Probability from Venn Diagrams

Venn Diagrams involving Frequencies

A vet surveys 100 of her clients. She finds that
25 own dogs, 15 own dogs and cats, 11 own dogs and tropical fish, 53 own cats, 10 own cats and tropical fish, 7 own dogs, cats and tropical fish, 40 own tropical fish.

Fill in this Venn Diagram, and hence answer the following questions:

a) $P(owns\ dog\ only)$

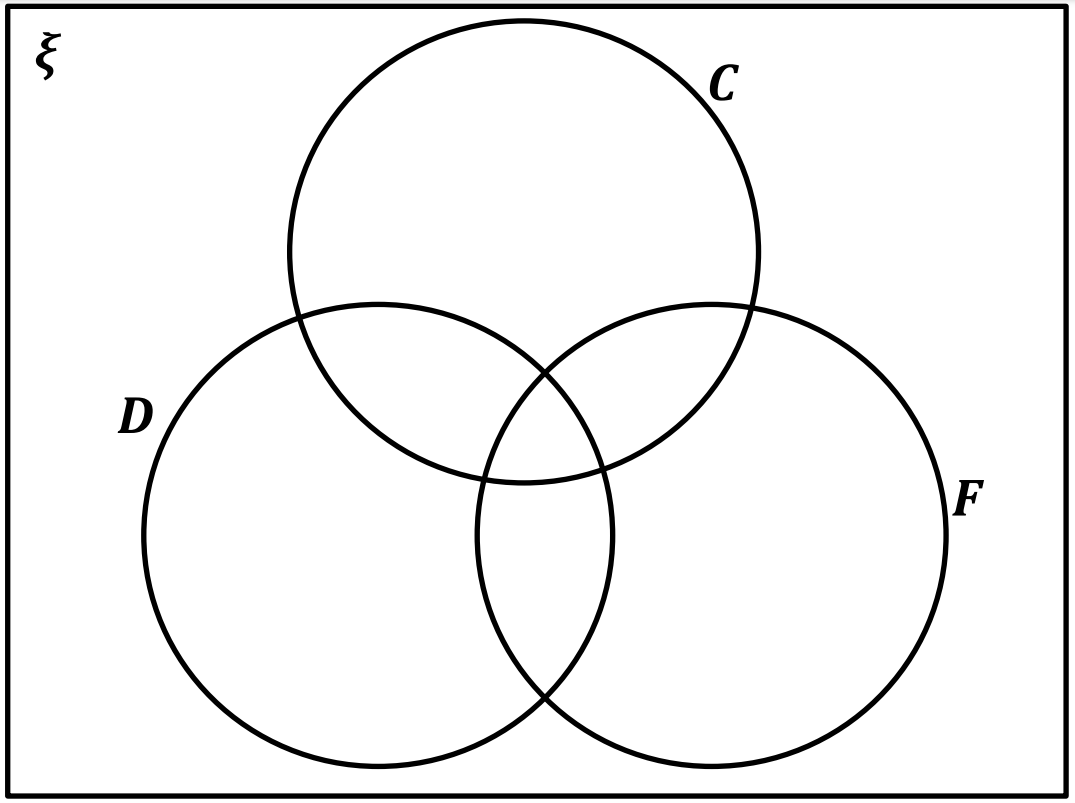
b) $P(does\ not\ own\ tropical\ fish)$

c) $P(does\ not\ own\ dogs,\ cats, or\ tropical\ fish)$

a)

b)

