A-Level Starter Activity

Jotwa Maths

Topic: Tree Diagrams

Chapter Reference: Statistics 1, Chapter 5

7 minutes

1. A manufacturer carried out a survey of the defects in their soft toys. It is found that the probability of a toy having poor stitching is 0.03 and that a toy with poor stitching has probability of 0.7 of splitting open. A toy without poor stitching has a probability of 0.02 of splitting open.

a. Draw a tree diagram to represent this information. **(3)**
b. Find the probability that a randomly chosen soft toy has exactly one of the two defects, poor stitching or splitting open. **(3)**

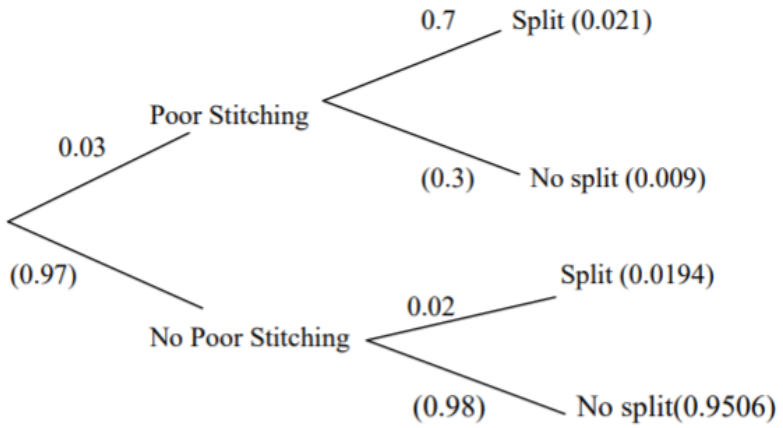
The manufacturer also finds that soft toys can become faded with probability 0.05 and that this defects is independent of poor stitching or splitting open. A soft toy is chosen at random.

c. Find the probability that the soft toy has none of these 3 defects. **(2)**

d. Find the probability that the soft toy have exactly one of these 3 defects. **(4)**

Solutions

1a.



Shape	**M1**
Labels and 0.03	**M1**
Labels, 0.7 and 0.02	**M1**

1b.

P(Exactly one defect) = 0.03 x 0.3 + 0.97 x 0.02	**M1**
= 0.009 + 0.0194	**M1**
= 0.0284	**M1**

1c.

P(No defects) = (1 – 0.03) x (1 – 0.02) x (1 – 0.05)	**M1**
= 0.90307… = 0.903	**M1**

1d.

P(Exactly one defect) = (b) x (1 – 0.05) + (1 – 0.03) x (1 – 0.02) x 0.05	**M1**
= 0.0284 x 0.95 + 0.97 x 0.98 x 0.05	**M1**
= 0.07451..	**M1**
= 0.0745	**M1**

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Jotnwa Maths

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Chapter Reference: Statistics 1, Chapter 5

7 minutes

1. In a factor, three machines, *J*, *K* and *L* are used to make biscuits.
Machine *J* makes 25% of the biscuits.
Machine *K* makes 45% of the biscuits.
The rest of the biscuits are made by machine *L*.
It is known that 2% of the biscuits made by machine *J* are broken, 3% of the biscuits made by machine *K* are broken and 5% of the biscuits made by machine *L* are broken.

a. Draw a tree diagram to illustrate all the possible outcomes and associated probabilities. **(2)**
A biscuit is selected at random.
b. Calculate the probability that the biscuit is made by machine *J* and is not broken. **(2)**
c. Calculate the probability that the biscuit is broken. **(2)**
d. Given that the biscuit is broken, find the probability that it was not made by machine *K*. **(3)**

Solutions

1a.

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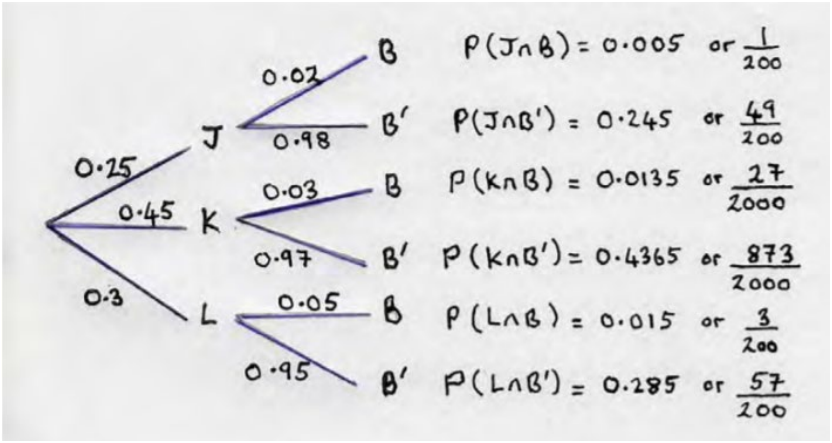


Shape M1	**M1**
Labels and values M1	**M1**

1b.

0.25 x 0.98	**M1**
= 0.245	**M1**

1c.

0.25 x 0.02 + 0.45 x 0.03 + 0.3 x 0.05	**M1**
= 0.0335	**M1**

1d.

