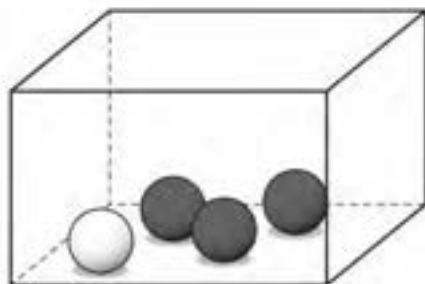
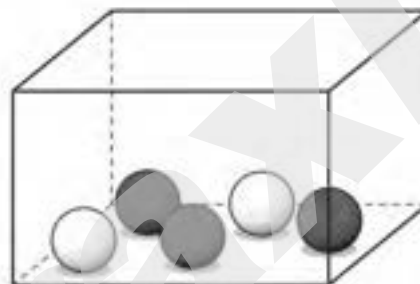


**Probability***(Past Year Topical Questions 2010-2015)*May/June 2010 (41)

4



A



B

Box A contains 3 black balls and 1 white ball.  
Box B contains 3 black balls and 2 white balls.

- (a) A ball can be chosen at random from either box.  
Complete the following statement.

There is a greater probability of choosing a white ball from Box .....

Explain your answer.

Answer(a) ..... [1]



- (c) Tatiana chooses a box and then chooses **two** balls from this box at random (without replacement).

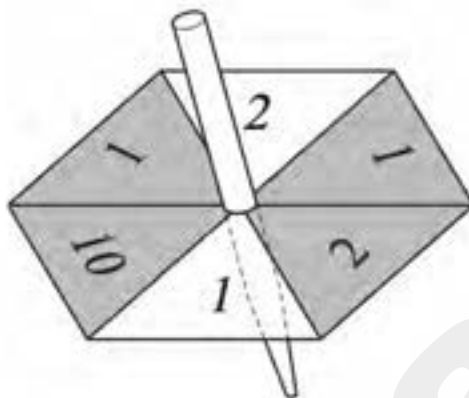
The probability that she chooses box A is  $\frac{2}{3}$ .

Find the probability that Tatiana chooses two white balls.

Answer(c) ..... [2]

May/June 2010 (42)

3



The diagram shows a spinner with six numbered sections.  
Some of the sections are shaded.  
Each time the spinner is spun it stops on one of the six sections.  
It is equally likely that it stops on any one of the sections.

(a) The spinner is spun once.

Find the probability that it stops on

(i) a shaded section,

Answer(a)(i) ..... [1]

(ii) a section numbered 1,

Answer(a)(ii) ..... [1]

(iii) a shaded section numbered 1,

Answer(a)(iii) ..... [1]

(iv) a shaded section or a section numbered 1.

Answer(a)(iv) ..... [1]

(b) The spinner is now spun twice.

Find the probability that the total of the two numbers is

(i) 20,

*Answer(b)(i)* ..... [2]

(ii) 11.

*Answer(b)(ii)* ..... [2]

(c) (i) The spinner stops on a shaded section.

Find the probability that this section is numbered 2.

*Answer(c)(i)* ..... [1]

(ii) The spinner stops on a section numbered 2.

Find the probability that this section is shaded.

*Answer(c)(ii)* ..... [1]

(d) The spinner is now spun until it stops on a section numbered 2.

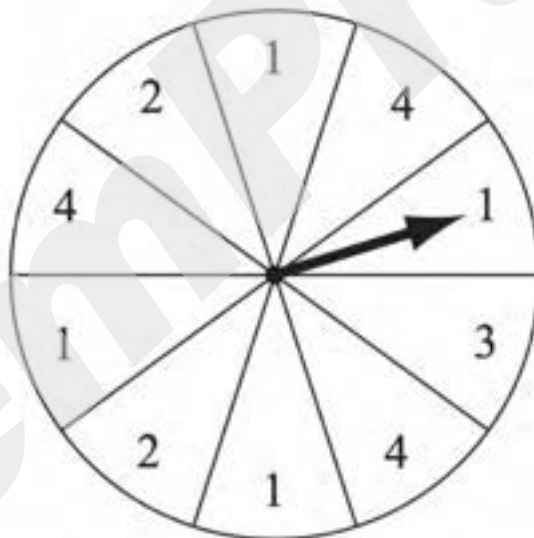
The probability that this happens on the  $n$ th spin is  $\frac{16}{243}$ .

Find the value of  $n$ .

Answer(d)  $n =$  ..... [2]

May/June 2010 (43)

3



The diagram shows a circular board, divided into 10 numbered sectors.

When the arrow is spun it is equally likely to stop in any sector.

- (a) Complete the table below which shows the probability of the arrow stopping at each number.

Number	1	2	3	4
Probability		0.2		0.3

[1]

- (b) The arrow is spun once.

Find

- (i) the most likely number,

Answer(b)(i) ..... [1]

- (ii) the probability of a number less than 4.

Answer(b)(ii) ..... [1]

- (c) The arrow is spun twice.

