IB Math SL **Probability**

Topic 5, Part II – Day 1 Notes

[](http://en.wikipedia.org/wiki/File:Blaise_pascal.jpg)

1. **History Tid-Bit:**

*In the mid-seventeenth century, Chevalier de Méré gambled frequently to increase his wealth. He bet on a roll of a die that at least one 6 would appear during a total of four rolls. From past experience, he knew that he was more successful than not with this game of chance. Tired of his approach, he decided to change the game. He bet that he would get a total of 12, or a double 6, on twenty-four rolls of two dice. Pascal*

*Soon he realized that his old approach to the game resulted in more money. He asked his friend Blaise Pascal why his new approach was not as profitable. Pascal worked through the problem and found that the probability of winning using the new approach was only 49.1 percent compared to 51.8 percent using the old approach.*

*[](http://en.wikipedia.org/wiki/File:Pierre_de_Fermat.jpg)*

*This problem proposed by Chevalier de Méré is said be the start of famous correspondence between Pascal and Pierre de Fermat. They continued to exchange their thoughts on mathematical principles and problems through a series of letters. Historians think that the first letters written were associated with the above problem and other problems dealing with probability theory. Therefore, Pascal and Fermat are the mathematicians credited with the founding of probability theory . Fermat*

[*http://www.teacherlink.org/content/math/interactive/probability/history/briefhistory/home.html*](http://www.teacherlink.org/content/math/interactive/probability/history/briefhistory/home.html)

1. **Basic info:**

Probability Theory: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The study of the theory of chance has vitally important applications in such fields as economics, politics, sports, quality control, and production planning in industry, to name a few.

**General Definitions:**

Number of Trials: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Sample Space: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Event: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Frequency: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mutually Exclusive Events: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. List the sample space of possible outcomes for :
2. Rolling a die b) tossing a coin
3. Draw a tree diagram that represents the possible outcomes for tossing 2 coins
4. **Elementary/Theoretical Probability:**

The theoretical probability of a particular event is a measure of the chance of that event occurring in any trial of the experiment.

The following are all examples of trials in which we want to explore the probability of obtaining a certain outcome. The examples all have equally likely outcomes.

1. A die is thrown. The probability of getting a 6 is \_\_\_\_\_\_\_.
2. A bag contains 4 black marbles and 6 white marbles, all of equal size and weight. The probability of choosing a white marble is \_\_\_\_\_\_\_\_.
3. A room contains 30 people: 14 with blue eyes, the other 16 with brown eyes. The probability of a person selected at random will have blues eyes is \_\_\_\_\_\_\_\_.
4. A game has a octagonal spinner. The probability of spinning an 8 is \_\_\_\_\_\_\_\_.

The following examples do NOT necessarily have equally likely outcomes, and therefore the probability of obtaining a certain outcome would have to be determined by performing trials. The probability would then be an estimate.

1. The probability that your soccer team will win its next match. (What would this depend on?)
2. The probability that a thumb tack is thrown in the air and falls to the ground and lands on its back and not on its side. (Why are these outcomes not equally likely?)
3. **Mathematical Summary of Definitions:**

Sample Space = U

Event = A. A is a subset of U. which contains all of the outcomes for which an event occurs.

Probability of an Event, A = :

