## Venn Diagrams and Probability

Date:

A number of probability laws can be established using Venn Diagrams.

This Venn diagram represents a <u>sample space</u>, S, of all children in a class. The <u>event</u>, E, shows all those students with blue eyes.



Determine the probability that a randomly selected child:

a) has blue eyes:

b) does not have blue eyes:

If A and B are two events in the sample space then the B means that any member of this event is in `at least events A or B'. This shaded region is A or B.

A **and** B means that any member of this event is in B'.



event A **or** one of the

`both A and

1) Shade the region representing:

a) in A but not in B



b) neither in A nor B.



2) In a class of 30 students, 19 study Physics, 17 study Chemistry and 15 study both of these subjects. Display this information on a Venn diagram and determine the probability that a randomly selected class member studies:

- a) both subjects
- b) at least one of the subjects
- c) Physics, but not Chemistry d) Chemistry, but not Physics
- e) Neither subject

## Extra Practice:

1) On separate Venn diagrams, using two events A and B, shade the region representing:

a) in A	b) in B
c) in both A and B	d) in A or B

e) in B but not in A f) in exactly one of A or B



- 2) In a class of 40 students, 19 play tennis, 20 play netball and 8 play neither of these sports. A student is randomly chosen from the class. Determine the probability that the student:
  - a) plays tennis b) does not play netball
  - c) plays at least one of the two sports d) plays one and only one of the sports
  - e) plays netball, but not tennis
- 3) 50 married women were asked whether they gave their husband flowers or chocolates for their last birthday. The results were: 31 gave chocolates, 12 gave flowers and 5 gave both chocolates and flowers. If one of the married women was chosen at random, determine the probability that she gave her husband:

a) chocolates or flowers b) chocolates but not flowers

c) neither chocolates nor flowers

- 4) The medical records for a class of 30 children showed whether they had previously had measles or chicken pox. The records showed 7 had had measles, 18 had had chicken pox, and 5 had had measles and chicken pox. If one child from the class is selected randomly from the group, determine the probability that he/she has had:
  - a) chicken pox b) chicken pox but not measles
  - c) neither chicken pox nor measles



5) Use the diagram on the right to find:

c) 
$$P(A \text{ or } B)$$
 d)  $P(A) + P(B) - P(A \text{ and } B)$ 



What is the connection between c) and d)?

- 6) The 36 students in 8 classes were assigned three challenging problems, A, B and C. A poll of the classes, one week later, showed that each student had solved at least one of the problems. It also showed this additional information.
  - 10 students had solved all three problems
  - 12 students had solved A and B
  - 17 students had solved B and C
  - 21 students had solved A and C
  - 24 students had solved A
  - 22 students had solved B
  - 30 students had solved C
  - a. What is the probability a student solved problem C only?
  - b. What is the probability a student solved problem A only?
  - c. What is the probability a student solved exactly one problem?
  - d. What is the probability a student solved exactly two problems?
- 7) In a class of 30 students, 17 play video games and 12 watch MTV. It turns out that 5 students play video games and watch MTV. A student in this class is to be selected at random.
  - a. What is the probability that a student plays video games?
  - b. What is the probability that a student watches MTV?



- c. What is the probability that a student watches MTV and plays video games?
- d. What is the probability that a student neither plays video games nor watches MTV?

