GCSE · Edexcel · Maths

3 hours 40 questions

Exam Questions

Simple Probability Diagrams

Two-Way Tables / Frequency Trees / Set Notation & Venn Diagrams

Easy (11 questions)	/38
Medium (11 questions)	/45
Hard (18 questions)	/82
Total Marks	**/165**

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Easy Questions

1 (a) Uditi has a bag of chocolate sweets.

There are 30 sweets in the bag.

This table shows the types of sweets in the bag.

	Strawberry	**Caramel**	**Nut**
Dark chocolate	3	1	6
Milk chocolate	4	5	2
White chocolate	1	4	4

Uditi takes at random a sweet from the bag.

Write down the probability that the sweet is a dark chocolate caramel.

(1 mark)

(b) Work out the probability that the sweet is a white chocolate.

(2 marks)

(c) There are some dark chocolates, some milk chocolates and some white chocolates in a box.

The table below shows the probabilities that a chocolate taken at random from the box is a dark chocolate or is a milk chocolate.

	Dark chocolate	Milk chocolate	White chocolate
Probability	0.35	0.17	

A chocolate is taken at random from the box.

Work out the probability that the chocolate is a white chocolate.

(2 marks)

2 Ali asked 200 students which sport they like best.
They could choose swimming or tennis or athletics.

The two-way table shows some information about their answers.

	Swimming	Tennis	Athletics	Total
Female			19	
Male	36	42		
Total	79		54	200

Complete the two-way table.

(3 marks)

3 (a) The two-way table gives some information about how 100 children travelled to school one day.

	Walk	Car	Other	Total
Boy	15		14	54
Girl		8	16	
Total	37			100

Complete the two-way table.

(3 marks)

(b) One of the children is picked at random.

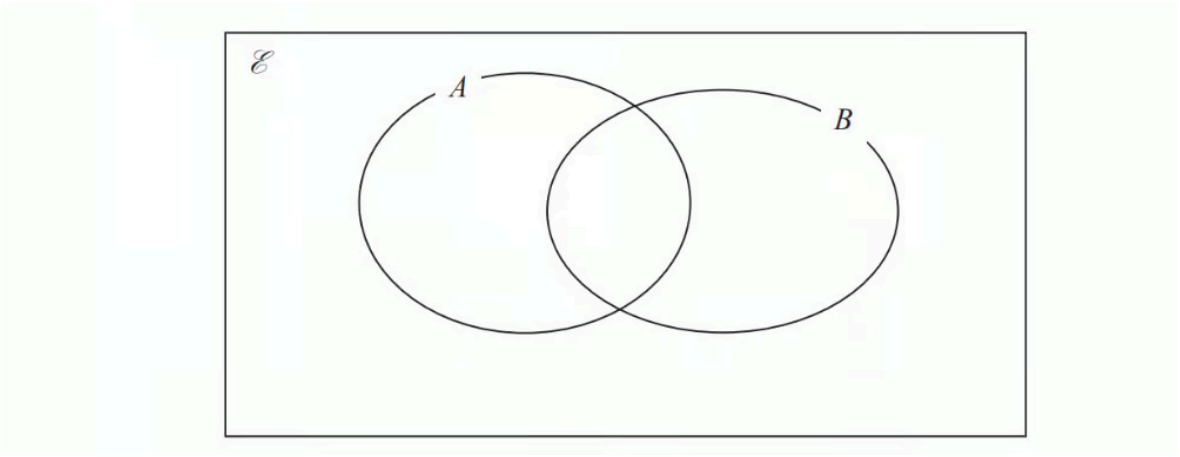
Write down the probability that this child walked to school that day.

(1 mark)

4 (a) $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

$A = \{1, 5, 6, 8, 9\}$

$B = \{2, 6, 9\}$



Complete the Venn diagram to represent this information.

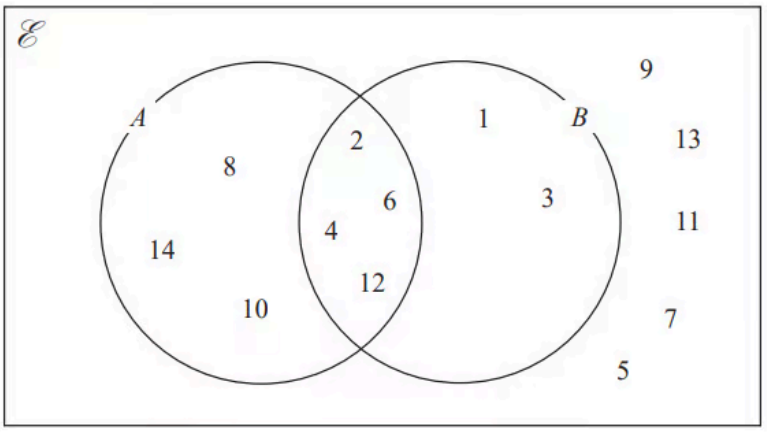
(3 marks)

(b) A number is chosen at random from the universal set $\mathscr{E}$.

Find the probability that the number is in the set $A \cap B$.

(2 marks)

5 The numbers from 1 to 14 are shown in the Venn diagram.



i) List the members of the set $A \cap B$

[1]

ii) List the members of the set B'

[1]

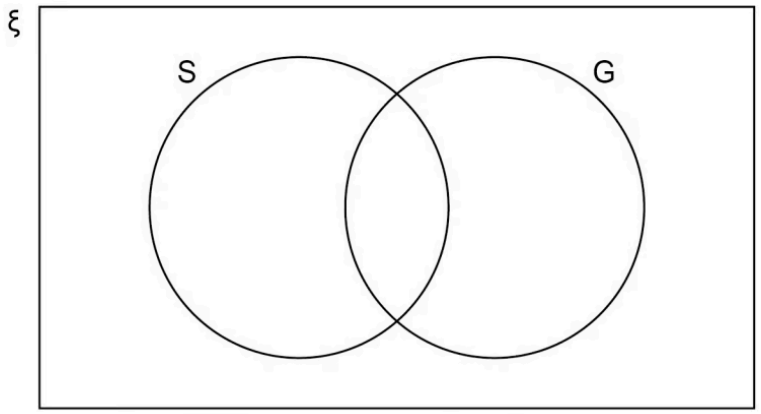
(2 marks)

6 Here is some information about 80 people who play in bands.

12 are singers but not guitar players.
30% are neither a singer nor a guitar player.
$\frac{1}{4}$ of the guitar players are also singers.