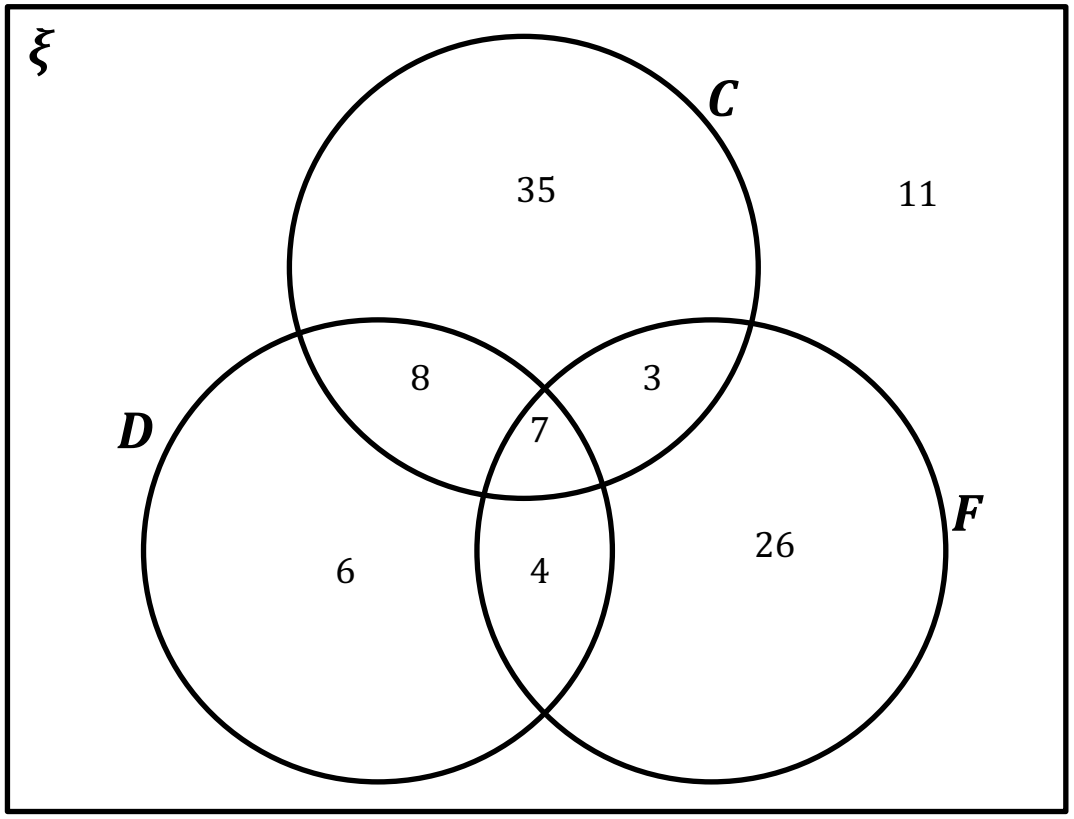
c)



Venn Diagrams involving Frequencies

Conditional Probabilities

Given that a randomly chosen person owns a cat, what's the probability they own a dog?



Question 1

The following shows the results of a survey on the types of exercise taken by a group of 100 people.

65 run	48 swim
60 cycle	40 run and swim
30 swim and cycle	35 run and cycle
25 do all three	

(*a*) Draw a Venn Diagram to represent these data. **(4)**

Find the probability that a randomly selected person from the survey

(*b*) takes none of these types of exercise, **(2)**

(*c*) swims but does not run, **(2)**

(d) takes at least two of these types of exercise. **(2)**

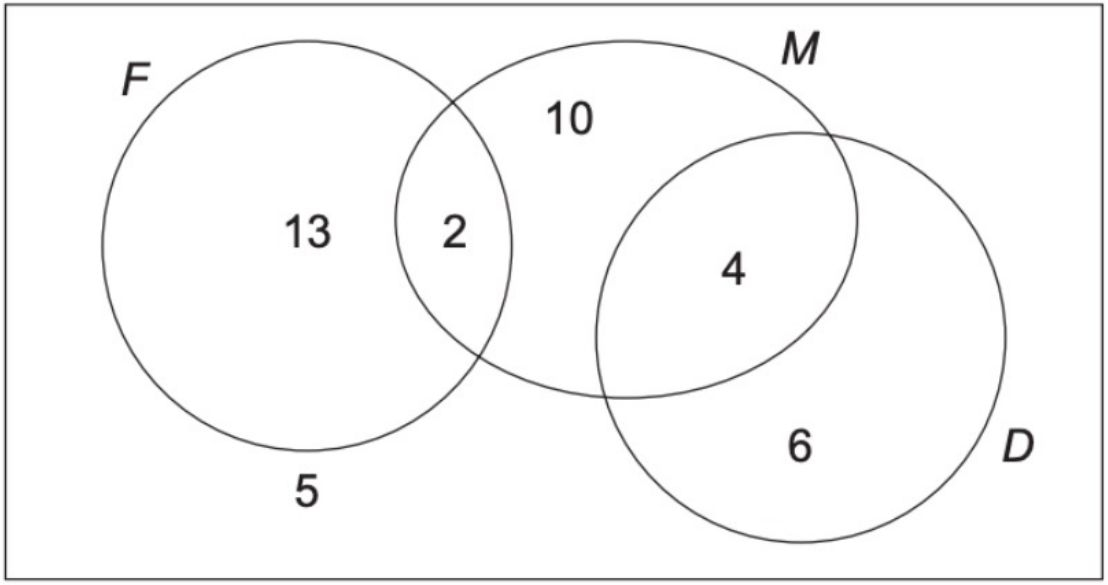
Jason is one of the above group. Given that Jason runs,

(*e*) find the probability that he swims but does not cycle. **(3)**

Question 2

The Venn diagram shows the subjects studied by 40 sixth form students. F represents the set of students who study French, M represents the set of students who study Mathematics and D represents the set of students who study Drama.

