Q1

1

First list out all the possible factors.

Factors of 8: 1, 2, 4, 8
Factors of 20: 1, 2, 4, 5, 10, 20

The universal set states that only even numbers can be used, so list the even factors.

Set A: 2, 4, 8
Set B: 2, 4, 10, 20

[1]

Find the numbers that appear in A 'or' B, $(A \cup B)$.

2, 4, 8, 10, 20 [1]

Q2

2a

$\emptyset$ is an empty set; a set that contains no elements.

No students study German and Maths [1]

2b

$\notin$ means an element not contained in a set.

Preety does not study French [1]

2c

Using $A \cap B = \{2, 4\}$, A and B must both contain 2 and 4.

Using $A \cup B = \{1, 2, 3, 4, 6, 8, 10\}$, if 1 and 3 are not in A but are in A 'or' B, they must be in B.

$B = \{1, 2, 3, 4\}$ [1]

Q3

3a

(i) List all the elements in A 'and' B.

u, p, e, r [1]

(ii) List all the elements in A 'or' B.

s, u, p, e, r, c, o, m, t [1]

3b

$X \cap Y \neq \emptyset$, the intersection of X and Y is not an empty set.

Tick (✓) the appropriate box.

	Yes	No
	☐	☑

2 and 3 are both prime AND factors of 12 [1]

Both tick and explanation are required for the mark

Q4

4

List all of the elements that are in set A 'and' set B, all the numbers that are both odd 'and' prime.

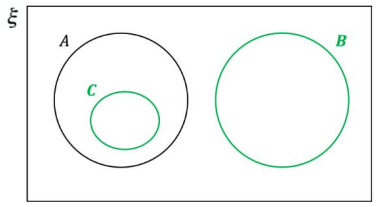
3, 5, 7, 11 [1]

Q5

5a

$A \cap B = \varnothing$, means that there is no intersection between sets A and B, so they must not overlap.

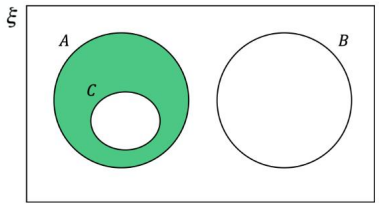
$C \subset A$, means that C is a subset of A, so set C must be inside set A.



Separate circle for B [1]
Circle for C is inside A [1]

5b

Shade the region inside by A 'and' not in C.



Correct region shaded [1]

Q6

6a

Find the number of elements that are in set A or set B.

$7 + 6 + 3 + 2 = 18$

18 [1]

6b

Find the number of elements that are not in set A.

$3 + 2 + 10 = 15$

15 [1]

6c

Find the number of elements that are in set B 'and' not in set C.

$6 + 3 = 9$

9 [1]

6d

Find the number of elements in set A 'or' not in set B.

$7 + 3 + 2 + 10 = 22$

22 [1]

Q7

7

List the factors of 100.

Factors of 100: 1, 2, 4, 5, 10, 20, 25, 50, 100

List any factors of 100 or multiples of 5 [1]

List the factors of 100 that are also multiples of 5.

5, 10, 20, 25, 50, 100 [1]

Q8

8a

$\emptyset$ is an empty set; a set that contains no elements.

No numbers are in both set *A* and set *B* [1]

8b

$x \in \xi$, means that x is an element in the universal set.

$x \notin A \cup B$, means that x is an element not in set A 'or' in set B.

9 is the only number in the universal set that is not in set A 'or' set B.

9 [1]

8c

$A \cup B \cup C = \xi$ that all of the numbers in the universal set are contains within A, B or C.

9 is the only number that is not in set A 'or' B, so it must be in set C.

$A \cap C = \{3, 7\}$ and $B \cap C = \{8\}$, tell us that set C also contains 3, 7 and 8.

3, 7, 8, 9 [1]

Q9

9a

(i) List the elements in set A 'and' not in set B, (odd numbers that are not multiples of 5).

1, 3, 7, 9, 11, 13, 17 [1]

(ii) List the elements in set B 'or' in set B, (multiples of 4 or multiples of 5).

