New test - November 16, 2014 *[125 marks]*

In a college 450 students were surveyed with the following results

150 have a television

205 have a computer

220 have an iPhone

75 have an iPhone and a computer

60 have a television and a computer

70 have a television and an iPhone

40 have all three.

1a. Draw a Venn diagram to show this information. Use *T* to represent the set of students who have a television, *C* the set of students who have a computer and *I* the set of students who have an iPhone. *[4 marks]*

1b. Write down the number of students that *[2 marks]*

(i) have a computer only;

(ii) have an iPhone and a computer but no television.

1c. Write down $n[T \cap (C \cup I)']$. *[1 mark]*

1d. Calculate the number of students who have none of the three. *[2 marks]*

1e. Two students are chosen at random from the 450 students. Calculate the probability that *[6 marks]*

(i) neither student has an iPhone;

(ii) only one of the students has an iPhone.

$U = \{x | x$ is an integer, $2 < x < 10\}$

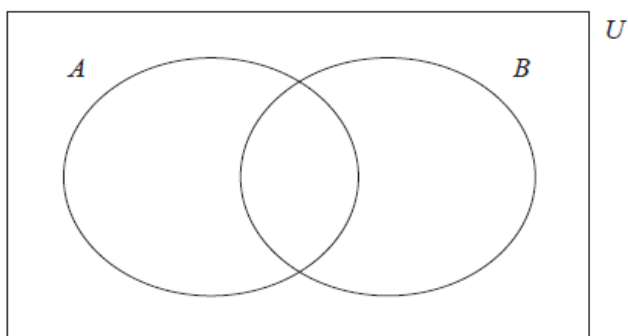*A* and *B* are subsets of *U* such that $A = \{$multiples of 3$\}$, $B = \{$factors of 24$\}$.

2a. List the elements of *[2 marks]*

(i) U ;

(ii) B .

2b. Write down the elements of U on the Venn diagram. *[3 marks]*

2c. Write down $n(A \cap B)$.   *[1 mark]*
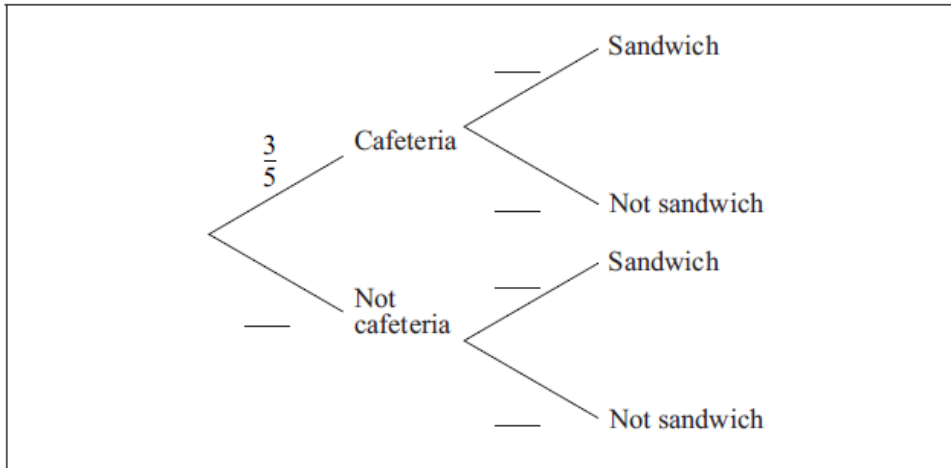
The probability that Tanay eats lunch in the school cafeteria is $\frac{3}{5}$.

If he eats lunch in the school cafeteria, the probability that he has a sandwich is $\frac{3}{10}$.

If he does not eat lunch in the school cafeteria the probability that he has a sandwich is $\frac{9}{10}$.

3a. Complete the tree diagram below.   *[3 marks]*

3b. Find the probability that Tanay has a sandwich for his lunch.   *[3 marks]*

100 students at IB College were asked whether they study Music (*M*), Chemistry (*C*), or Economics (*E*) with the following results.

  10 study all three

  15 study Music and Chemistry

  17 study Music and Economics

  12 study Chemistry and Economics

  11 study Music **only**

  6 study Chemistry **only**

4a. Draw a Venn diagram to represent the information above.   *[4 marks]*

4b. Write down the number of students who study Music but not Economics.   *[1 mark]*

4c. There are 22 Economics students **in total**.   *[4 marks]*

  (i) Calculate the number of students who study Economics only.

  (ii) Find the number of students who study none of these three subjects.

4d. A student is chosen at random from the 100 that were asked above.   *[7 marks]*

    Find the probability that this student

    (i) studies Economics;

    (ii) studies Music and Chemistry but not Economics;

    (iii) does not study either Music or Economics;

    (iv) does not study Music given that the student does not study Economics.