Complete this Venn diagram to represent the information.

ξ = 80 people who play in bands
S = singers
G = guitar players



(4 marks)

7 What does A U B represent in P(A U B) ?

A. A or B or both

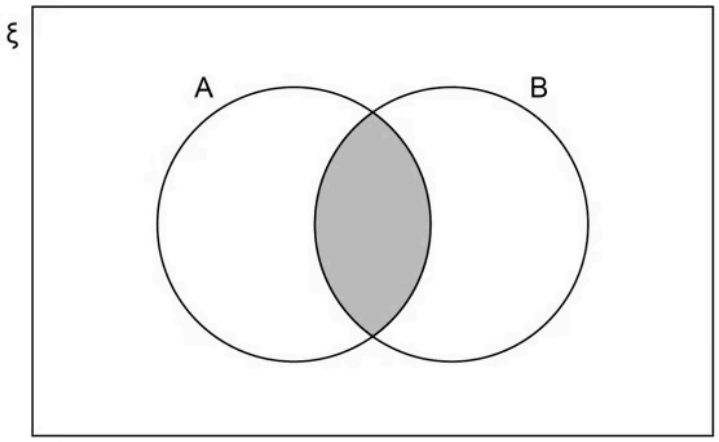
B. A but not B

C. not A and not B

D. A and B

(1 mark)

8



Which of these represents the shaded region?

A. $A \cup B$

B. $(A \cap B)'$

C. $A \cap B$

D. $A' \cup B'$

(1 mark)

9 (a) 72 children are asked whether they have a laptop or an iPad.

- 31 have a laptop.
- 48 have an iPad.
- 12 have both.
- 5 have neither.

Represent this information on a Venn diagram.

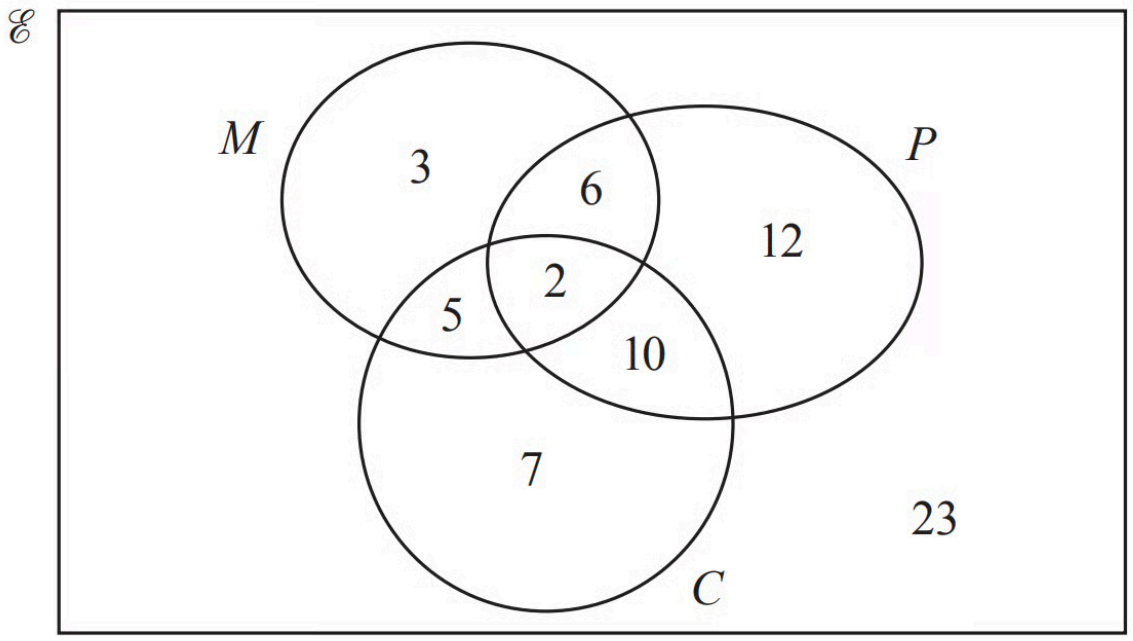
(3 marks)

(b) One of the children is chosen at random.

Write down the probability that they have an iPad but not a laptop.

(2 marks)

10 The Venn diagram below shows information about the number of gardeners who grow melons (M), potatoes (P) and carrots (C).



A gardener is chosen at random from the gardeners who grow melons.
Find the probability that this gardener does not grow carrots.

(2 marks)

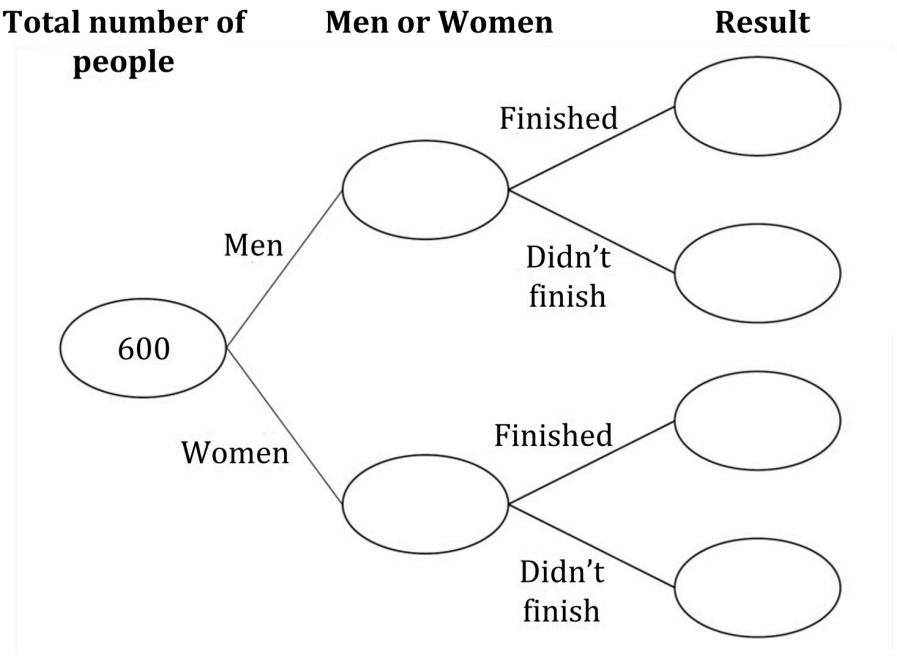
11 (a) 600 people started a marathon.

