Venn Diagrams

A.1.2 sample space as a set that contains all possible outcomes of an experiment, and distinguish between a discrete sample space as one whose outcomes can be counted (e.g., all possible outcomes of drawing a card or tossing a coin) and a continuous sample space as one whose outcomes can be measured (e.g., all possible outcomes of the time it takes to complete a task or the maximum distance a ball can be thrown)

A.1.3 determine the theoretical probability, P (i.e., a value from 0 to 1), of each outcome of a discrete sample space (e.g., in situations in which all outcomes are equally likely), recognize that the sum of the probabilities of the outcomes is 1 (i.e., for n outcomes, P + P + P + … + P = 1), recognize that the probabilities P form the probability distribution associated with the sample space, and solve related problems

A.1.5 recognize and describe an event as a set of outcomes and as a subset of a sample space, determine the complement of an event, determine whether two or more events are mutually exclusive or non-mutually exclusive (e.g., the events of getting an even number or getting an odd number of heads from tossing a coin 5 times are mutually exclusive), and solve related probability problems [e.g., calculate P(~A), P(A and B), P(A or B)] using a variety of strategies (e.g., Venn diagrams, lists, formulas)

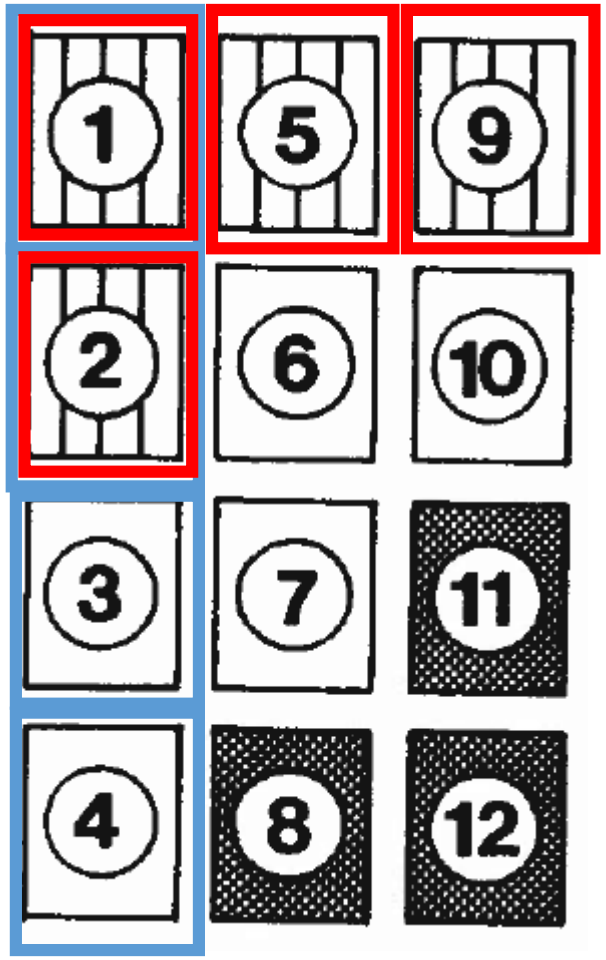
There are three main strategies for calculating probability:

1. List the sample space
2. Use a tree diagram
3. Use a Venn diagram

Often a problem can be solved more than one way.

Less than 5

Striped

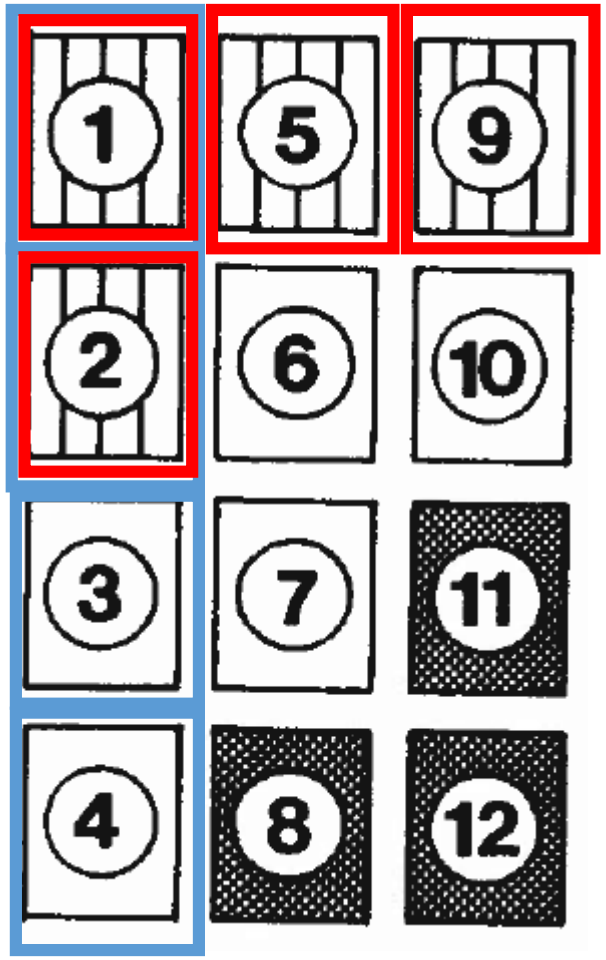


What is the probability that a card drawn at random is striped AND less than five?

What is the probability that a card drawn at random is striped OR less than five?

Less than 5

Striped



What is the probability that a card drawn at random is striped AND less than five?

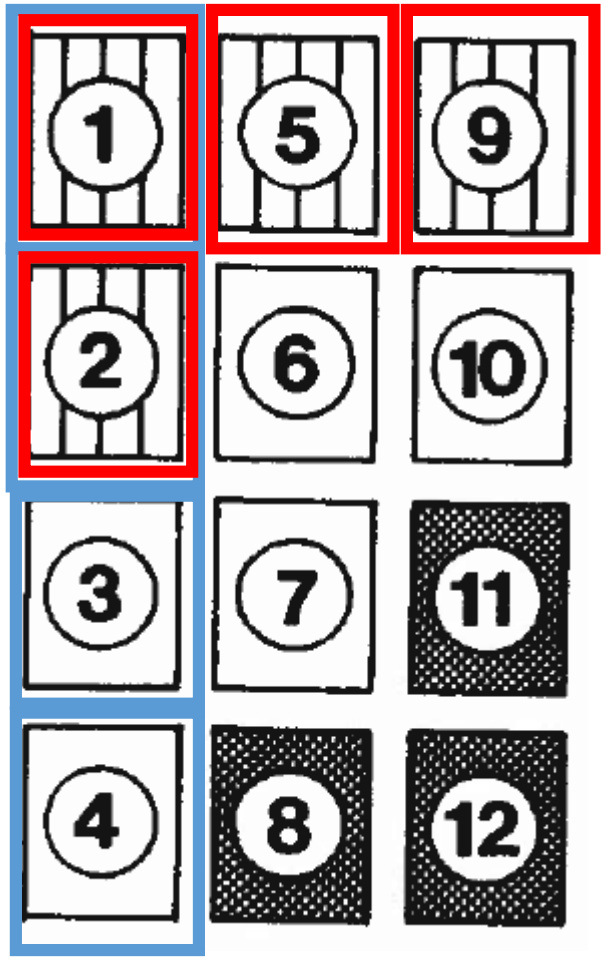
SandF= {1, 2}

What is the probability that a card drawn at random is striped OR less than five?

SorF= {1, 2, 3, 4, 5, 9}

Less than 5

Striped



What is the probability that a card drawn at random is striped AND less than five?

SandF= {1, 2}

$$P(\text{SandF}) = \frac{2}{12}$$

$$= \frac{1}{6}$$

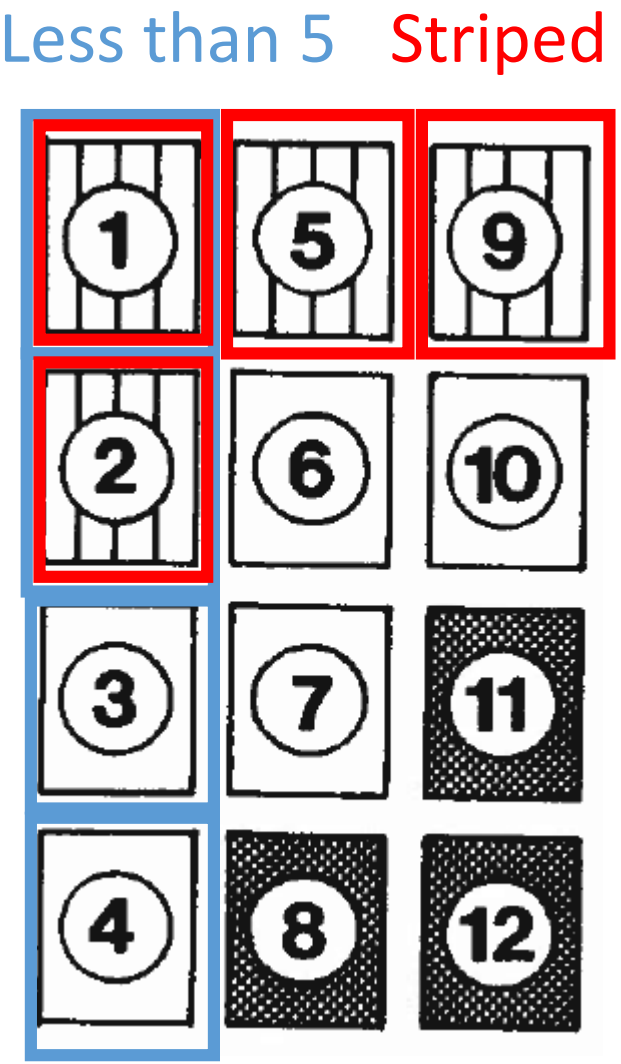
What is the probability that a card drawn at random is striped OR less than five?

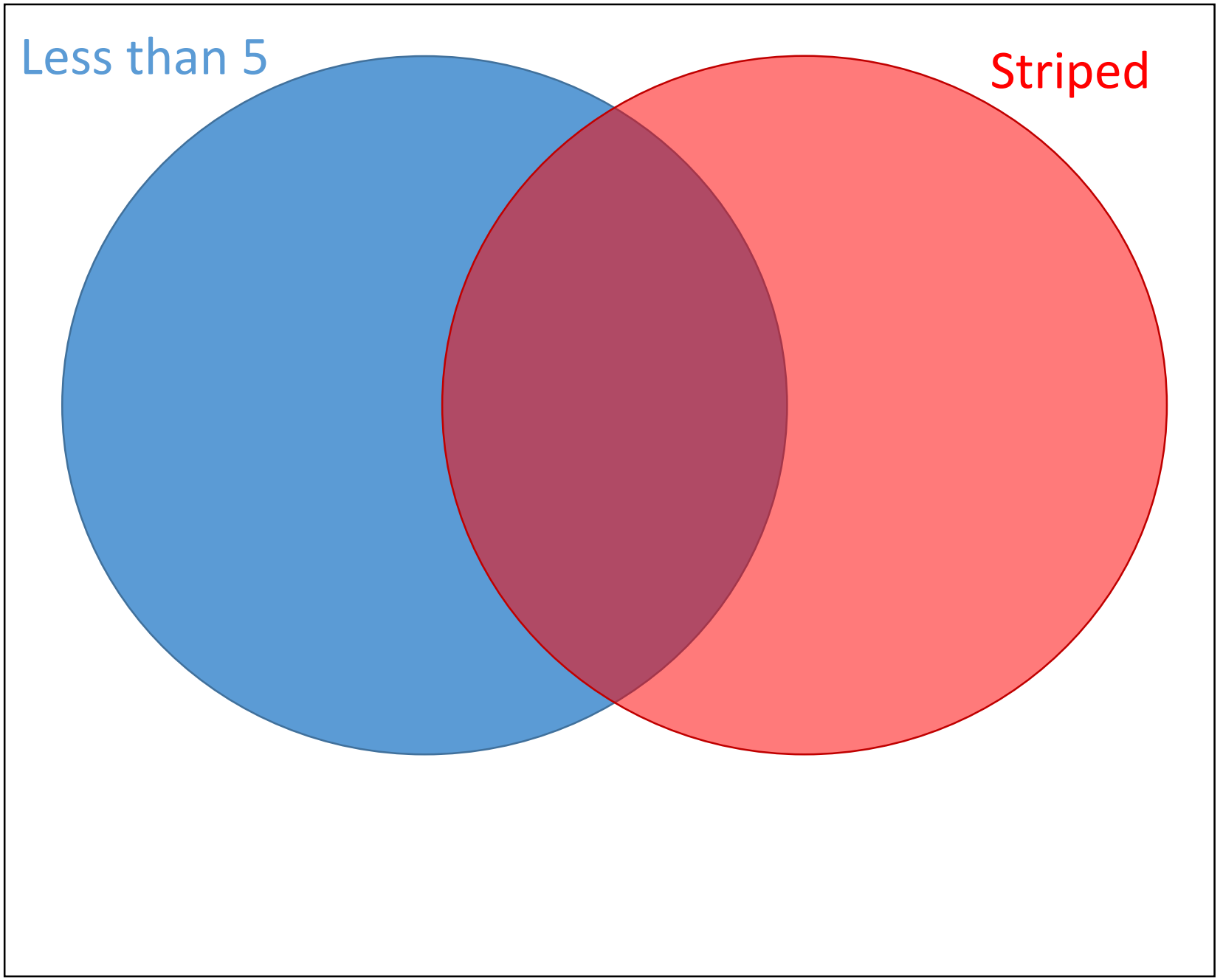
SorF= {1, 2, 3, 4, 5, 9}

$$P(\text{SorF}) = \frac{6}{12}$$

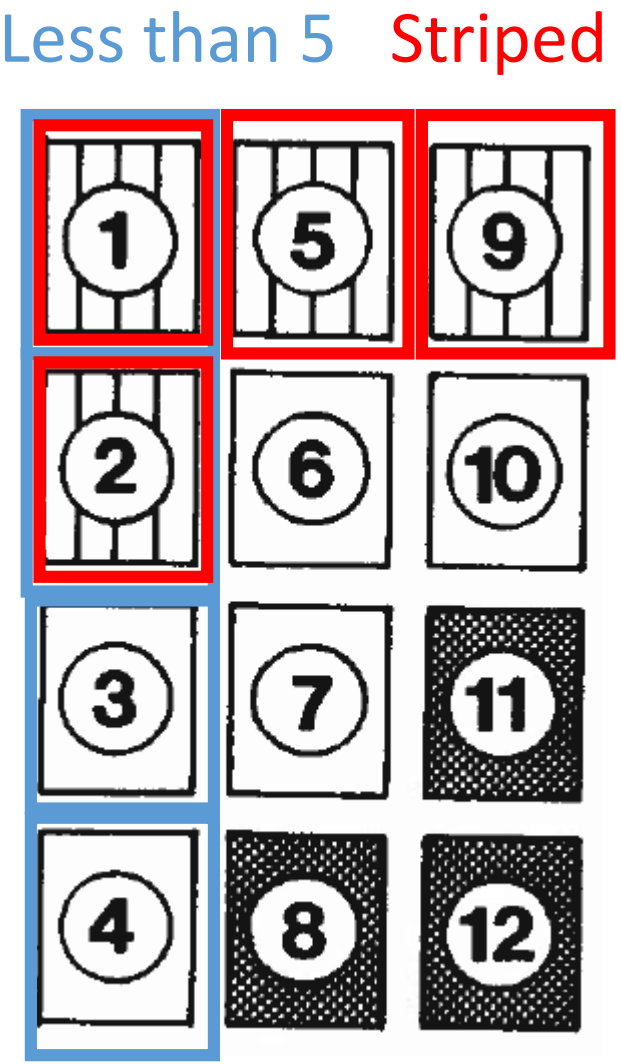
$$= \frac{1}{2}$$

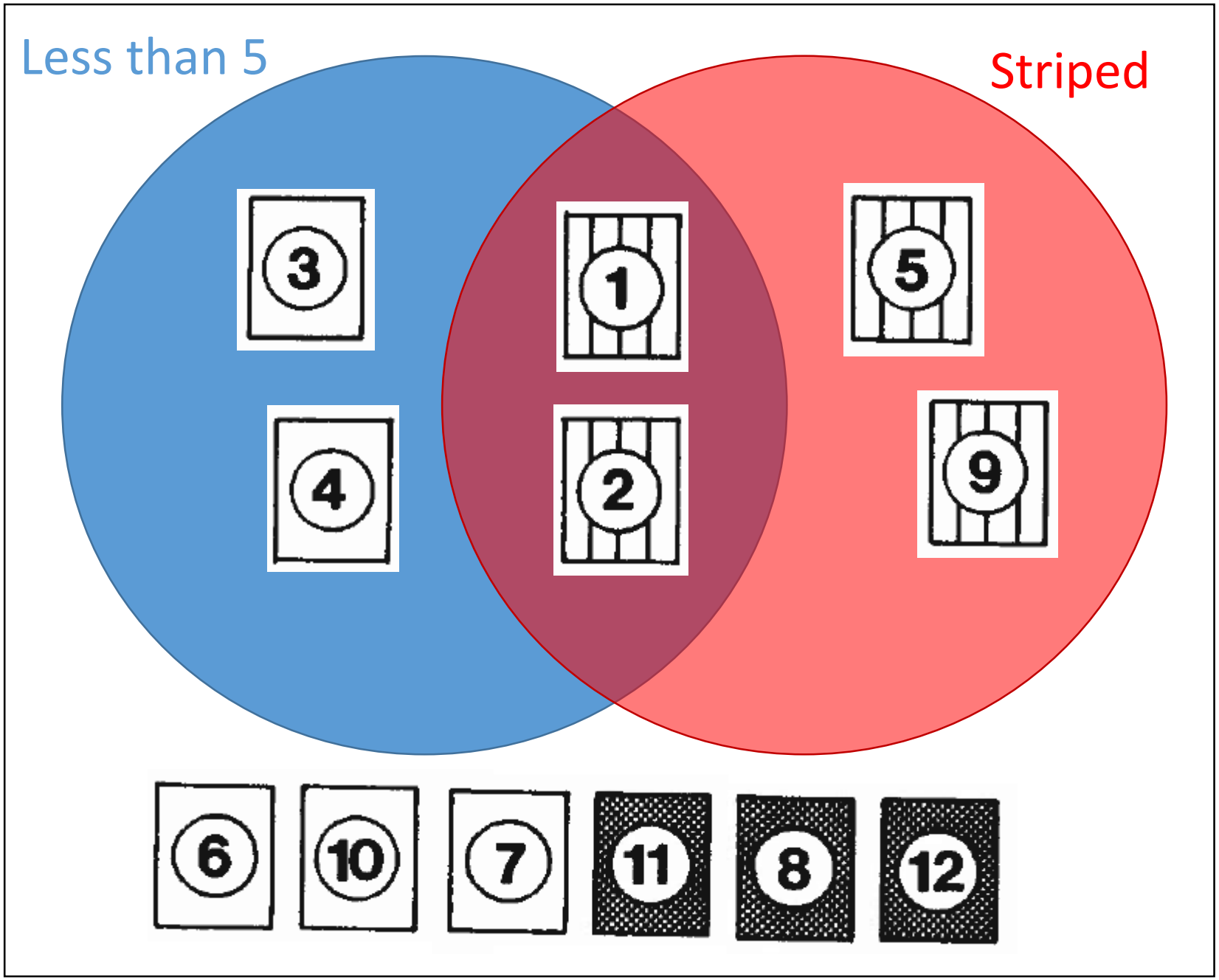
Convert the Sample Space into a Venn Diagram.