4, 5, 8, 10, 12, 15, 16 [1]

9b

4 is an even number, so it is divisible by 2.

All multiples of 4 can therefore also be divided by 2.

Tick (✓) the appropriate box.

Yes	No
☑	☐

No multiples of 4 are prime [1]

Both the tick and the explanation are required for the mark

Q10

10a

List the elements that are not in set B, numbers that are not multiples of 3.

1, 2, 4, 5, 7, 8, 10 [1]

10b

List the number of elements that are not in set A 'and' are in set B, numbers that are not even and are multiples of 3.

3, 9

Write down the number of elements in the list.

2 [1]

10c

$x \in B$ means that x is an element of B, so x could be any multiple of 3 between 1 and 10.

3, 6, 9

[1]

$x \notin A$ means that x is an element that is not in set A, so x cannot be even.

3 and 9 are the only odd multiples of 3 between 1 and 10.

3, 9 [1]

Q11

11a

$n(A \cap B) = 8$ means that there are 8 elements in the intersection of A and B.

Find the number of elements that are in B but not in A by subtracting the number of elements that are in both A and B from the number of elements in B.

$21 - 8 = 13$

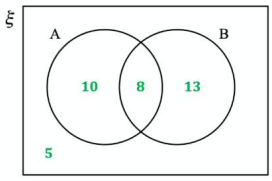
Find the number of elements that are not in set A 'or' in set B by subtracting the number of elements that are in set B but not set A from the number of elements that are not in set A.

$18 - 13 = 5$

Find the number of elements that are in set A but not in set B by subtracting all of thevalues in the other sections of the Venn diagram from the number of elements in the universal set.

$36 - 8 - 13 - 5 = 10$

Fill in the values in the appropriate parts of the Venn diagram.



Correct value for the number of elements in set B but not in set A [1]
Correct value for either the number of elements in set A but not set B OR correct value for the number of elements not in set A or set B [1]
All values correct [1]

11b

(i) Find the number of elements that are in set A 'or' in set B.

$10 + 8 + 13 = 31$

31 [1]

(ii) Find the number of elements that are in set A 'and' not in set B.

10 [1]

Q12

12a

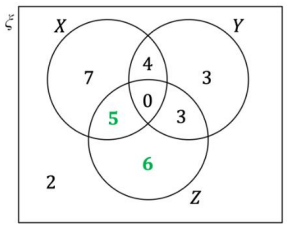
Find the number of elements that are in Z but not in X 'or' Y by subtracting the number of elements that are in Y only, the number of elements that are in Y 'and' Z 'and' not X and the number of elements that are not in X, Y 'or' Z from the number of elements that are not in X.

$$14 - 3 - 3 - 2 = 6$$

Find the number of elements that are in X 'and' in Z 'and' not in Y by subtracting the number of elements in all of the other sections in Z from the number of elements in Z.

$$14 - 0 - 3 - 6 = 5$$

Complete the Venn diagram putting the values in the appropriate places.



Any correct missing value in Venn diagram [1]
Venn diagram completed with all correct values [1]

12b

(i) The number of elements that are in set X 'or' in set Z.

$$7 + 4 + 5 + 6 + 3 = 25$$

25 [1]

(ii) The number of elements that are in set X 'and' not in set Y.

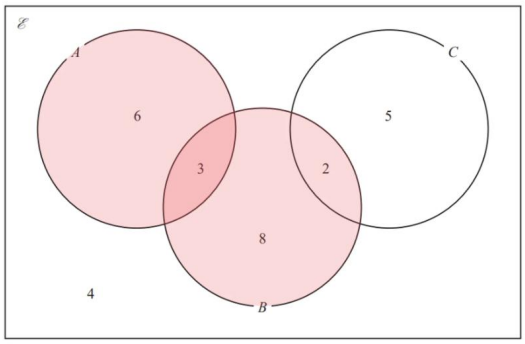
$$7 + 5 = 12$$

12 [1]

Q13

13a

$n(A \cup B)$ means the number of elements in A **or** B. It is everything shaded below.

