

SOLUTIONS.

Section A: Vocabulary (5 marks)

Choose a word from the list below that best completes each sentence. Write your answers in the space provided:

1. The number of times an outcome occurs is called the frequency.
2. The result of a trial is called an outcome.
3. The sample space of rolling a six sided die is $\{1,2,3,4,5,6\}$.
4. The events; "owning one television" and "owning two televisions", are examples of mutually exclusive events.
5. A tree diagram can be used to show all the outcomes of three sequential trials.

Sample space	Trial	Probability
Frequency	Complementary	Mutually exclusive
Two way table	Tree diagram	Intersection

The following information is needed to answer questions 1 - 3

A bag contains 30 balls. 10 are white, 5 are blue and the rest are red. One ball is selected at random.

Question 1

P(a red ball is selected) is:

A $\frac{5}{30}$

B $\frac{15}{30}$

C $\frac{1}{6}$

D $\frac{2}{3}$

E $\frac{1}{2}$

$$\frac{15}{30} = \frac{1}{2}$$

Question 2

P(either a blue or red ball is selected) is;

A $\frac{1}{3}$

B $\frac{20}{30}$

C $\frac{2}{3}$

D $\frac{1}{2}$

E $\frac{15}{20}$

$$\frac{15 + 5}{30} = \frac{20}{30} = \frac{2}{3}$$

Question 3

P(A blue ball is not selected) is;

A $\frac{1}{6}$

B $\frac{15}{20}$

C $\frac{5}{6}$

D $\frac{2}{3}$

E $\frac{1}{3}$

$$\begin{aligned} \Pr(\text{blue}') &= \frac{25}{30} \\ &= \frac{5}{6} \end{aligned}$$

Question 4

Which of the following is an example of complementary events;

- A. "Driving a black car" and "driving a white car".
- B. "Watching the football" and "watching the tennis".
- C. "Rolling an even number on a die" and "rolling an odd number on a die".
- D. "Eating pizza" and "eating pasta".
- E. "Walking to school" and "driving to school".

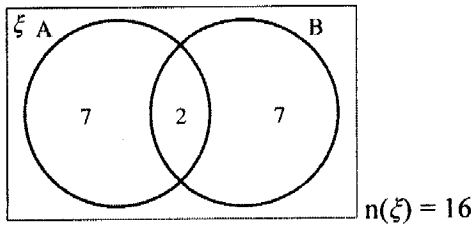
Question 5

A horse has odds 3-2. The probability of the horse winning is:

- A $\frac{2}{3}$
- B $\frac{3}{2}$
- C $\frac{2}{5}$
- D $\frac{3}{5}$
- E $\frac{1}{2}$

Loss : Win
3 : 2
 $\frac{3}{5} : \frac{2}{5}$

Use the Venn diagram below to answer questions 6 - 8



Question 6

P(A) is:

- A 0.125
- B 0.2
- C 0.4375
- D 0.5625
- E 0.875

$$Pr(A) = \frac{7+2}{16}$$
$$= \frac{9}{16}$$

Question 7

$P(A \cap B')$ is;

- A 0.125
- B 0.2
- C 0.4375
- D 0.5625
- E 0.875

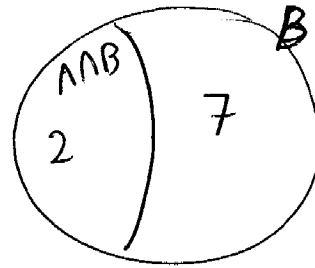
$$\Pr(A \cap B') = \frac{7}{16}$$

Question 8

$P(A | B)$ is;

- A 0.125
- B 0.2
- C 0.4375
- D 0.5625
- E 0.875

$$\Pr(A | B) = \frac{2}{9}$$



Question 9

In the month of February, the chance of rain on any day is 18%. Approximately how many days in February would we expect to have rain?

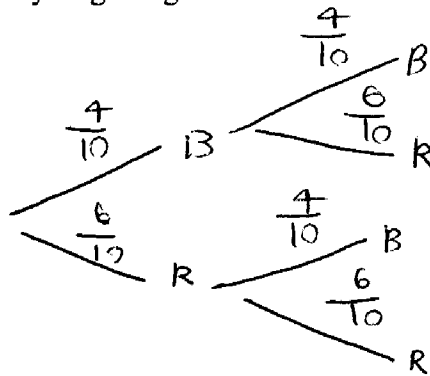
- A. 0
- B. 3
- C. 4
- D. 5**
- E. 18

$$0.18 \times 28 \approx 5$$

Question 10

A bag contains 4 blue and 6 red marbles. A marble is drawn from the bag, its colour recorded, and it is then put back into the bag. A second marble is then drawn and its colour again recorded. The probability of getting two red marbles would be:

