

Identify and represent sets

1

Are the two sets the same or different? Tick your answers.

Give reasons for your answers.

- a) $A = \{1, 2, 3, 4\}$ $B = \{4, 3, 2, 1\}$ ☒ same ☐ different

The elements of A and B are identical.

- b) $A = \{-1, -2, -3, -4\}$ $B = \{1, 2, 3, 4\}$ ☐ same ☒ different

The elements of A are negative whereas B are positive.

- c) $A = \{\text{even numbers}\}$ $B = \{2, 4, 6, 8\}$ ☐ same ☒ different

B doesn't contain all even numbers, only 4

- d) $A = \{\text{names of pets}\}$ $B = \{\text{types of pets}\}$ ☐ same ☒ different

The name of a pet is generally different than the type of pet.

- e) $A = \{\text{letters in "word scare"}\}$ $B = \{\text{letters in "word cares"}\}$ ☒ same ☐ different

scare and cares contain the same letters.

- f) $A = \{\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{5}{5}\}$ $B = \{0.2, 0.4, 0.6, 0.8, 1\}$ ☒ same ☐ different

$\frac{1}{5}$ is equivalent to 0.2 and so on.

2

List the elements of the sets.

Use correct set notation.

- a) Set A: months of the year

$A = \{\text{January, February, March, April, May, June, July, August, September, October, November, December}\}$

- b) Set B: quadrilaterals with at least two right angles

$B = \{\text{square, rectangle, right-trapezium}\}$

- c) Set C: factors of 27

$C = \{1, 3, 9, 27\}$

- d) Set D: square numbers less than 100

$D = \{1, 4, 9, 16, 25, 36, 49, 64, 81\}$

- e) Set E: letters in "mathematics"

$E = \{m, a, t, h, e, i, c, s\}$

3

$\xi = \{\text{letters in the alphabet}\}$

- a) $A = \{\text{letters in "symmetry"}\}$

List the elements of set A.

s y m e t r y

- b) $B = \{\text{letters in "proportion"}\}$

List the elements of set B.

p r o p o r t i o n

- c) Which letters are in both set A and set B?

r and t

4

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

List the elements of the sets.

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

1, 3, 5, 7, 9, 11, 13, 15, 17, 19

b) $B = \{\text{even numbers}\}$

2, 4, 6, 8, 10, 12, 14, 16, 18, 20

c) $C = \{\text{multiples of 8}\}$

8, 16

d) $D = \{\text{factors of 40}\}$

1, 2, 4, 5, 8, 10, 20

5

Describe the sets in words.

a) $\{4, 8, 12, 16, 20\}$

Multiples of 4 between 1 and 20 inclusive.

b) $\{-4, -8, -12, -16, -20\}$

Multiples of -4 between -1 and -20 inclusive.

c) $\{a, t, h, m, s\}$

Letters in the word maths.

d) $\{1, 3, 7, 21\}$

Factors of 21

e) $\{35, 70, 105, 140, 175\}$

Multiples of 35 between 1 and 175 inclusive.

Compare answers with a partner.

Do any of the sets have more than one solution?

6

 $\xi = \{\text{integers between 1 and 50 inclusive}\}$
 $A = \{\text{factors of 100}\}$ $C = \{\text{even numbers}\}$
 $B = \{\text{multiples of 5}\}$ $D = \{\text{odd numbers}\}$

a) List the elements in the sets.

A 1, 2, 4, 5, 10, 20, 25, 50

B 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

C 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50

D 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49

b) List the elements that are in both set A and set B.

5, 10, 20, 25, 50

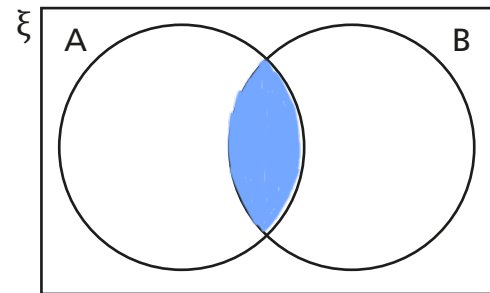
c) Are any elements in both set C and set D? Explain your answer.

No. A number can't be both odd and even.

Compare answers with a partner.

Interpret and create Venn diagrams

1 The Venn diagram shows the intersection of sets A and B.



ξ is the universal set.

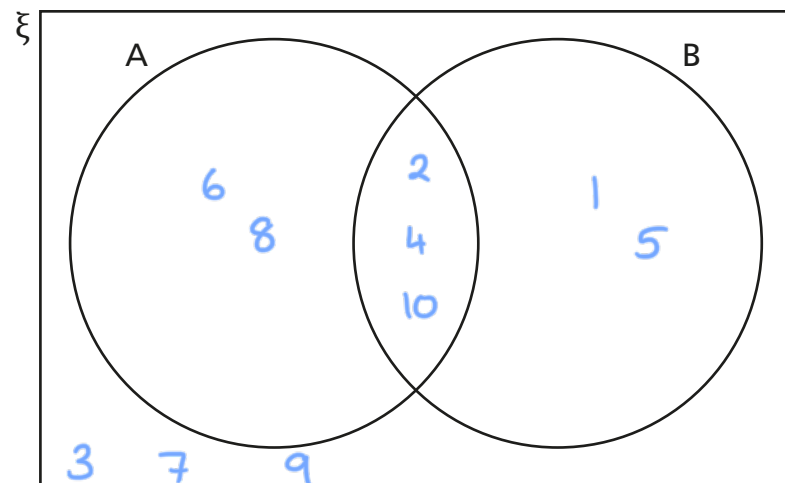
ξ is the universal set.