360 were men and the rest were women.

65% of the men finished the marathon.

40 women did not finish the marathon.

Complete the frequency tree.



(3 marks)

(b) A woman is selected at random.

What is the probability that she did not finish the marathon?

(1 mark)

(c) Find the percentage of the 600 people that finished the marathon.

Give your answer to 2 significant figures.

(2 marks)

Medium Questions

1 50 people each did one activity at a sports centre.

Some of the people went swimming.
Some of the people played squash.
The rest of the people used the gym.

21 of the people were female.
6 of the 8 people who played squash were male.
18 of the people used the gym.
9 males went swimming.

Work out the number of females who used the gym.

(4 marks)

2 Milk is sold in $\frac{1}{2}$ pint bottles, in 1 pint bottles and in 2 pint bottles. One weekend a shop sold 100 bottles of milk.

46 of the bottles were sold on Sunday.
15 of the bottles sold on Sunday were 2 pint bottles.

31 of the bottles sold on Saturday were $\frac{1}{2}$ pint bottles.
22 of the bottles sold were 2 pint bottles.
30 of the bottles sold were 1 pint bottles.

How many 1 pint bottles were sold on Sunday?

(4 marks)

3 66 people went on a day trip.

Each person did only one activity on the trip.

Each person went skating or went to an art gallery or went bowling.

43 of the people are female.
4 of the 10 people who went skating are male.
20 of the people went to the art gallery.
10 males went bowling.

Work out the number of females who went to the art gallery.

(4 marks)

4 There are 130 adults at a language school.
Each adult studies one of French or Spanish or German.

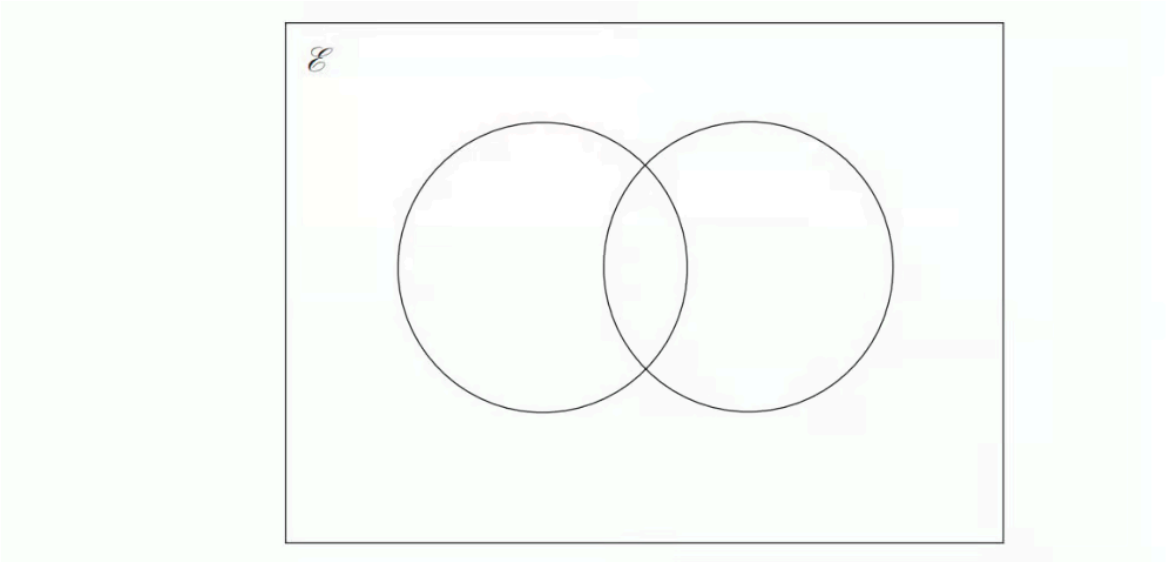
96 of the adults are women.
12 of the women study French.
73 of the adults study Spanish.
55 of the women study Spanish.
9 of the men study German.

How many of the adults study French?

(4 marks)

5 (a) $\mathscr{E}$ = {odd numbers less than 30}
A = {3, 9, 15, 21, 27}
B = {5, 15, 25}

Complete the Venn diagram to represent this information.



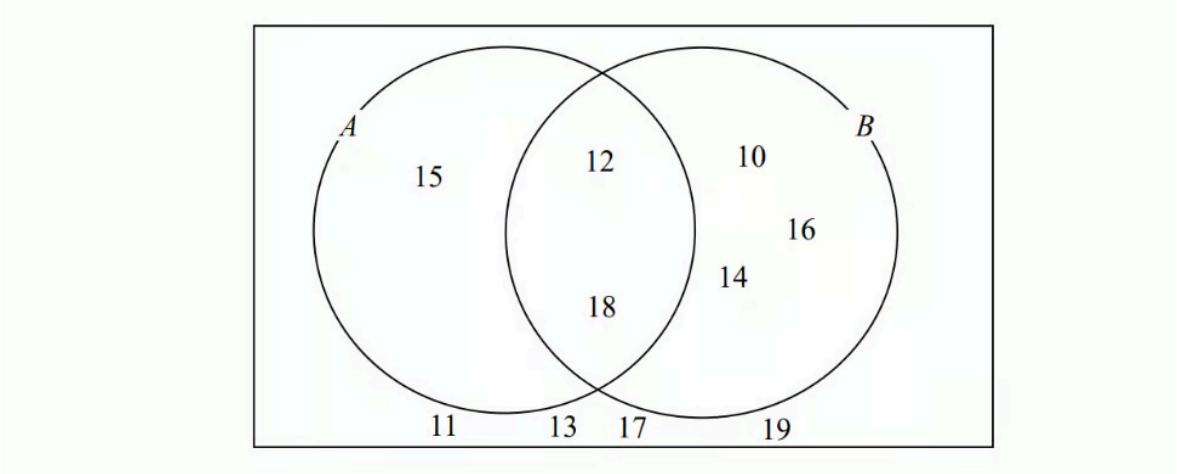
(4 marks)