Convert the Sample Space into a Venn Diagram.





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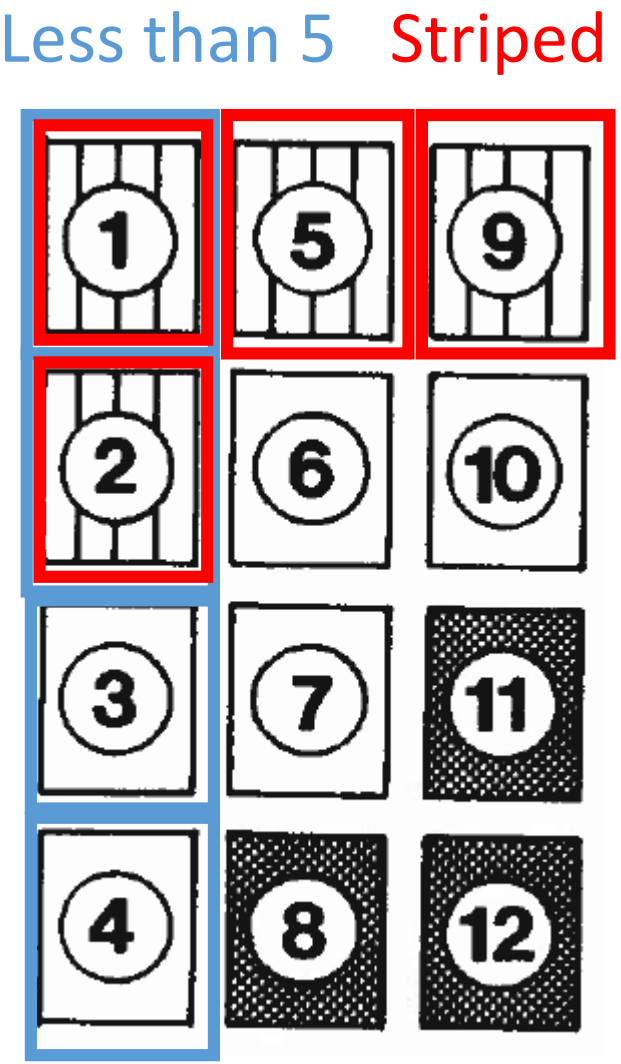
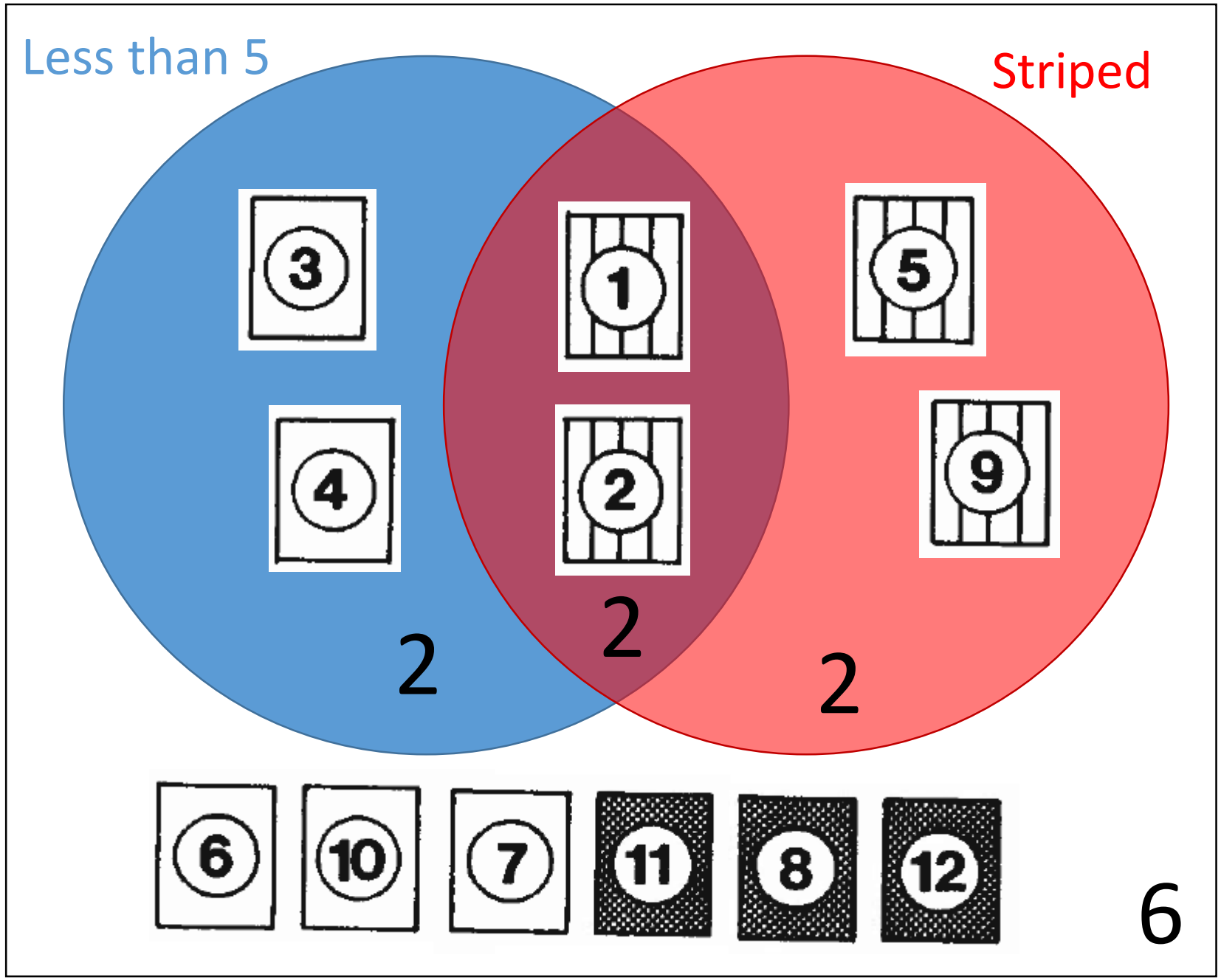




The events you are considering are:

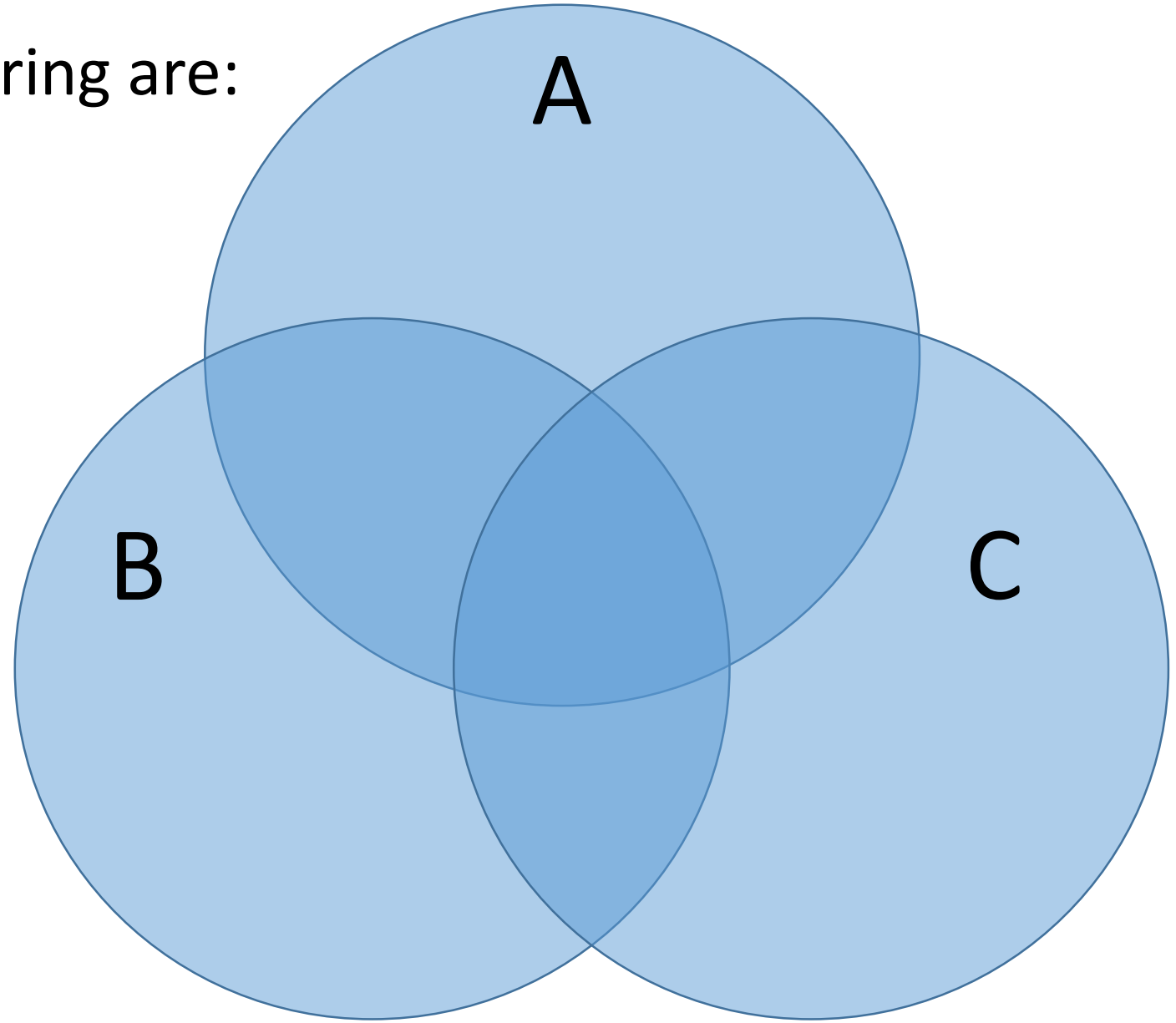
A: Less than 6

B: Multiple of 2

C: Multiple of 3

Place these numbers into the diagram:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9



The events you are considering are:

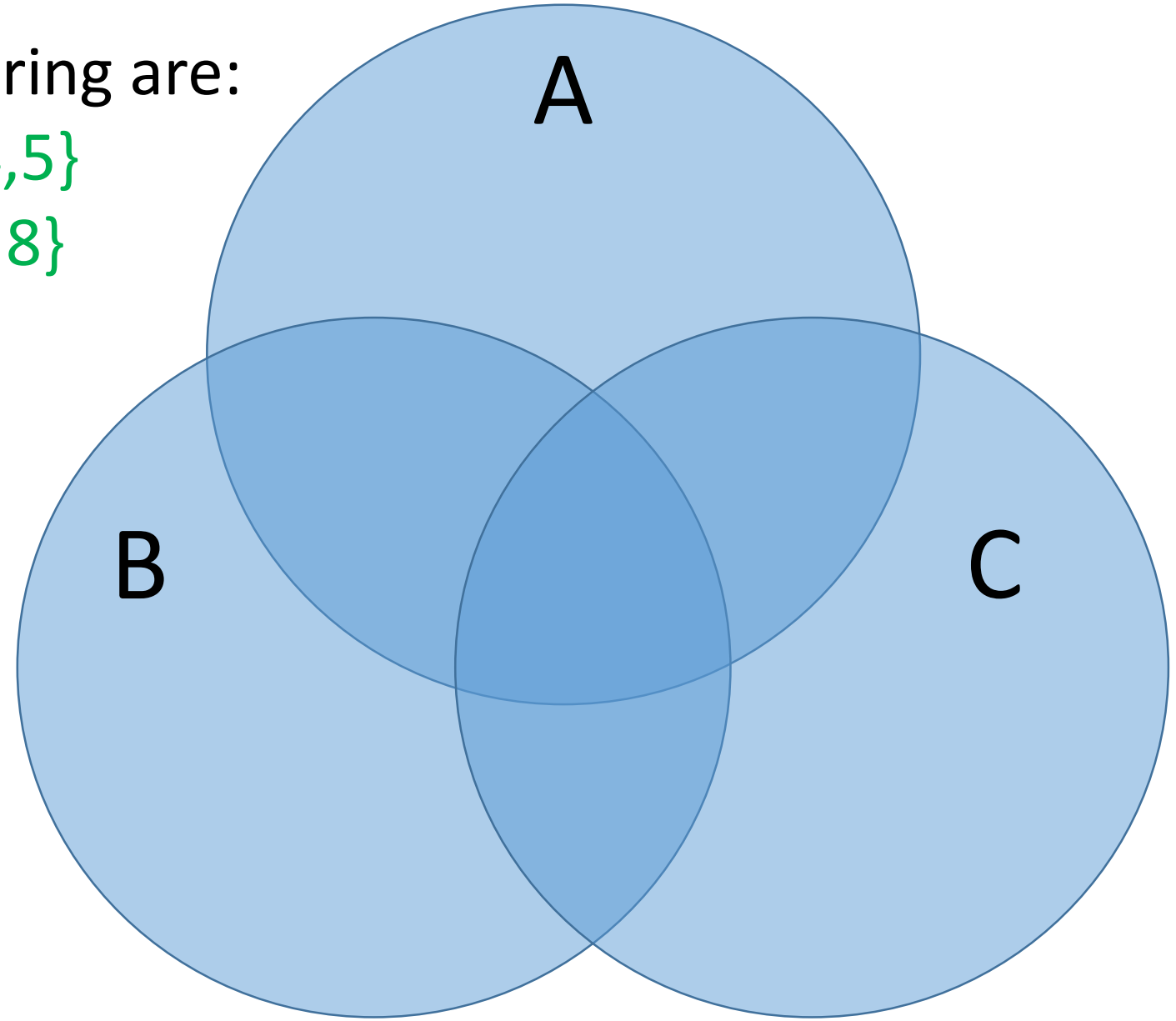
A: Less than 6; A={0,1,2,3,4,5}

B: Multiple of 2; B={2, 4, 6, 8}

C: Multiple of 3; C={3, 6, 9}

Place these numbers into the diagram:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9



