Unit 2: Combinations & Venn Diagrams

Venn Diagrams

Feb 20/2020

Imagine an experiment where we are interested in outcomes A and B.

Overall, there are various outcomes related to A and B:
(1) A only
(2) B only
(3) both A and B simultaneously
(4) neither A nor B
(5) either A or B

All of these possibilities can be visually represented as a Venn diagram

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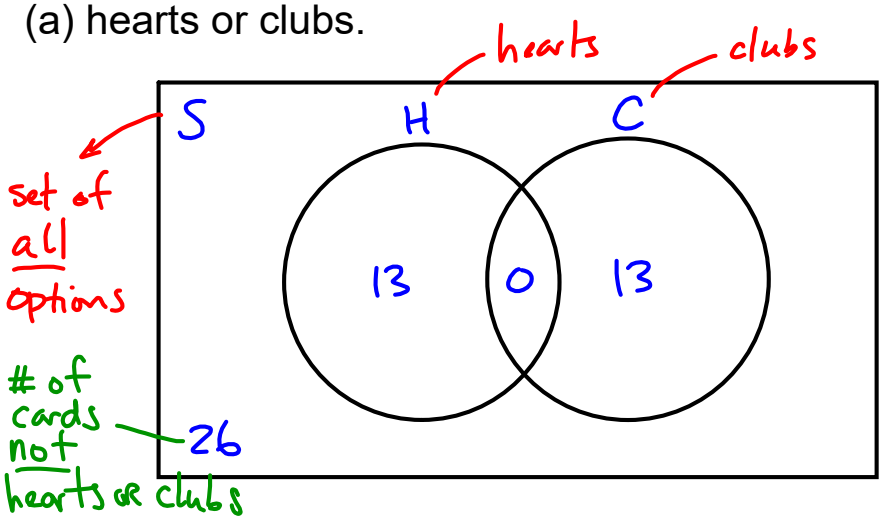
Ex. For a standard deck of cards, use a Venn diagram to determine all possible outcomes involving:

(a) hearts or clubs.



$$n(H \text{ or } C) = n(H) + n(C)$$
$$= 13 + 13$$
$$= 26$$

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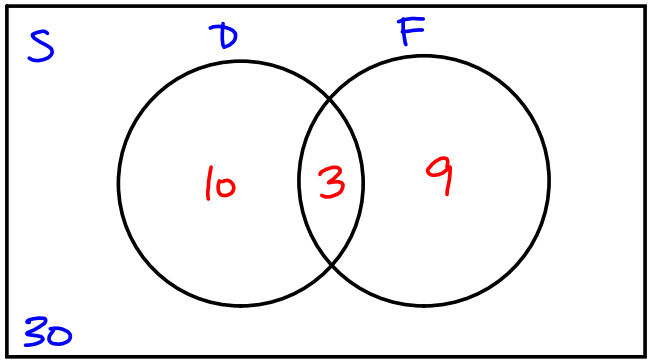
Ex. For a standard deck of cards, use a Venn diagram to determine all possible outcomes involving:

(b) diamonds or face cards.



$n(D \text{ or } F) = 13 + 12 - 3$

3 is here and here

remove the double-count of 3

$= n(D) + n(F) - n(D \text{ and } F)$

$= 22$

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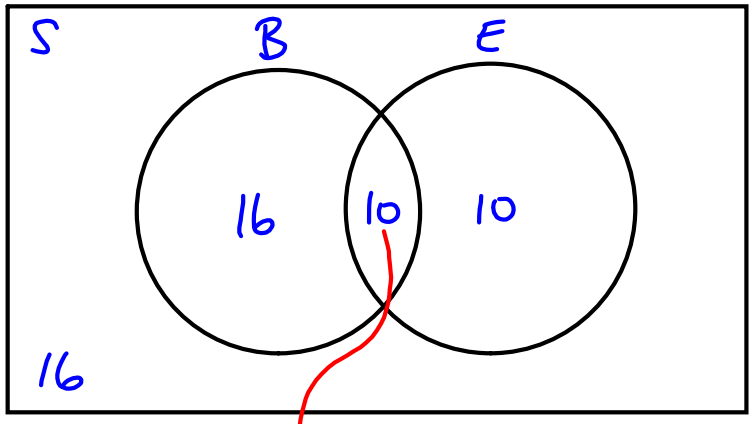
Ex. For a standard deck of cards, use a Venn diagram to determine all possible outcomes involving:

(c) black cards and even numbered cards.