(b) A number is chosen at random from the universal set, $\mathscr{E}$.

What is the probability that the number is in the set $A \cup B$?

(2 marks)

6 (a) Here is a Venn diagram.



Write down the numbers that are in set

i) $A \cup B$

[1]

ii) $A \cap B$

[1]

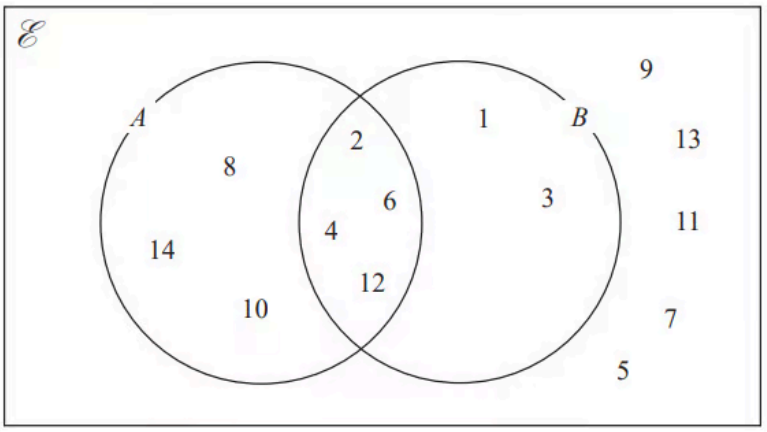
(2 marks)

(b) One of the numbers in the diagram is chosen at random.

Find the probability that the number is in set A'.

(2 marks)

7 (a) The numbers from 1 to 14 are shown in the Venn diagram.



i) List the members of the set $A \cap B$

[1]

ii) List the members of the set B'

[1]

(2 marks)

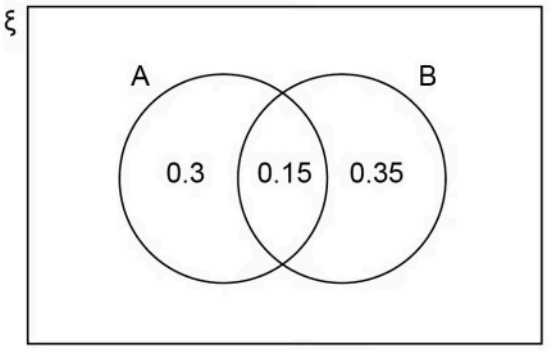
(b) A number is picked at random from the numbers in the Venn diagram.

Find the probability that this number is in set A but is **not** in set B.

(2 marks)

8 A and B are two events.

Some probabilities are shown on the Venn diagram.



Work out $P(A' \cup B)$.

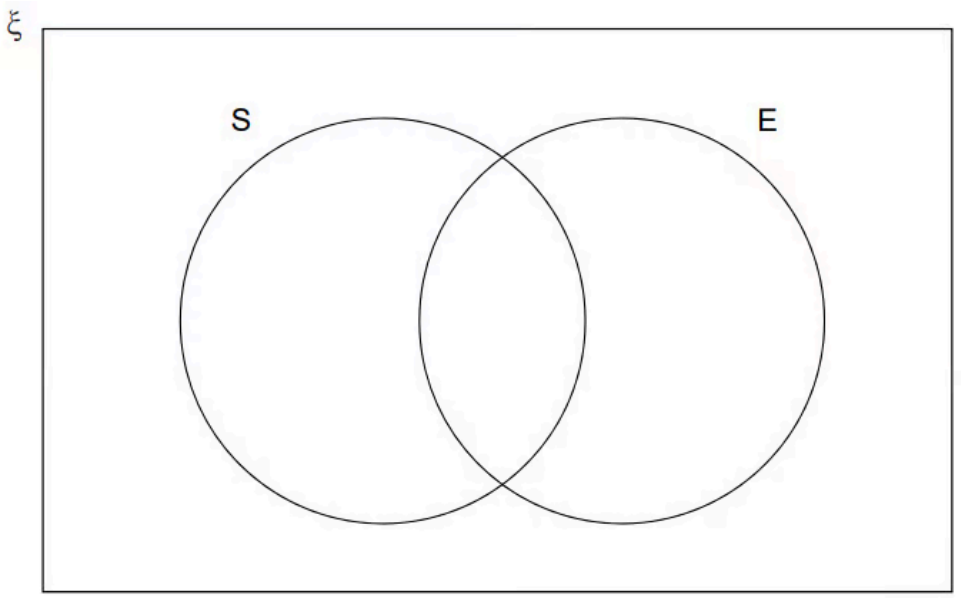
(2 marks)

9 (a) ξ = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}

S = square numbers

E = even numbers

Complete the Venn diagram.



(3 marks)

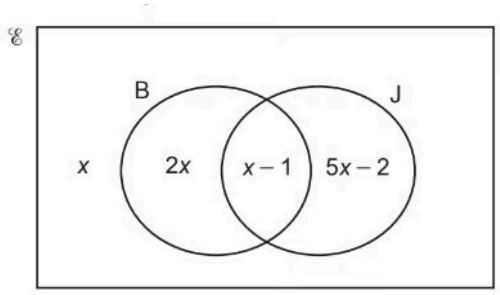
(b) One of the numbers is chosen at random.
Write down $\mathrm{P}(\mathrm{S} \cap \mathrm{E})$.