- Shade the part of the diagram where you would put elements of both set A and set B.
- Explain where you would put elements that are in the universal set but are not members of set A or set B.

2

$\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 $A = \{\text{even numbers}\}$
 $B = \{\text{factors of 20}\}$

- List the elements of set A. 2, 4, 6, 8, 10
- List the elements of set B. 1, 2, 4, 5, 10
- List the elements that are in both set A and set B. 2, 4, 10
- Show this information on the Venn diagram.



3

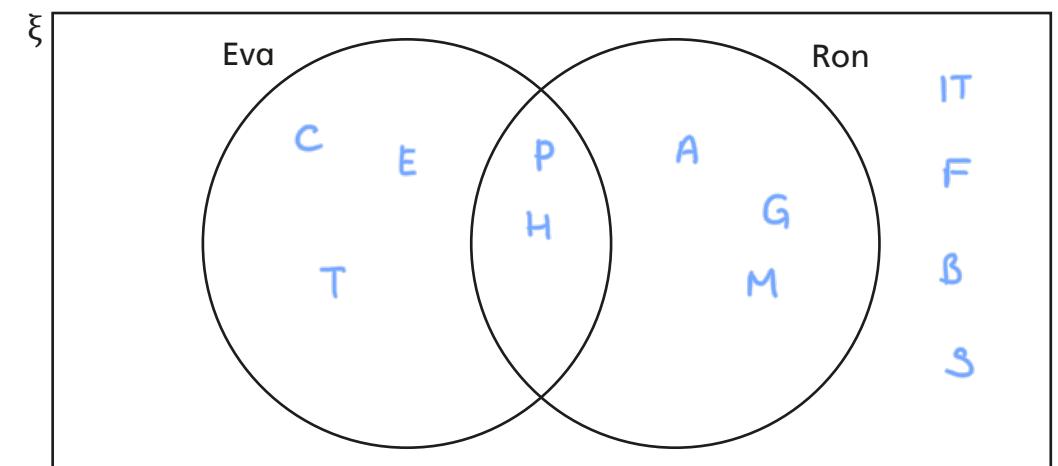
Students in Year 9 can choose from these subjects for GCSE.

| | | | |
|-----------------|--------------|-----------------|--------------|
| Music (M) | PE (P) | Computing (C) | History (H) |
| Geography (G) | Art (A) | Technology (IT) | Business (B) |
| Engineering (E) | Textiles (T) | French (F) | Spanish (S) |

Eva chooses PE, Computing, Engineering, History and Textiles.

Ron chooses PE, Art, Geography, History and Music.

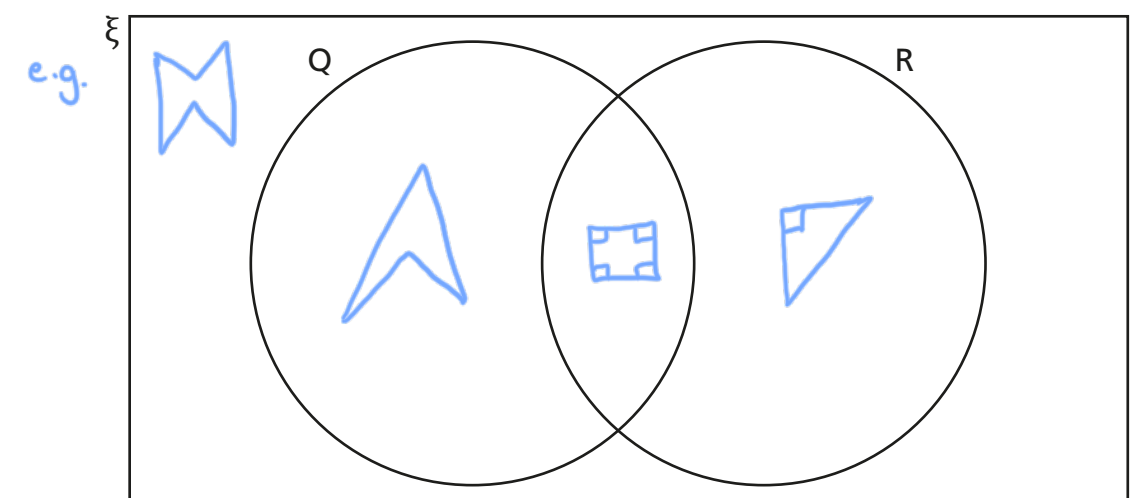
Represent this information in the Venn diagram.