The diagram shows the number of students in each set.



One of these students is chosen at random. Find the probability that this student studies exactly two of these subjects.

Question 3

There are 180 students at a college following a general course in computing. Students on this course can choose to take up to three extra options.

112 take systems support,
70 take developing software,
81 take networking,
35 take developing software and systems support,
28 take networking and developing software,
40 take systems support and networking,
4 take all three extra options.

(a) In the space below, draw a Venn diagram to represent this information.

A student from the course is chosen at random.

Find the probability that this student takes

(b) none of the three extra options,

(c) networking only.

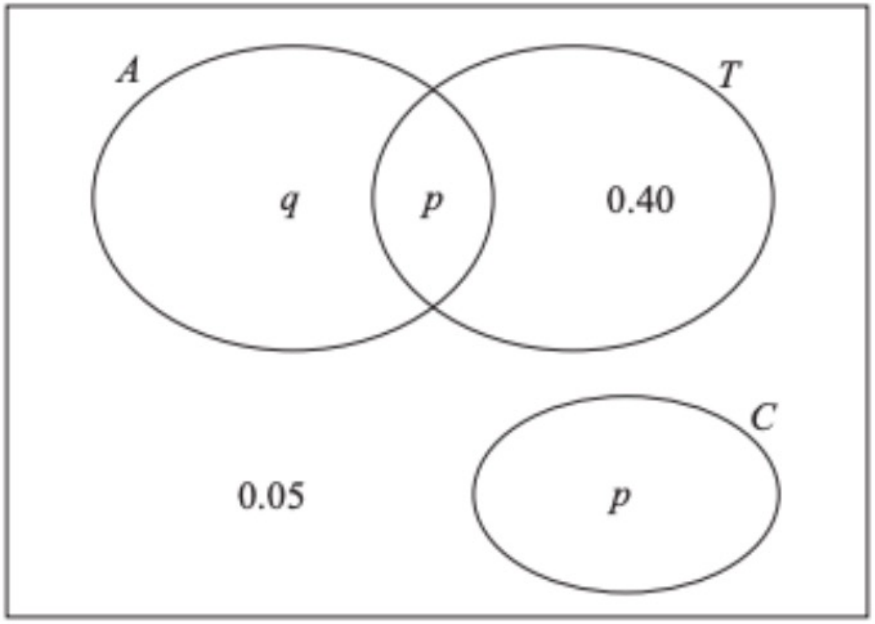
Students who want to become technicians take systems support and networking. Given that a randomly chosen student wants to become a technician,

(d) find the probability that this student takes all three extra options.

Question 4

The Venn diagram shows the probabilities for students at a college taking part in various sports.

A represents the event that a student takes part in Athletics.T represents the event that a student takes part in Tennis.C represents the event that a student takes part in Cricket.p and q are probabilities.



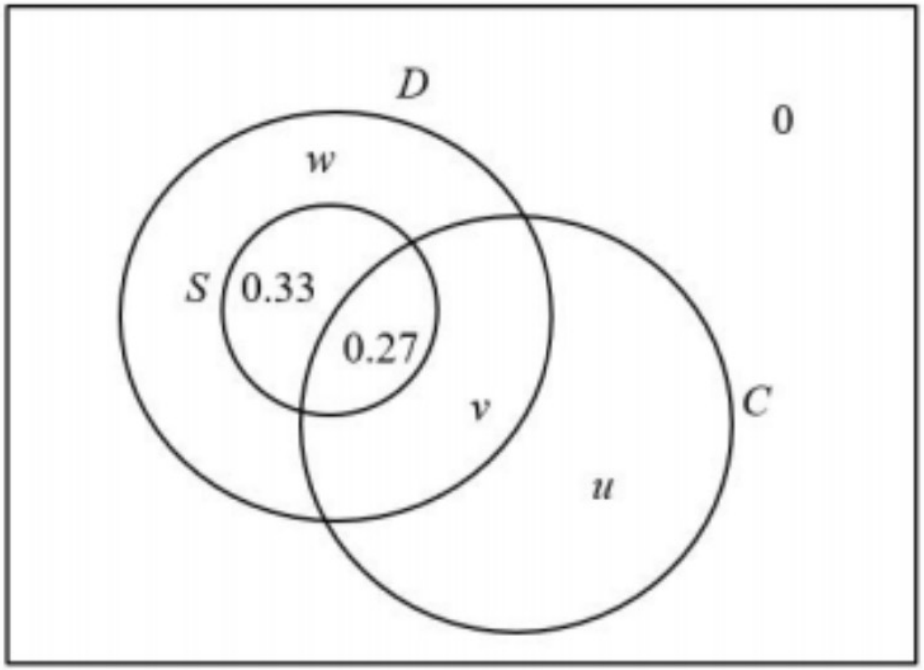
The probability that a student selected at random takes part in Athletics or Tennis is 0.75

Find the value of p

Question 5

The Venn diagram shows the probabilities of students' lunch boxes containing a drink, sandwiches and a chocolate bar.