$= \frac{0.25\times0.02+0.3\times0.05}{0.0335}$	**M1**
= 0.5970…	**M1**
= 0.597	**M1**

A-Level Starter Activity

Jotwa Maths

Topic: Venn Diagrams

Chapter Reference: Statistics 1, Chapter 5

6 minutes

1. The following shows the results of a wine tasting survey of 100 people.

96 like wine A
93 like wine B
96 like wine C
92 like A and B
91 like B and C
93 like A and C
90 like all three wines.

a. Draw a Venn Diagram to represent these data. **(6)**

Find the probability that a randomly selected person from the survey likes,

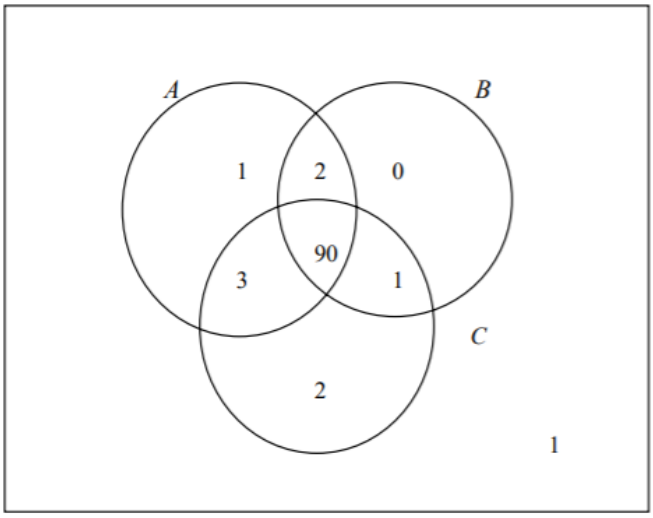
b. None of the three wines. **(1)**
c. Wine A but not wine B **(1)**
d. Any wine in there survey except wine C **(1)**
e. Exactly two of the three types of wine. **(1)**

Given that a person from the survey likes win A,

f. Find the probability that the person likes wine C. **(2)**

Solutions

1a.



3 enclosed curves	**M1**
90, 3, 2, 1	**M1**
1, (0), 2	**M1**
1 outside	**M1**
Box	**M1**
Labels	**M1**

1b.

P(none) = 0.01	**M1**

1c.

P(A but not B) = 0.04	**M1**

1d.

P(any wine by C) = 0.03	**M1**

1e.

P(exactly 2) = 0.06	**M1**

1f.

P(C given A) = $\frac{93}{96}$	**M1**
= $\frac{31}{32}$	**M1**

A-Level Starter Activity

Jotwa Maths

Topic: Venn Diagrams

Chapter Reference: Statistics 1, Chapter 5

6 minutes

1. 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

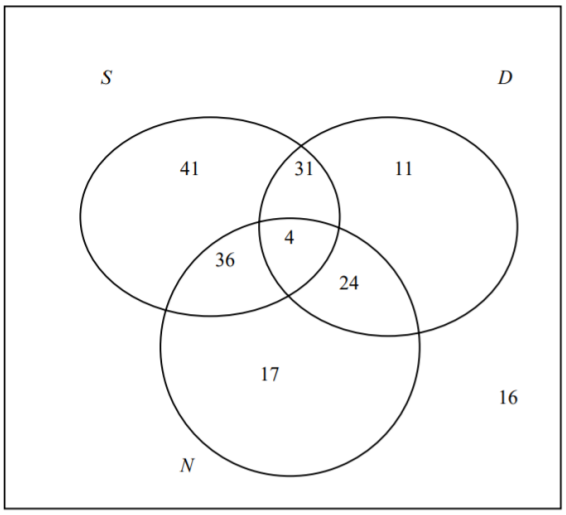
b. None of the three extra options **(1)**
c. Networking only **(1)**

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. **(2)**

Solutions

1a.



3 enclosed curves and 4 in centre.	**M1**
Evidence of subtraction	**M1**
31, 36, 24	**M1**
41, 17, 11	**M1**
Labels on loops, 16 and box.	**M1**

1b.

P(none of the 3 options) = $\frac{16}{180} = \frac{4}{45}$	**M1**

1c.

P(networking only) = $\frac{17}{180}$	**M1**

1d.

P(All 3 options) = $\frac{4}{40}$	**M1**
$= \frac{1}{10}$	**M1**

A-Level Starter Activity

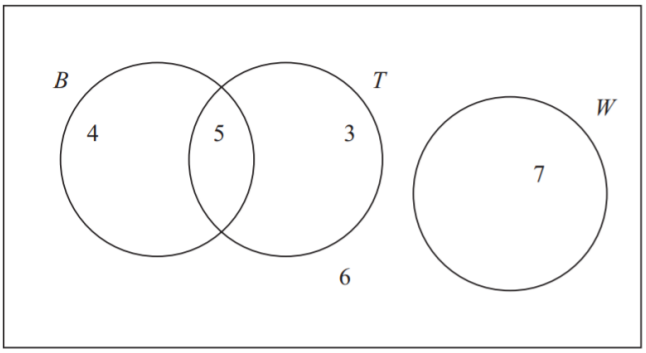
Jethwa Maths

Topic: Venn Diagrams

Chapter Reference: Statistics 1, Chapter 5

6 minutes

1. The figure shows how 25 people travelled to work.



Their travel to work is represented by the events, B; bicycle, T; train and 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 the probability that this person,

c. Walks to work.

d. Travels to work by bicycle and train. **(1)**

e. Given that this person travels to work by bicycle, find the probability that they will also take the train. **(2)**

Solutions

1a.

B and W or T and W	**M1**
As there is no overlap between these events.	**M1**

1b.

$P(B) = \frac{9}{25}$ $P(T) = \frac{8}{25}$ $P(B \text{ and } T) = \frac{5}{25}$	**M1**
$P(B \text{ and } T) \neq P(B) \text{ and } P(T)$ $0.2 \neq 0.36 \times 0.32$	**M1**
Therefore, B and T are not independent	**M1**

1c.

$P(W) = \frac{7}{25}$	**M1**

1d.

$P(B \text{ and } T) = \frac{5}{25}$	**M1**

1e.

$P(T \text{ given } B) = \frac{0.2}{\frac{5+4}{25}}$	**M1**
$= \frac{5}{9}$	**M1**