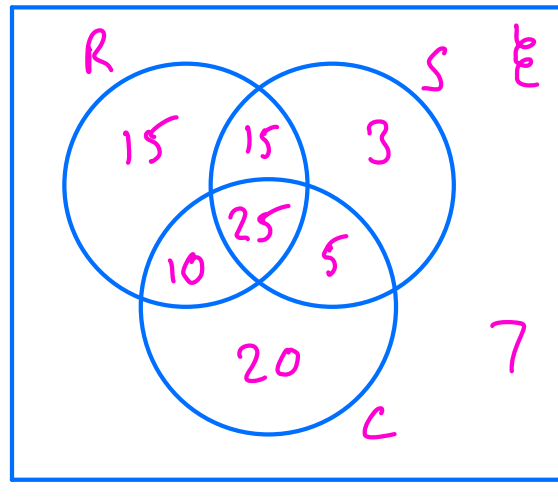


Venn Diagram Homework Solutions

Q2.

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,

$$\frac{7}{100}$$

(2)

(c) swims but does not run,

$$\frac{5+3}{100} = \frac{8}{100} = \frac{2}{25}$$

(2)

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

$$\frac{10+5+15+25}{100} = \frac{55}{100} = \frac{11}{20}$$

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

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

$$P(S \cap C' \mid R) = \frac{P(S \cap C' \cap R)}{P(R)} = \frac{15}{65} \quad (3)$$

$$= \frac{15}{65} = \frac{3}{13}$$

or direct from diagram $\frac{15}{65}$

(Total 13 marks)

Q3.

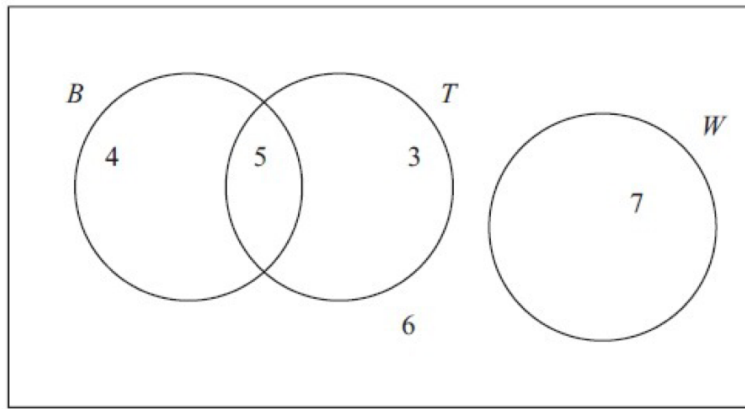


Figure 1

Figure 1 shows how 25 people travelled to work.

Their travel to work is represented by the events

B bicycle

T train

W walk

(a) Write down 2 of these events that are mutually exclusive. Give a reason for your answer.

B and W or T and W Circles do not overlap (2)

(b) Determine whether or not B and T are independent events.

$$P(B) = \frac{9}{25} \quad P(T) = \frac{8}{25} \quad P(B \cap T) = \frac{5}{25} \quad (3)$$

One person is chosen at random.

$$P(B) \times P(T) = \frac{72}{625} \neq \frac{5}{25}$$

Find the probability that this person

(c) walks to work,

$$\frac{7}{25} \quad (1)$$

(d) travels to work by bicycle and train.

$$\frac{5}{25} \quad (1)$$

(e) Given that this person travels to work by bicycle, find the probability that they will also take the train.

$$\frac{5}{9} \quad (2)$$

(Total 9 marks)

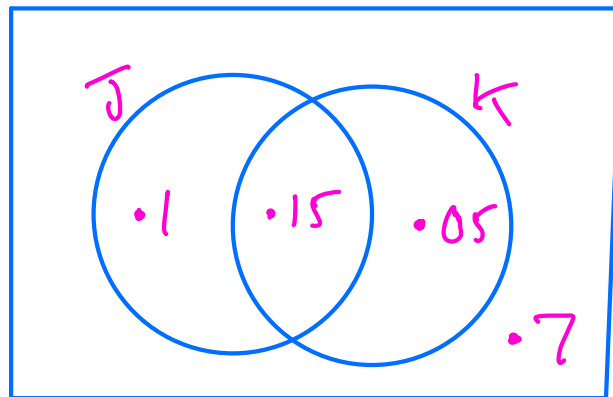
Q4.

Jake and Kamil are sometimes late for school.
The events J and K are defined as follows

J = the event that Jake is late for school

K = the event that Kamil is late for school

$P(J) = 0.25$, $P(J \cap K) = 0.15$ and $P(J' \cap K') = 0.7$



On a randomly selected day, find the probability that

(a) at least one of Jake or Kamil are late for school,

$$P(J \cup K) = 0.3 \quad (1)$$

(b) Kamil is late for school.

$$P(K) = 0.2 \quad (2)$$

Given that Jake is late for school,

(c) find the probability that Kamil is late.

$$\frac{0.15}{0.25} = 0.6$$

(3)

The teacher suspects that Jake being late for school and Kamil being late for school are linked in some way.

(d) Determine whether or not J and K are statistically independent.

$$P(J) \times P(K) = 0.25 \times 0.2 = 0.05 \neq 0.15 = P(J \cap K) \quad (2)$$

\therefore not independent

(e) Comment on the teacher's suspicion in the light of your calculation in (d).

Teacher's suspicion correct (1)

(Total 9 marks)

Q5.

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.

