

Statistics 8 – More Probability and Tree Diagrams

Please **complete** this homework by _____. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

Section 1 – Review of previous topics. Please complete all questions.

Q1.

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) Draw a Venn diagram to represent this information.

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

- (b) Find the probability that the student studies Chemistry but not Biology or Physics.
- (c) Find the probability that the student studies Chemistry or Physics or both.

Q2

The table below summarises the results of an investigation into the number of thistles in each of 100 randomly selected 1-metre square plots of grazing land on a farm

Number of thistles	0	1	2	3	4	5	6 to 9	10 to 14	15 to 19	20 to 30
Number of plots	23	19	15	12	9	6	6	5	3	2

- (a) Estimate the median and the mean
- (b) Estimate the interquartile range and standard deviation
- (c) State, with a reason, which of (a) and (b), is the most appropriate measure

Section 2 – Consolidation of this week’s topic. Please complete all questions.

Total 20 marks

Q1.

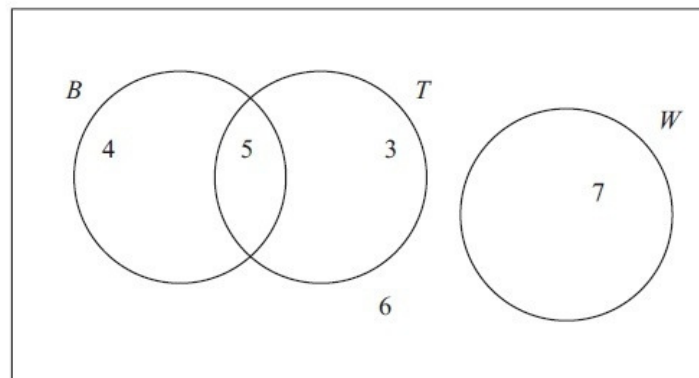


Figure 1

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. (2)

(b) Determine whether or not B and T are independent events. (3)

One person is chosen at random.

Find

(c) $P(W)$, (1)

(d) $P(B \cap T)$ (1)

Q2

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 $P((J \cup K)') = 0.7$

On a randomly selected day, find:

(a) $P(J \cup K)$, (1)

(b) $P(K)$. (2)

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

(c) Determine whether or not J and K are statistically independent. (2)

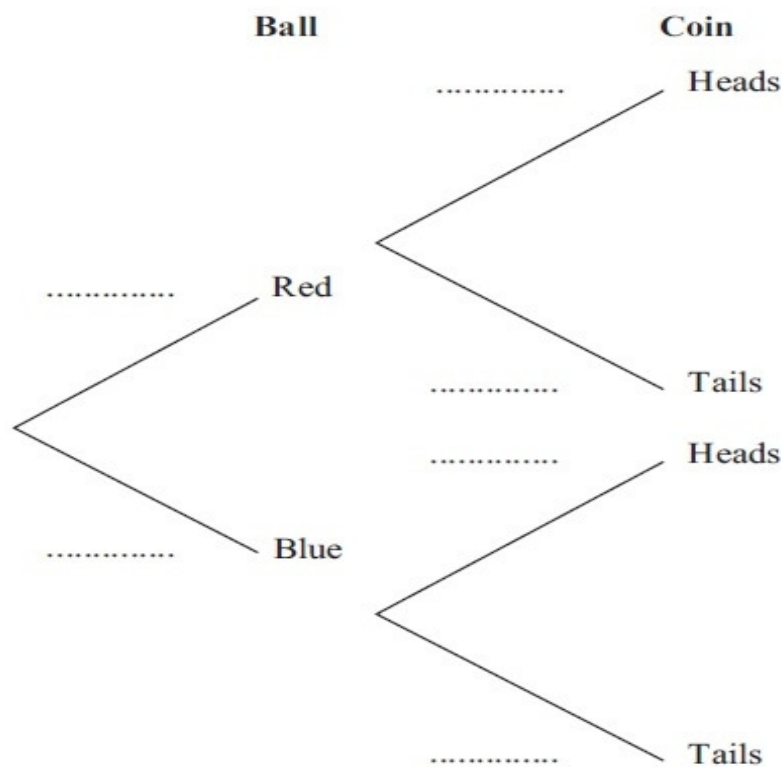
(d) Comment on the teacher's suspicion in the light of your calculation in (c). (1)