$n(B \text{ and } E) = 10$

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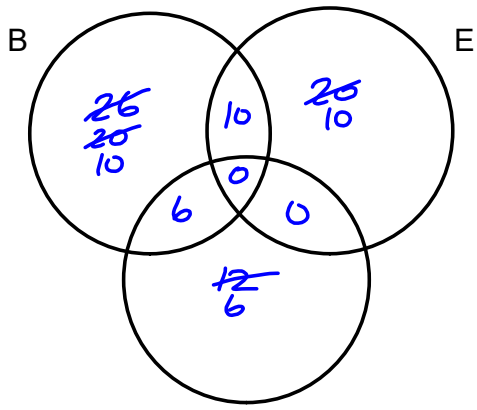
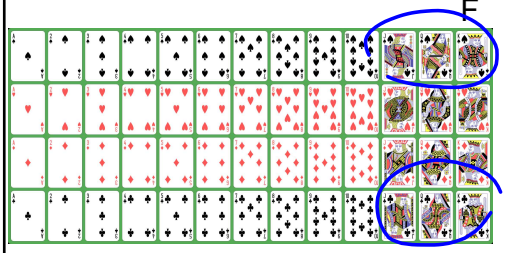
Ex. For a standard deck of cards, use a Venn diagram to determine all possible outcomes involving:

(c) black cards, & even numbered cards, & face cards.





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Logical Operators: For events A and B,

(1) A and B refers to both events occurring simultaneously. Also called the intersection. $A \cap B$

(2) A or B refers to either event occurring, which may or may not be simultaneous. Also called the union. $A \cup B$

When multiple events cannot occur simultaneously, they are called mutually exclusive.

$$n(A \cap B) = 0$$

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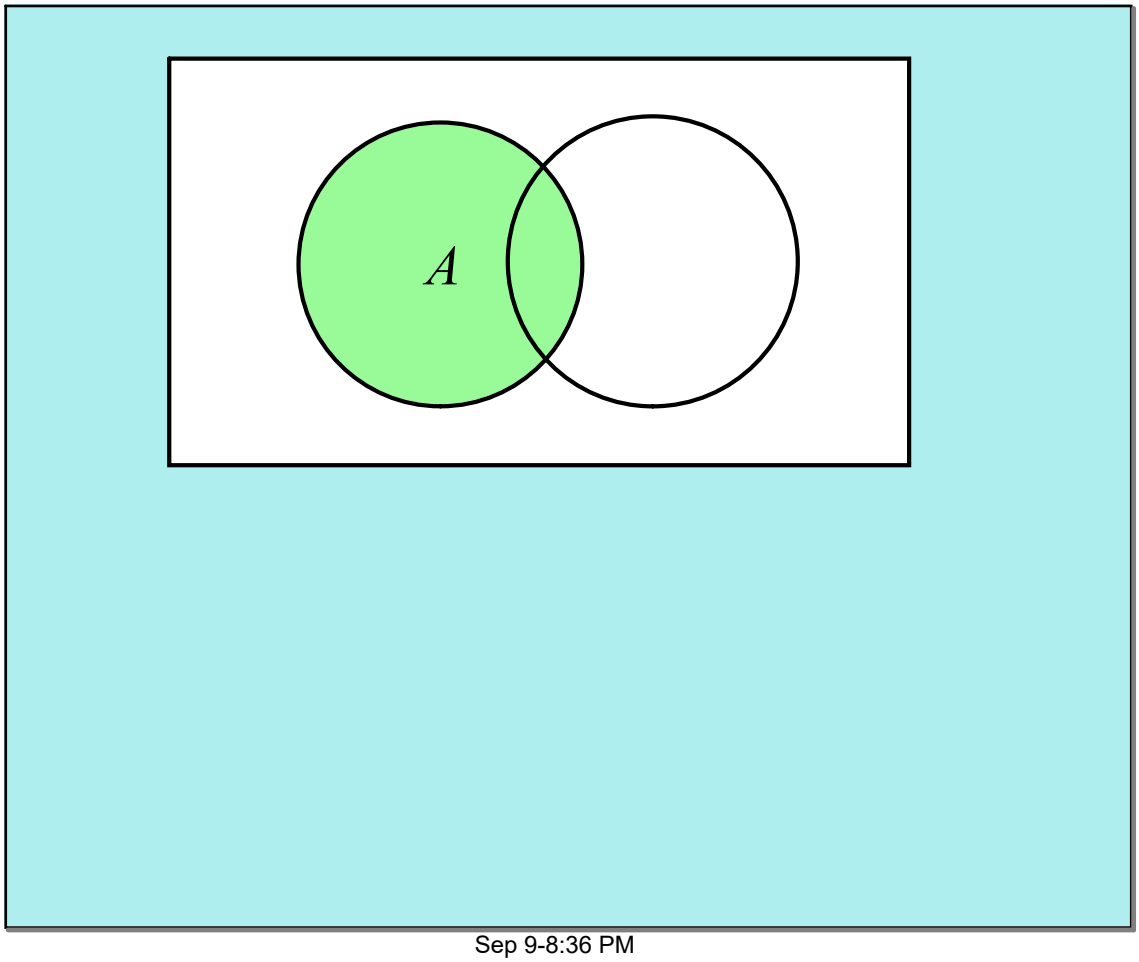