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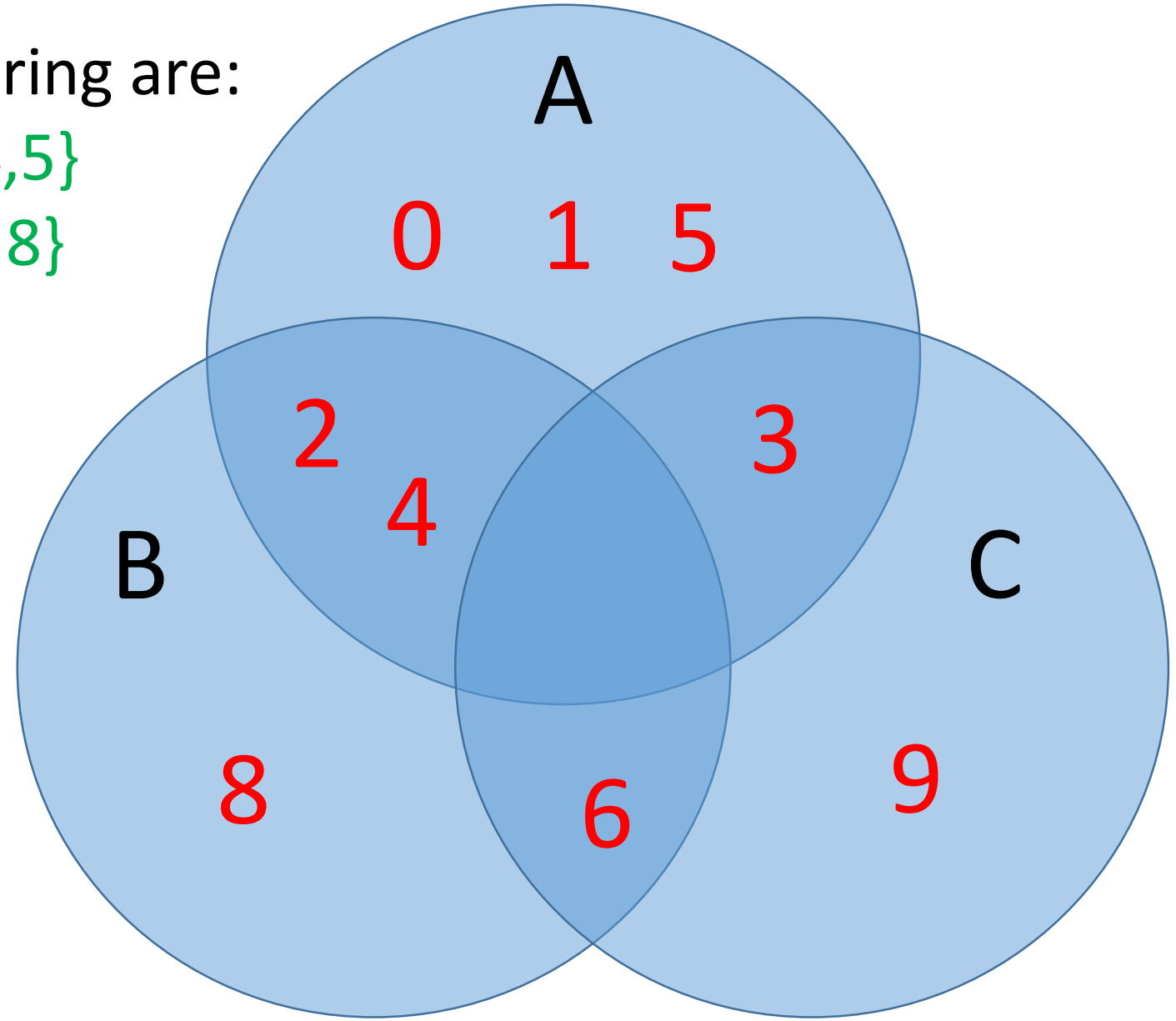
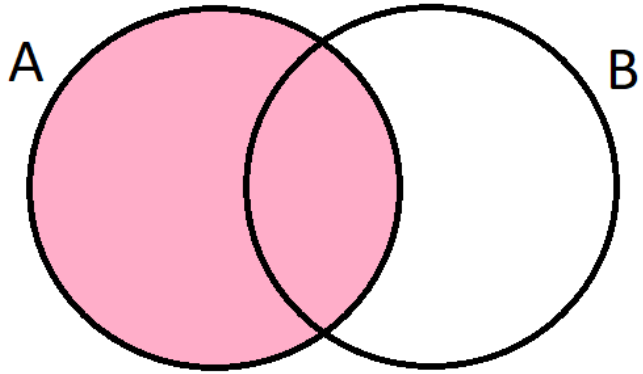
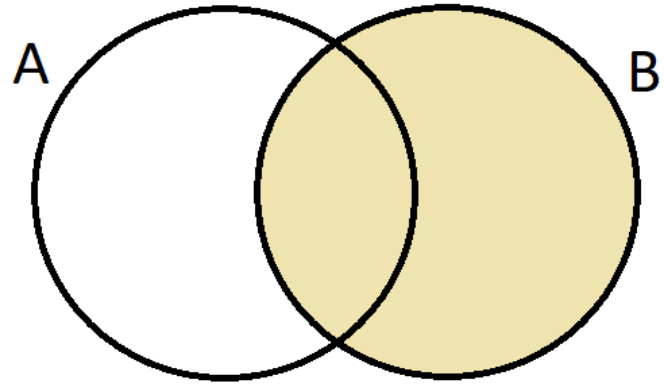
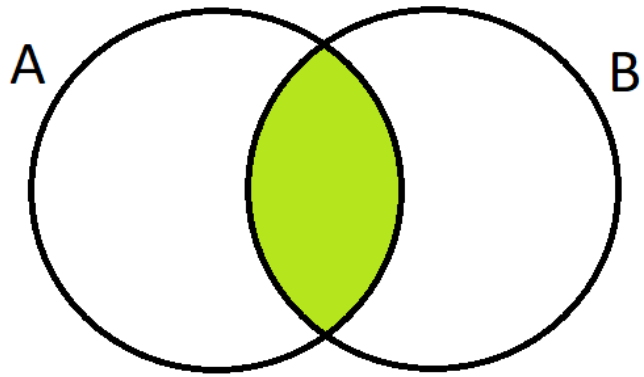
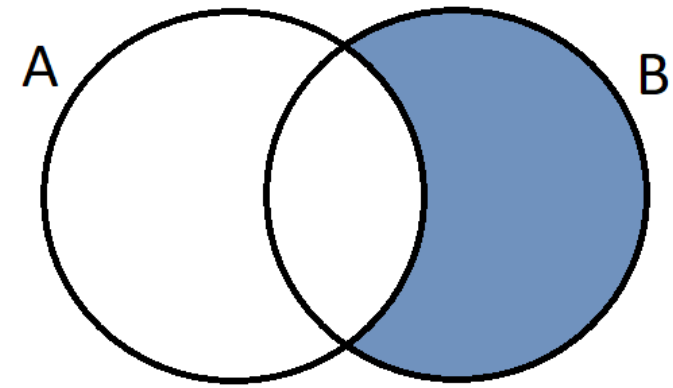


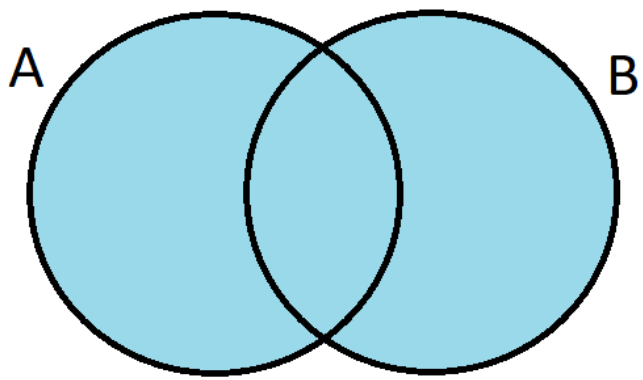
What is highlighted in each diagram?

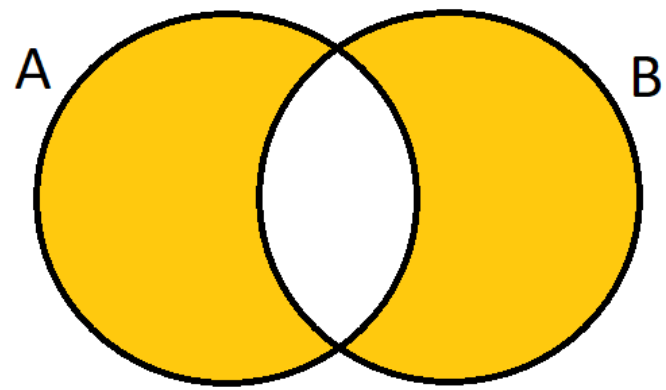












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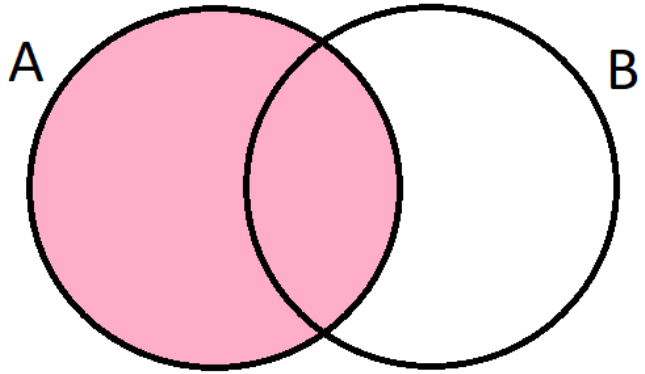
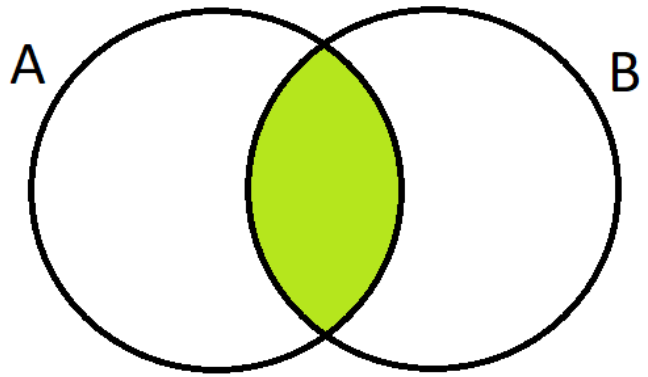
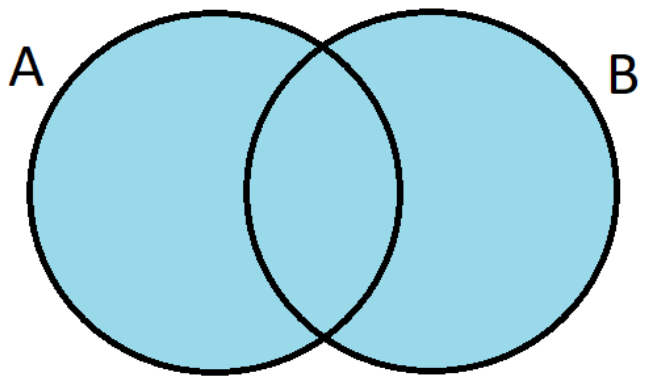
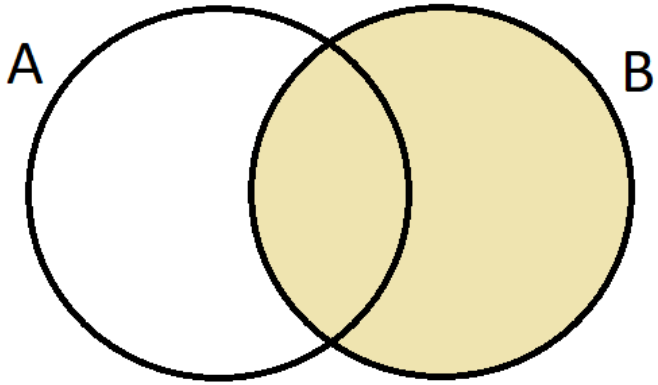
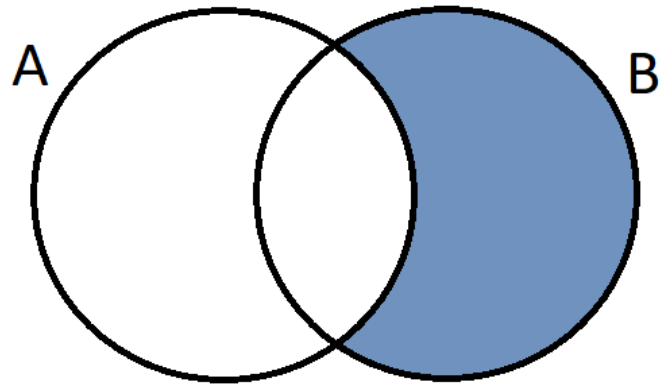
A

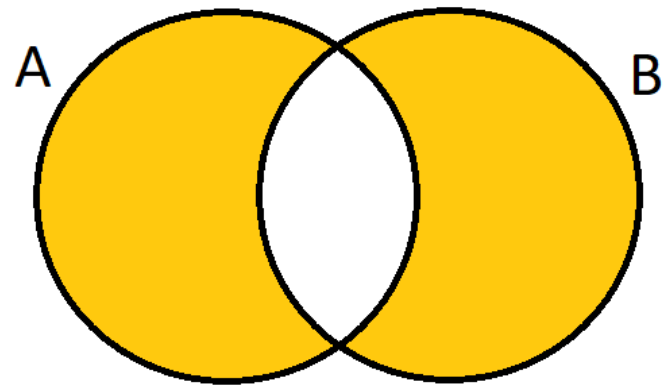












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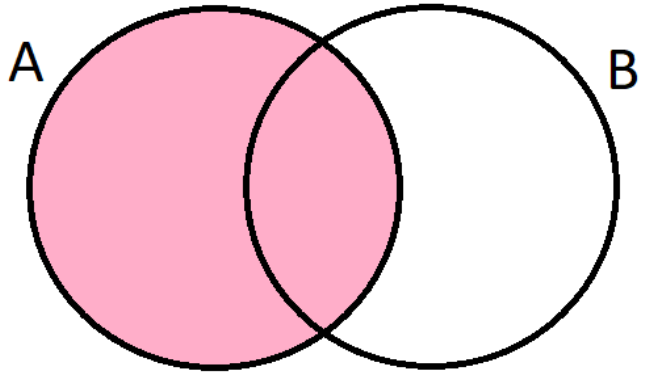
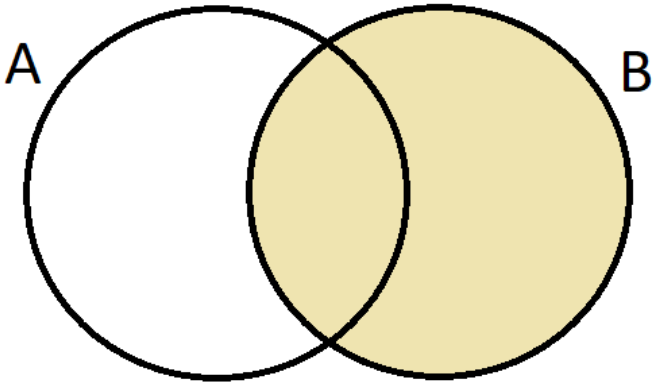
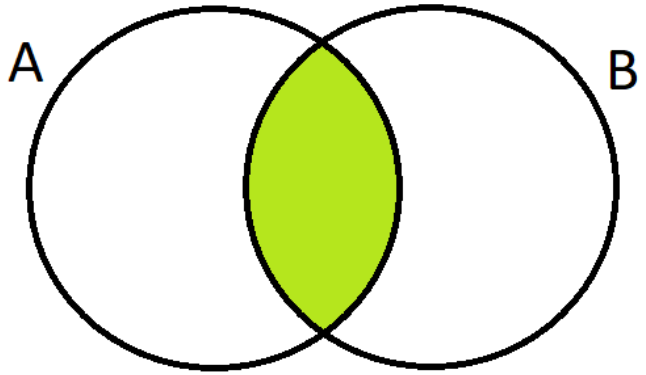
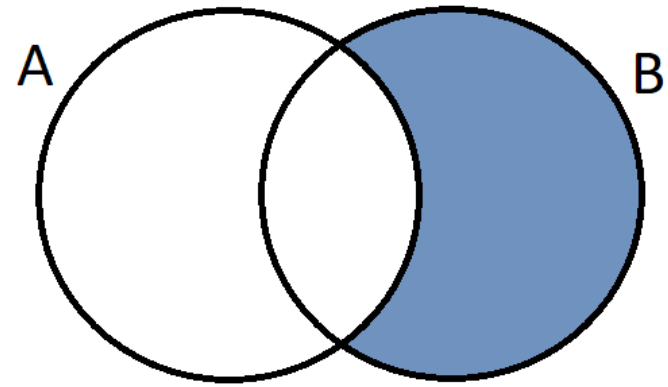
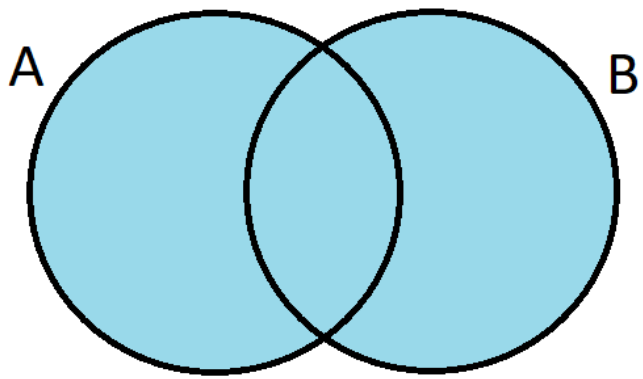


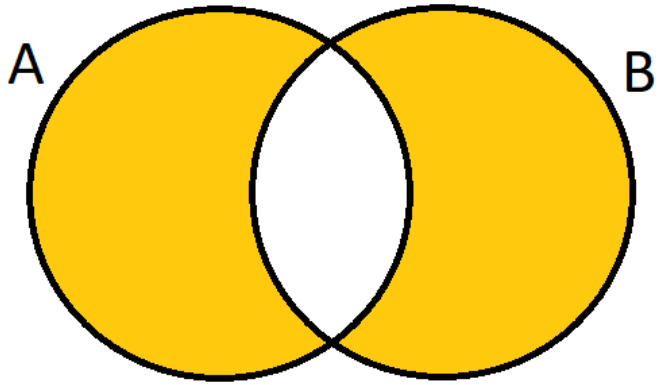


$A \cap B$









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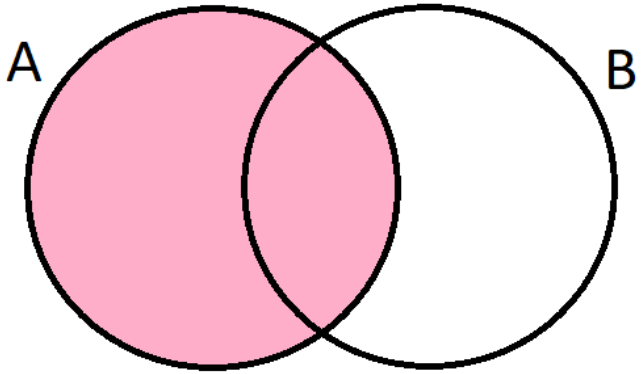