4

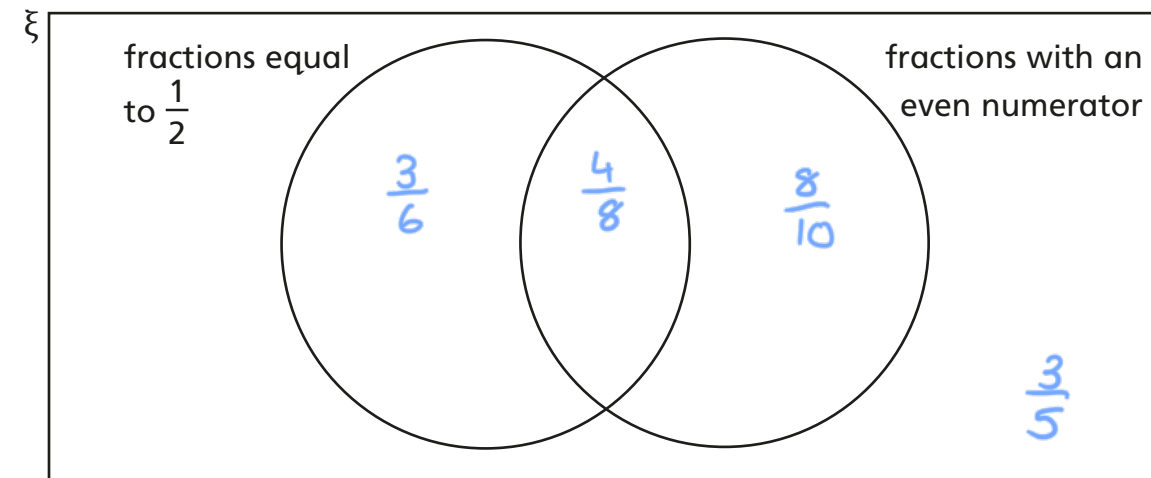
$\xi = \{\text{2D shapes}\}$
 $Q = \{\text{quadrilaterals}\}$ and $R = \{\text{shapes with a right angle}\}$

Draw four shapes, each one in a different section of the Venn diagram.



- 5 Esther and Nijah are writing fractions in a Venn diagram.

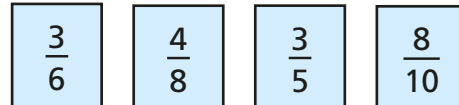
The universal set ξ is fractions between 0 and 1



- b) Explain where you would place $\frac{6}{12}$

In the overlapping bit because $\frac{6}{12} = \frac{1}{2}$ and 6 is even.

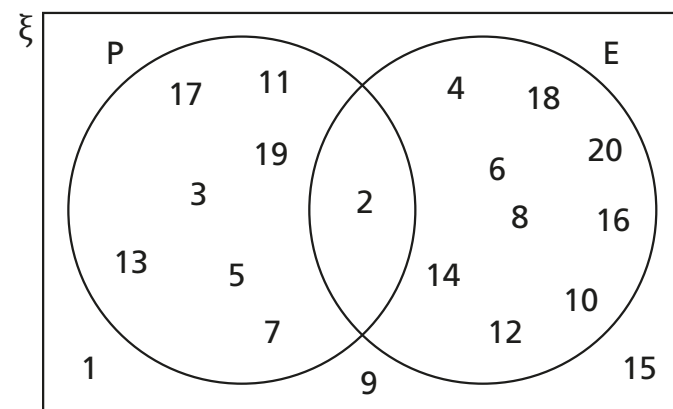
- a) Write the fractions in the Venn diagram.



- c) Explain why $\frac{5}{2}$ would not be placed in the Venn diagram at all.

It is not between 0 and 1

- 6 The numbers from 1 to 20 have been put in a Venn diagram.



- a) Describe what you think set P and set E represent.

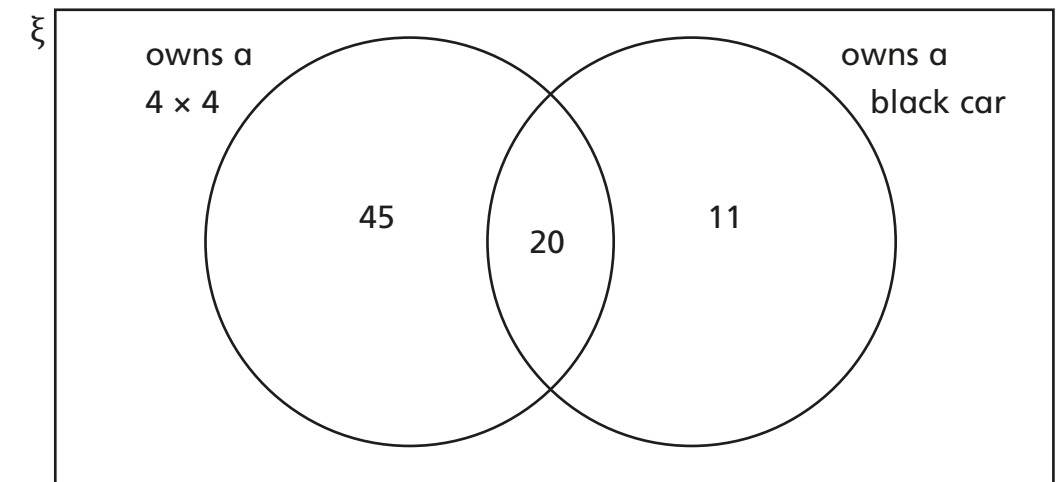
P: Prime E: Even

- b) Do you think any other numbers will be in both sets?