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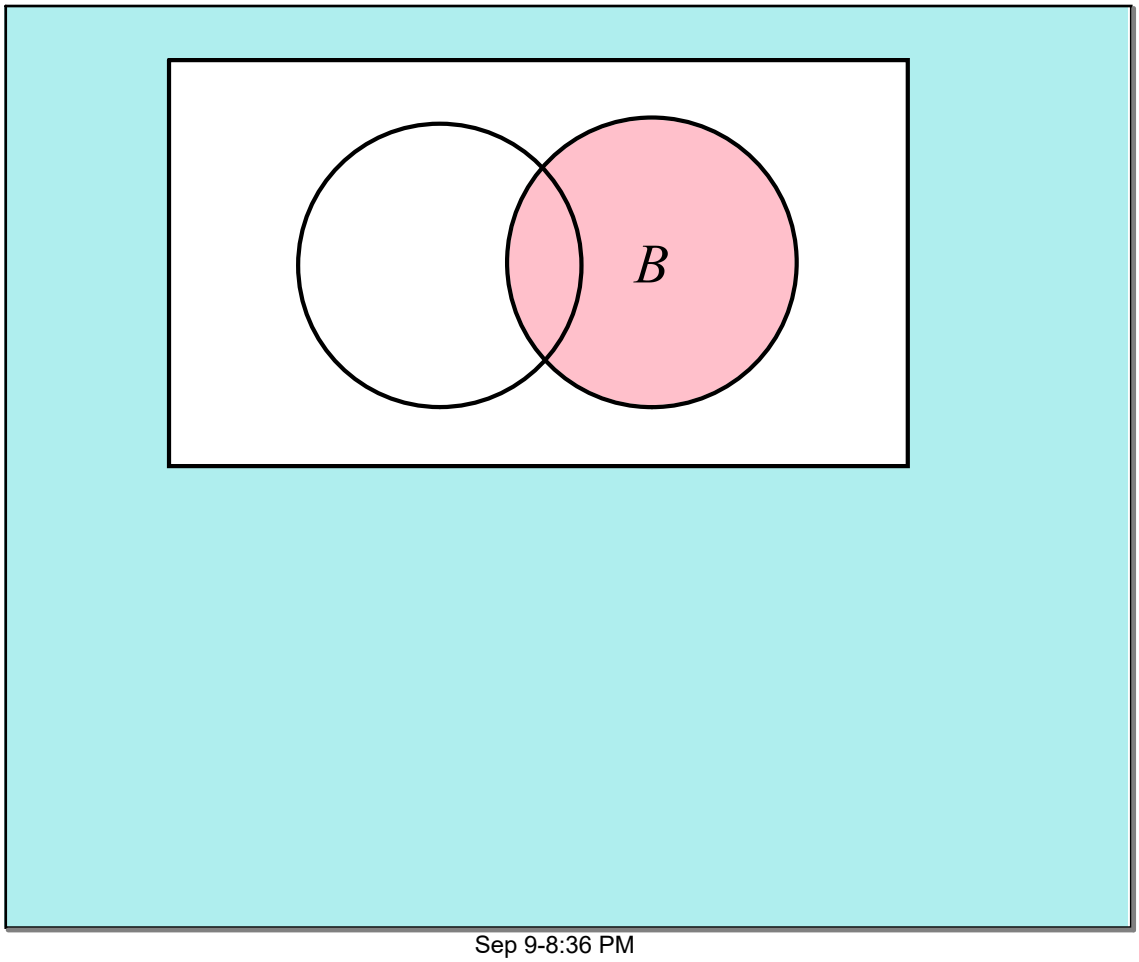