(1 mark)

10 In a survey, 60 students were asked whether they have a bank account (B) and whether they have a part-time job (J).

The number of students who had neither a bank account nor a part-time job was x.

The Venn diagram shows the results in terms of x.



One of the 60 students is chosen at random.

Find the probability that they have a bank account.
Show your working.

(5 marks)

11 There are 50 employees in a company.

Each employee either works in the Sales, Marketing or IT department.

Each employee either works remotely or on-site.

There are 20 employees in the IT department.

12 of the Marketing employees work remotely.

10 of the Sales employees work on-site.

18 employees in total work remotely.

6 of the IT employees work remotely.

How many more employees work in Marketing than in Sales?

(4 marks)

Hard Questions

1 60 people were asked if they prefer to go on holiday in Britain or in Spain or in Italy.

38 of the people were male.
11 of the 32 people who said Britain were female.
8 males said Italy.
12 people said Spain.

One of the females is chosen at random.

What is the probability that this female said Spain?

(4 marks)

2 (a) Sami asked 50 people which drinks they liked from tea, coffee and milk.

All 50 people like at least one of the drinks
19 people like all three drinks.
16 people like tea and coffee but do **not** like milk.
21 people like coffee and milk.
24 people like tea and milk.
40 people like coffee.
1 person likes only milk.

Sami selects at random one of the 50 people.

Work out the probability that this person likes tea.

(4 marks)

(b) Given that the person selected at random from the 50 people likes tea, find the probability that this person also likes exactly one other drink.

(2 marks)

3 50 people were asked if they speak French or German or Spanish.

Of these people,

31 speak French
2 speak French, German and Spanish
4 speak French and Spanish but not German
7 speak German and Spanish
8 do not speak any of the languages
all 10 people who speak German speak at least one other language

Two of the 50 people are chosen at random.

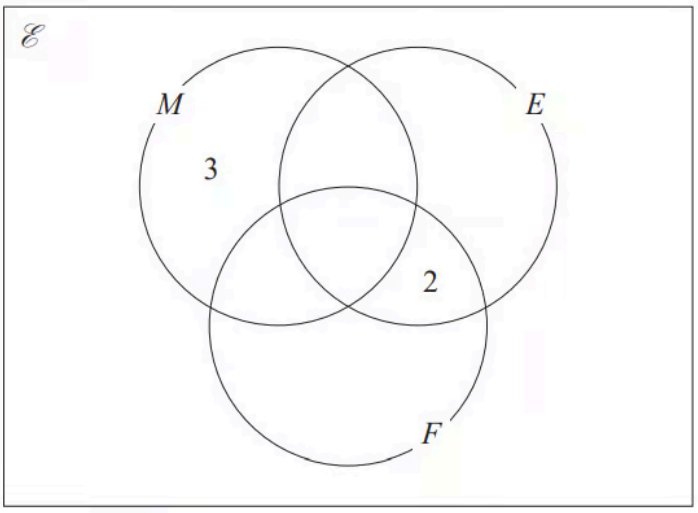
Work out the probability that they both only speak Spanish.

(5 marks)

4 (a) There are 32 students in a class.
In one term these 32 students each took a test in Maths (M), in English (E) and in French (F).

25 students passed the test in Maths.
20 students passed the test in English.
14 students passed the test in French.
18 students passed the tests in Maths and English.
11 students passed the tests in Maths and French.
4 students failed all three tests.
x students passed all three tests.

The incomplete Venn diagram gives some more information about the results of the 32 students.

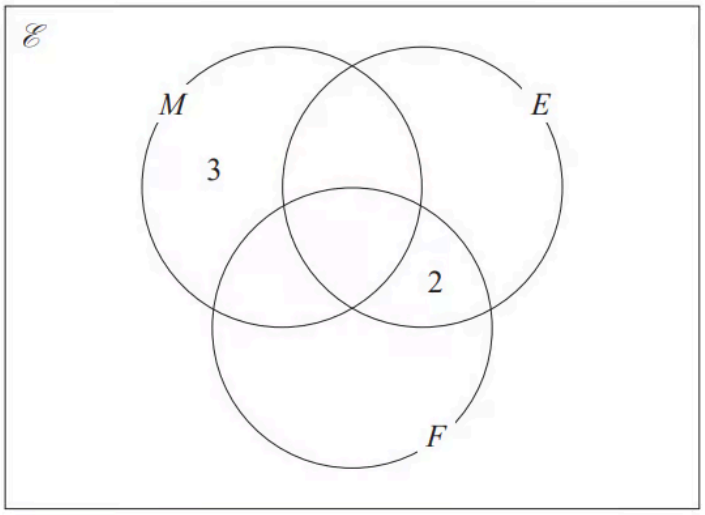


Use all the given information about the results of students who passed the test in Maths to find the value of x.

x = ...

(2 marks)

(b) Use your value of x to complete the Venn diagram to show the number of students in each subset.



(2 marks)

(c) A student who passed the test in Maths is chosen at random.

Find the probability that this student failed the test in French.

(1 mark)

5 (a) Some students were asked the following question.

