PROBABILITY THEORY

1. There are 4 red and 6 yellow counters in a box. One is picked out and replaced, then a second is picked. Draw a probability tree to show all the possible outcomes and use it to find
   (a) P(red)
   (b) P(2 yellow)
   (c) P(1 red, 1 yellow).

2. The two sides of a coin are known as 'head' and 'tail'. Two coins are tossed at the same time. List all the possible outcomes. Find the probability of obtaining
   (a) two heads, (b) a head and a tail.

3. A bag contains 6 red balls and 4 green balls.
   (a) Find the probability of selecting at random:
      (i) a red ball (ii) a green ball.
   (b) One red ball is removed from the bag. Find the new probability of selecting at random:
      (i) a red ball (ii) a green ball.

4. One letter is selected at random from the word 'UNNECESSARY'. Find the probability of selecting:
   (a) an R (b) an E (c) an O

5. Three coins are tossed at the same time. List all the possible outcomes. Find the probability of obtaining:
   (a) three heads,
   (b) two heads and one tail,
   (c) no heads,
   (d) at least one head.

6. A bag contains 10 red balls, 5 blue balls and 7 green balls. Find the probability of selecting at random:
   (a) a red ball,
   (b) a green ball,
   (c) a blue or a red ball,
   (d) a red or a green ball.

7. A red die and a blue die are thrown at the same time. List all the possible outcomes in a systematic way. Find the probability of obtaining:
   (a) a total of 10.
   (b) a total of 12.
   (c) a total less than 6.
   (d) the same number on both dice.
   (e) a total more than 9.

8. A die is thrown; when the result has been recorded, the die is thrown a second time. Display all the possible outcomes of the two throws. Find the probability of obtaining:
   (a) a total of 4 from the two throws.
   (b) a total of 8 from the two throws,

(c) a total between 5 and 9 inclusive from the two throws,
(d) a number on the second throw which is four times the number on the first throw.

9. One ball is selected at random from a bag containing 12 balls of which x are white.
(a) What is the probability of selecting a white ball?
When a further 6 white balls are added the probability of selecting a white ball is doubled.
(a) Find x.

10. A coin is tossed and a die is thrown. Write down the probability of obtaining:
(a) a head on the coin,
(b) an odd number on the die,
(c) a 'head' on the coin and an odd number on the die.

11. A ball is selected from a bag containing 3 red balls, 4 black balls and 5 green balls. The first ball is replaced and a second is selected. Find the probability of obtaining
(a) two red balls, (b) two green balls.

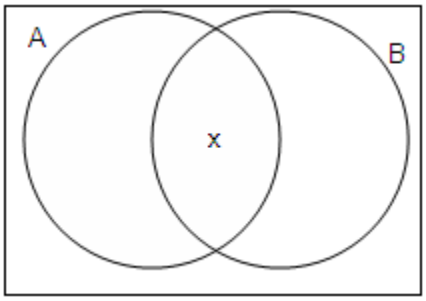
12. The letters of the word 'INDEPENDENT' are written on individual cards and the cards are put into a box. A card is selected at random and then replaced and then a second card is selected. Find the probability of obtaining:
(a) the letter 'P' twice,
(b) the letter 'E' twice.

13. A bag contains 5 red balls, 3 blue balls and 2 yellow balls. A ball is drawn and not replaced. A second ball is drawn. Find the probability of drawing
(a) two red balls
(b) one blue ball and one yellow ball,
(c) two yellow balls,
(d) two balls of the same colour.

SET THEORY

1. In a class of 30 girls, 18 play netball and 14 play hochey, whilst 5 play neither. Find the number who play both netball and hockey.

2. In the Venn diagram $n(A) = 10$, $n(B) = 13$, $n(A \cap B) = x$ and $n(A \cup B) = 18$.



(a) write in terms of x the number of elements in A but not in B.
(b) Write in terms of x the number of elements in B but not in A.
(c) Write down an equation in x, hence find the $\cap$(A and B).