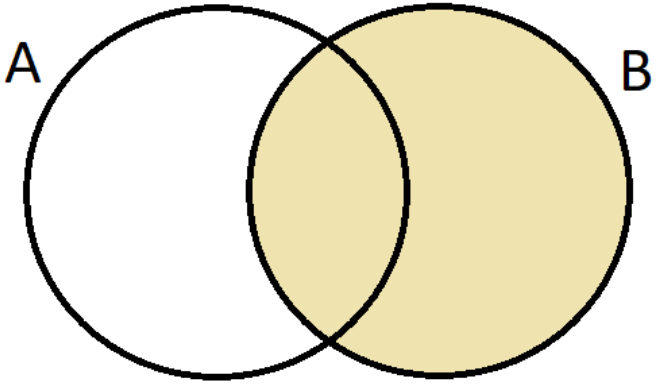

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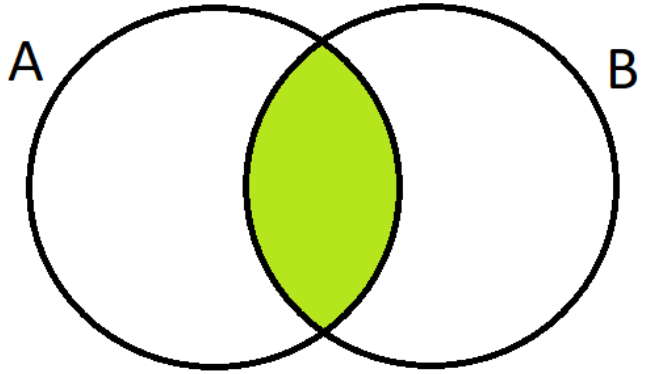
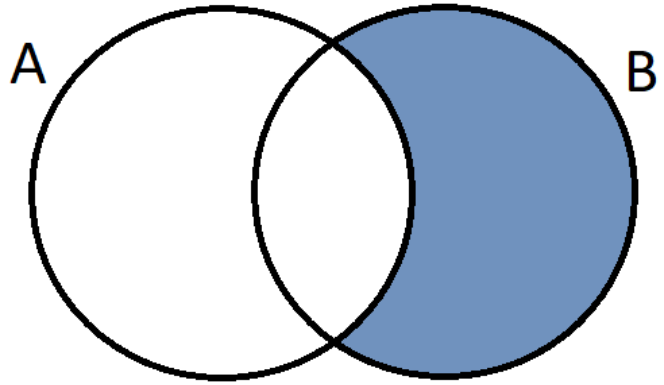
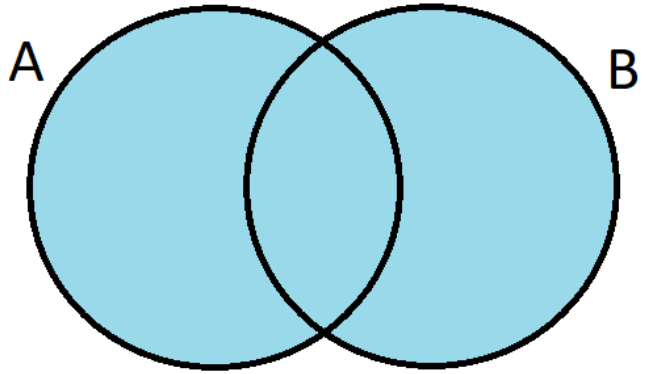
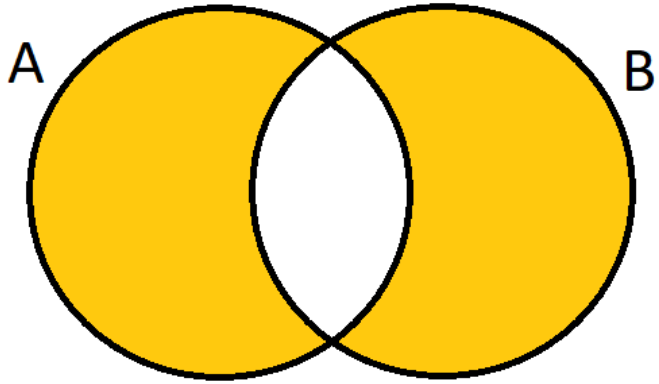




$A \cup B$





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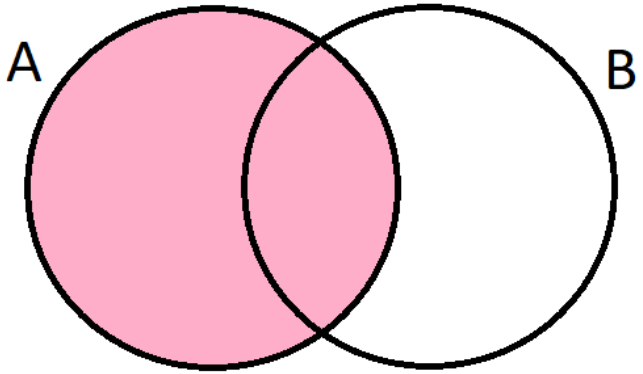

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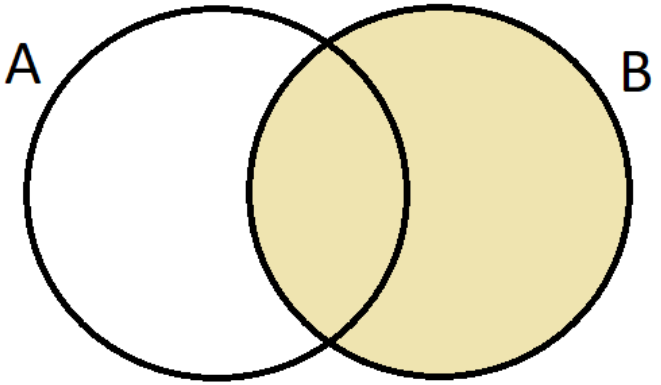
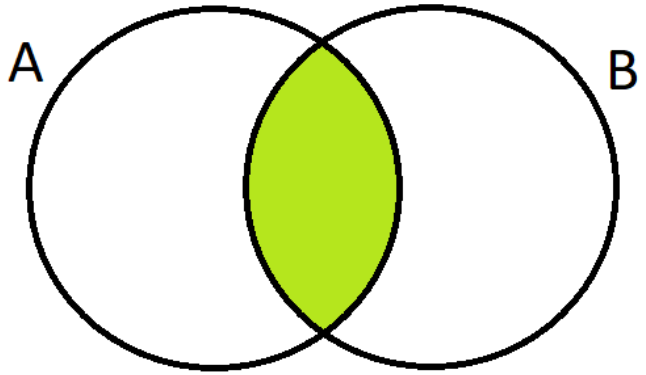
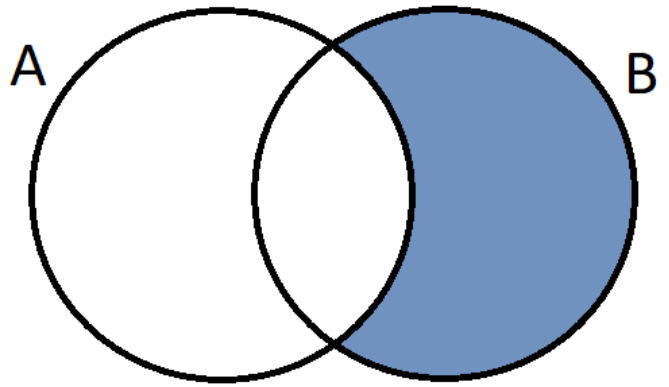


$A \cap B$





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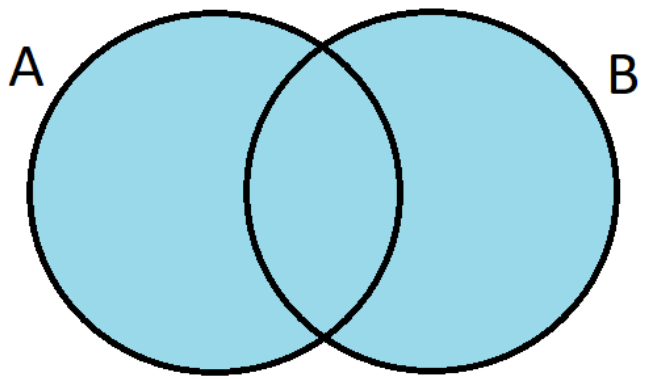

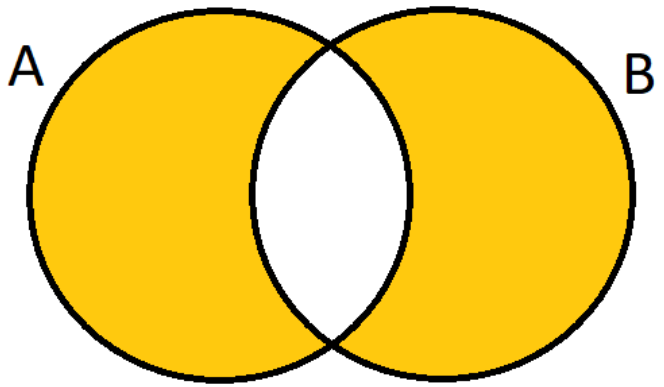

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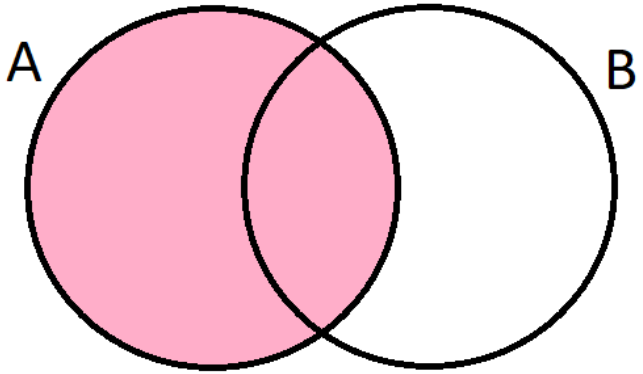
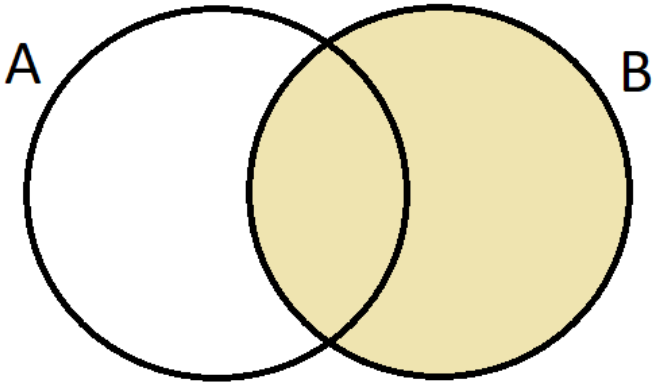
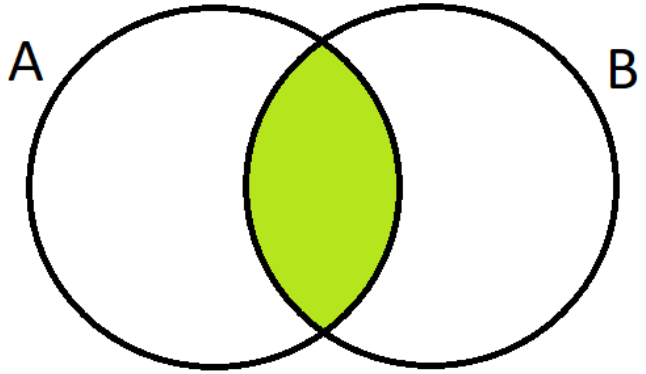


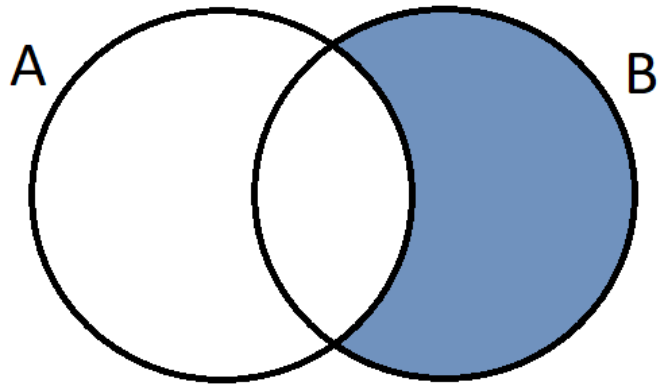
B



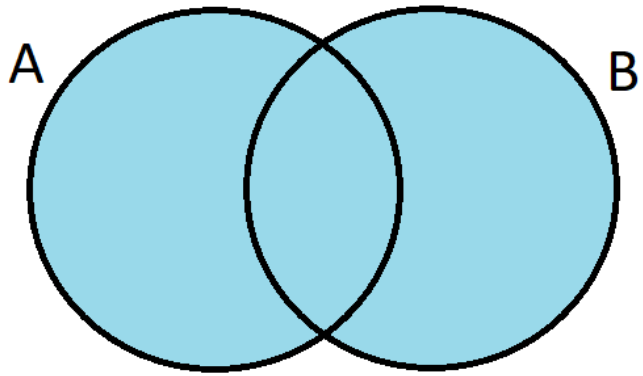
$A \cap B$

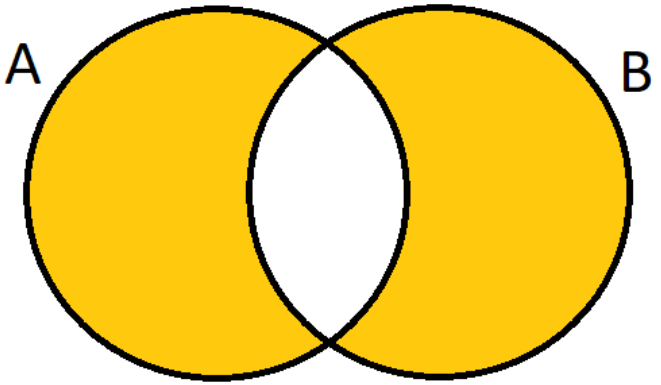


$B \cap A'$



$A \cup B$





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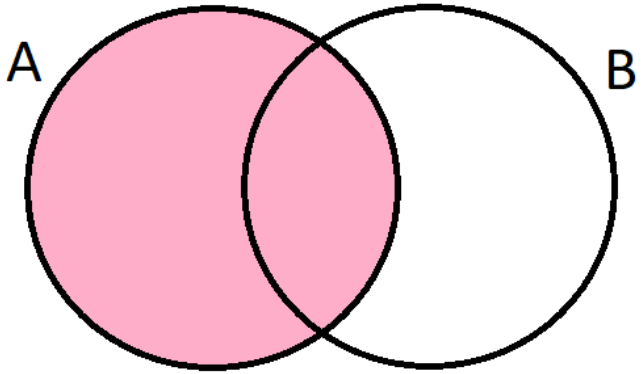
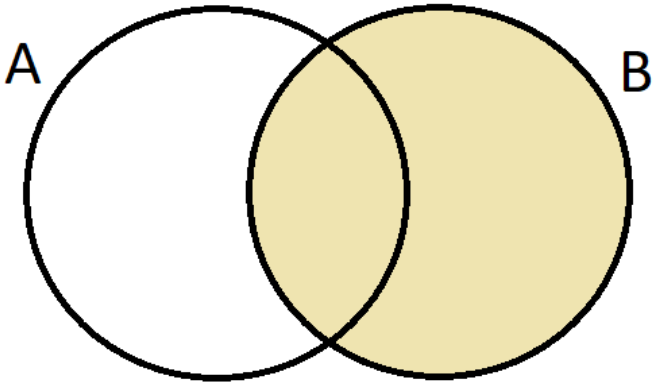
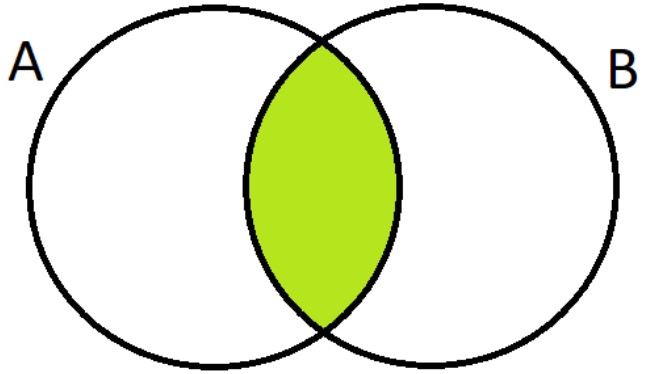