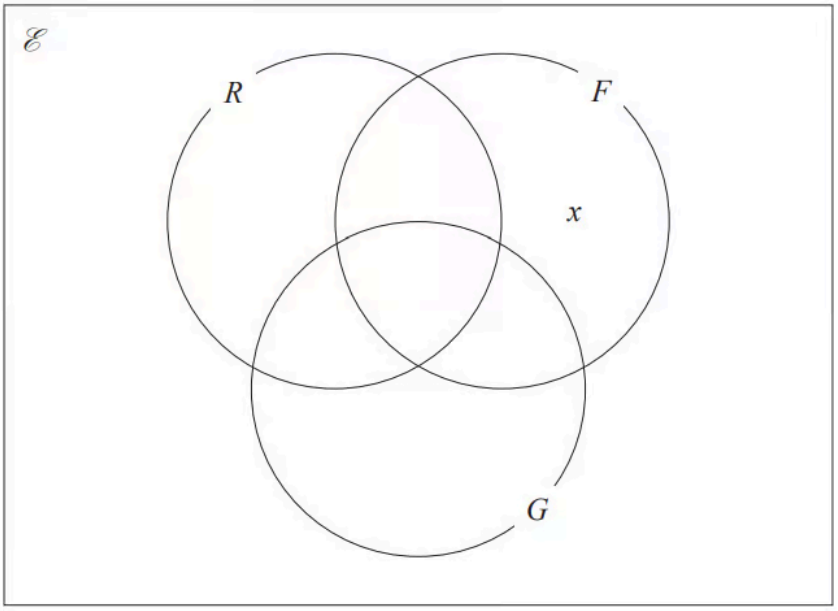
"Which of the subjects Russian (*R*), French (*F*) and German (*G*) do you study?"

Of these students

4 study all three of Russian, French and German
10 study Russian and French
13 study French and German
6 study Russian and German
24 study German
11 study none of the three subjects
the number who study Russian only is twice the number who study French only.

Let x be the number of students who study French only.

Show all this information on the Venn diagram, giving the number of students in each appropriate subset, in terms of x where necessary.



(3 marks)

(b) Given that the number of students who were asked the question was 80, work out the number of these students that study Russian.

(3 marks)

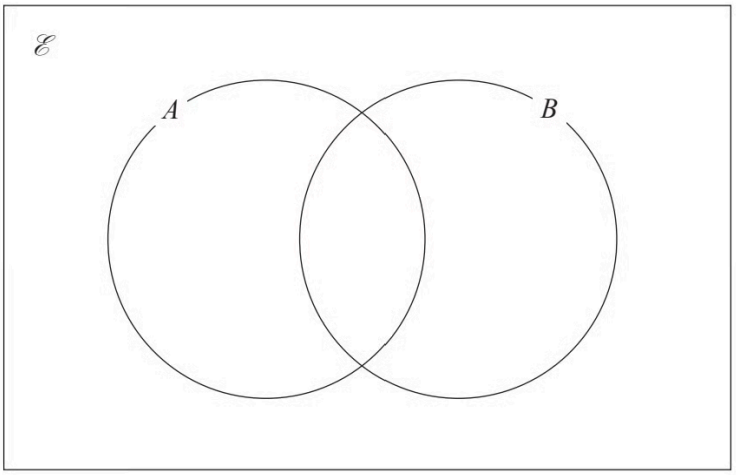
6 $\mathscr{E}$ = {4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15}

$A \cap B$ = {5, 10, 15}

B' = {7, 8, 9, 11, 12, 13, 14}

A' = {4, 6, 7, 8, 14}

Complete the Venn diagram for this information.



(3 marks)

7 (a) Some students in a school were asked the following question.

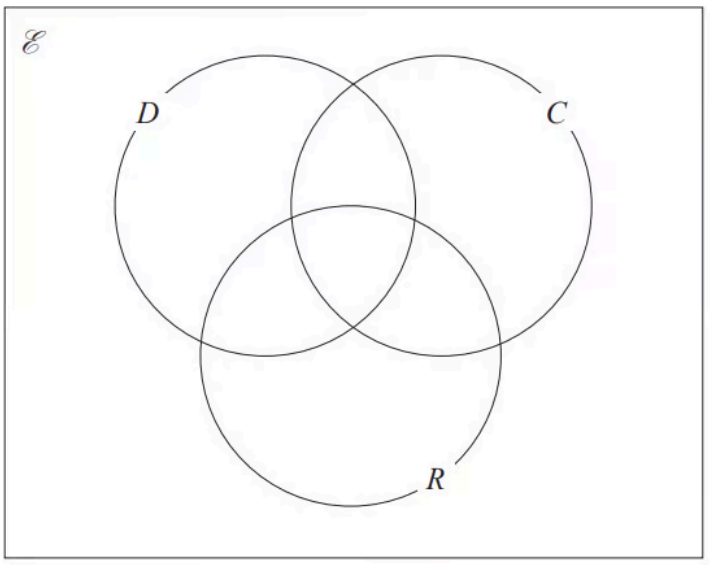
"Do you have a dog (D), a cat (C) or a rabbit (R)?"

Of these students

28 have a dog
18 have a cat
20 have a rabbit
8 have both a cat and a rabbit
9 have both a dog and a rabbit
x have both a dog and a cat

6 have a dog, a cat and a rabbit
5 have not got a dog or a cat or a rabbit

Using this information, complete the Venn diagram to show the number of students in each appropriate subset.
Give the numbers in terms of x where necessary.



(3 marks)

(b) Given that a total of 50 students answered the question, work out the value of x.

x = ...