3. The sets A and B intersect such that $n(A \cap B) = 7$, $n(A) = 20$ and $n(B) = 23$. Find $n(A \cup B)$.

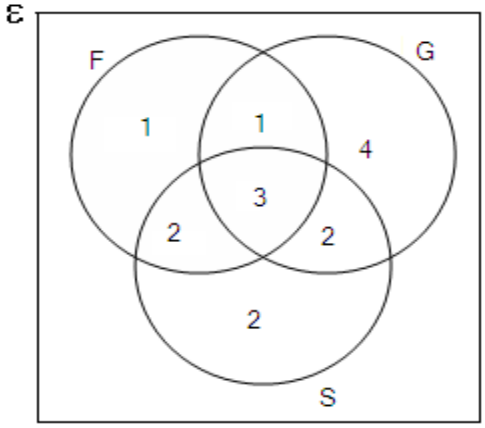
4. Twenty boys in a class all play either football or basketball (or both). If thirteen play football and ten play basketball, how many play both sports?

5. Of the 53 staff at a school, 36 drink tea, 18 drink coffee and 10 drink neither tea nor coffee. How many drink both tea and coffee?

6. All of 60 different vitamin pills contain at least one of the vitamins A, B and C. Twelve have A only, 7 have B only, and 11 have C only. If 6 have all three vitamins and there are x having both A and B only, B and C only, and A and C only, how many pills contain vitamin A?

7. In a group of 59 people, some are wearing hats, gloves or scarves (or a combination of these), 4 are wearing all three, 7 are wearing just a hat and gloves, 3 are wearing just gloves and a scarf and 9 are wearing just a hat and scarf. The number wearing only a hat or only gloves is x, and the number wearing only a scarf or none of the three items is (x – 2). Find x and hence the number of people wearing a hat.

8. In the Venn diagram, ε = {pupils in a class of 15}, G = {girls}, S = {swimmers}, F = {pupils who believe in Father Christmas}. A pupil is chosen at random. Find the probability that the pupil:
(a) can swim
(b) is a girl swimmer,
(c) is a boy swimmer who believes in Father Christmas.
Two pupils are chosen at random. Find the probability that:
(d) both are boys,
(e) neither can swim,
(f) both are girl swimmers who believe in Father Christmas.



9. In a class of 30 pupils, all pupils are required to take part in at least two sports chosen from football, gymnastics and tennis. 9 do football and gymnastics; 19 do football and gymnastics; 6 pupils do all three sports. Draw a Venn diagram t show this information. Use your diagram to calculate how many pupils do gymnastics and tennis but not football.

10. The population of a certain town have a choice of three daily newspapers; the Monitor, the New Vision and the Red pepper. 10% take all three newspapers, 20% take only the Monitor, 20% take both the Monitor and Red pepper but not the New Vision, 10% take only the New Vision. 23% take the New Vision and Monitor, 27% take the Red pepper and New Vision and 5% take only the Red pepper. Draw a Venn diagram to show this information and use it to answer the following questions. What percentage:
    (a) do not take a newspaper?
    (b) have the Monitor or New Vision?
    (c) have the Monitor or Red pepper?
    (d) have the Red pepper or New Vision but not the Monitor?

11. It is given that $\varepsilon = \{1,2,3,4,5,6\}$; $A = \{2,3,5\}$; $B = \{3,4,5\}$. List the members of:
(i) A', (ii) B', (iii) $A' \cap B$, (iv) $A \cup B'$, (v) $(A \cap B)'$, (vi) $A' \cap B'$

12. The population of a certain town has a choice of three daily newspapers; the New Vision (N), The Monitor (M), and Bukedde (B). 40 read N, 35 read M and 60 read B; 7 read N and M, 10 read M and B and 4 read N and B; 34 read no paper at all. If there are 150 people in the town, find the:
(a) number of people who read all the three,
(b) number of people who read only one newspaper.
(c) number of people who read N and M only.
(d) probability that a person chosen at random from this town reads two newspapers only.

13. In a school, students must take at least one of these subjects: Maths (M), Physics (P) or Chemistry (C). In a group of 50 students, 7 take all three subjects, 9 take Physics and Chemistry only, 8 take Maths and Physics only and 5 take Maths and Chemistry only. Of these 50 students, x take Maths only, x take Physics only and x + 3 take Chemistry only. Draw a Venn diagram, find x, and hence find the number taking Maths.