Forty families were surveyed about the places they went to on the weekend. The places were the circus (C), the museum (M) and the park (P).

16 families went to the circus

22 families went to the museum

14 families went to the park

4 families went to all three places

7 families went to both the circus and the museum, but not the park

3 families went to both the circus and the park, but not the museum

1 family went to the park only

5a. Draw a Venn diagram to represent the given information using sets labelled C, M and P. Complete the diagram to include the number of families represented in each region. *[4 marks]*

5b. Find the number of families who *[4 marks]*

(i) went to the circus only;

(ii) went to the museum and the park but not the circus;

(iii) did not go to any of the three places on the weekend.

5c. A family is chosen at random from the group of 40 families. Find the probability that the family went to *[8 marks]*

(i) the circus;

(ii) two or more places;

(iii) the park or the circus, but not the museum;

(iv) the museum, given that they also went to the circus.

5d. Two families are chosen at random from the group of 40 families. *[3 marks]*

Find the probability that both families went to the circus.

Alan's laundry basket contains two green, three red and seven black socks. He selects one sock from the laundry basket at random.

6a. Write down the probability that the sock is red. *[1 mark]*

6b. Alan returns the sock to the laundry basket and selects two socks at random. *[2 marks]*

Find the probability that the first sock he selects is green and the second sock is black.

6c. Alan returns the socks to the laundry basket and again selects two socks at random. *[3 marks]*

Find the probability that he selects two socks of the same colour.

A store recorded their sales of televisions during the 2010 football World Cup. They looked at the numbers of televisions bought by gender and the size of the television screens.

This information is shown in the table below; S represents the size of the television screen in inches.

	$S \leq 22$	$22 < S \leq 32$	$32 < S \leq 46$	$S > 46$	Total
Female	65	100	40	15	220
Male	20	65	140	55	280
Total	85	165	180	70	500

The store wants to use this information to predict the probability of selling these sizes of televisions for the 2014 football World Cup.

7. Use the table to find the probability that   *[6 marks]*

   (i) a television will be bought by a female;

   (ii) a television with a screen size of $32 < S \leq 46$ will be bought;

   (iii) a television with a screen size of $32 < S \leq 46$ will be bought by a female;

   (iv) a television with a screen size greater than 46 inches will be bought, given that it is bought by a male.

Merryn plans to travel to a concert tomorrow. Due to bad weather, there is a 60 % chance that all flights will be cancelled tomorrow. If the flights are cancelled Merryn will travel by car.

If she travels by plane the probability that she **will be late** for the concert is 10 %.

If she travels by car, the probability that she **will not be late** for the concert is 25 %.

8a. Complete the tree diagram below.   *[1 mark]*
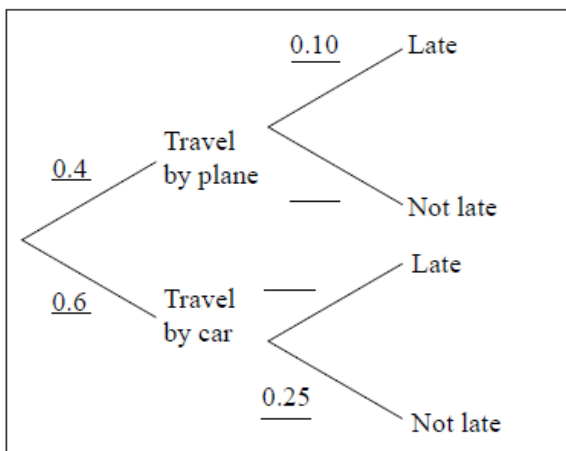
8b. Find the probability that Merryn will not be late for the concert.   *[3 marks]*

8c. Merryn was not late for the concert the next day.   *[2 marks]*

   Given that, find the probability that she travelled to the concert by car.

Beartown has three local newspapers: *The Art Journal*, *The Beartown News*, and *The Currier*.

A survey shows that

32 % of the town's population read *The Art Journal*,

46 % read *The Beartown News*,

54 % read *The Currier*,

3 % read *The Art Journal* and *The Beartown News* **only**,

8 % read *The Art Journal* and *The Currier* **only**,

12 % read *The Beartown News* and *The Currier* **only**, and

5 % of the population reads **all** three newspapers.

9a. Draw a Venn diagram to represent this information. Label *A* the set that represents *The Art Journal* readers, *B* the set that represents *The Beartown News* readers, and *C* the set that represents *The Currier* readers. [4 marks]

9b. Find the percentage of the population that does not read any of the three newspapers. [2 marks]

9c. Find the percentage of the population that reads exactly one newspaper. [2 marks]

9d. Find the percentage of the population that reads *The Art Journal* or *The Beartown News* but not *The Currier*. [2 marks]

9e. A local radio station states that 83 % of the population reads either *The Beartown News* or *The Currier*. [2 marks]

Use your Venn diagram to decide whether the statement is true. Justify your answer.