Q3

An experiment consists of selecting a ball from a bag and spinning a coin. The bag contains 5 red balls and 7 blue balls. A ball is selected at random from the bag, its colour is noted and then the ball is returned to the bag.

When a red ball is selected, a biased coin with probability $\frac{2}{3}$ of landing heads is spun. When a blue ball is selected a fair coin is spun.

(a) Complete the tree diagram below to show the possible outcomes and associated probabilities.



(b) Shivani selects a ball and spins the appropriate coin. Find the probability that she obtains a head. (2)

Shivani and Tom each repeat this experiment. (2)

(c) Find the probability that the colour of the ball Shivani selects is the same as the colour of the ball Tom selects. (Hint: Is the coin relevant?) (3)

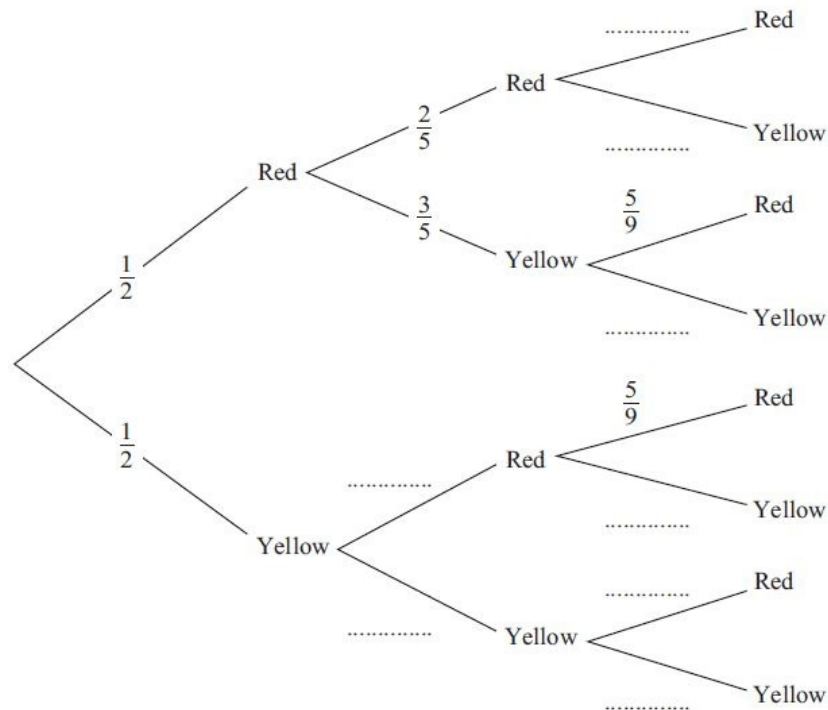
Section 3 – Extension questions. If you are aiming for a top grade, you should attempt these questions.

The bag P contains 6 balls of which 3 are red and 3 are yellow. The bag Q contains 7 balls of which 4 are red and 3 are yellow. A ball is drawn at random from bag P and placed in bag Q . A second ball is drawn at random from bag P and placed in bag Q . A third ball is then drawn at random from the 9 balls in bag Q .

The event A occurs when the 2 balls drawn from bag P are of the same colour. The event B occurs when the ball drawn from bag Q is red.

(a) Complete the tree diagram shown below.

(4)



(b) Find $P(A)$

(3)

(c) Show that $P(B) = \frac{5}{9}$

(3)

(d) Show that $P(A \cap B) = \frac{2}{9}$

(2)

(e) Hence find $P(A \cup B)$

(2)