1. **Venn Diagrams – a bit more history**

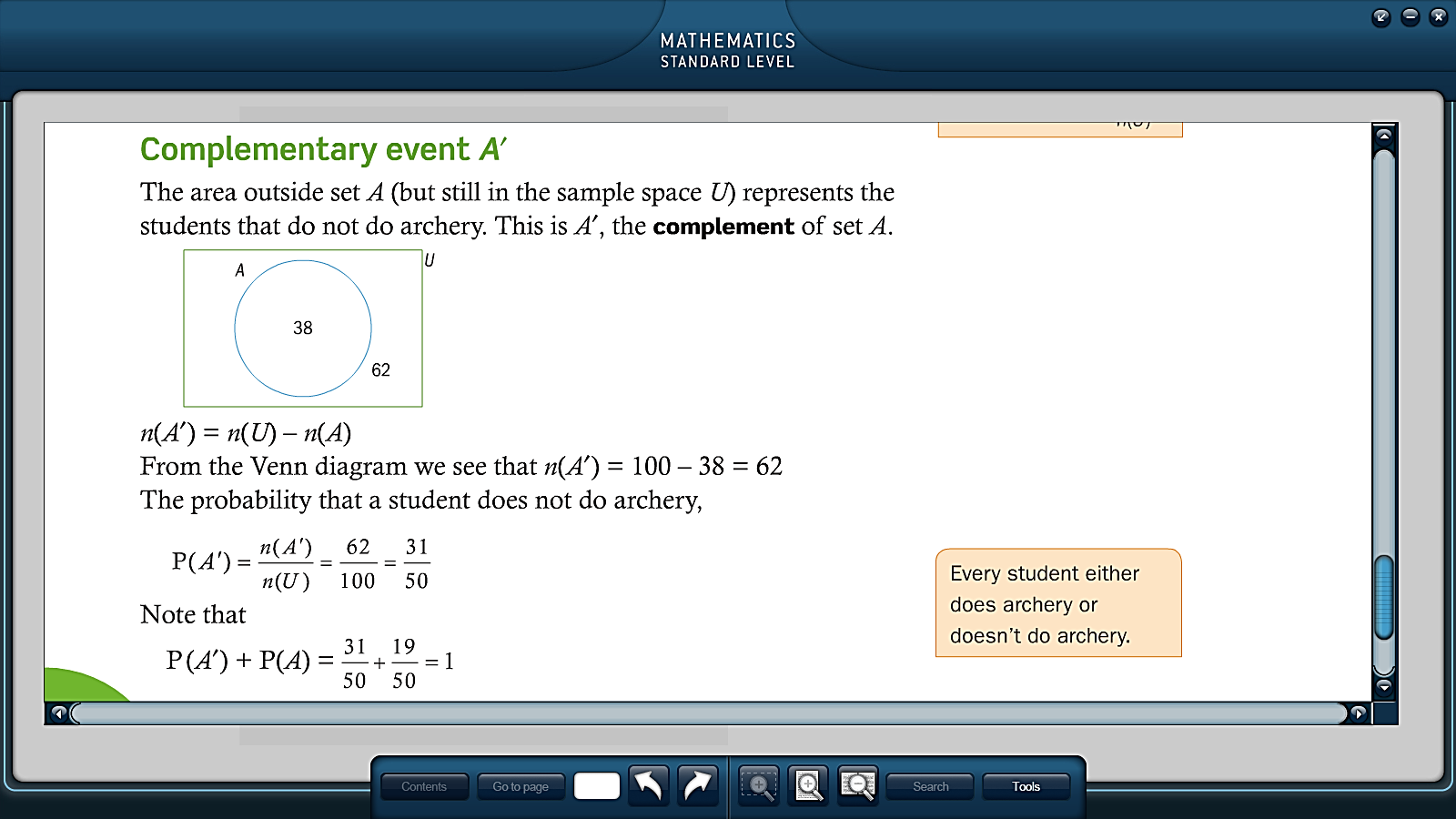
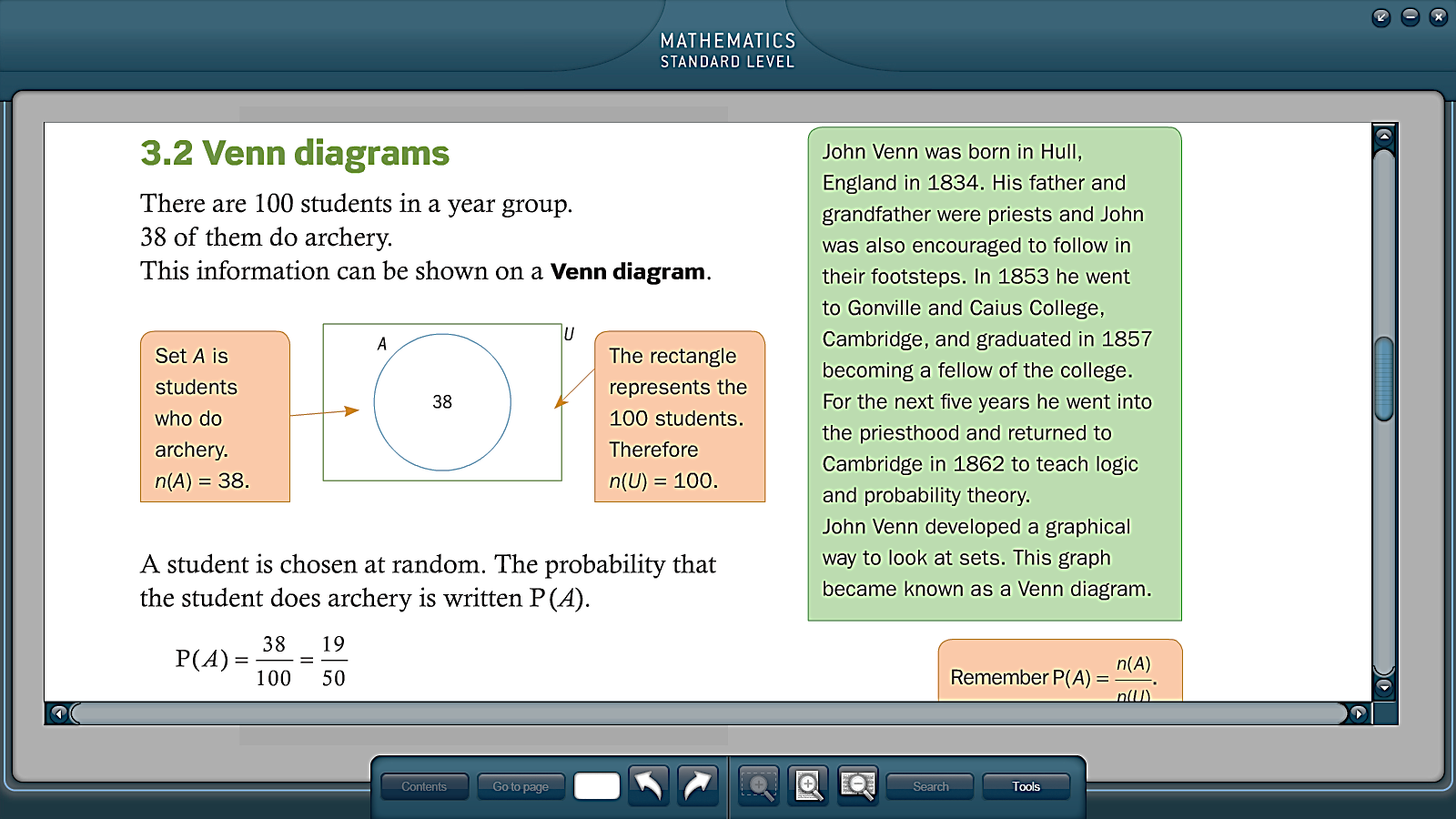
*Venn diagrams were introduced in 1880 by*[*John Venn*](http://en.wikipedia.org/wiki/John_Venn)*(1834–1923) in a paper entitled "On the Diagrammatic and Mechanical Representation of Propositions and Reasonings" in the "Philosophical Magazine and Journal of Science", about the different ways to represent*[*propositions*](http://en.wikipedia.org/wiki/Proposition)*by diagrams. They are rightly associated with Venn because he comprehensively surveyed and formalized their usage, and was the first to generalize them.*