Find the probability that

- (i) both numbers are 2,

Answer(c)(i) ..... [1]

- (ii) the first number is 3 and the second number is 4,

Answer(c)(ii) ..... [2]

(iii) the two numbers add up to 4.

*Answer(c)(iii)* ..... [3]

(d) The arrow is spun several times until it stops at a number 4.

Find the probability that this happens on the third spin.

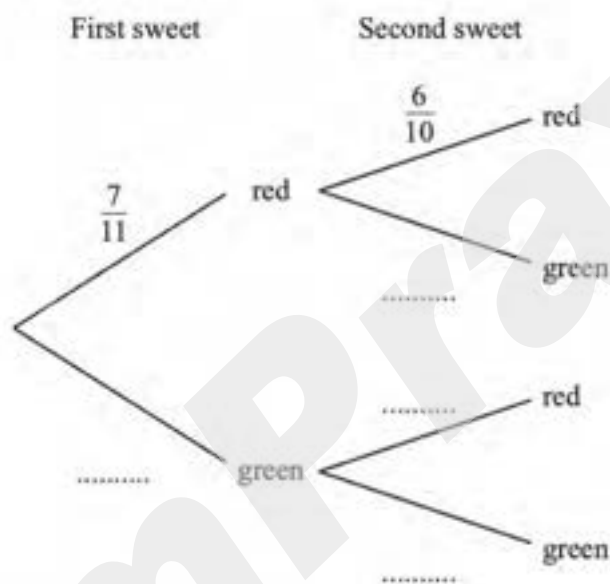
*Answer(d)* ..... [2]



October/November 2010 (42)

- 9 A bag contains 7 red sweets and 4 green sweets. Aimee takes out a sweet at random and eats it. She then takes out a second sweet at random and eats it.

(a) Complete the tree diagram.



[3]

(b) Calculate the probability that Aimee has taken

- (i) two red sweets,

Answer(b)(i) ..... [2]

(ii) one sweet of each colour.

Answer(b)(ii) ..... [3]

(c) Aimee takes a third sweet at random.  
Calculate the probability that she has taken

(i) three red sweets,

Answer(c)(i) ..... [2]

(ii) at least one red sweet.

Answer(c)(ii) ..... [3]

May/June 2011 (41)

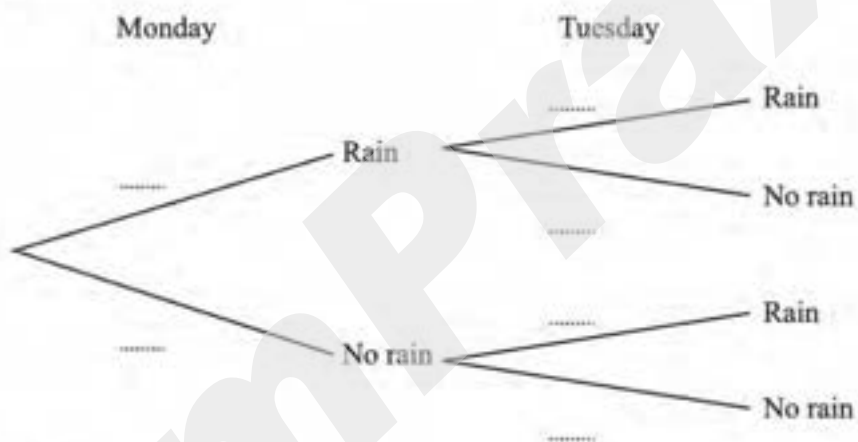
2 In this question give all your answers as fractions.

The probability that it rains on Monday is  $\frac{3}{5}$ .

If it rains on Monday, the probability that it rains on Tuesday is  $\frac{4}{7}$ .

If it does not rain on Monday, the probability that it rains on Tuesday is  $\frac{5}{7}$ .

(a) Complete the tree diagram.



[3]

(b) Find the probability that it rains

(i) on both days,

Answer(b)(i) ..... [2]

(ii) on Monday but not on Tuesday,

Answer(b)(ii) ..... [2]

(iii) on only one of the two days.

Answer(b)(iii) ..... [2]

- (c) If it does **not** rain on Monday and it does **not** rain on Tuesday, the probability that it does **not** rain on Wednesday is  $\frac{1}{4}$ .

Calculate the probability that it rains on **at least one** of the three days.

*Answer(c)* ..... [3]

May/June 2011 (43)

- 7 Katrina puts some plants in her garden.

The probability that a plant will produce a flower is  $\frac{7}{10}$ .

If there is a flower, it can only be red, yellow or orange.

When there is a flower, the probability it is red is  $\frac{2}{3}$  and the probability it is yellow is  $\frac{1}{4}$ .

- (a) Draw a tree diagram to show all this information.

Label the diagram and write the probabilities on each branch.

*Answer(a)*

[5]

(b) A plant is chosen at random.

Find the probability that it will **not** produce a yellow flower.