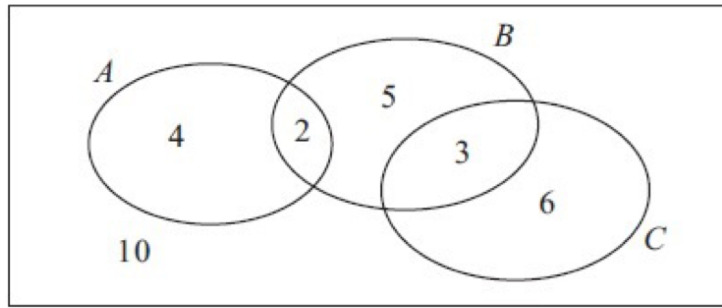


Figure 1

One of these students is selected at random.

(a) Show that the probability that the student reads more than one magazine is $\frac{1}{6}$.

$$P(\text{Reads more than one}) = \frac{2+3}{30} = \frac{5}{30} = \frac{1}{6} \quad (2)$$

(b) Find the probability that the student reads A or B (or both).

$$\frac{4+2+5+3}{30} = \frac{14}{30} = \frac{7}{15} \quad (2)$$

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

$$0 \quad (1)$$

Given that the student reads at least one of the magazines,

(d) find the probability that the student reads C.

$$\frac{9}{20} \quad (2)$$

(e) Determine whether or not reading magazine B and reading magazine C are statistically independent.

$$P(B) = \frac{10}{30} = \frac{1}{3} \quad P(C) = \frac{9}{30} = \frac{3}{10} \quad (3)$$

$$P(B \cap C) = \frac{3}{30} = \frac{1}{10}$$

(Total 10 marks)

$$P(B) \times P(C) = \frac{1}{3} \times \frac{3}{10} = \frac{1}{10}$$

$$\therefore P(B) \times P(C) = P(B \cap C) \Rightarrow B \text{ and } C \text{ independent}$$

Q6.

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,

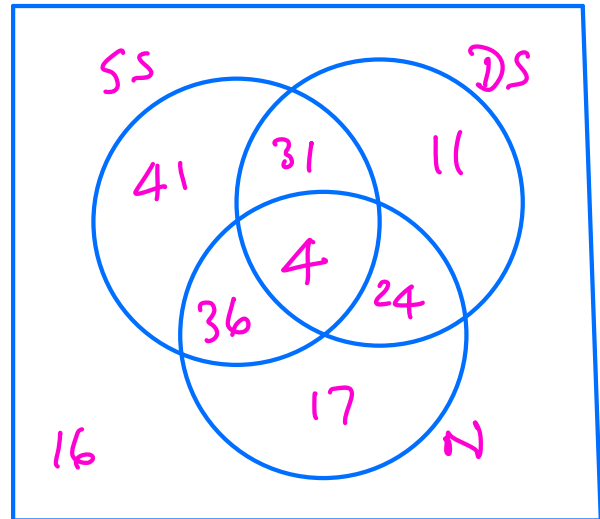
81 take networking,

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.

(5)

A student from the course is chosen at random.

Find the probability that this student takes

(b) none of the three extra options,

$$\frac{16}{180} = \frac{4}{45}$$

(1)

(c) networking only.

$$\frac{17}{180}$$

(1)

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.

$$\frac{4}{4+36} = \frac{4}{40} = \frac{1}{10}$$

(2)

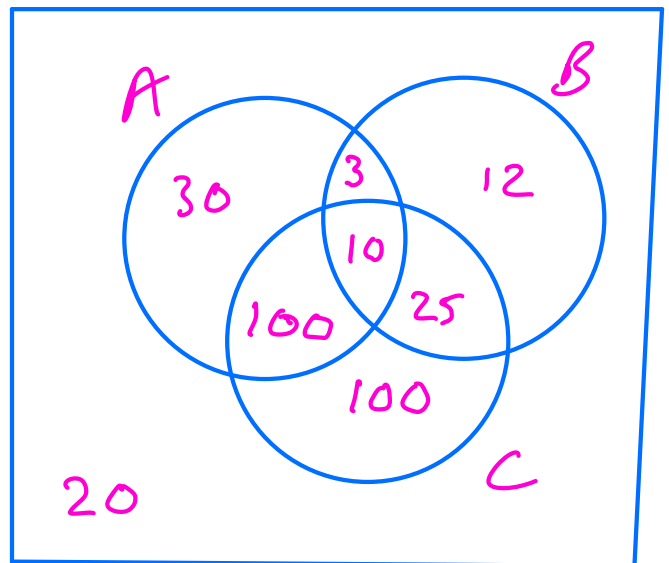
(Total 9 marks)

Q13.

A person's blood group is determined by whether or not it contains any of 3 substances A, B and C.

A doctor surveyed 300 patients' blood and produced the table below.

Blood contains	No. of Patients
only C	100
A and C but not B	100
only A	30
B and C but not A	25
only B	12
A, B and C	10
A and B but not C	3



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

(4)

(b) Find the probability that a randomly chosen patient's blood contains substance C.

$$\frac{235}{300} = \frac{47}{60}$$

(2)

Harry is one of the patients. Given that his blood contains substance A,

(c) find the probability that his blood contains all 3 substances.

$$\frac{10}{100+30+10+3} = \frac{10}{143}$$

(2)

Patients whose blood contains none of these substances are called universal blood donors.

(d) Find the probability that a randomly chosen patient is a universal blood donor.

$$\frac{20}{300} = \frac{1}{15}$$

(2)

(Total 10 marks)