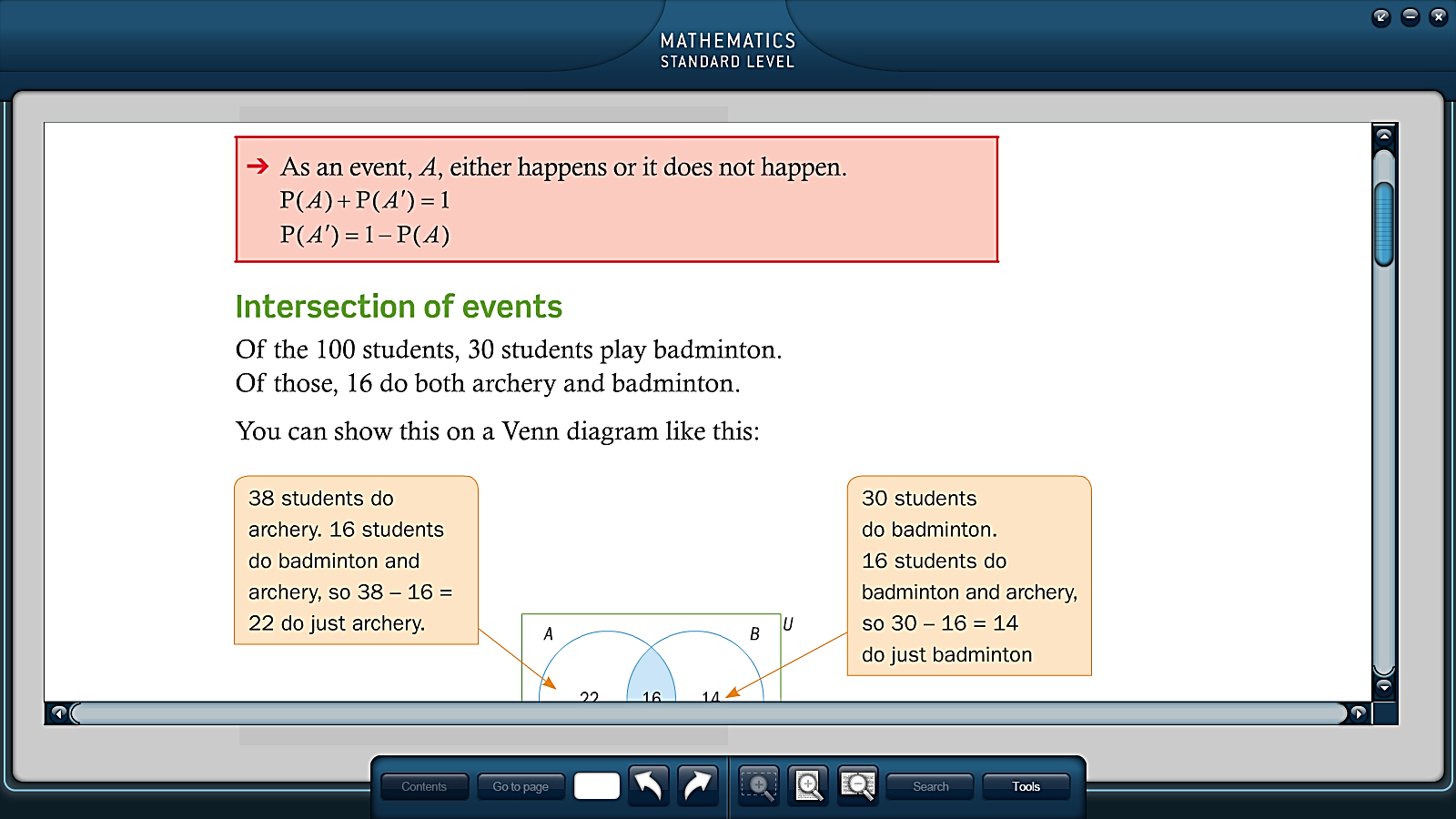
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