*Answer(b)* ..... [3]

(c) If Katrina puts 120 plants in her garden, how many orange flowers would she expect?

*Answer(c)* ..... [2]

October/November 2011 (42)

- 9 (a) Emile lost 2 blue buttons from his shirt.

A bag of spare buttons contains 6 white buttons and 2 blue buttons.

Emile takes 3 buttons out of the bag at random **without replacement**.

Calculate the probability that

- (i) all 3 buttons are white,

*Answer(a)(i)* ..... [3]

- (ii) exactly one of the 3 buttons is blue.

*Answer(a)(ii)* ..... [3]

- (b) There are 25 buttons in another bag.

This bag contains  $x$  blue buttons.

Two buttons are taken at random **without replacement**.

The probability that they are both blue is  $\frac{7}{100}$ .

- (i) Show that  $x^2 - x - 42 = 0$ .

*Answer (b)(i)*

- (ii) Factorise  $x^2 - x - 42$ .

[4]

*Answer(b)(ii)* .....

[2]

- (iii) Solve the equation  $x^2 - x - 42 = 0$ .

*Answer(b)(iii)*  $x =$  ..... or  $x =$  ..... [1]

- (iv) Write down the number of buttons in the bag which are **not** blue.

*Answer(b)(iv)* ..... [1]

October/November 2011 (43)

9



The diagram shows two sets of cards.

(a) One card is chosen at random from Set A and replaced.

(i) Write down the probability that the card chosen shows the letter M.

Answer(a)(i) ..... [1]

(ii) If this is carried out 100 times, write down the expected number of times the card chosen shows the letter M.

Answer(a)(ii) ..... [1]

(b) Two cards are chosen at random, without replacement, from Set A.

Find the probability that both cards show the letter S.

Answer(b) ..... [2]

(c) One card is chosen at random from Set A and one card is chosen at random from Set B.

Find the probability that exactly one of the two cards shows the letter U.

Answer(c) ..... [3]



- (d) A card is chosen at random, **without** replacement, from Set B until the letter shown is either I or U.

Find the probability that this does not happen until the 4th card is chosen.

Answer(d) ..... [2]

May/June 2012 (42)

- 8 In all parts of this question give your answer as a fraction in its lowest terms.**

- (a) (i) The probability that it will rain today is  $\frac{1}{3}$ .

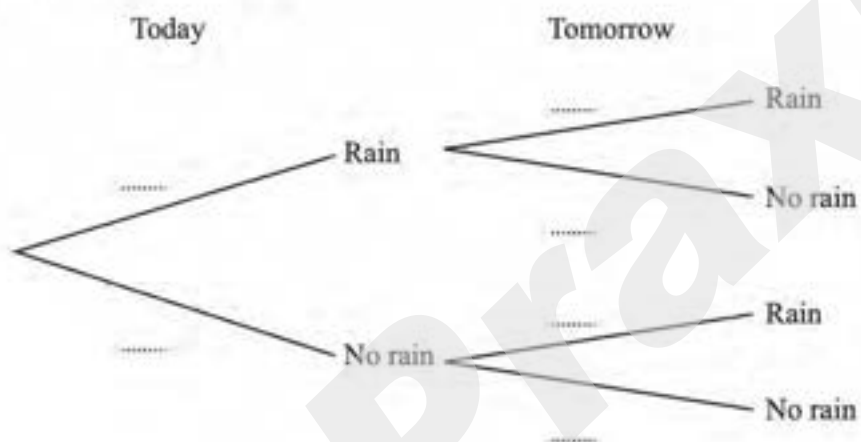
What is the probability that it will not rain today?

Answer(a)(i) ..... [1]

(ii) If it rains today, the probability that it will rain tomorrow is  $\frac{2}{5}$ .

If it does not rain today, the probability that it will rain tomorrow is  $\frac{1}{6}$ .

Complete the tree diagram.



[2]

(b) Find the probability that it will rain on at least one of these two days.

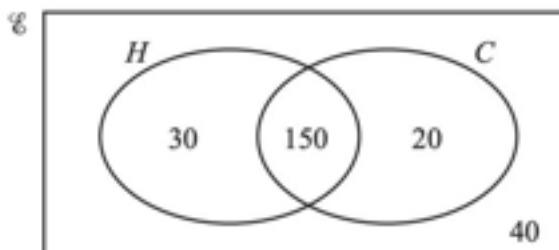
Answer(b) ..... [3]

(c) Find the probability that it will rain on only one of these two days.

Answer(c) ..... [3]

May/June 2012 (43)

6



$\mathcal{U} = \{240 \text{ passengers who arrive on a flight in Cyprus}\}$

$H = \{\text{passengers who are on holiday}\}$

$C = \{\text{passengers who hire a car}\}$

(c) One of the 240 passengers is chosen at random.

Write down the probability that this passenger

(i) hires a car,

Answer(c)(i) ..... [1]

(ii) is on holiday and hires a car.