Talk about it with a partner.

- 7 80 people completed an online survey about the car they own.

The Venn diagram shows some information from the survey.



- a) How many people own a 4 x 4?

65

- b) How many people own a black car?

31

- c) How many people own a black 4 x 4?

20

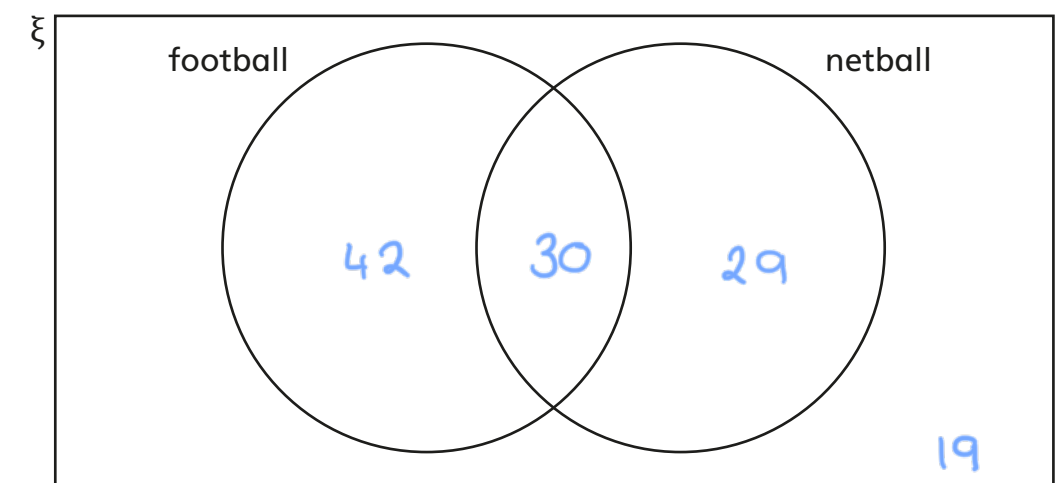
- d) How many people own a car that is not black or a 4 x 4?

4

- 8 120 students were asked what sports they play.

- 72 students play football.
- 59 students play netball.
- 30 students play both.

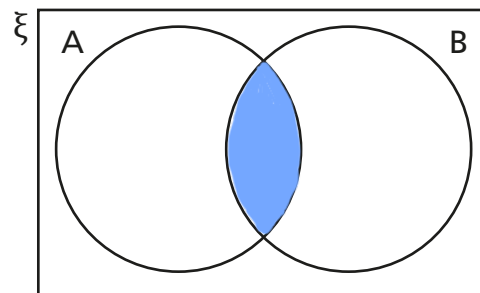
Complete the Venn diagram to show this information.



Understand and use the intersection of sets

1

Here are two sets: A and B.

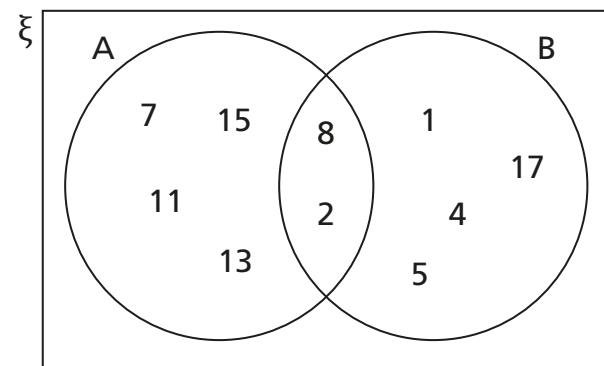


- Shade the region that represents $A \cap B$.
- Describe what $A \cap B$ means.

It's the set containing all the elements that are in set A AND set B.

2

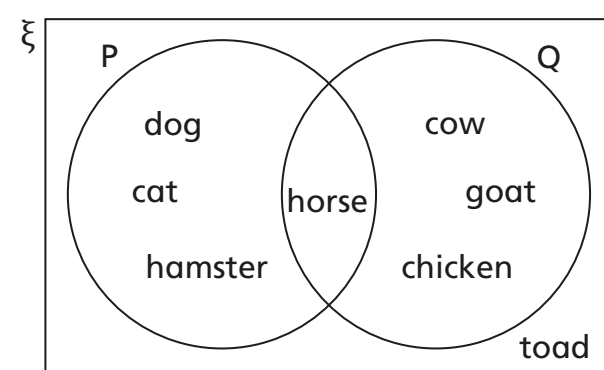
a)



Write the elements of $A \cap B$.