- A. $\frac{1}{2}$
- B. $\frac{4}{25}$
- C. $\frac{6}{25}$
- D. $\frac{9}{25}$**
- E. $\frac{2}{15}$



$$Pr(RR) = \frac{6}{10} \times \frac{6}{10} = \frac{36}{100} = \frac{9}{25}$$

Question 11

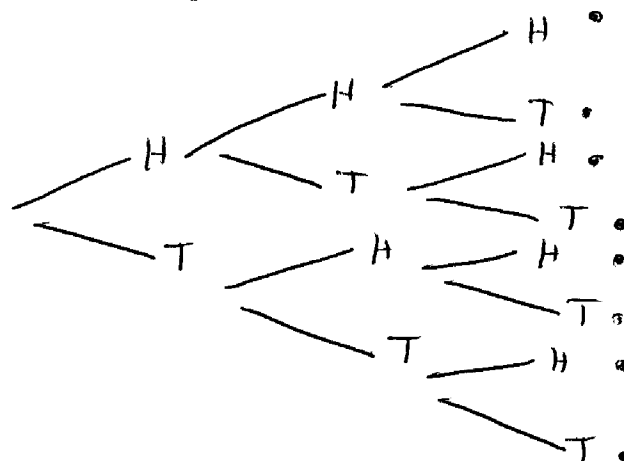
Which of the following is always true:

- A. Dependent events are mutually exclusive.
- B. Dependent events are conditional.**
- C. Dependent events are complementary.
- D. Independent events are conditional.
- E. Independent events are complementary.

Question 12

The number of outcomes for the experiment; "A coin is flipped three times" is:

- A. 2
- B. 3
- C. 6
- D. 8**
- E. 9



8 outcomes

Section C: Short Answer

Appropriate working must be shown to gain all the marks available in this section of the test.

Question 1

A year 10 maths methods class with 21 students was surveyed and it was found that 12 students had not brought their CAS calculator to class on this occasion.

- a. What is the relative frequency of students who bring CAS calculators?

$$21 - 12 = 9$$

$$\frac{9}{21} = \frac{3}{7}$$

- b. If there are a total of 100 year 10 maths methods students, how many of these students would we expect to bring their calculators to class? (Round your answer to the nearest whole number).

$$\frac{3}{7} \times 100 = 43$$

(2 + 2 = 4 marks)

Question 2

If $P(A) = 0.5$, $P(B) = 0.4$ and $P(A \cap B) = 0.3$

- a. Are events A and B independent? Show your reasoning.

$$Pr(A \cap B) = 0.3$$

$$Pr(A) \times Pr(B) = 0.5 \times 0.4 = 0.2$$

- b. Find $P(B')$

Since $Pr(A \cap B) \neq Pr(A) \times Pr(B)$,
A and B are not independent.

$$Pr(B') = 1 - Pr(B)$$

$$= 1 - 0.4$$

- c. Find $P(A \cup B)$

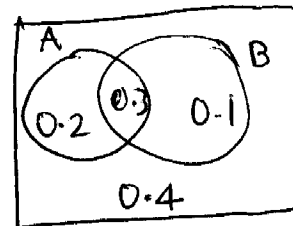
$$= 0.6$$

$$Pr(A \cup B) = Pr(A) + Pr(B) - Pr(A \cap B)$$

$$= 0.5 + 0.4 - 0.3 = 0.6$$

- d. Find $P(A|B)$

$$Pr(A|B) = \frac{Pr(A \cap B)}{Pr(B)} = \frac{0.3}{0.4} = 0.75$$



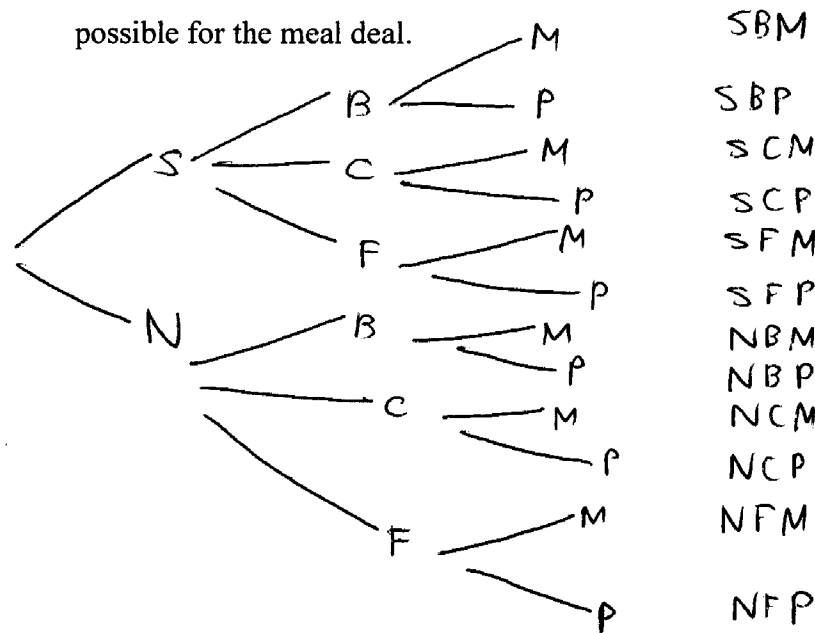
(2 + 1 + 2 + 2 = 7 marks)