D is the event that a lunch box contains a drink, S is the event that a lunch box contains sandwiches, C is the event that a lunch box contains a chocolate bar, u , v and w are probabilities.

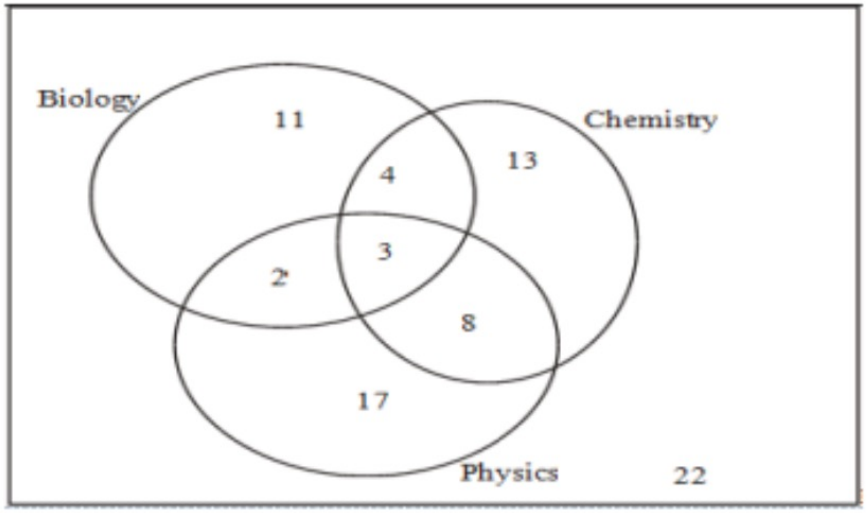


Write down $P(S \cap D')$

Question 6

A college has 80 students in Year 12.

20 students study Biology
28 students study Chemistry
30 students study Physics
7 students study both Biology and Chemistry
11 students study both Chemistry and Physics
5 students study both Physics and Biology
3 students study all 3 of these subjects



A Year 12 student at the college is selected at random.

Given that the student studies Chemistry or Physics or both, find the probability that the student does not study Biology.

Question 7

In a company the 200 employees are classified as full-time workers, part-time workers or contractors.

The table below shows the number of employees in each category and whether they walk to work or use some form of transport.

	Walk	Transport
Full-time worker	2	8
Part-time worker	35	75
Contractor	30	50

The events F, H and C are that an employee is a full-time worker, part-time worker or contractor respectively.

Let B be the event that an employee uses the bus.

Given that 10% of full-time workers use the bus, 30% of part-time workers use the bus and 20% of contractors use the bus, draw a Venn diagram to represent the events F, H, C and B, and find the probability that a randomly selected employee uses the bus to travel to work.

Question 8

The Venn diagram in Figure 1 shows the number of students in a class who read any of 3 popular magazines A , B and C .

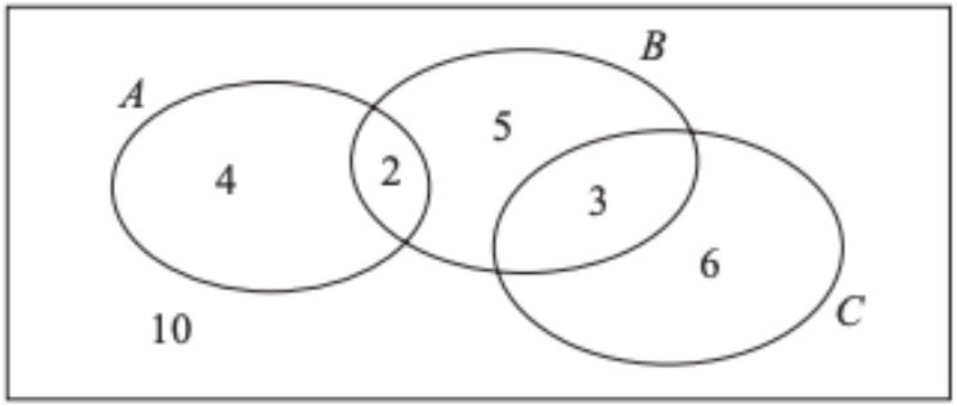


Figure 1

One of these students is selected at random.

Write down the probability that the student reads both A and C .