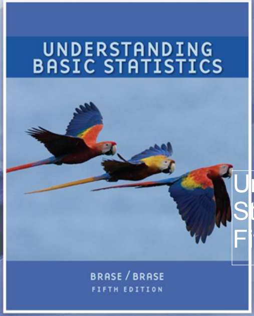
Login your clickers & yes on calculators.

Do the 5.1 checkpoint & start the 5.2 vocabulary

May 1-7:07 AM



Chapter 5

Elementary Probability Theory

Understanding Basic Statistics
Fifth Edition

Oct 15-10:59 AM

Independent Events

with replacement
with out replacement

- Two events are independent if the occurrence or nonoccurrence of one event does *not* change the probability of the other event.

Cards
52

1
2
3
4
5
6

Roll a die = 2

$P(2) = \frac{1}{6}$

$P(3) = \frac{1}{6}$

Cards

$P(A) = \frac{4}{52} = \frac{1}{13}$

$P(A) = \frac{3}{51}$ wo

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1 Answer?

Independent Events

Which of the following represent independent events?

$\frac{13}{52}\ \frac{12}{51}$

a). Two hearts are drawn from a standard deck of cards.
[✓ b)]. Two dice are rolled resulting in a "2" and a "5".
c). Both a and b.
d). Neither a nor b.

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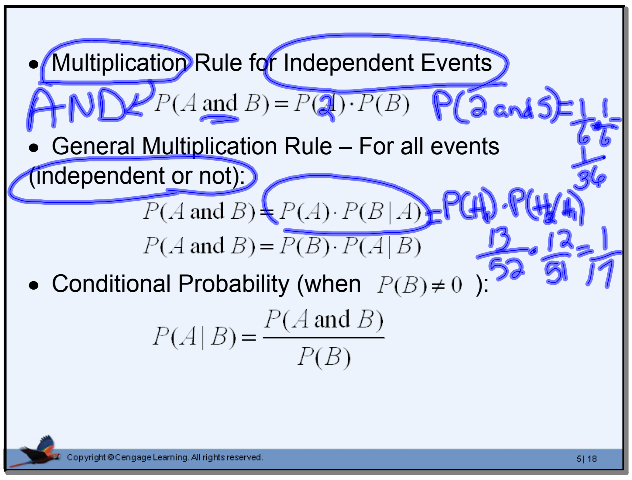

- Multiplication Rule for Independent Events

AND $P(A \text{ and } B) = P(\overset{2}{A}) \cdot P(B)$ $P(2 \text{ and } 5) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$

- General Multiplication Rule – For all events (independent or not):

$$P(A \text{ and } B) = P(A) \cdot P(B \mid A) = P(H_1) \cdot P(H_2 / H_1)$$

$$P(A \text{ and } B) = P(B) \cdot P(A \mid B)$$

$\frac{13}{52} \cdot \frac{12}{51} = \frac{1}{17}$

- Conditional Probability (when $P(B) \neq 0$):

$$P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)}$$

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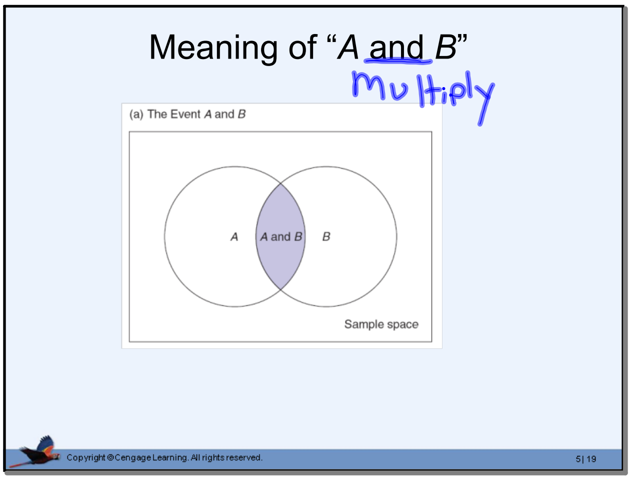

