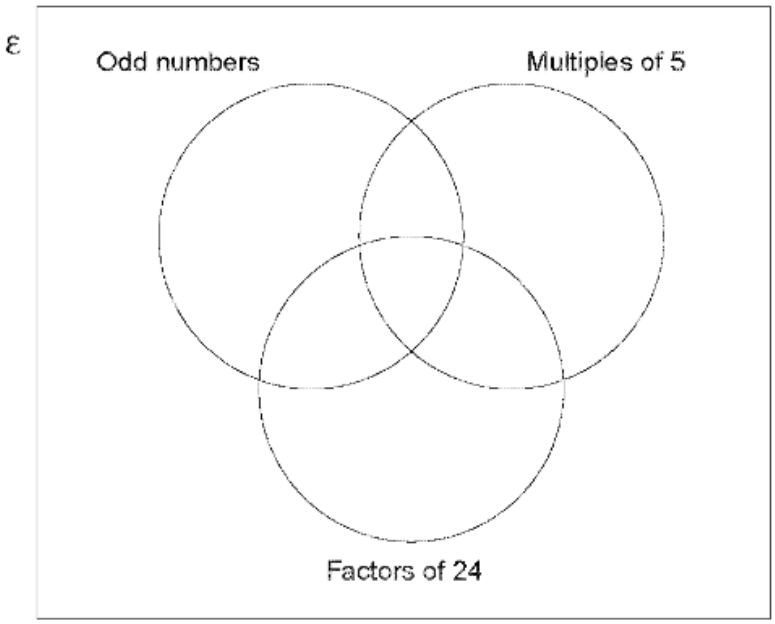
Within this universal set ε,

- 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
Calculate: a) $3 - 4 =$ b) $-3 + 4 =$ c) $-3 - 4 =$ d) $-4 + 3 =$ e) $-4 - 3 =$	Calculate: a) $-5 + 7 =$ b) $-7 + 5 =$ c) $5 - 7 =$ d) $-7 - 5 =$ e) $-5 - 7 =$

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

3.2 Multiplying Negative Numbers

Worked Example	Your Turn
Calculate: a) $3 \times (-4) =$ b) $(-3) \times 4 =$ c) $(-3) \times (-4) =$ d) $(-4) \times (-3) =$	Calculate: a) $(-5) \times (-7) =$ b) $5 \times (-7) =$ c) $(-7) \times (-5) =$ d) $(-5) \times 7 =$

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3.3 Dividing Negative Numbers

Worked Example	Your Turn
Calculate: a) $12 \div (-3) =$ b) $12 \div (-4) =$ c) $(-12) \div (-3) =$ d) $(-12) \div (-4) =$	Calculate: a) $(-35) \div (-5) =$ b) $35 \div (-5) =$ c) $(-35) \div (-7) =$ d) $35 \div (-7) =$

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3.4 Real Life Applications

Worked Example

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.

Your Turn

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.

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Worked Example	Your Turn
a) Delfina has $-£30$ in her bank account. She withdraws £43 to pay for her weekly groceries. Find the current balance in her account. b) Beth has $-£48$ in her bank account. She deposits £22. Find the current balance in her account.	a) Oumou has $-£21$ in her bank account. She withdraws £17 to pay for her weekly groceries. Find the current balance in her account. b) Lilly has $-£72$ in her bank account. She deposits £42. Find the current balance in her account.

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Worked Example	Your Turn
a) Imene has $-£300$ in her bank account at the end of the month. She deposits some money so that the account balance is now $£650$. Find out how much money Imene deposited into her account. b) Beth has $-£250$ in her bank account. She deposits some money so that the account balance is now $-£232$. Find out how much money Beth deposited into her account.	a) Melissa has $-£650$ in her bank account. She deposits some money so that the account balance is now $-£616$. Find out how much money Melissa deposited into her account. b) Amayra has $-£100$ in her bank account at the end of the month. She deposits some money so that the account balance is now $£1250$. Find out how much money Amayra deposited into her account.

Dr Frost 87d and 87g

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: $70 \div -10 \times -8$

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Worked Example	Your Turn
Fill in the missing number. a) $9 - \square = 14$ b) $18 + \square = -5$ c) $\square \times -10 = -90$ d) $\square \div -10 = -7$	Fill in the missing number. a) $-9 + \square = -12$ b) $\square - (-6) = 13$ c) $32 \div \square = -4$ d) $\square \times -6 = -66$

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