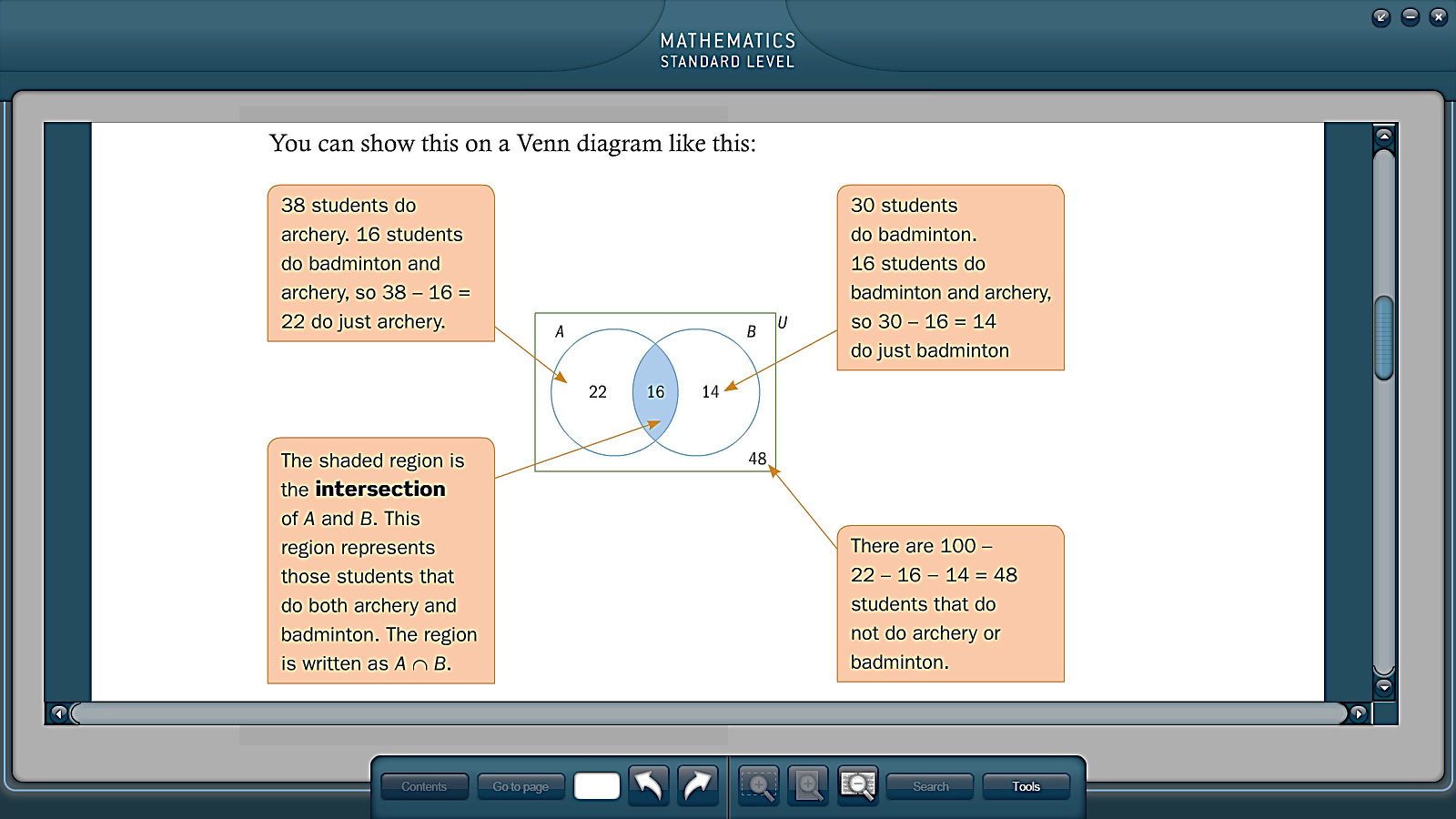
*Venn himself did not use the term "Venn diagram" but kept speaking of "Eulerian Circles."*