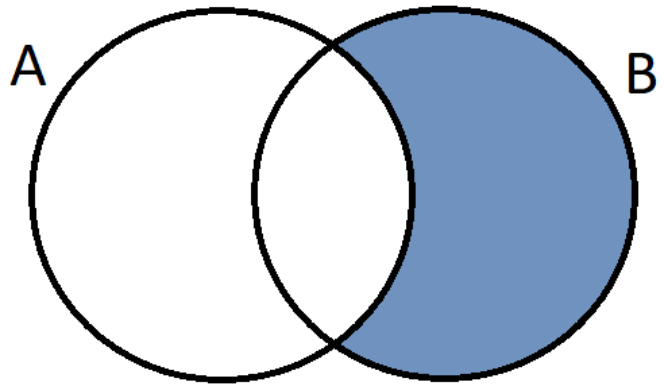
B



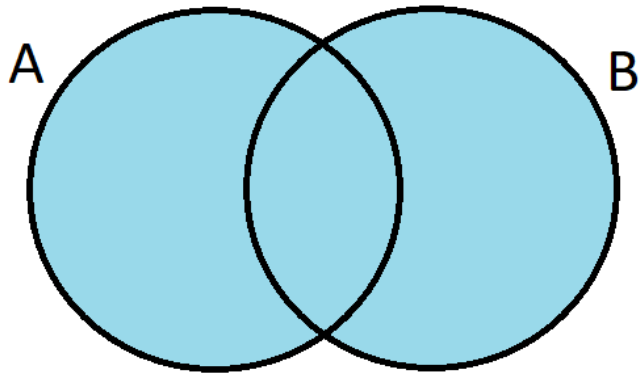
$A \cap B$



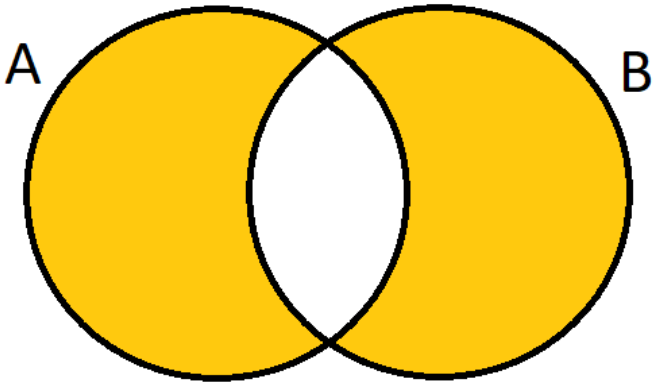
$B \cap A'$



$A \cup B$



$A \cup B - A \cap B$

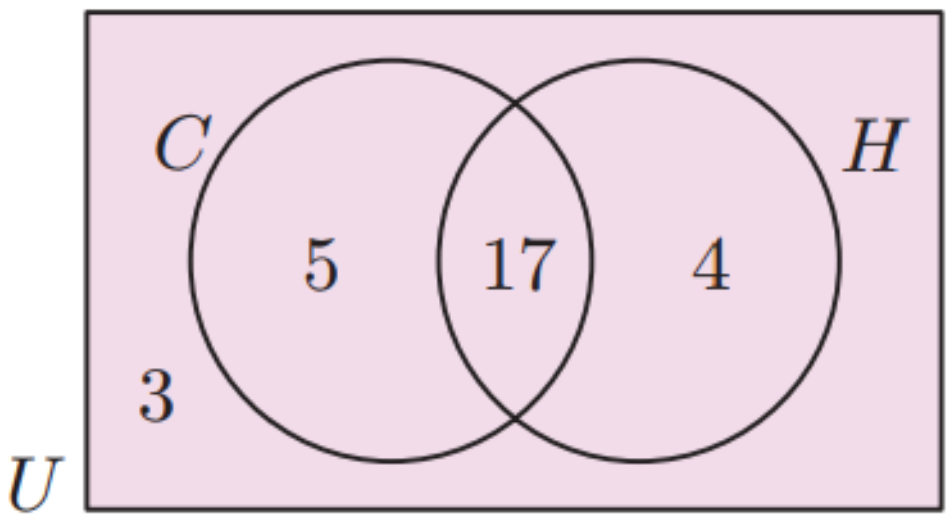


The Venn diagram alongside illustrates the number of students in a particular class who study Chemistry (C) and History (H). Determine the number of students:

a in the class **b** who study both subjects

c who study at least one of the subjects

d who only study Chemistry.



The Venn diagram alongside illustrates the number of students in a particular class who study Chemistry (C) and History (H). Determine the number of students:

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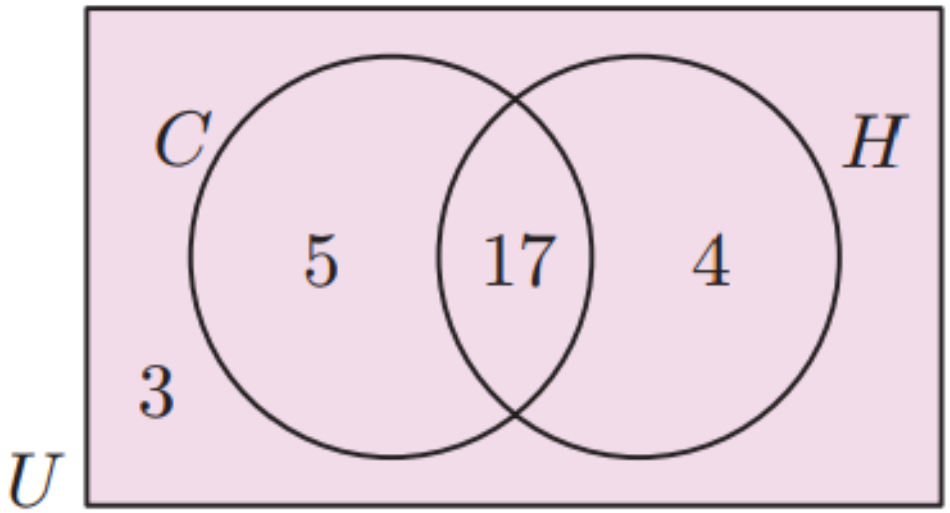


a. n(Class) = 3+5+17+4

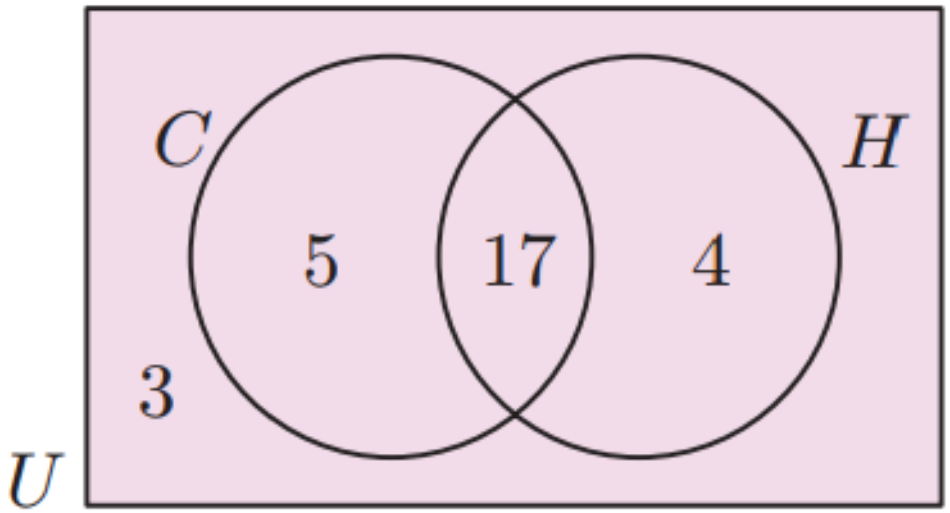
= 29

The Venn diagram alongside illustrates the number of students in a particular class who study Chemistry (C) and History (H). Determine the number of students:

a in the class **b** who study both subjects

c who study at least one of the subjects

d who only study Chemistry.



a. n(Class) = 3+5+17+4
= 29

c. n(at least 1) = 5+17+4
= 26

The Venn diagram alongside illustrates the number of students in a particular class who study Chemistry (C) and History (H). Determine the number of students:

a in the class **b** who study both subjects

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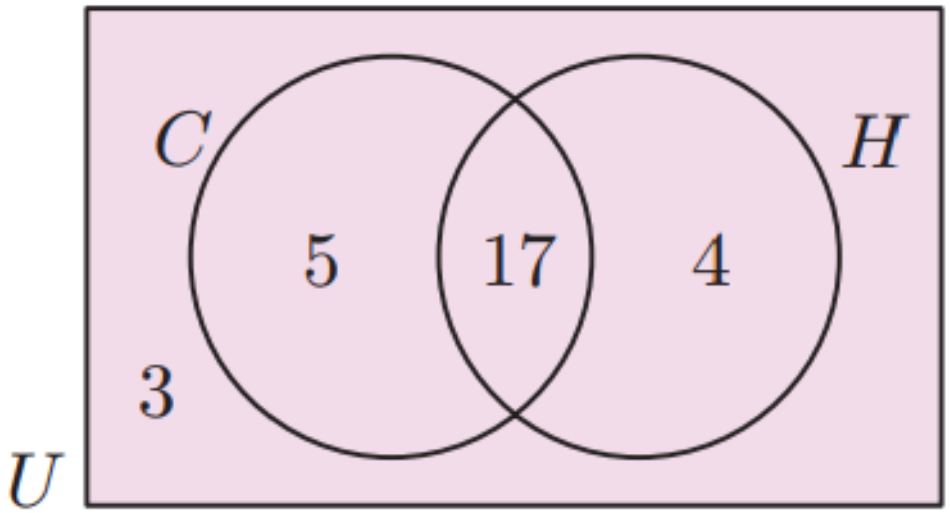
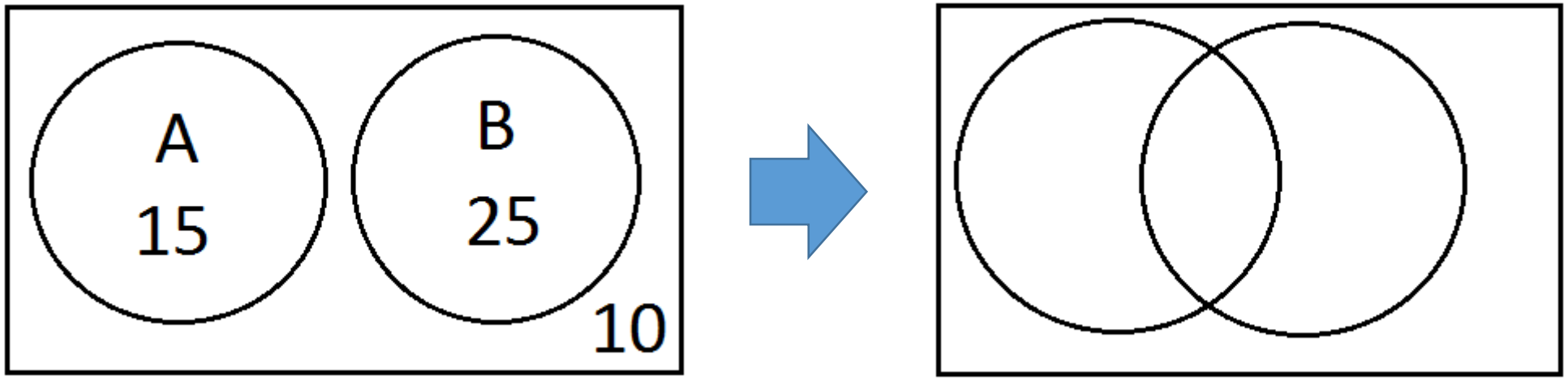


a. n(Class) = 3+5+17+4
= 29

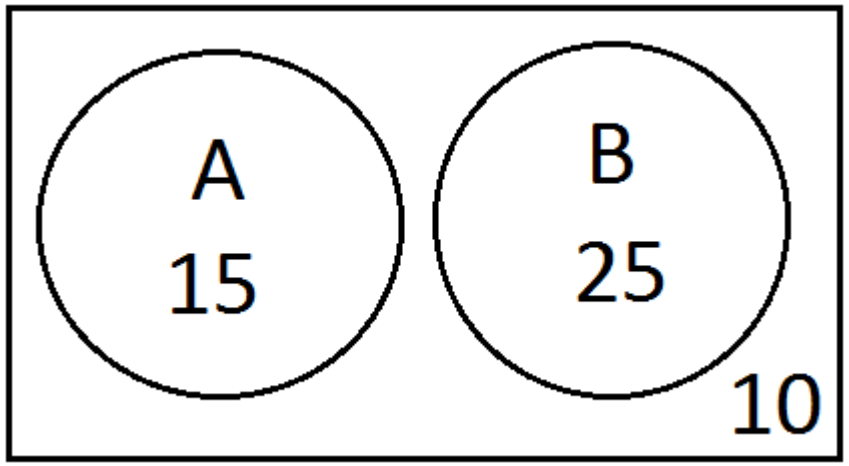
c. n(at least 1) = 5+17+4
= 26

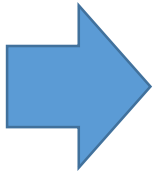
d. n(Chem) = 5+17
= 22

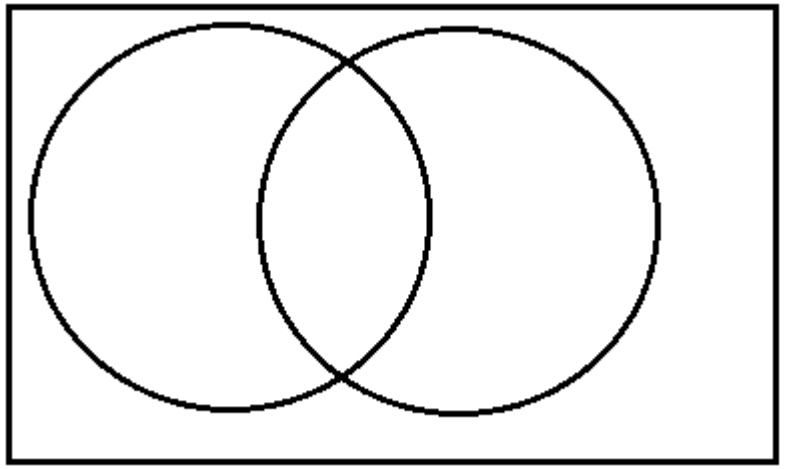
Convert the first diagram into the layout of the second.

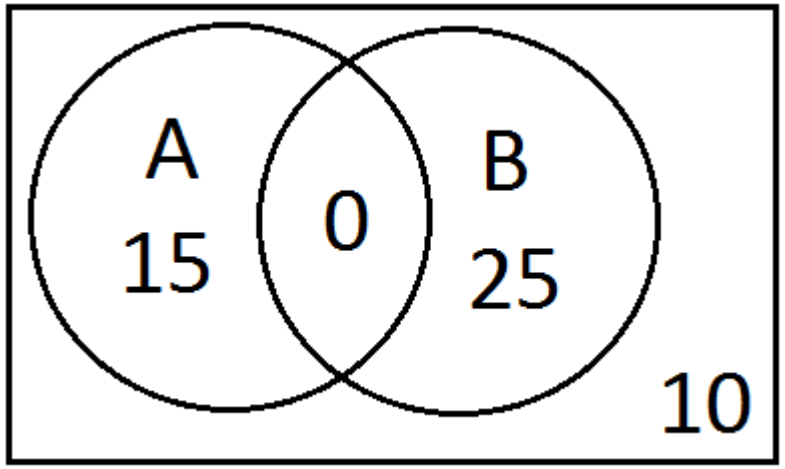


Convert the first diagram into the layout of the second.