Answer(c)(ii) ..... [1]

**(d) Give your answers to this part correct to 4 decimal places.**

Two of the 240 passengers are chosen at random.

Find the probability that

**(i)** they are both on holiday,

*Answer(d)(i)* ..... [2]

**(ii)** exactly one of the two passengers is on holiday.

*Answer(d)(ii)* ..... [3]

**(e) Give your answer to this part correct to 4 decimal places.**

Two passengers are chosen at random from those on holiday.

Find the probability that they both hire a car.

*Answer(e)* ..... [3]

October/November 2012 (41)

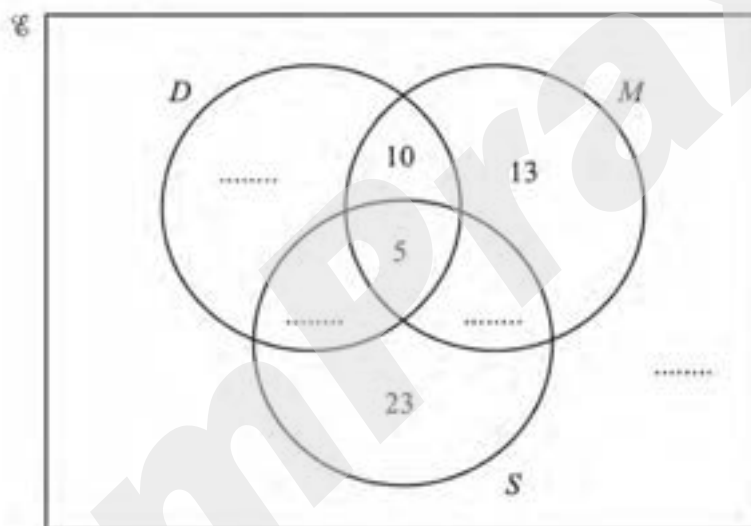
- 3 90 students are asked which school clubs they attend.

$D = \{\text{students who attend drama club}\}$

$M = \{\text{students who attend music club}\}$

$S = \{\text{students who attend sports club}\}$

39 students attend music club.  
 26 students attend **exactly two** clubs.  
 35 students attend drama club.



- (a) Write the four missing values in the Venn diagram. [4]

- (d) One of the 90 students is chosen at random.

Find the probability that the student

- (i) **only** attends music club,

Answer(d)(i) ..... [1]

- (ii) attends **both** music and drama clubs.

Answer(d)(ii) ..... [1]

(e) Two of the 90 students are chosen at random without replacement.

Find the probability that

(i) they **both** attend all three clubs,

*Answer(e)(i)* ..... [2]

(ii) one of them attends sports club only and the other attends music club only.

*Answer(e)(ii)* ..... [3]

October/November 2012 (42)

9 (a)  $\mathcal{E} = \{25 \text{ students in a class}\}$

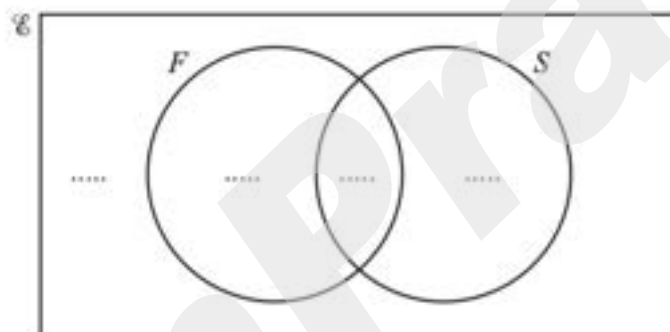
$F = \{\text{students who study French}\}$

$S = \{\text{students who study Spanish}\}$

16 students study French and 18 students study Spanish.

2 students study neither of these.

(i) Complete the Venn diagram to show this information.



(ii) Find  $n(F')$ .

[2]

Answer(a)(ii) .....

[1]

(iii) Find  $n(F \cap S)$ .

Answer(a)(iii) .....

[1]

(iv) One student is chosen at random.

Find the probability that this student studies both French and Spanish.

Answer(a)(iv) .....

[1]

(v) Two students are chosen at random without replacement.

Find the probability that they both study only Spanish.

*Answer(a)(v)* ..... [2]



(b) In another class the students all study at least one language from French, German and Spanish.

No student studies all three languages.

The set of students who study German is a proper subset of the set of students who study French.

4 students study both French and German.

12 students study Spanish but not French.

9 students study French but not Spanish.

A total of 16 students study French.

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

[4]

(ii) Find the total number of students in this class.

Answer(b)(ii) ..... [1]

October/November 2012 (43)

7 (a)



Two discs are chosen at random **without** replacement from the five discs shown in the diagram.

(i) Find the probability that both discs are numbered 2.

*Answer(a)(i)* ..... [2]

(ii) Find the probability that the numbers on the **two** discs have a total of 5.

*Answer(a)(ii)* ..... [3]

(iii) Find the probability that the numbers on the two discs do **not** have a total of 5.