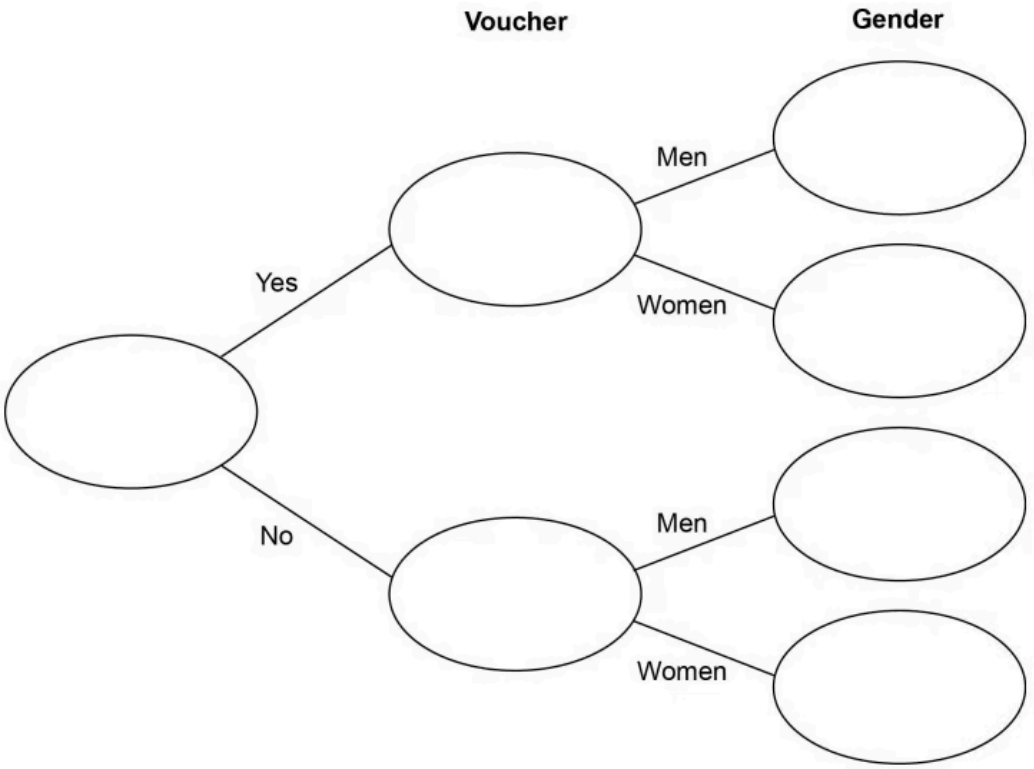
(2 marks)

8 42 men and 38 women visit a restaurant.

44 of these people have a voucher.

Three times as many men as women do **not** have a voucher.

Complete the frequency tree.



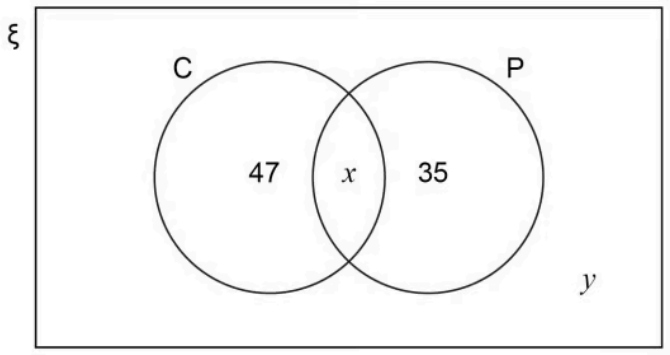
(4 marks)

9 The Venn diagram shows some information about 150 students.

ξ = 150 students

C = students who study Chemistry

P = students who study Physics



The probability that a Physics student, chosen at random, also studies Chemistry is $\frac{5}{12}$

One of the 150 students is chosen at random.

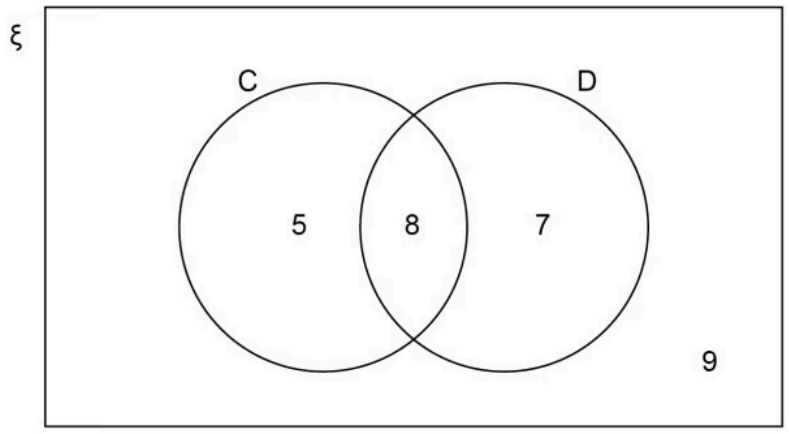
Work out the probability that the student does **not** study either Chemistry or Physics.

(4 marks)

10 (a) ξ = 29 students in a class

C = students who own a cat

D = students who own a dog



A student is chosen at random.

Choose the probability that the student owns a cat or a dog but not both.

A. $\frac{12}{29}$

B. $\frac{13}{29}$

C. $\frac{15}{29}$

D. $\frac{20}{29}$

(1 mark)

(b) A student who owns a dog is chosen at random.

Choose the probability that the student also owns a cat.

A. $\frac{7}{15}$

B. $\frac{8}{15}$

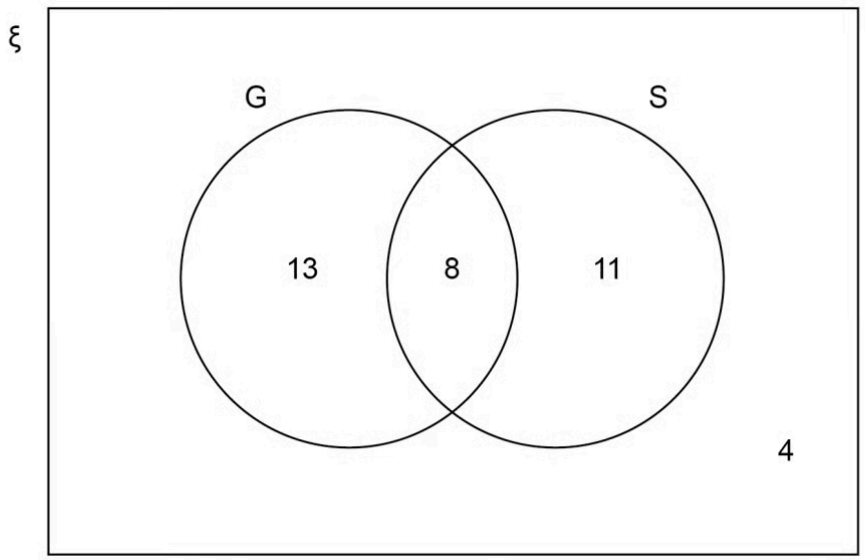
C. $\frac{7}{29}$

D. $\frac{8}{29}$

(1 mark)

11 (a) The Venn diagram shows information about some houses.