STATISTICS

In an experiment, 50 people were asked to guess the weight of a mobile phone in grams. The guesses were as follows:

47	39	21	30	42	35	44	36	19	52
23	32	66	29	5	40	33	11	44	22
27	58	38	37	48	63	23	40	53	24
47	22	44	33	13	59	33	49	57	30
17	45	38	33	25	40	51	56	28	64

Construct a frequency table using intervals 0 – 9, 10 – 19, 20 – 29, etc.
Hence draw a cumulative frequency curve and estimate:
(a) the median weight,
(b) the inter-quartile range,

2. In a competition, 30 children had to pick up as many paper clips as possible in one minute using a pair of tweezers. The results were as follows:

3	17	8	11	26	23	18	28	33	38
12	38	22	50	5	35	39	30	31	43
27	34	9	25	39	14	27	16	33	49

Construct a frequency table using intervals of width 10, starting with 1 – 10.
From the frequency table, estimate the
(i) mean,
(ii) median of the distribution.

3. The mean weight of 8 boys is 55 kg and the mean weight of a group of girls is 52 kg. The mean weight of all the children is 53.2 kg. How many girls are there?

4. A group of 50 people were asked how many books they had read in the previous year; the results are shown in the frequency table below. Calculate the mean number of books read per person.

No of books	0	1	2	3	4	5	6	7	8
Frequency	5	5	6	9	11	7	4	2	1

5. The following tables give the distribution of marks obtained by different classes in various tests. For each table find the mean, median and mode.

(a)

Mark	0	1	2	3	4	5	6
Frequency	3	5	8	9	5	7	3

(b)

Mark	15	16	17	18	19	20
Frequency	1	3	7	1	5	3

6. The table below shows the marks obtained, out of 50, by Form 4E students in a Mathematics test.

Mark (x)	No. of students (f)
1 - 10	9
11 - 20	10
21 - 30	11
31 - 40	8
41 - 50	7

Using an assumed mean, calculate the mean mark to the nearest whole number.

7. The marks obtained by 90 students in an end of term examination are given in the table below.

Mark (%)	No. of students
1 – 10	4
11 – 20	5
21 – 30	10
31 – 40	11
41 – 50	12
51 – 60	15
61 – 70	10
71 – 80	9
81 – 90	8
91 - 100	6

Using 55.5 as the assumed mean, calculate the mean mark.

8. The heights of 50 army recruits were measured and tabulated as shown below.

Height (cm)	No. of recruits
151 – 155	8
156 – 160	16
161 – 165	14
166 – 170	10
171 - 175	2

Using 160 cm as an assumed mean, calculate the mean height.

9. The frequency table below shows the marks scored by 45 students in a test.

Mark	frequency
11 – 15	4
16 – 20	0
21 – 25	5
26 – 30	21
31 – 35	10
36 – 40	3
41 - 50	2

(a) State the modal class.
(b) Calculate the median mark.

10 The speeds of public service vehicles during a police check are shown in the table below.

Speed (km/h)	No. of vehicles
31 - 40	5
41 - 50	10
51 - 60	15
61 - 70	30
71 - 80	55
81 - 90	70
91 - 100	15

(a) Draw a cumulative frequency curve for this data.
(b) Use your graph to estimate:
  (i) the median speed.
  (ii) the lower and upper quartiles.
  (iii) the percentage of vehicles traveling between 64km/h and 72 km/h.

11. The table below shows the distribution of marks of 81 candidates in a UCE Mathematics examination.

Mark	No. of candidates
$1 < x \leq 10$	1
$10 < x \leq 20$	3
$20 < x \leq 30$	9
$30 < x \leq 40$	11
$40 < x \leq 50$	14
$50 < x \leq 60$	19
$60 < x \leq 70$	11
$70 < x \leq 80$	8
$80 < x \leq 90$	4
$90 < x \leq 100$	1

(a) Draw a cumulative frequency curve to show the data.
(b) Use your graph to estimate:
  (i) the median mark.
  (ii) the upper quartile.
  (iii) the number of candidates who scored less than 75 marks.
  (iv) The pass mark, if 60% of the candidates passed.

12. The times taken by a group of students to solve a mathematical problem are given below:

Time(min)	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34
No. of students	5	14	30	17	11	3

(b) Draw a histogram for the data. Use it to estimate the modal time for solving a problem.
(c) Calculate the mean time of solving a problem.

13. The ages of 36 students are given below.

13	16	16	15	12	14	13	15	16
16	14	15	12	16	13	14	16	12
15	13	15	16	13	13	15	14	16
13	14	16	15	15	12	14	12	13

Make a frequency table and hence represent the age distribution of the students on a frequency polygon.