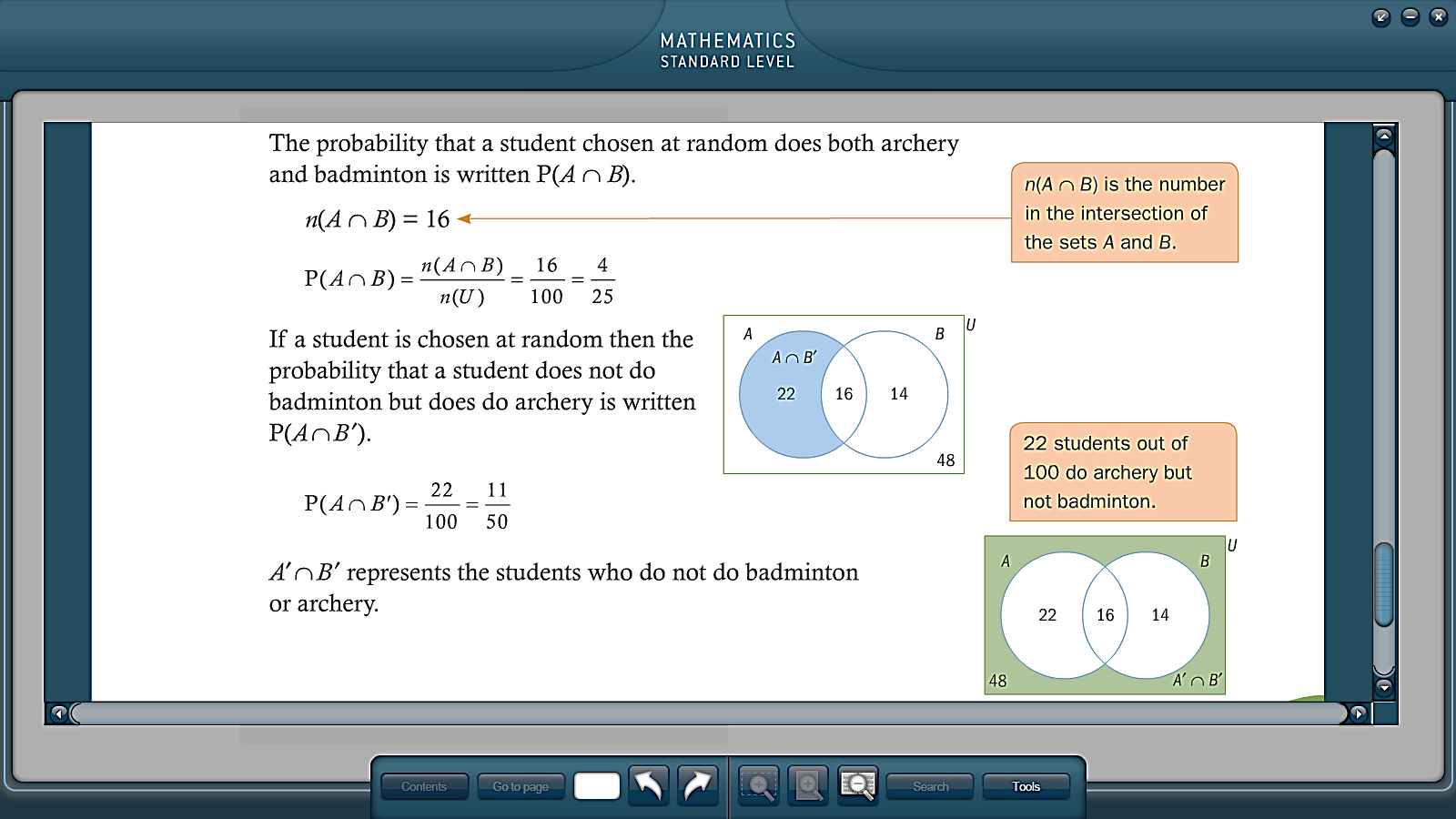
*Venn diagrams are very similar to*[*Euler diagrams*](http://en.wikipedia.org/wiki/Euler_diagram)*, which were invented by*[*Leonhard Euler*](http://en.wikipedia.org/wiki/Leonhard_Euler)*(1708–1783) in the 18th century.* [*Leibniz*](http://en.wikipedia.org/wiki/Leibniz)*(1646–1716) in the 17th century produced similar diagrams before Euler, but much of it was unpublished.* Old Swiss 10 Franc banknote