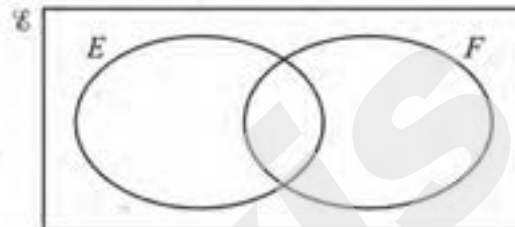
*Answer(a)(iii)* ..... [1]

- (b) A group of international students take part in a survey on the nationality of their parents.

$E = \{\text{students with an English parent}\}$

$F = \{\text{students with a French parent}\}$

$n(\mathcal{E}) = 50$ ,  $n(E) = 15$ ,  $n(F) = 9$  and  $n(E \cup F)' = 33$ .



- (i) Find  $n(E \cap F)$ .

Answer(b)(i) ..... [1]

- (ii) Find  $n(E' \cap F)$ .

Answer(b)(ii) ..... [1]

- (iii) A student is chosen at random.  
Find the probability that this student has an English parent and a French parent.

Answer(b)(iii) ..... [1]

- (iv) A student who has a French parent is chosen at random.  
Find the probability that this student also has an English parent.

Answer(b)(iv) ..... [1]

May/June 2013 (41)

Question 7b

(b) A bag contains 7 white beads and 5 red beads.

- (i) The mass of a red bead is 2.5 grams more than the mass of a white bead.  
The total mass of all the 12 beads is 114.5 grams.

Find the mass of a white bead and the mass of a red bead.

Answer(b)(i) White ..... g

Red ..... g [5]

(ii) Two beads are taken out of the bag at random, without replacement.

Find the probability that

- (a) they are both white,

Answer(b)(ii)(a) ..... [2]

(b) one is white and one is red.

Answer(b)(ii)(b) ..... [3]

May/June 2013 (42)

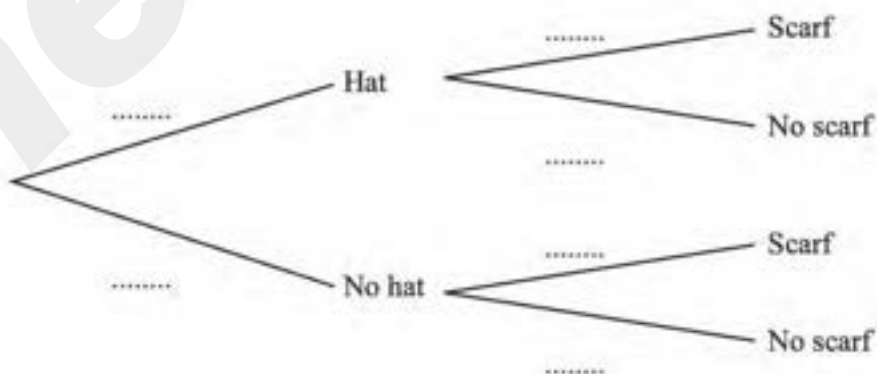
**8** In this question, give all your answers as fractions.

When Ivan goes to school in winter, the probability that he wears a hat is  $\frac{5}{8}$ .

If he wears a hat, the probability that he wears a scarf is  $\frac{2}{3}$ .

If he does not wear a hat, the probability that he wears a scarf is  $\frac{1}{6}$ .

(a) Complete the tree diagram.



[3]

(b) Find the probability that Ivan

(i) does not wear a hat and does not wear a scarf,

*Answer(b)(i)* ..... [2]

(ii) wears a hat but does not wear a scarf,

*Answer(b)(ii)* ..... [2]

(iii) wears a hat or a scarf but not both.

*Answer(b)(iii)* ..... [2]

(c) If Ivan wears a hat and a scarf, the probability that he wears gloves is  $\frac{7}{10}$ .

Calculate the probability that Ivan does **not** wear all three of hat, scarf and gloves.

*Answer(c)* ..... [3]



October/November 2013 (42)

6



Prettie picks a card at random from the 11 cards above and does not replace it. She then picks a second card at random and does not replace it.

(a) Find the probability that she picks

(i) the letter L and then the letter G,

*Answer(a)(i)* ..... [2]

(ii) the letter E twice,

*Answer(a)(ii)* ..... [2]

(iii) two letters that are the same.

*Answer(a)(iii)* ..... [2]



(b) Prettie now picks a third card at random.