The seniors from Gulf High School are required to participate in exactly one after-school sport. Data were gathered from a sample of 120 students regarding their choice of sport. The following data were recorded.

Gender	Football	Tennis	Basketball	Total
			Sport	
Male	17	8	10	35
Female	31	17	37	85
Total	48	25	47	120

A χ^2 test was carried out at the 5 % significance level to analyse the relationship between gender and choice of after-school sport.

10a. One student is chosen at random from the 120 students. [2 marks]

Find the probability that this student

(i) is male;

(ii) plays tennis.

10b. Two students are chosen at random from the 120 students. [5 marks]

Find the probability that

(i) both play football;

(ii) neither play basketball.

Music lessons in Piano (P), Violin (V) and Flute (F) are offered to students at a school.

The Venn diagram shows the number of students who learn each kind of instrument.
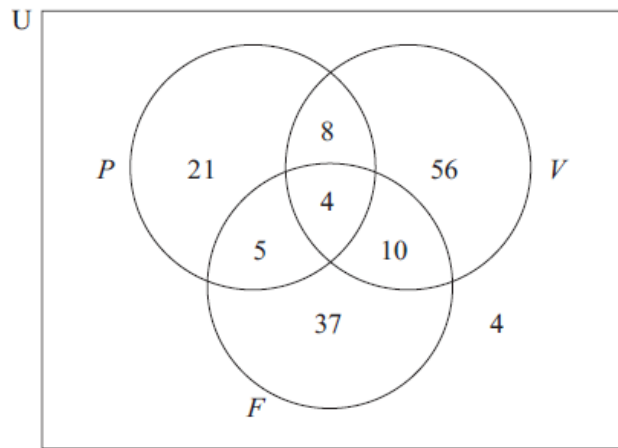
11a. Write down the total number of students in the school. *[1 mark]*

11b. Write down the number of students who *[3 marks]*

    (i) learn violin only;

    (ii) learn piano or flute or both;

    (iii) do not learn flute.

11c. Explain, in words, the meaning of the part of the diagram that represents the set $P \cap F'$. *[2 marks]*

Leanne goes fishing at her favourite pond. The pond contains four different types of fish: bream, flathead, whiting and salmon. The fish are either undersized or normal. This information is shown in the table below.

| Size / Type of fish	Bream	Flathead	Whiting	Salmon	Total
Undersized	3	12	18	9	42
Normal	0	11	24	13	48
Total	3	23	42	22	

12a. Leanne catches a fish. *[7 marks]*

    Find the probability that she

    (i) catches an undersized bream;

    (ii) catches either a flathead or an undersized fish or both;

    (iii) does not catch an undersized whiting;

    (iv) catches a whiting given that the fish was normal.

12b. Leanne notices that on windy days, the probability she catches a fish is 0.1 while on non-windy days the probability she catches a fish is 0.65. The probability that it will be windy on a particular day is 0.3. *[3 marks]*

Copy and complete the probability tree diagram below.
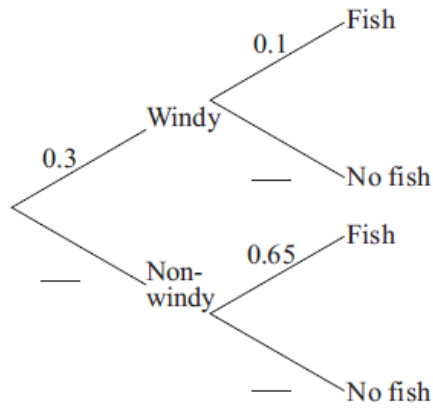
12c. Leanne notices that on windy days, the probability she catches a fish is 0.1 while on non-windy days the probability she catches a fish is 0.65. The probability that it will be windy on a particular day is 0.3. *[2 marks]*

Calculate the probability that it is windy and Leanne catches a fish on a particular day.

12d. Leanne notices that on windy days, the probability she catches a fish is 0.1 while on non-windy days the probability she catches a fish is 0.65. The probability that it will be windy on a particular day is 0.3. *[3 marks]*

Calculate the probability that Leanne catches a fish on a particular day.

12e. Use your answer to part (e) to calculate the probability that Leanne catches a fish on two consecutive days. *[2 marks]*

12f. Leanne notices that on windy days, the probability she catches a fish is 0.1 while on non-windy days the probability she catches a fish is 0.65. The probability that it will be windy on a particular day is 0.3. *[3 marks]*

Given that Leanne catches a fish on a particular day, calculate the probability that the day was windy.