2, 8

b)



Write the element of $P \cap Q$.

horse

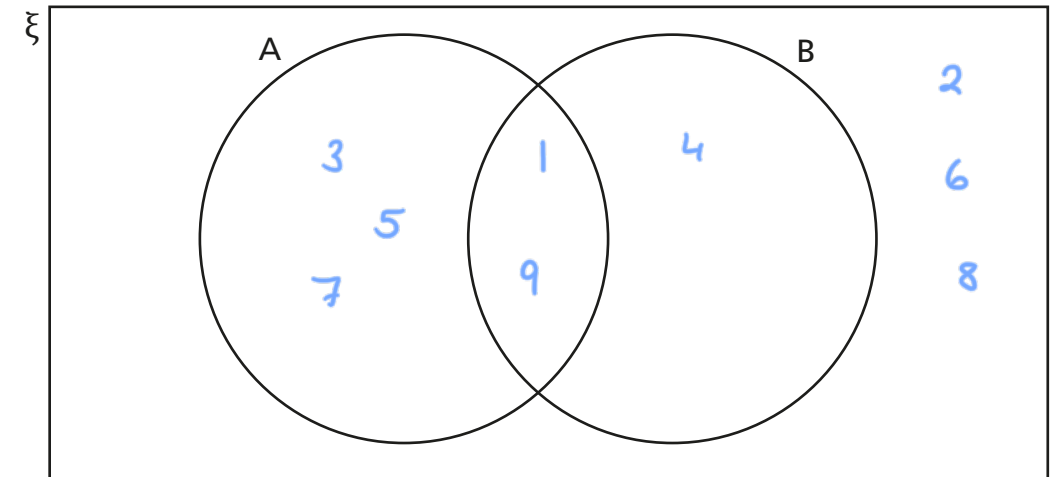
3

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

$$A = \{1, 3, 5, 7, 9\}$$

$$B = \{1, 4, 9\}$$

- Complete the Venn diagram to show the information.



- Use your Venn diagram to work out $A \cap B$.

1, 9

- Which description best describes the elements of $A \cap B$?

Tick your answer.

square numbers ☐

odd square numbers ☒

even numbers ☐

odd numbers ☐

4

$$A = \{0, 5, 10, 15, 20, 25, 30\}$$

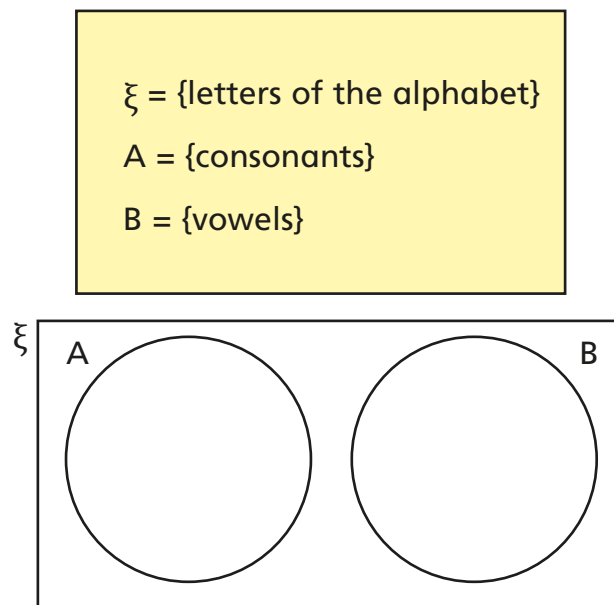
$$B = \{0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20\}$$

- Work out the elements of $A \cap B$.

0, 10, 20

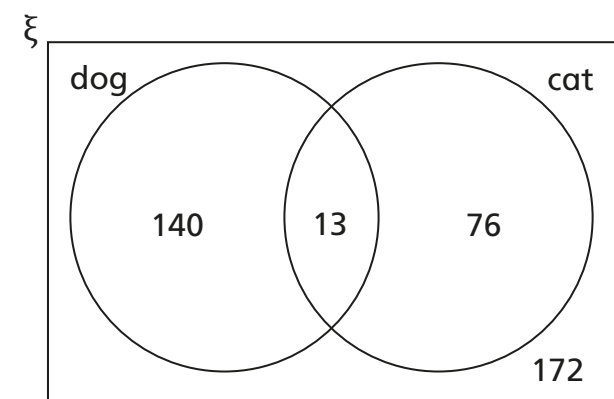
- Discuss with a partner how to describe the members of $A \cap B$.

- 5 Explain why the Venn diagram represents the information.



There is no intersection. A letter is either a vowel or a consonant, it can't be both.

- 6 The Venn diagram shows the number of students in a school who own a cat or a dog.



- a) How many students own a cat and a dog?
 b) How many students own a dog?
 c) How many students do not own a cat?