Find the probability that the three letters

(i) are all the same,

*Answer(b)(i)* ..... [2]

(ii) do not include a letter E,

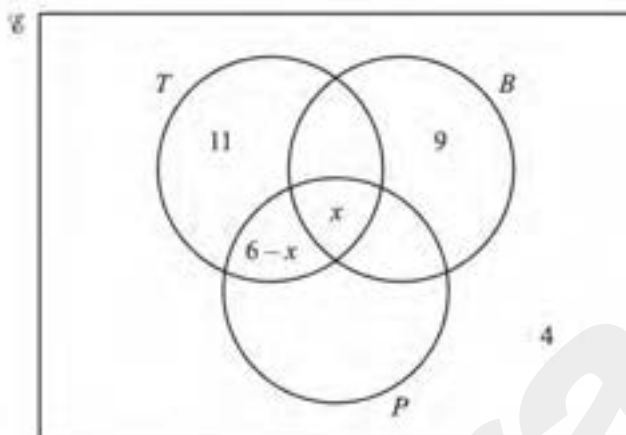
*Answer(b)(ii)* ..... [2]

(iii) include exactly two letters that are the same.

*Answer(b)(iii)* ..... [5]

May/June 2014 (41)

4



In the Venn diagram,  $U = \{\text{children in a nursery}\}$

- $B = \{\text{children who received a book for their birthday}\}$
- $T = \{\text{children who received a toy for their birthday}\}$
- $P = \{\text{children who received a puzzle for their birthday}\}$

$x$  children received a book and a toy and a puzzle.

6 children received a toy and a puzzle.

- (a) 4 children received a book and a toy.  
 5 children received a book and a puzzle.  
 7 children received a puzzle but not a book and not a toy.

Complete the Venn diagram above.

[3]

- (b) There are 40 children in the nursery.

Using the Venn diagram, write down and solve an equation in  $x$ .

*Answer(b)*

[3]

- (c) Work out

- (i) the probability that a child, chosen at random, received a book but not a toy and not a puzzle,

*Answer(c)(i)* ..... [1]

- (ii) the number of children who received a book and a puzzle but not a toy,

*Answer(c)(ii)* ..... [1]

- (iii)  $n(B)$ ,

*Answer(c)(iii)* ..... [1]

- (iv)  $n(B \cup P)$ ,

*Answer(c)(iv)* ..... [1]

- (v)  $n(B \cup T \cup P)'$ .

*Answer(c)(v)* ..... [1]

- 6 (a) A square spinner is biased.  
The probabilities of obtaining the scores 1, 2, 3 and 4 when it is spun are given in the table.

Score	1	2	3	4
Probability	0.1	0.2	0.4	0.3

- (i) Work out the probability that on one spin the score is 2 or 3.

*Answer(a)(i)* ..... [2]

- (ii) In 5000 spins, how many times would you expect to score 4 with this spinner?

*Answer(a)(ii)* ..... [1]

- (iii) Work out the probability of scoring 1 on the first spin and 4 on the second spin.

*Answer(a)(iii)* ..... [2]

- (b) In a bag there are 7 red discs and 5 blue discs.  
From the bag a disc is chosen at random and not replaced.  
A second disc is then chosen at random.

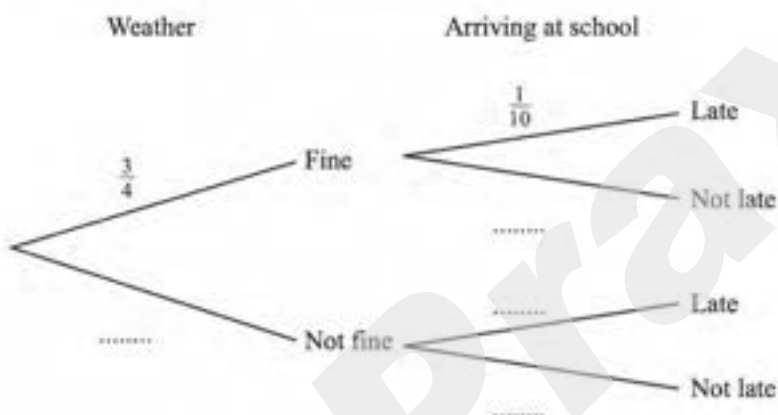
Work out the probability that at least one of the discs is red.  
Give your answer as a fraction.

*Answer(b)* ..... [3]

May/June 2014 (42)

- 9 If the weather is fine the probability that Carlos is late arriving at school is  $\frac{1}{10}$ .  
 If the weather is not fine the probability that he is late arriving at school is  $\frac{1}{3}$ .  
 The probability that the weather is fine on any day is  $\frac{3}{4}$ .

(a) Complete the tree diagram to show this information.



[3]

- (b) In a school term of 60 days, find the number of days the weather is expected to be fine.

Answer(b) ..... [1]

- (c) Find the probability that the weather is fine and Carlos is late arriving at school.

Answer(c) ..... [2]

- (d) Find the probability that Carlos is not late arriving at school.

Answer(d) ..... [3]

- (e) Find the probability that the weather is not fine on at least one day in a school week of 5 days.

Answer(e) ..... [2]

May/June 2014 (43)

- 6 In this question, give all your answers as fractions.



The letters of the word **NATION** are printed on 6 cards.

- (a) A card is chosen at random.

Write down the probability that

- (i) it has the letter **T** printed on it,

Answer(a)(i) ..... [1]

- (ii) it does not have the letter **N** printed on it,

Answer(a)(ii) ..... [1]

- (iii) the letter printed on it has no lines of symmetry.