Question 3

James is opening a new restaurant. He offers diners a special deal on a three course meal. The menu consists of;

- An entree of either salad (S), or nachos (N).
- A main course of either beef (B), chicken (C) or fish (F).
- A dessert of chocolate mousse (M) or pavlova (P)

a. Create a tree diagram to illustrate all the possible meal combinations that would be possible for the meal deal.



b. State the value of $n(\varepsilon)$. 12

c. How many more meal combinations would there be if James introduced a third dessert?

If he adds another dessert, the number of outcomes

$$= 2 \times 3 \times 3$$

$$= 18.$$

(4 + 1 + 1 = 6 marks)

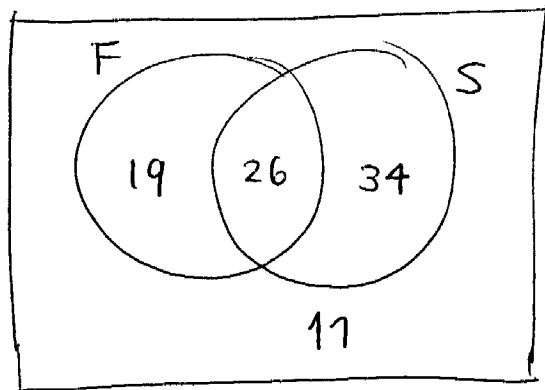
$$\therefore 18 - 12 = 6. \quad \therefore 6 \text{ more outcomes.}$$

Question 4

In a survey of 90 year 10 students, 45 played football, 60 played soccer, 26 played both sports.

Let F = plays football and let S = plays soccer.

- a. Construct a Venn Diagram to display this information.



- b. What is the probability that any randomly selected student plays football or soccer? Give your answer as a fraction.

$$\Pr(F \cup S) = \frac{79}{90}$$

- c. i. Find $\Pr(F \cap S')$, giving your answer as a fraction.

$$\Pr(F \cap S') = \frac{19}{90}$$

- ii. Describe in words the students who belong to the set $F \cap S'$.

Students who play football and not soccer.

- d. How many students did not play either sport?

11

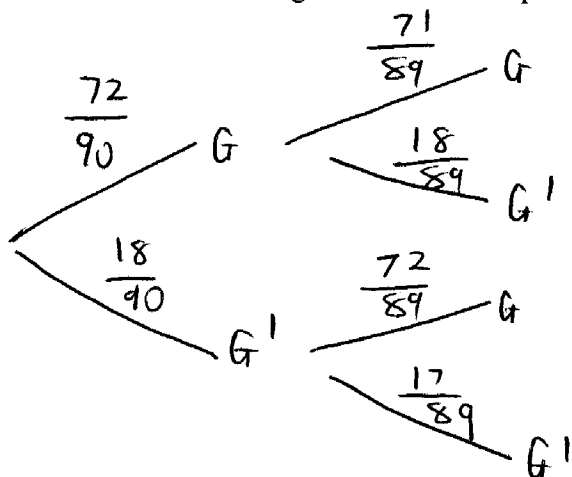
(4 + 1 + 2 + 1 = 8 marks)

Question 5

At a Woolworths distribution centre, a batch of watermelons is received. There are 90 watermelons and 18 watermelons are bad. A quality control employee randomly selects two watermelons without replacing them.

Let G = good watermelon G' = bad watermelon

- a. Construct a tree diagram to show the possible outcomes of the two selections.



- a. What is the probability of the employee picking two bad watermelons?

$$\Pr(G'G') = \frac{18}{90} \times \frac{17}{89} = \frac{17}{445}$$

- b. What is the probability of the employee picking two good watermelons?

$$\Pr(GG) = \frac{72}{90} \times \frac{71}{89} = \frac{284}{445}$$

- c. What is the probability that at least one of the watermelons is bad?

At least one: $GG', G'G, G'G'$

$$\Pr(\text{at least one bad}) = \frac{72}{90} \times \frac{18}{89} + \frac{18}{90} \times \frac{72}{89} + \frac{18}{90} \times \frac{17}{89} = \frac{161}{445}$$

- d. What is the relationship between your answers to part b and c?

They are complementary to each other

$$\left(\frac{284}{445} + \frac{161}{445} = 1 \right)$$

(4+1+1+1+1=8 marks)