G = houses with a garage
S = houses with a shed



A house is chosen at random.

The house has a garage.

What is the probability that it has a shed?

(1 mark)

(b) The house does **not** have a garage.

What is the probability that it does **not** have a shed?

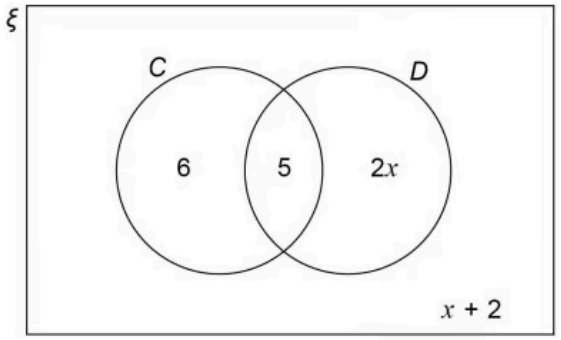
(1 mark)

(c) Show that $P((G \cap S)') > P(G \cup S')$

(2 marks)

12 (a) In the Venn diagram

ξ represents 31 students in a class
C is students who have a cat
D is students who have a dog



One student from the class is picked at random.

Work out the probability that the student has a dog.

(3 marks)

(b) One of the students who has a cat is picked at random.

Work out the probability that this student has a dog.

(1 mark)

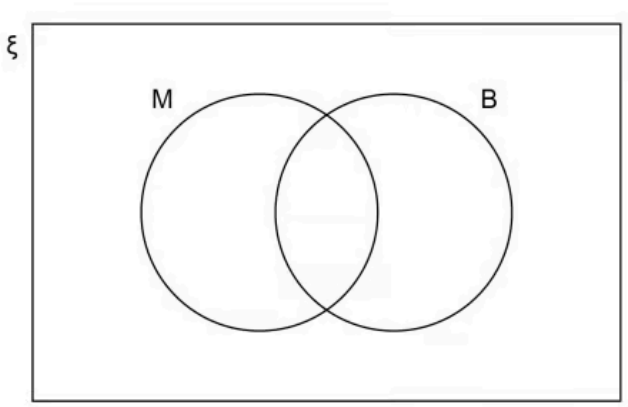
13 (a) A school has 86 teachers.

42 are male and 44 are female.

$\frac{1}{3}$ of the male teachers have blue eyes.

$\frac{1}{4}$ of the female teachers have blue eyes.

ξ = teachers in the school
M = male teachers
B = teachers who have blue eyes



Complete the Venn diagram.

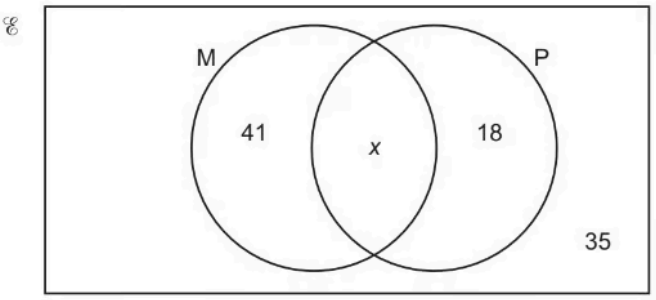
(3 marks)

(b) One teacher who has blue eyes is chosen at random.

Work out the probability that the teacher is male.

(1 mark)

14 (a) The Venn diagram shows the number of students studying Mathematics (M) and the number of students studying Physics (P) in a college.
35 students do not study either subject.



The total number of students is 121.
Find the value of x.

x = ...

(1 mark)

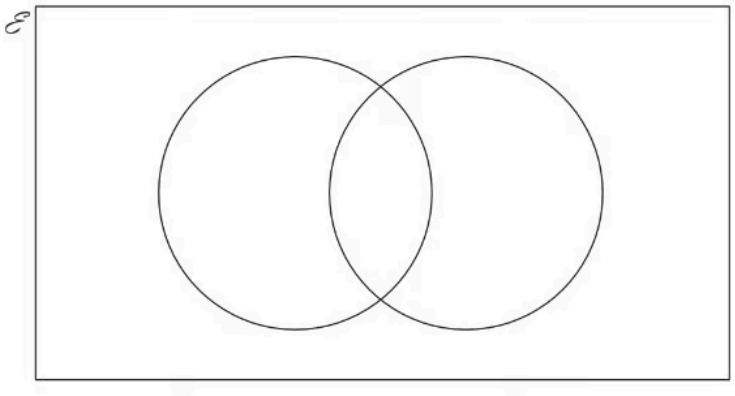
(b) One of the 121 students is selected at random.

Find the probability that this student studies Mathematics, given that they study Physics.

(2 marks)

15 (a) A skills test has two sections, literacy (L) and numeracy (N).
One day everyone who took the skills test passed at least one section.
88% passed the literacy section and 76% passed the numeracy section.

Represent this information on a Venn diagram.
Show clearly the **percentage** in each section of the diagram.



(3 marks)

(b) One person is chosen at random from all the people who took the skills test that day.

What is the probability that this person

i) passed the numeracy section, given that they passed the literacy section,

[2]

ii) passed the literacy section, given that they passed only one section?

[2]

(4 marks)

16 50 people attended an outdoor activity day.

- 40 took part in walking.
- 18 took part in sailing.
- 3 did neither activity.

One of the people who walked is chosen at random.
Find the probability that this person also sailed.

(5 marks)

17 Here are the results of a survey of 437 people in a town.

- 62 males speak Spanish.
- 153 females do not speak Spanish.
- 280 people do not speak Spanish.

Jeff says

> At least 2 out of every 5 females in the town can speak Spanish.

Is he correct?
Show clearly how you reached your decision.

(6 marks)

18 In a group of 120 adults, 85 watch football, 78 play a sport and 20 do neither.
Find the probability that an adult chosen at random from those who watch football does not play a sport.

(5 marks)