Answer(a)(iii) ..... [1]

- (b) Lara chooses a card at random, replaces it, then chooses a card again.

Calculate the probability that only **one** of the cards she chooses has the letter **N** printed on it.

Answer(b) ..... [3]

- (c) Jacob chooses a card at random and does not replace it.  
He continues until he chooses a card with the letter **N** printed on it.

Find the probability that this happens when he chooses the 4th card.

Answer(c) ..... [3]

October/November 2014 (41)

**Question 6c**

- (c) Robert buys one energy saving bulb and one halogen bulb.

The probability that the energy saving bulb lasts longer than 3500 hours is  $\frac{9}{10}$ .

The probability that the halogen bulb lasts longer than 3500 hours is  $\frac{3}{5}$ .

Work out the probability that exactly one of the bulbs will last longer than 3500 hours.

Answer(c) ..... [4]

October/November 2014 (42)

- 10 Kenwyn plays a board game.  
Two cubes (dice) each have faces numbered 1, 2, 3, 4, 5 and 6.  
In the game, a **throw** is rolling the **two** fair 6-sided dice and then adding the numbers on their top faces.  
This total is the number of spaces to move on the board.  
For example, if the numbers are 4 and 3, he moves 7 spaces.

(a) Giving each of your answers as a fraction in its simplest form, find the probability that he moves

(i) two spaces with his next throw,

Answer(a)(i) ..... [2]

(ii) ten spaces with his next throw.

Answer(a)(ii) ..... [3]

(b) What is the most likely number of spaces that Kenwyn will move with his next throw?  
Explain your answer.

Answer(b) ..... because .....  
..... [2]



(c)

95	96	97	98	99 Go back 3 spaces	100 WIN
----	----	----	----	---------------------------	------------

To win the game he must move **exactly** to the 100th space.

Kenwyn is on the 97th space.

If his next throw takes him to 99, he has to move back to 96.

If his next throw takes him over 100, he stays on 97.

Find the probability that he reaches 100 in either of his next two throws.

Answer(c) ..... [5]

October/November 2014 (43)

- 4 Yeung and Ariven compete in a triathlon race.

The probability that Yeung finishes this race is  $\frac{3}{5}$ .

The probability that Ariven finishes this race is  $\frac{2}{3}$ .

- (a) (i) Which of them is more likely to finish this race?  
Give a reason for your answer.

Answer(a)(i) ..... because .....

[1]

- (ii) Find the probability that they both finish this race.

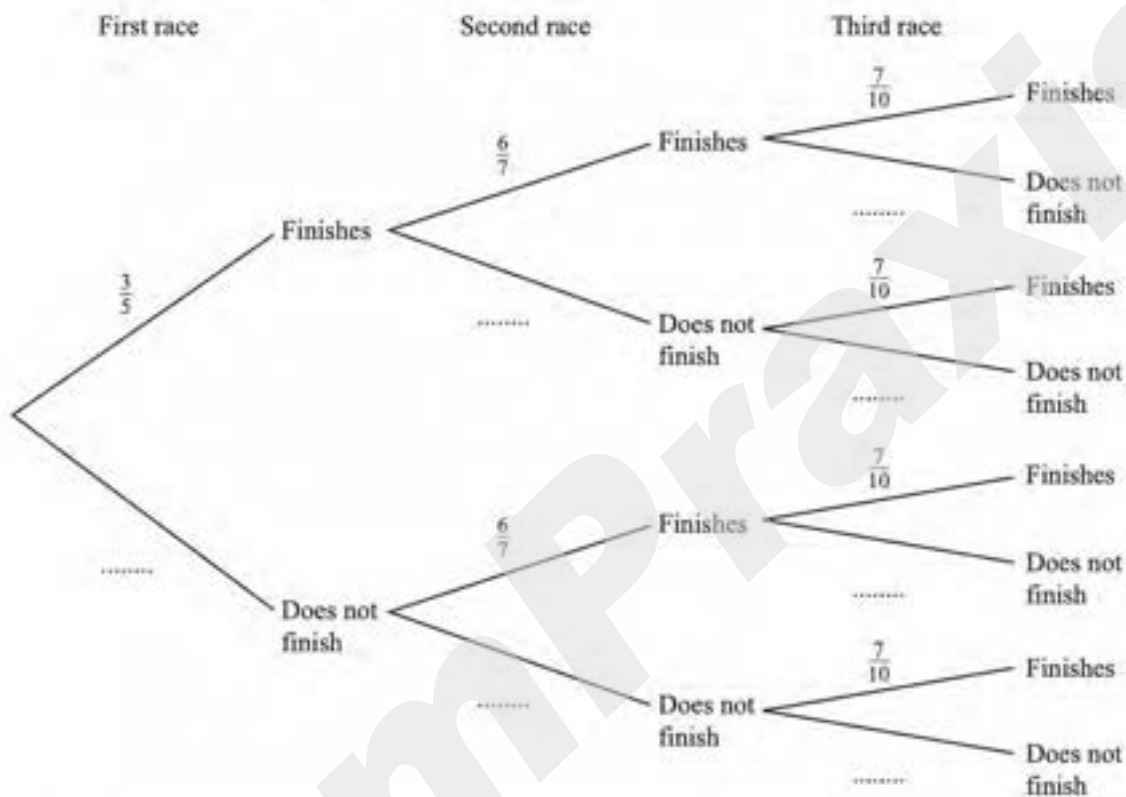
Answer(a)(ii) ..... [2]

- (iii) Find the probability that only one of them finishes this race.