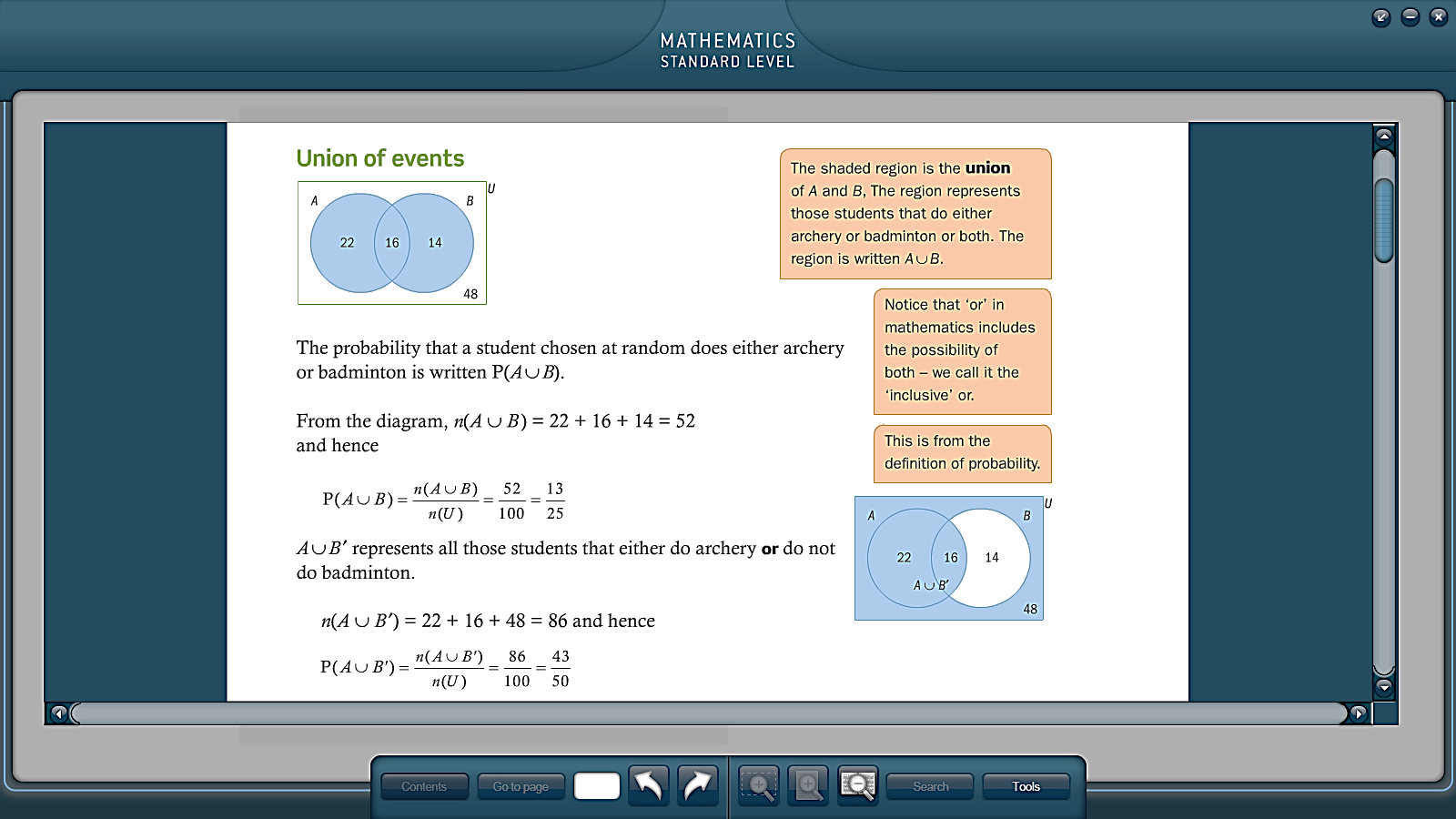
*Venn diagrams and Euler diagrams were incorporated as part of instruction in*[*set theory*](http://en.wikipedia.org/wiki/Set_theory)*as part of the*[*new math*](http://en.wikipedia.org/wiki/New_math)*movement in the 1960s. Since then, they have also been adopted by other curriculum fields such as reading.* [*http://en.wikipedia.org/wiki/Venn\_diagram*](http://en.wikipedia.org/wiki/Venn_diagram)

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Does

A formula for finding

**Mixed Examples:**

1. The Venn diagram shown represents members of a sporting club who play tennis (T) and hockey (H). Find the number of people who:

T H

15 27 26

7

1. are in the club
2. play hockey
3. play both sports
4. play neither sport
5. play at least one sport
6. In a class of 30 students, 19 study Physics, 17 study Chemistry, and 15 are taking both of these subjects. Determine the probability that a student in this class studies
7. Both
8. At least one
9. Physics, but not Chemistry
10. Exactly one of the subjects
11. Neither
12. Chemistry if it is known that they study Physics.
13. Two regular six-sided die are thrown. How many equally likely outcomes are there?
14. A ticket is randomly drawn from a basket containing 3 green, 4 yellow, and 3 blue tickets. Find the probability of getting:
15. A green ticket c) a green or yellow ticket
16. an orange ticket d) a green, yellow, or blue ticket
17. In a class of 32 students, 8 have one first name, 19 have two first names, and 5 have three first names. One student is selected at random. Find the probability that the student has:
18. No first name c) one first name
19. Two first names d) three first names

IB Math SL Homework – Topic 5, Part II Day1 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