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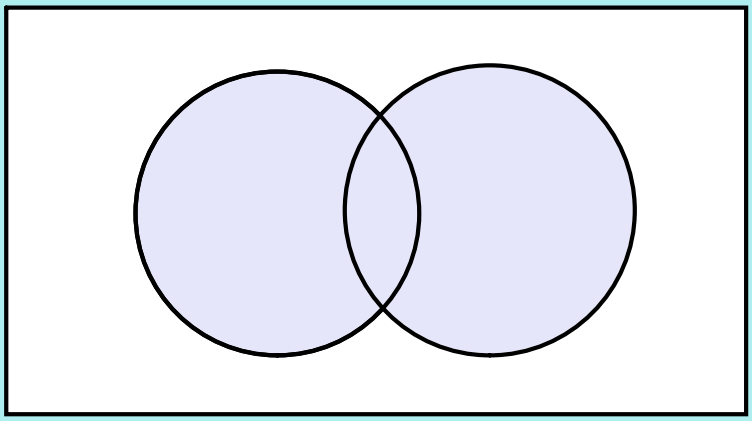

$A \cup B$

A or B

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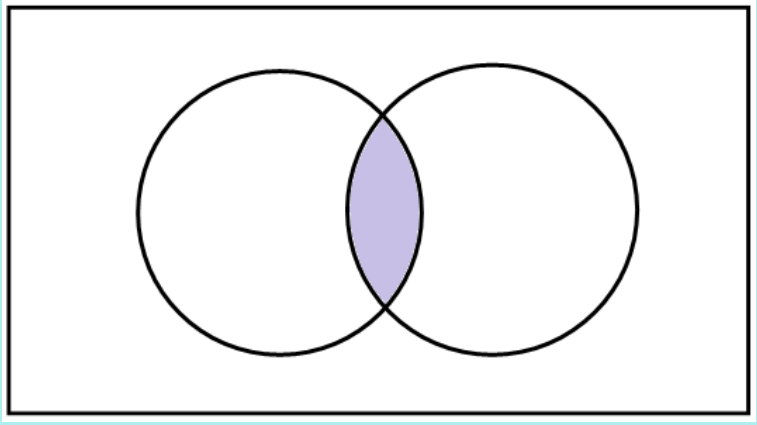

$A \cap B$

A and B

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In general,

$$n(A \text{ or } B) = n(A) + n(B) - n(A \text{ and } B)$$

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

Assigned Work:

Two-element Venn Diagrams

p.270 # 3, 5

Three or more elements

p.270 # 2, 4, 6-9 4, 6

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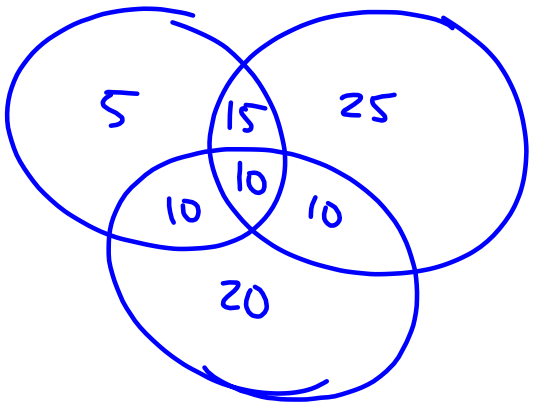
4.



A = 1200
B = 1800
C = 2300

* build from centre → out.

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