Answer(a)(iii) ..... [3]

(b) After the first race, Yeung competes in two further triathlon races.

(i) Complete the tree diagram.



[3]

(ii) Calculate the probability that Yeung finishes all three of his races.

Answer(b)(ii) ..... [2]

(iii) Calculate the probability that Yeung finishes at least one of his races.

Answer(b)(iii) ..... [3]

February/March 2015 (42)

6 In this question write any probability as a fraction.

Navpreet has 15 cards with a shape drawn on each card.  
5 cards have a square, 6 cards have a triangle and 4 cards have a circle drawn on them.

(a) Navpreet selects a card at random.

Write down the probability that the card has a circle drawn on it.

Answer(a) ..... [1]

(b) Navpreet selects a card at random and replaces it.  
She does this 300 times.

Calculate the number of times she expects to select a card with a circle drawn on it.

Answer(b) ..... [1]

(c) Navpreet selects a card at random, replaces it and then selects another card.

Calculate the probability that

(i) one card has a square drawn on it and the other has a circle drawn on it,

Answer(c)(i) ..... [3]

(ii) neither card has a circle drawn on it.

Answer(c)(ii) ..... [3]

(d) Navpreet selects two cards at random, without replacement.

Calculate the probability that

(i) only one card has a triangle drawn on it,

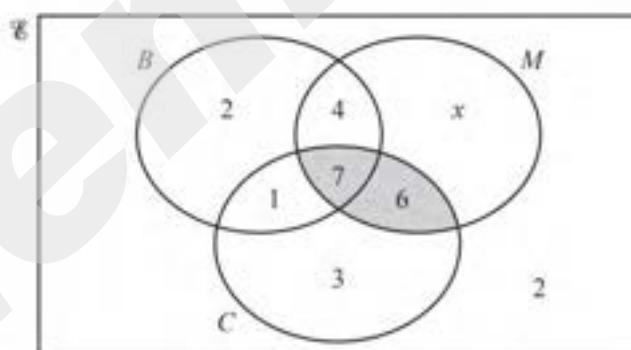
Answer(d)(i) ..... [3]

(ii) the two cards have different shapes drawn on them.

Answer(d)(ii) ..... [4]

May/June 2015 (41)

- 4 30 students were asked if they had a bicycle ( $B$ ), a mobile phone ( $M$ ) and a computer ( $C$ ). The results are shown in the Venn diagram.



(a) Work out the value of  $x$ .

Answer(a)  $x =$  ..... [1]

(b) Use set notation to describe the shaded region in the Venn diagram.

Answer(b) ..... [1]

(c) Find  $n(C \cap (M \cup B)')$ .

Answer(c) ..... [1]

(d) A student is chosen at random.

(i) Write down the probability that the student is a member of the set  $M'$ .

Answer(d)(i) ..... [1]

(ii) Write down the probability that the student has a bicycle.

Answer(d)(ii) ..... [1]

(e) Two students are chosen at random from the students who have computers.

Find the probability that each of these students has a mobile phone but no bicycle.

Answer(e) ..... [3]

May/June 2015 (42)

- 11 Gareth has 8 sweets in a bag.  
4 sweets are orange flavoured, 3 are lemon flavoured and 1 is strawberry flavoured.

(a) He chooses two of the sweets at random.

Find the probability that the two sweets have different flavours.

Answer(a) ..... [4]

(b) Gareth now chooses a third sweet.

Find the probability that none of the three sweets is lemon flavoured.

Answer(b) ..... [2]

May/June 2015 (43)

5



- (a) One of these 7 cards is chosen at random.

Write down the probability that the card

- (i) shows the letter  $A$ ,

Answer(a)(i) ..... [1]

- (ii) shows the letter  $A$  or  $B$ ,

Answer(a)(ii) ..... [1]

- (iii) does not show the letter  $B$ .

Answer(a)(iii) ..... [1]

- (b) Two of the cards are chosen at random, without replacement.

Find the probability that

- (i) both show the letter  $A$ ,

Answer(b)(i) ..... [2]

- (ii) the two letters are different.

Answer(b)(ii) ..... [3]



(c) Three of the cards are chosen at random, without replacement.

Find the probability that the cards do not show the letter C.

Answer(c) ..... [2]