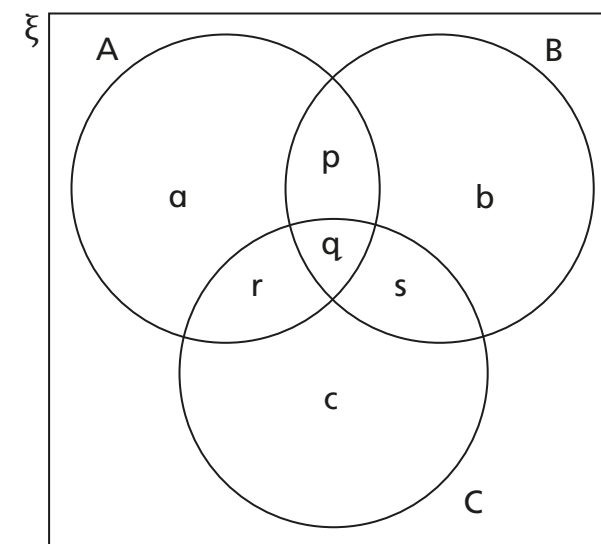
13

153

312

- 7 Here are three sets: A, B and C.

Some letters have been placed in different regions.



List the elements of:

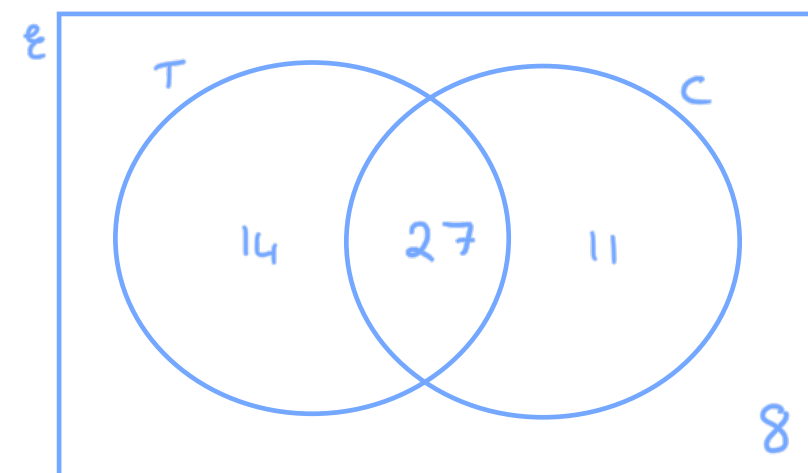
- a) $A \cap B = \{p, q\}$
 c) $B \cap C = \{q, s\}$
 b) $A \cap C = \{q, r\}$
 d) $(A \cap B) \cap C = \{q\}$

- 8 60 people were asked whether they liked tea and coffee.
 The results are shown in the two-way table.

| | Like | Do not like |
|--------|------|-------------|
| Tea | 41 | 19 |
| Coffee | 38 | 22 |

27 people like both tea and coffee.

- a) Draw a Venn diagram to represent this information.

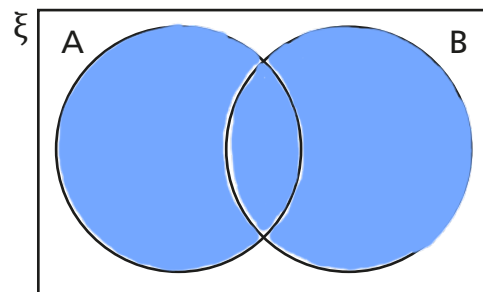


- b) How many people do not like tea or coffee?

8

Understand and use the union of sets

1 Here are two sets: A and B.

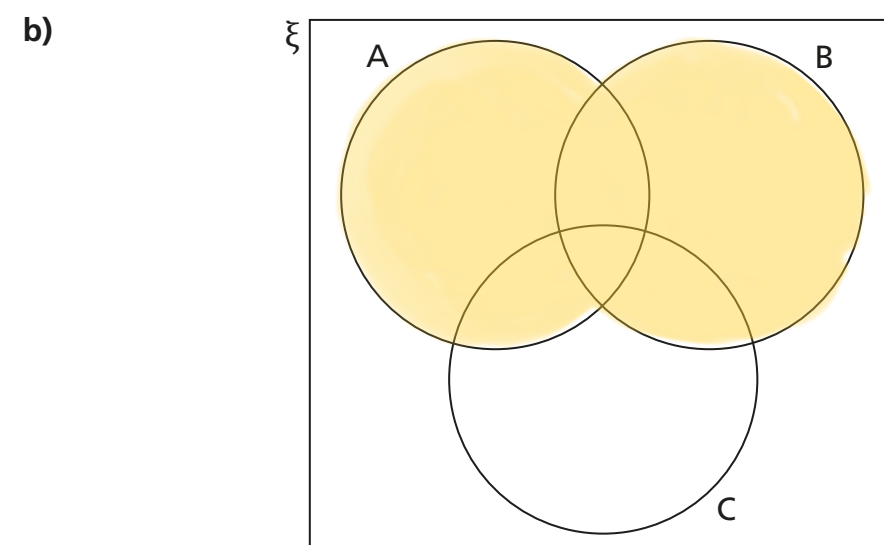
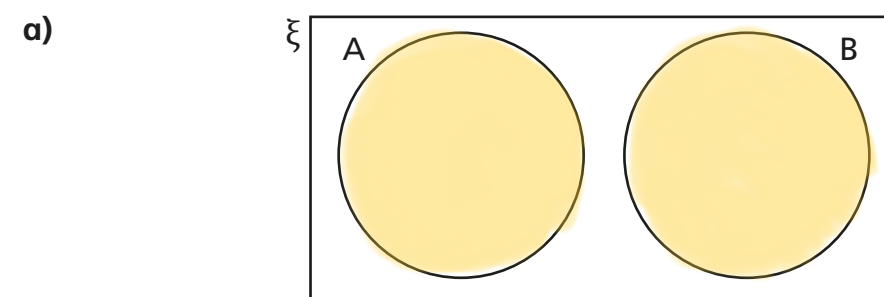