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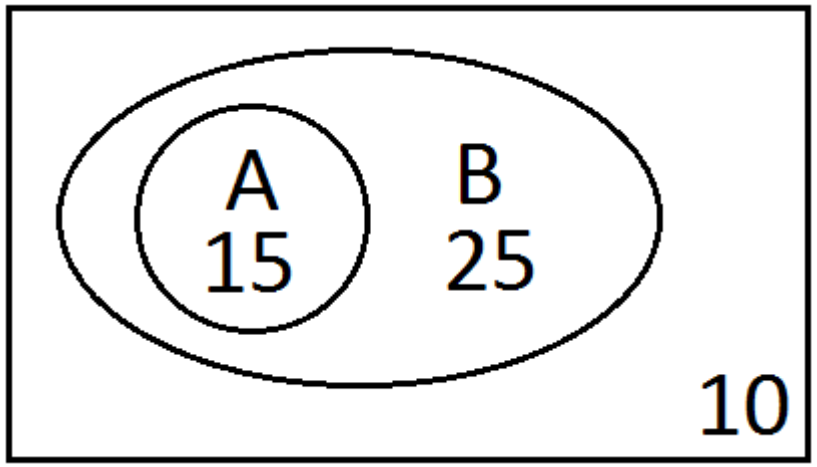

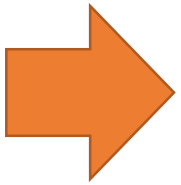

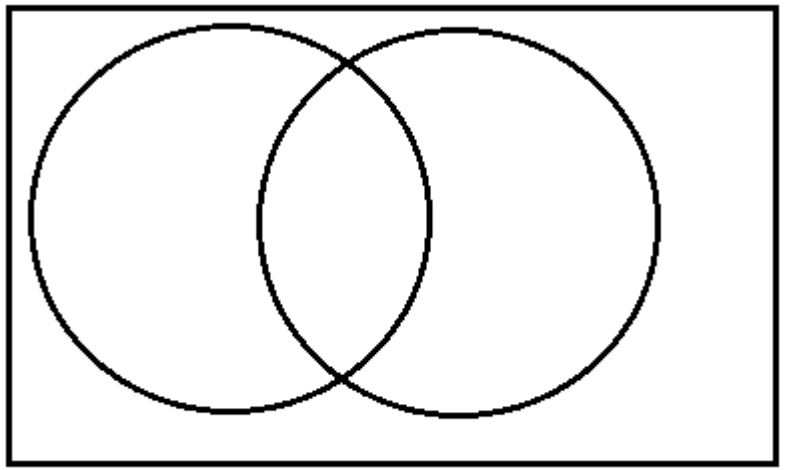

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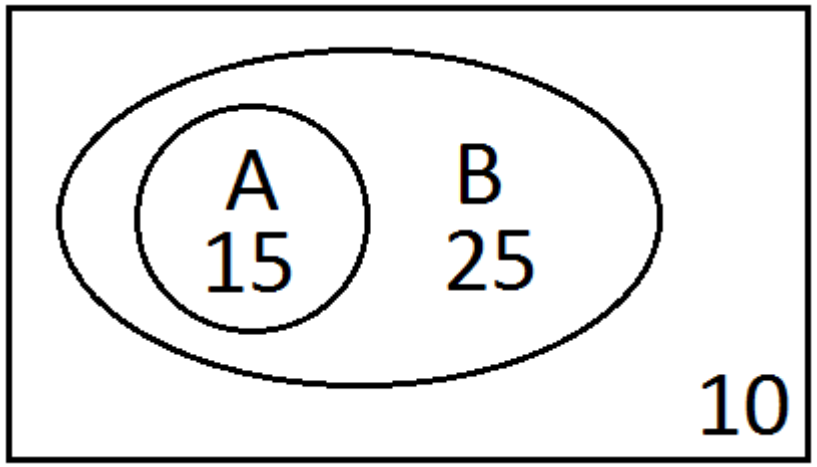

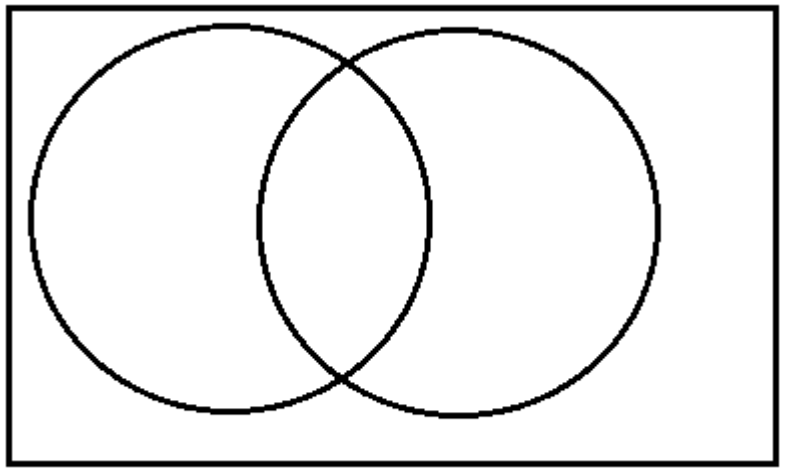

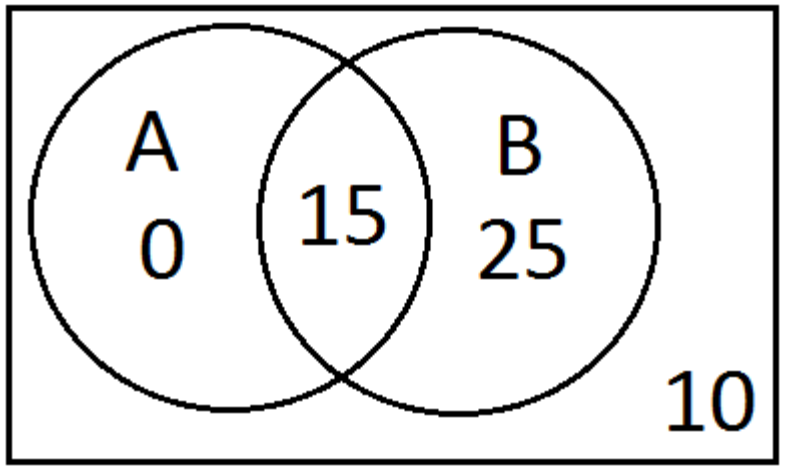

50 students went bushwalking. 23 were sunburnt, 22 were bitten by ants, and 5 were both sunburnt and bitten by ants. Determine the probability that a randomly selected student:

a escaped being bitten

b was bitten or sunburnt (or both)

c was neither bitten nor sunburnt

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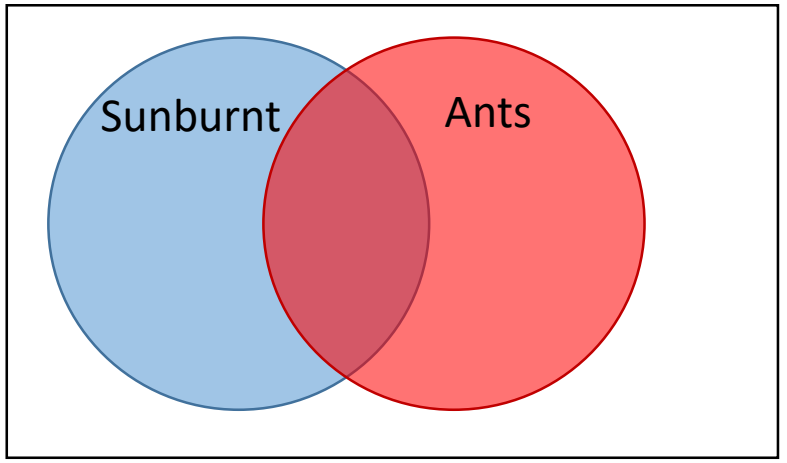

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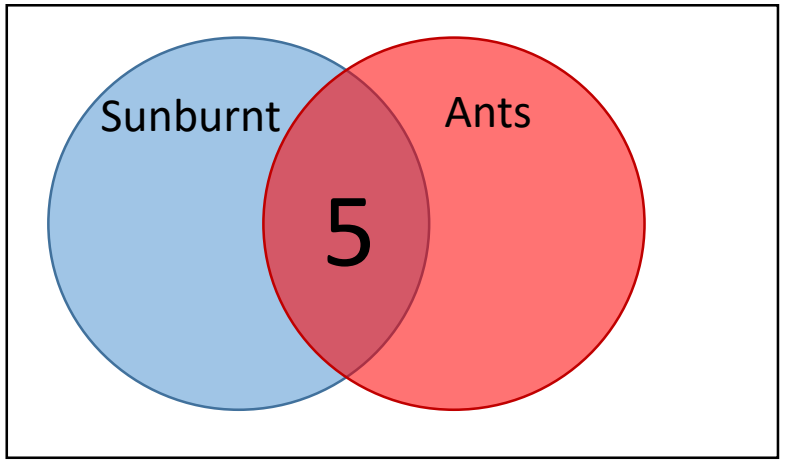

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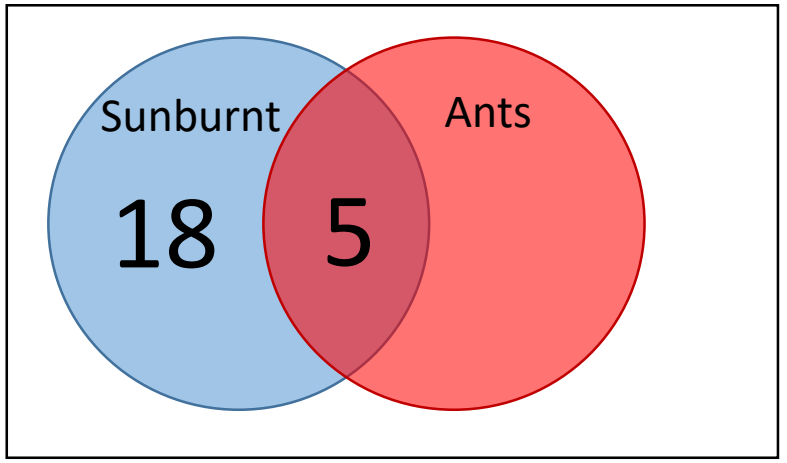

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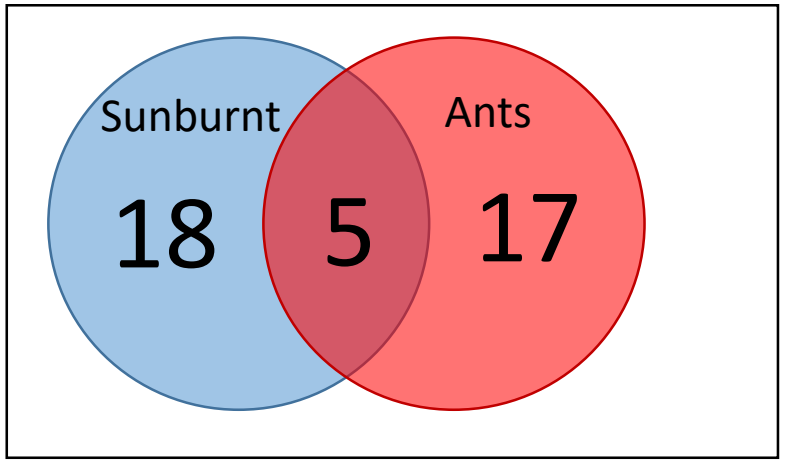

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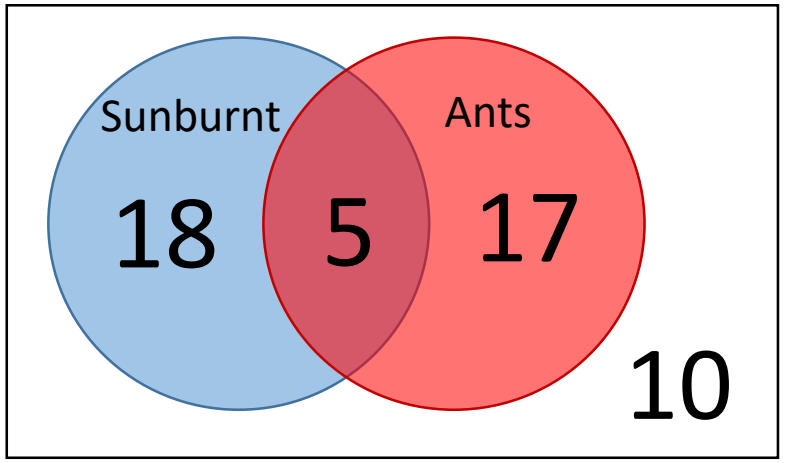

$$P(not\ bitten) = \frac{18 + 10}{50}$$

$$= \frac{28}{50}$$

$$= \frac{14}{25}$$

50 students went bushwalking. 23 were sunburnt, 22 were bitten by ants, and 5 were both sunburnt and bitten by ants. Determine the probability that a randomly selected student:

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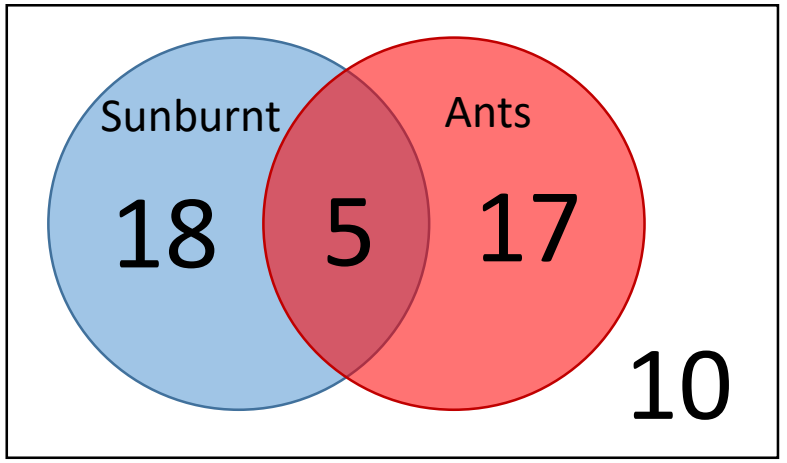

$$P(not\ bitten) = \frac{18 + 10}{50}$$

$$= \frac{28}{50}$$

$$= \frac{14}{25}$$

$$P(rotten\ day) = 1 - \frac{10}{50}$$

$$= \frac{40}{50}$$

$$= \frac{4}{5}$$

50 students went bushwalking. 23 were sunburnt, 22 were bitten by ants, and 5 were both sunburnt and bitten by ants. Determine the probability that a randomly selected student:

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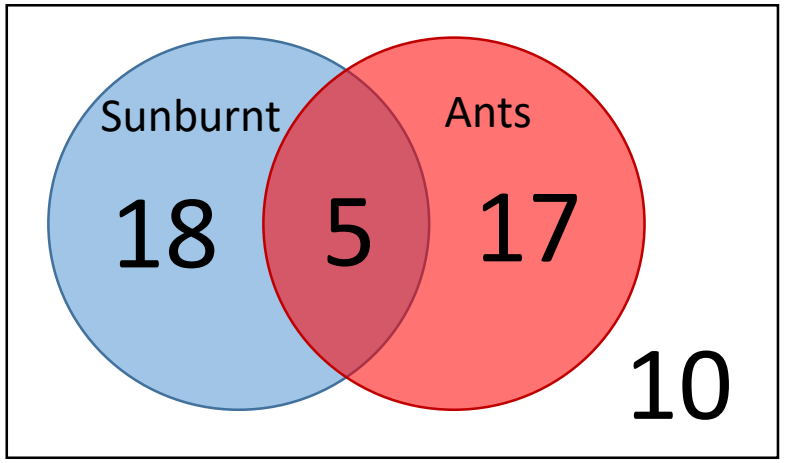


$$P(\text{not bitten}) = \frac{18 + 10}{50}$$

$$= \frac{28}{50}$$

$$= \frac{14}{25}$$

$$P(\text{rotten day}) = 1 - \frac{10}{50}$$

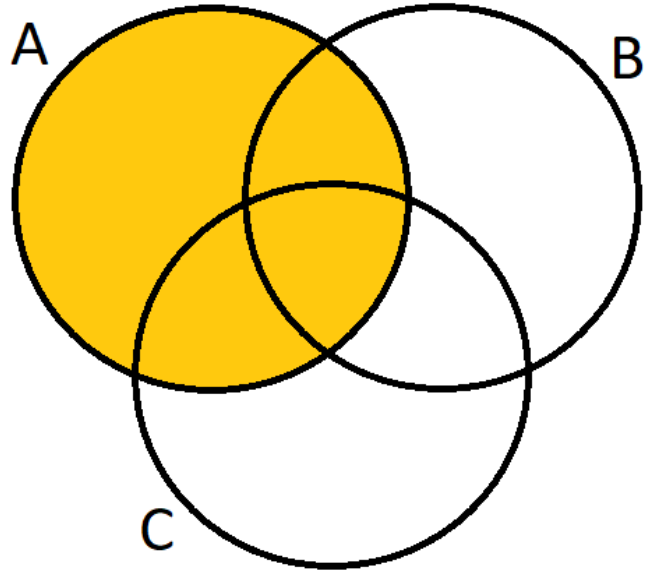
$$= \frac{40}{50}$$

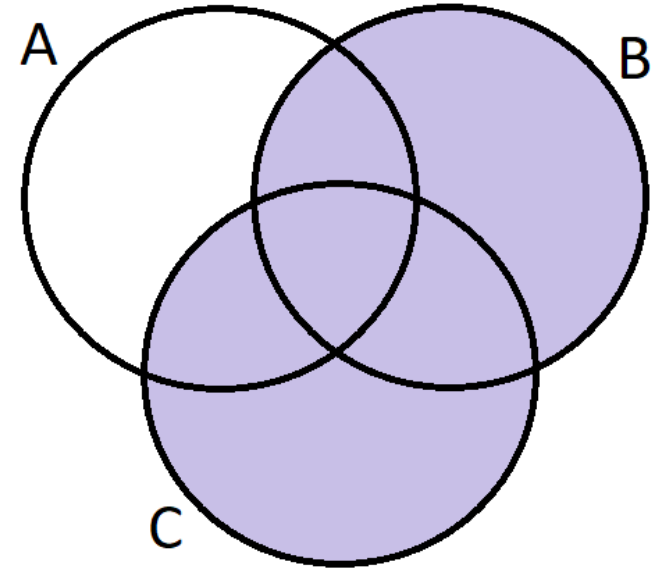
$$= \frac{4}{5}$$

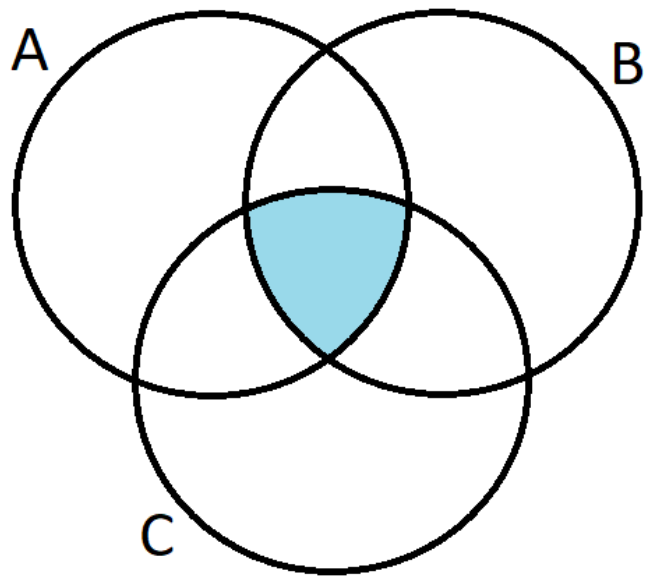
$$P(\text{survived}) = \frac{10}{50}$$

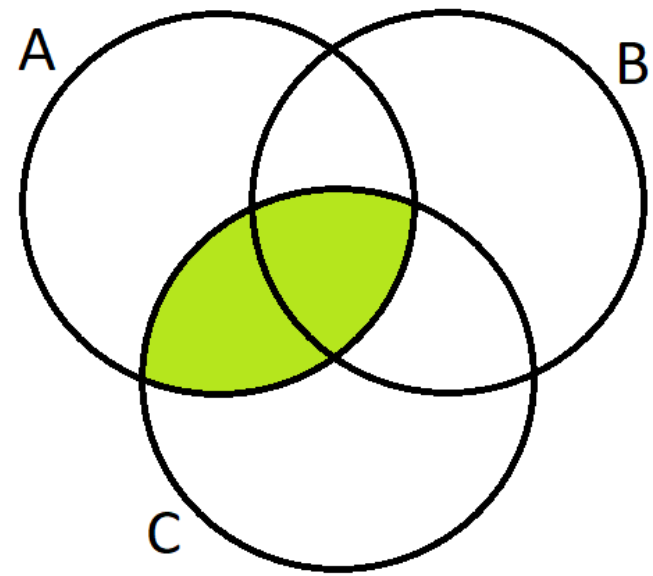
$$= \frac{1}{5}$$

What is highlighted in each diagram?