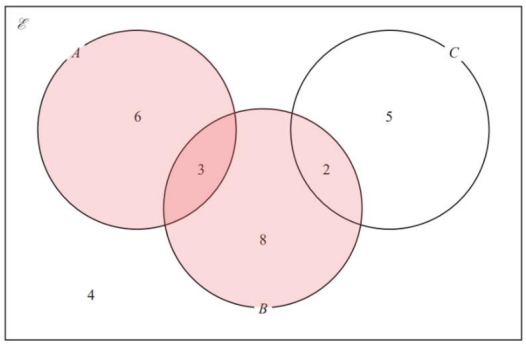


$$n(A \cup B) = 6 + 3 + 8 + 2$$

Answer = 19 [1]

13b

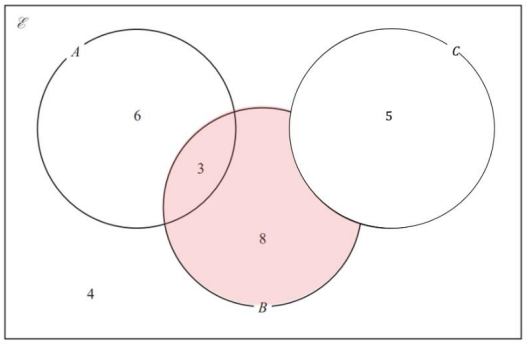
$n(A \cap B)$ means the number of elements in A **and** B. It is the overlapping shaded part below.



Answer = 3 [1]

13c

$n(B \cap C')$ means the number of elements in B **and not** in C. It is everything shaded below.



$$n(B \cap C') = 3 + 8$$

Answer = 11 [1]

13d

$n(A' \cup B' \cup C')$ means the number of elements that are either not in A or not in B or not in C. None of the elements are in A, B and C at the same time, so all of the elements are either not in A or not in B or not in C.

Add all the numbers in the diagram.

$$n(A' \cup B' \cup C') = 6 + 3 + 8 + 2 + 5 + 4$$

Answer = 28 [1]

Q14

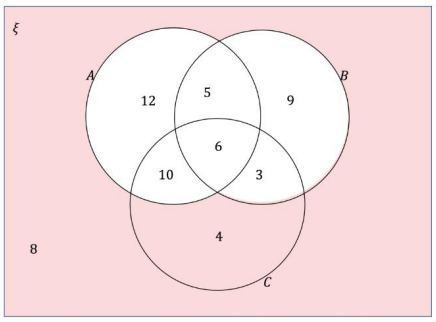
14

i) $n(A \cup B)$ means the number of elements in A "or" B.

$$n(A \cup B) = 12 + 10 + 5 + 6 + 9 + 3$$

Answer = 45 [1]

ii) $n(A' \cap B')$ means the number of elements that are not in A **and** are not in B. It is represented by the shaded area in the diagram below.

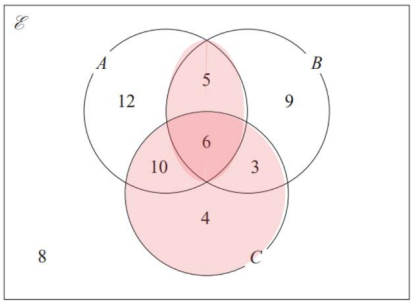


$$n(A' \cap B') = 4 + 8$$

Answer = 12 [1]

iii) $n([A \cap B] \cup C)$ means the number of elements that are in A **and** B, **or** in C. It is represented by all the shaded area in the diagram below.
($n([A \cap B] \cap C)$ would be the overlapping shaded area below, or 6)

iii) $n([A \cap B] \cup C)$ means the number of elements that are in A **and** B, **or** in C. It is represented by all the shaded area in the diagram below.
($n([A \cap B] \cap C)$ would be the overlapping shaded area below, or 6)



$$n([A \cap B] \cup C) = 5 + 6 + 10 + 3 + 4$$

Answer = 28 [1]