- Shade the region that represents $A \cup B$.
- Describe what $A \cup B$ means.

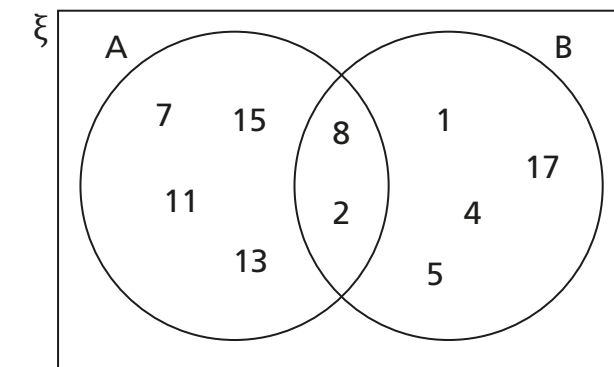
The set that contains elements that are in set A
OR set B OR both.



2 Shade the regions that represent $A \cup B$.



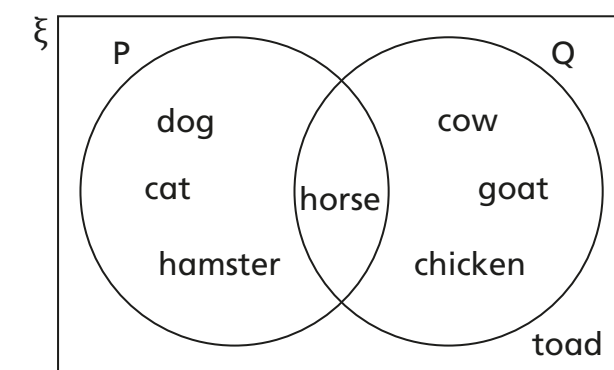
3 a)



Write the elements of $A \cup B$.

7, 11, 15, 13, 8, 2, 1, 4, 5, 17

b)

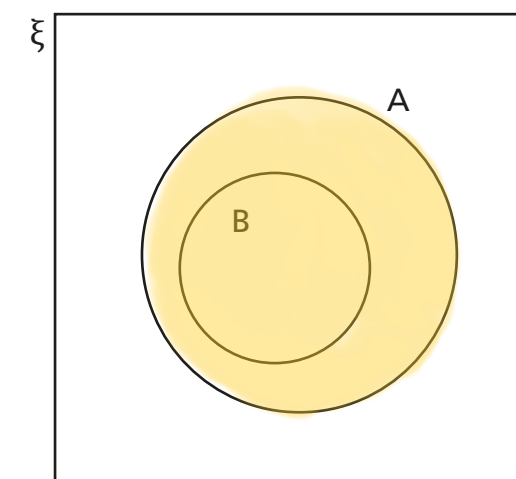


Write the element of $P \cup Q$.

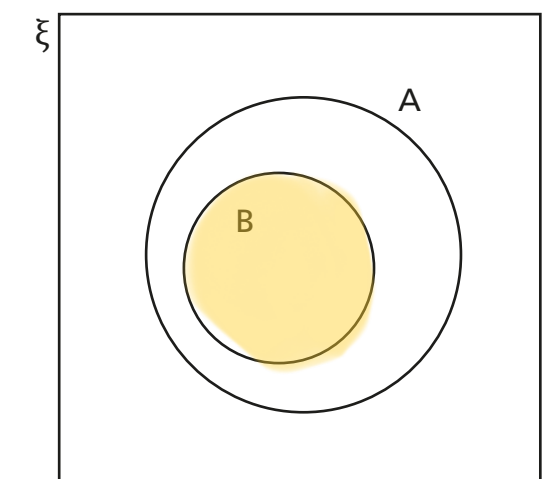
dog, cat, hamster, horse, cow, goat, chicken.

4 Shade the regions.

a) $A \cup B$



b) $A \cap B$



- 5 A is the set of children who went to a theme park on a school trip.
B is the set of children who went to a museum on a school trip.