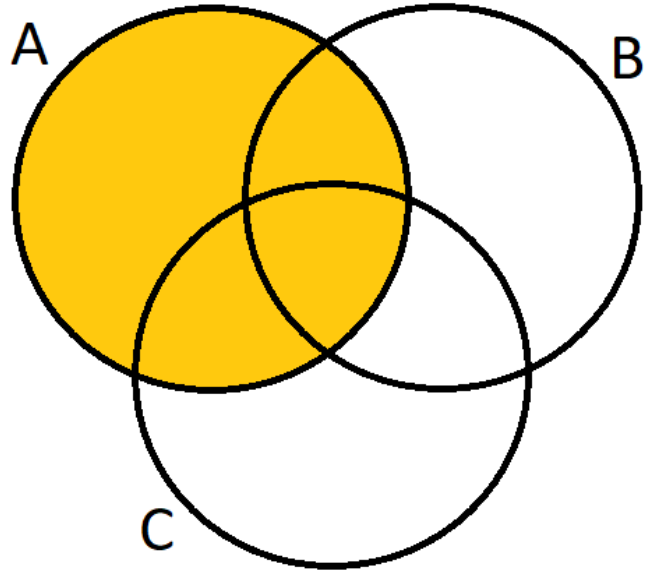


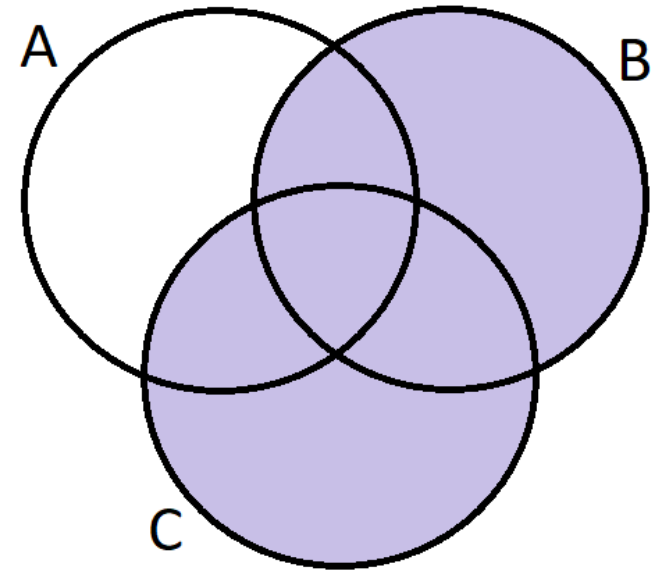


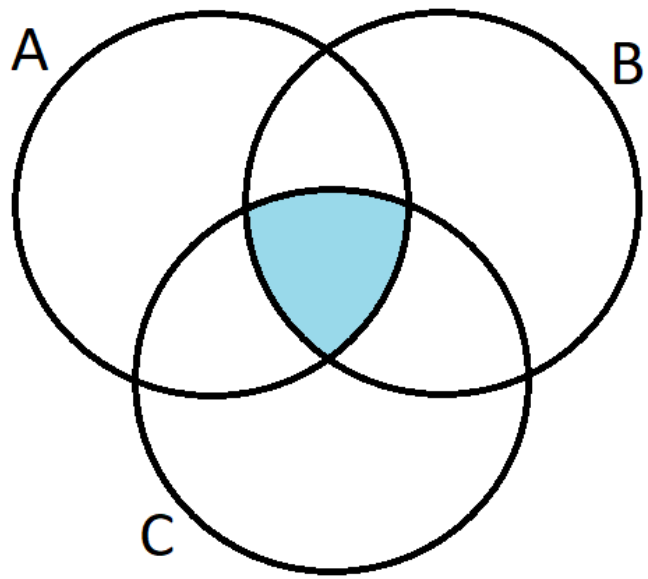


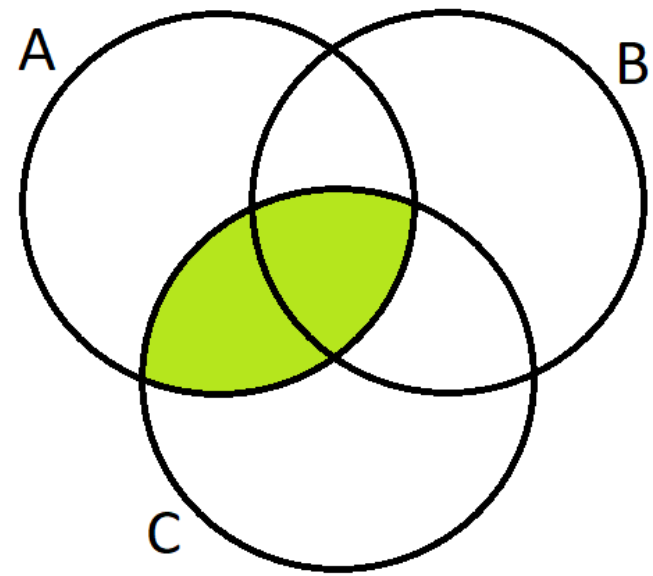
What is highlighted in each diagram?

A



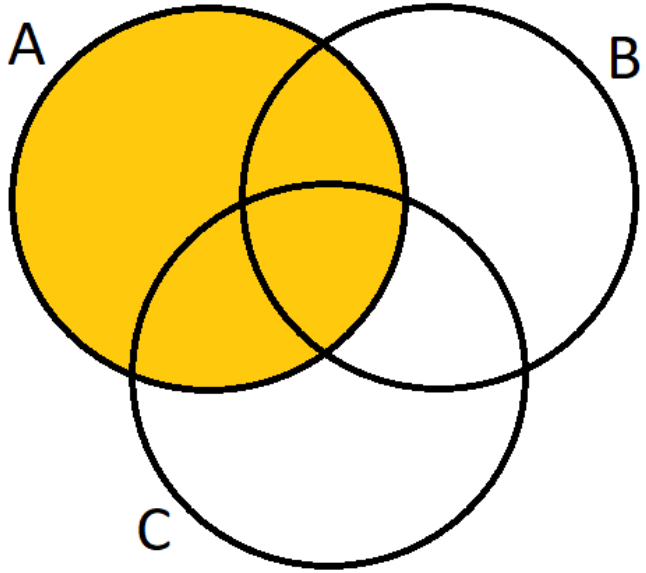


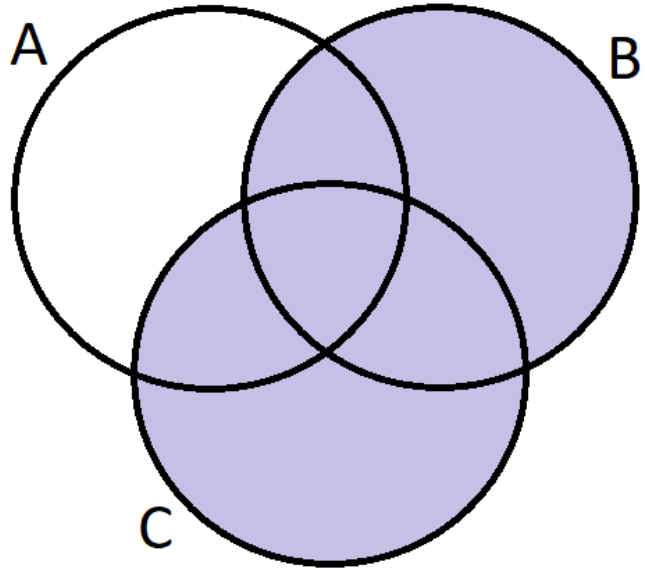




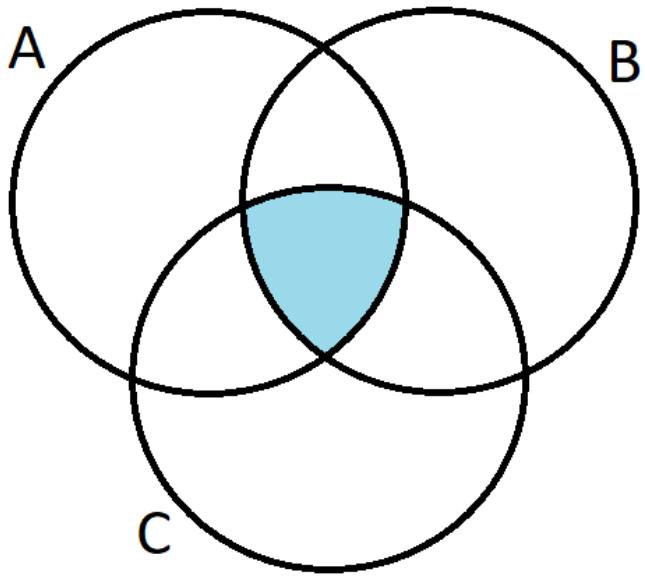
What is highlighted in each diagram?

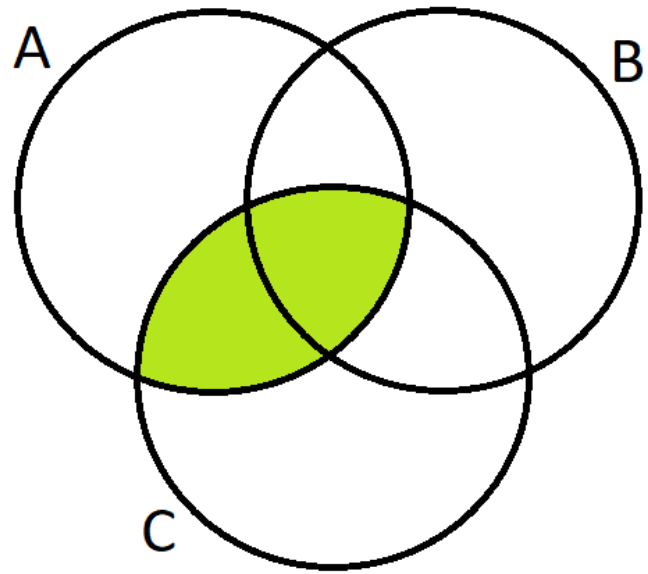
A





$A \cap B \cap C$





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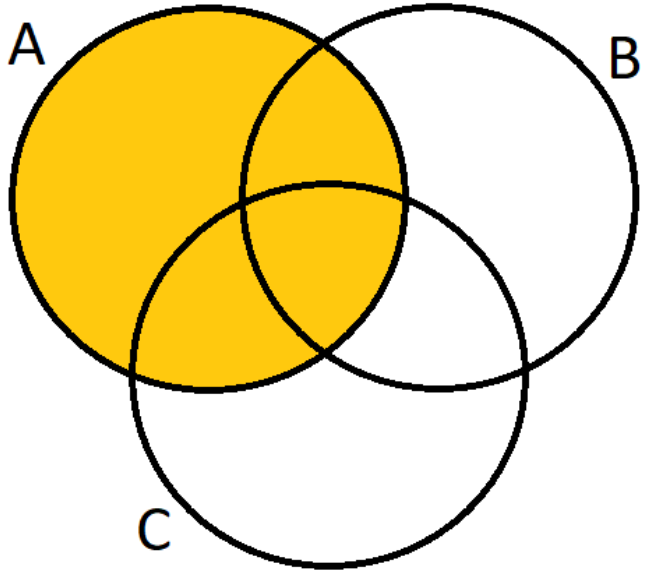
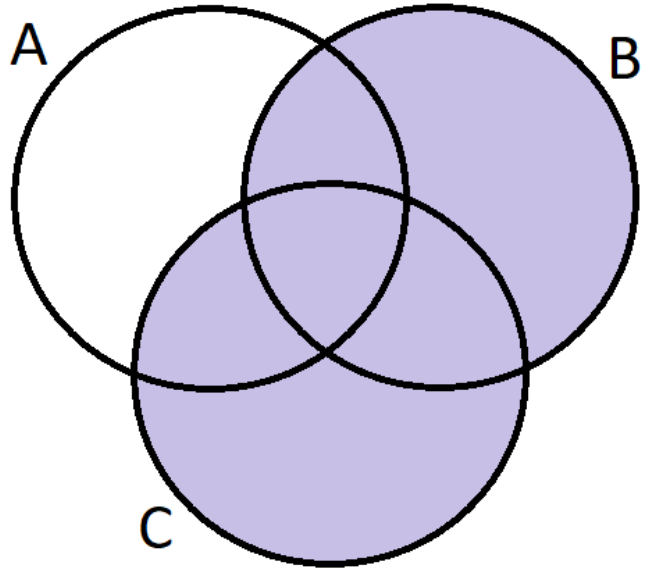
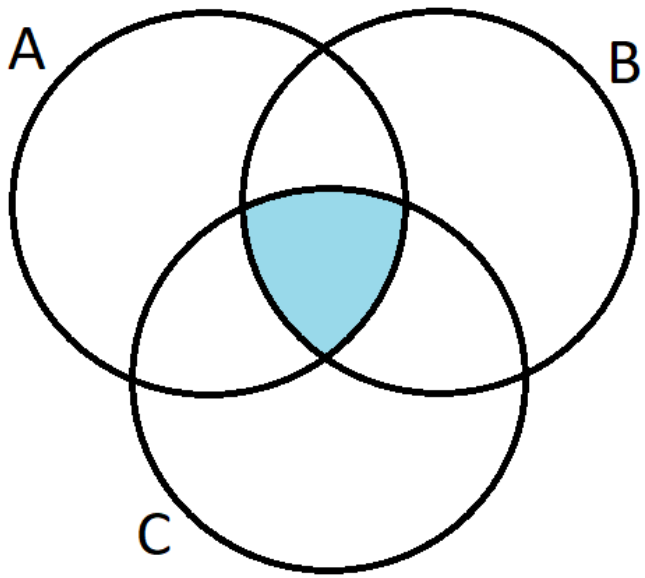
A

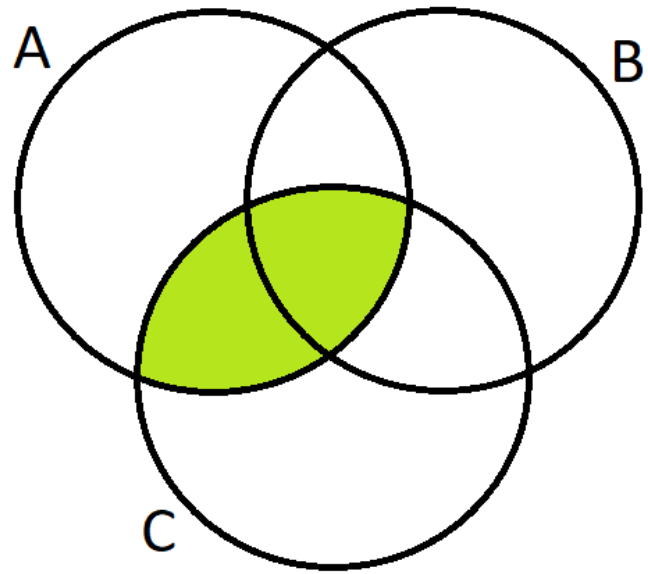


$B \cup C$



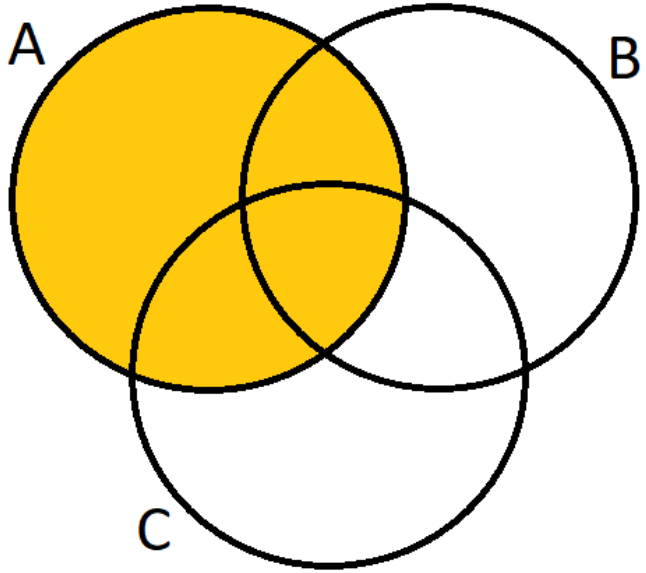
$A \cap B \cap C$





What is highlighted in each diagram?