$A = \{\text{Whitney, Filip, Rosie, Ron, Nijah, Brett, Amir}\}$

$B = \{\text{Eva, Ron, Kim, Tom, Filip, Huan, Amir, Mo}\}$

- a) List the elements of $A \cup B$.

Whitney, Filip, Rosie, Ron, Nijah, Brett, Amir, Eva, Kim,
Tom, Huan, Mo

- b) The teacher says that $A \cup B$ is the children who went to both the theme park and the museum.

Explain why the teacher is incorrect.

It's the children who went to the theme park or
the museum or both.

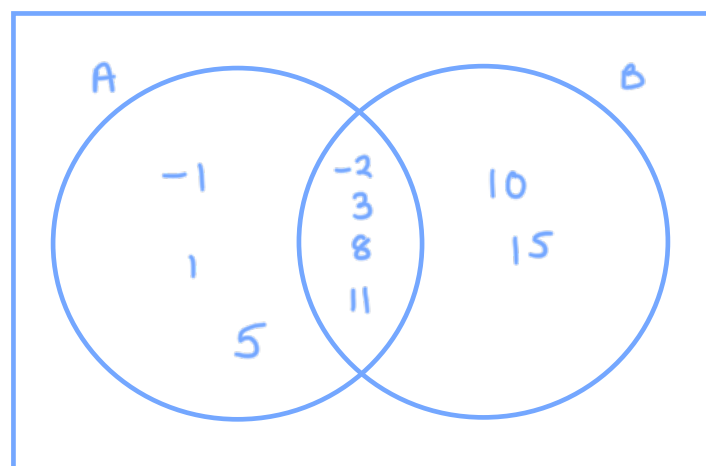
6

$$A \cap B = \{-2, 3, 8, 11\}$$

$$A \cup B = \{-2, -1, 1, 3, 5, 8, 10, 11, 15\}$$

Draw a possible Venn diagram to represent A and B.

e.g.

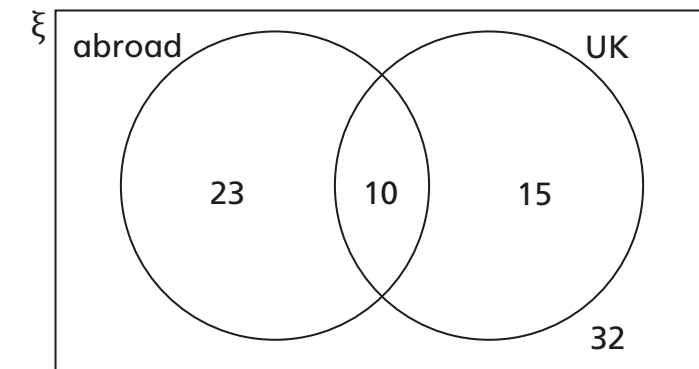


Compare your diagram to a partner's.

What is the same and what is different?

7

80 families were asked if they went on holiday abroad or in the UK.



- a) How many families went on holiday abroad?

33

- b) How many families went on holiday either abroad or in the UK?

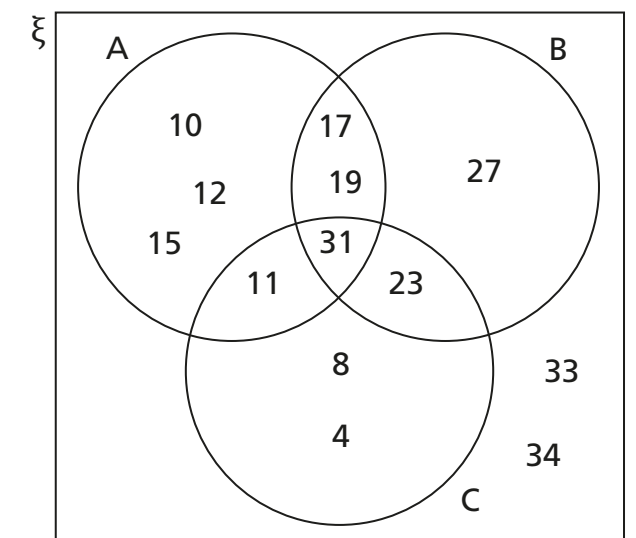
48

- c) How many families went on holiday abroad and in the UK?

10

8

Here are three sets: A, B and C.



List the elements of:

a) $A \cup B = \{10, 12, 15, 11, 17, 19, 31, 27, 23\}$

b) $A \cup C = \{10, 12, 15, 17, 19, 11, 31, 23, 8, 4\}$

c) $B \cup C = \{17, 19, 31, 23, 27, 11, 8, 4\}$

d) $A \cup B \cup C = \{10, 12, 15, 17, 19, 27, 11, 31, 23, 8, 4\}$

e) $(A \cap B) \cup C = \{17, 19, 11, 31, 23, 8, 4\}$

f) $(A \cup B) \cap C = \{31, 11, 23\}$