A



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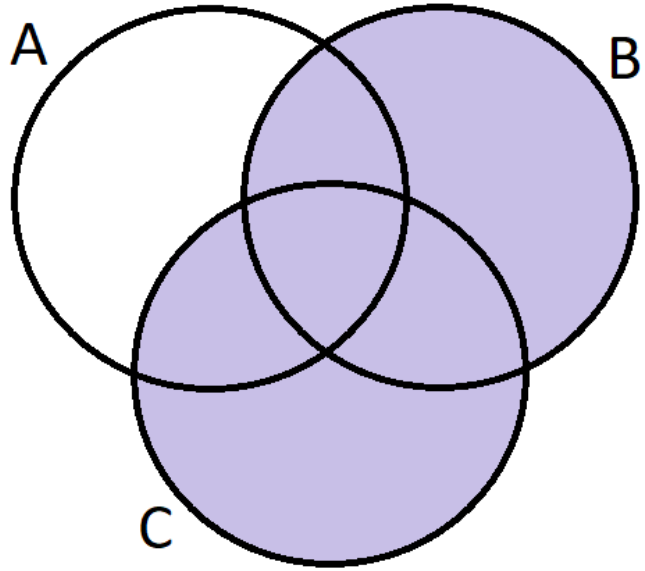
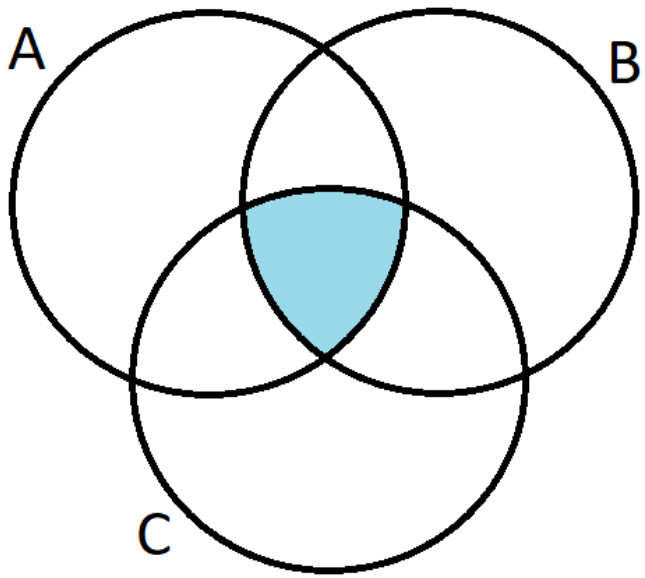
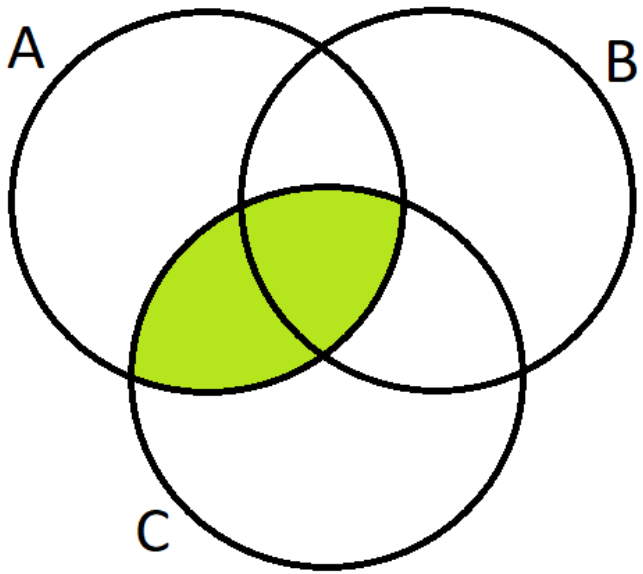


$A \cap B \cap C$



$A \cap C$



In a certain town three newspapers are published. 20% of the population read A, 16% read B, 14% read C, 8% read A and B, 5% read A and C, 4% read B and C, and 2% read all 3 newspapers. A person is selected at random. Use a Venn diagram to help determine the probability that the person reads:

a none of the papers

b at least one of the papers

c exactly one of the papers

d A or B (or both)

A = 20%
B = 16%
C = 14%
A and B = 8%
A and C = 5%
B and C = 4%
All = 2%

In a certain town three newspapers are published. 20% of the population read A, 16% read B, 14% read C, 8% read A and B, 5% read A and C, 4% read B and C, and 2% read all 3 newspapers. A person is selected at random. Use a Venn diagram to help determine the probability that the person reads:

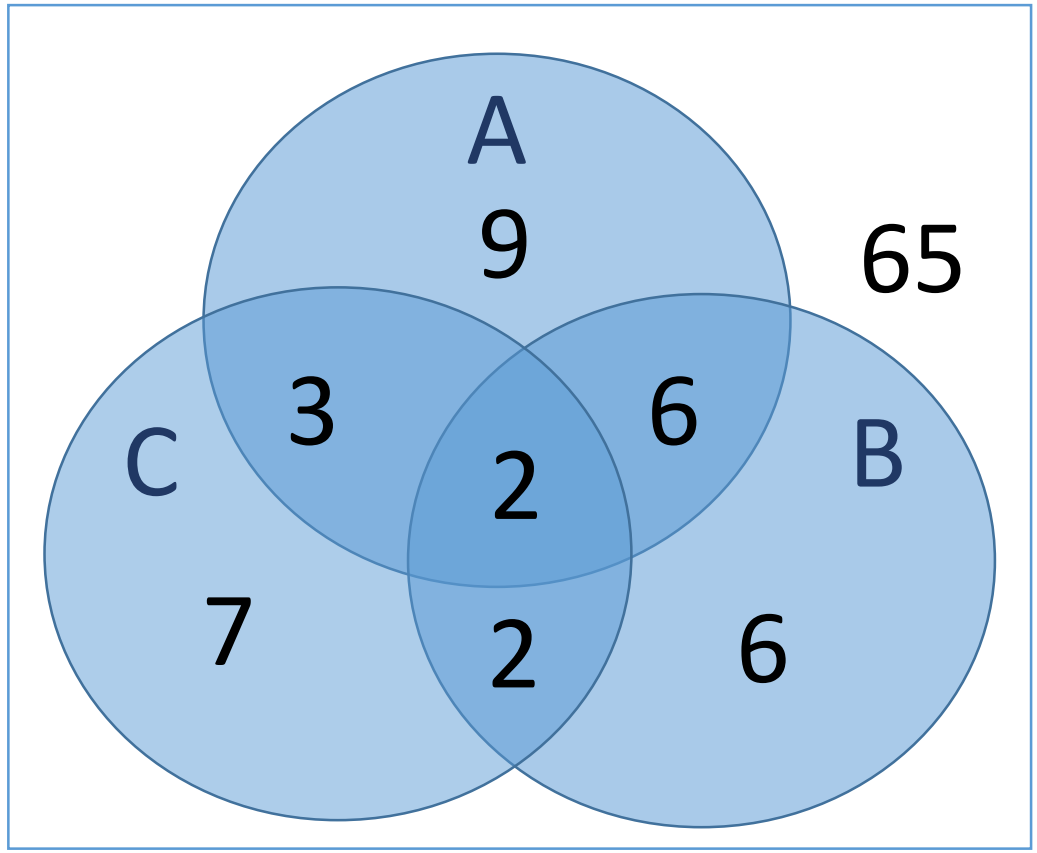
a none of the papers

b at least one of the papers

c exactly one of the papers

d A or B (or both)

A = 20%
B = 16%
C = 14%
A and B = 8%
A and C = 5%
B and C = 4%
All = 2%



a $\frac{13}{20}$ **b** $\frac{7}{20}$ **c** $\frac{11}{50}$ **d** $\frac{7}{25}$

A survey of Grade 12 math students produced these results.

a. How many students are enrolled in Functions and no other math course?

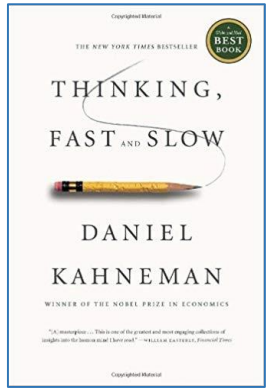
b. How many students are taking exactly 2 math courses?

Math Course	Number of Students
Functions	80
Geometry	33
Data Management	68
Functions and Geometry	30
Geometry and Data Management	6
Data Management and Functions	50
All three courses	5

Keep in mind this question was written in 1980:

Linda is thirty-one years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice and also participated in antinuclear demonstrations.

Which is more probable?
a. Linda is a bank teller.
b. Linda is a bank teller and is active in the feminist movement.



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Linda is thirty-one years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice and also participated in antinuclear demonstrations.

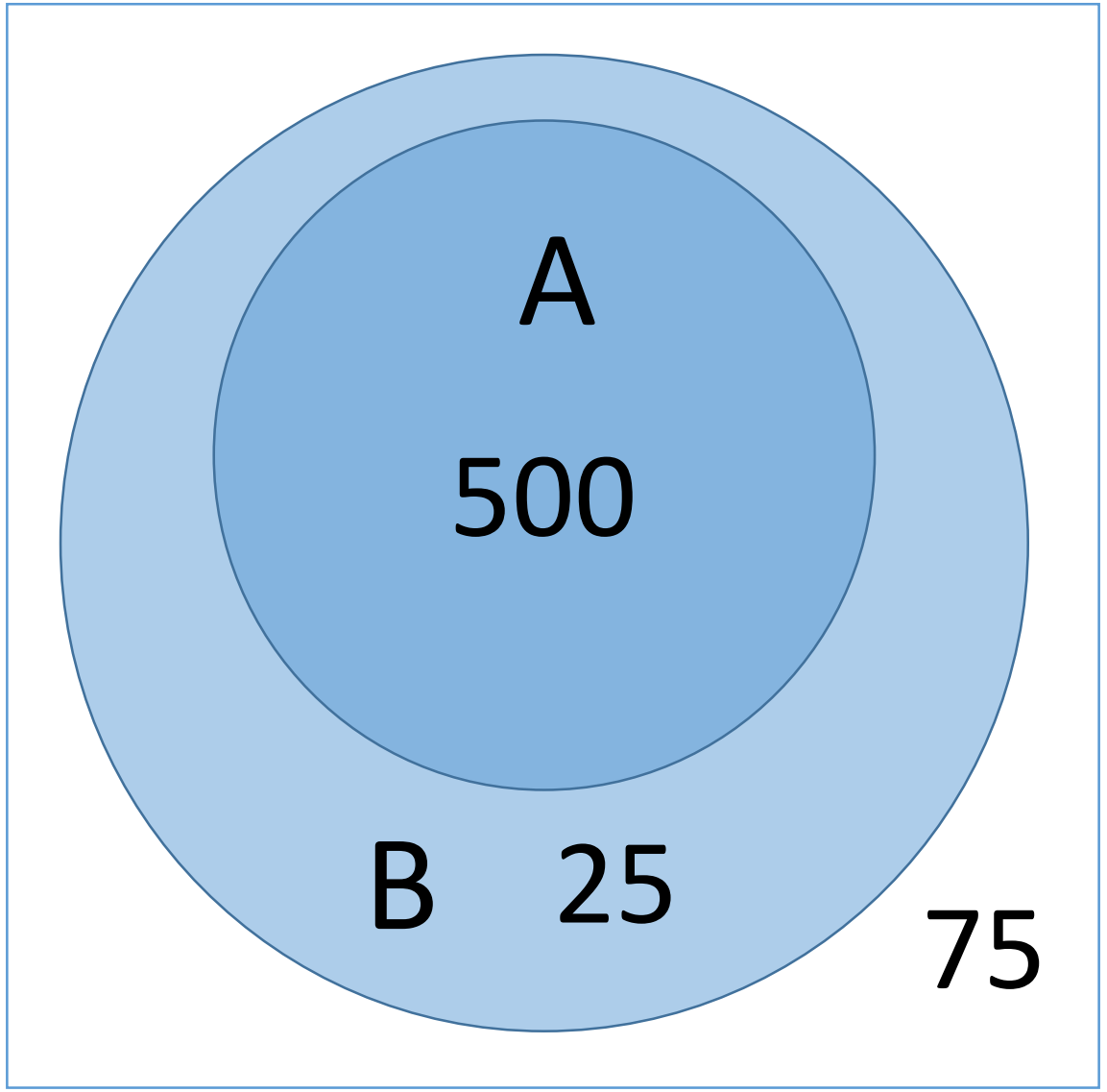
Which is more probable?
a. Linda is a bank teller.
b. Linda is a bank teller and is active in the feminist movement.

85% to 90% picked this.

$$P(A) = \frac{500}{600}$$

$$P(B) = \frac{525}{600}$$

The group that contains the other is ALWAYS more probable.

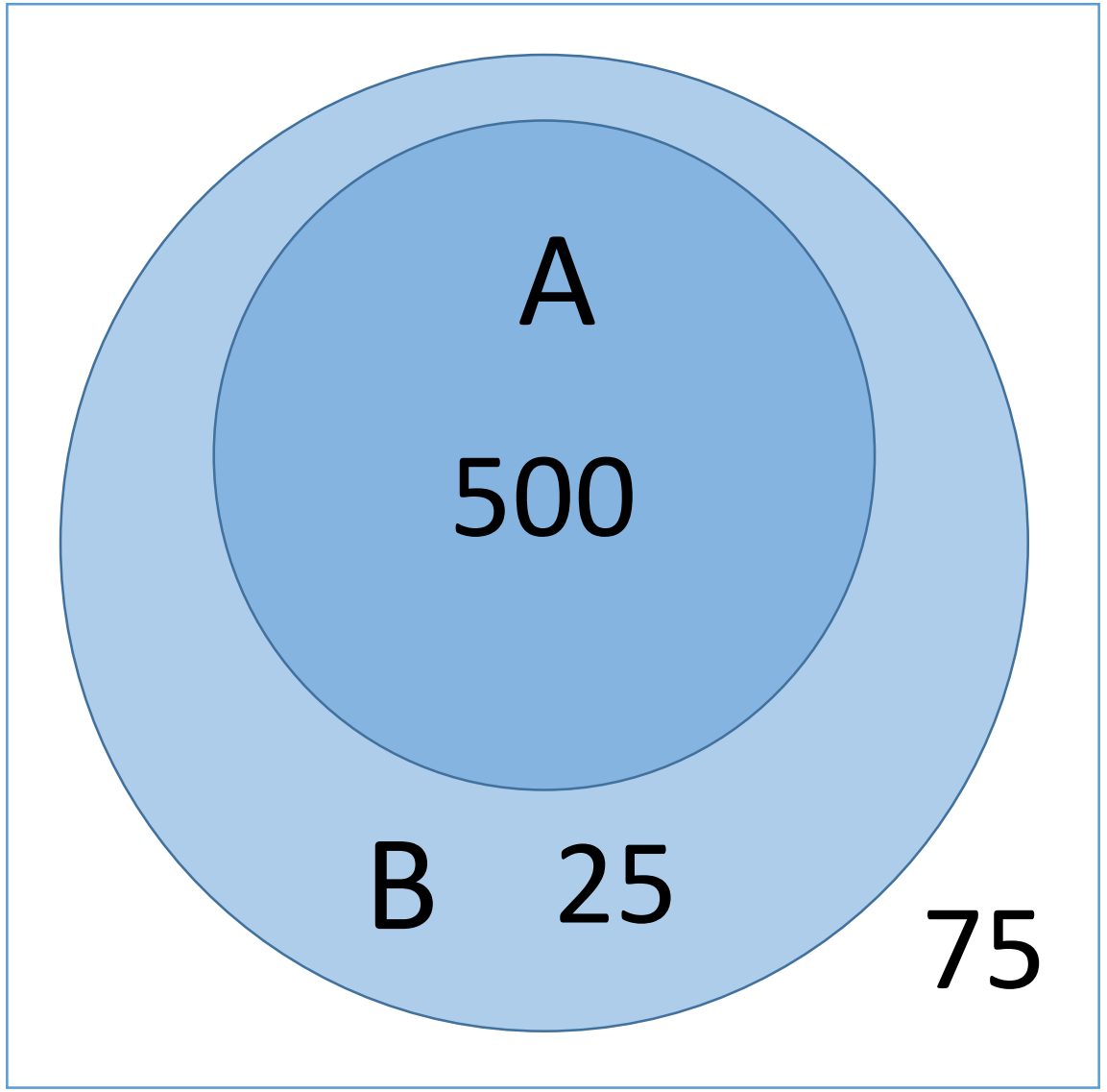


Bank Teller and Feminist:

$$P(A) = \frac{500}{600}$$

Bank Teller:

$$P(B) = \frac{525}{600}$$



The group that contains the other is ALWAYS more probable.
Don’t let the descriptive details pull you in.

Which is more probable:

a) A massive flood somewhere in North America next year, in which more than 1,000 people drown.
b) An earthquake in California sometime next year, causing a flood in which more than 1,000 people drown.

The group that contains the other is ALWAYS more probable.
Don’t let the descriptive details pull you in.