Meaning of "*A* and *B*"

Multiply

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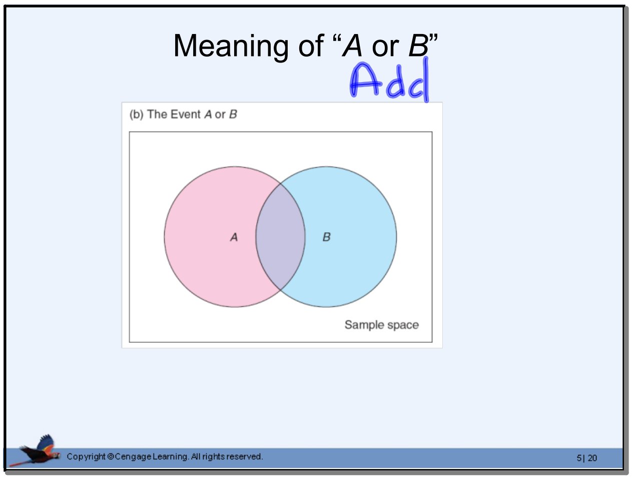

Meaning of "*A* or *B*"

Add

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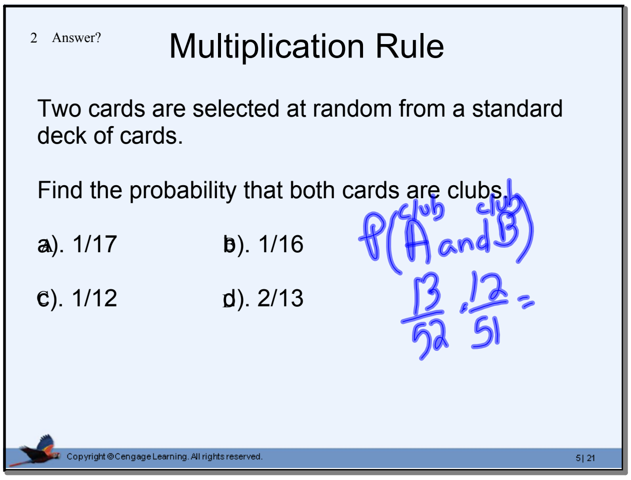

2 Answer?

Multiplication Rule

Two cards are selected at random from a standard deck of cards.

Find the probability that both cards are clubs.

$P(\overset{\text{club}}{A} \text{ and } \overset{\text{club}}{B})$

a). 1/17 b). 1/16

c). 1/12 d). 2/13

$\frac{13}{52} \cdot \frac{12}{51} =$

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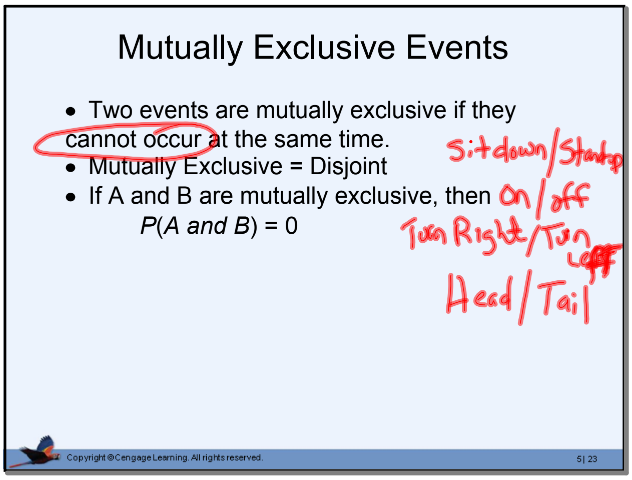

Mutually Exclusive Events

- Two events are mutually exclusive if they cannot occur at the same time.
- Mutually Exclusive = Disjoint
- If A and B are mutually exclusive, then
  $P(A \text{ and } B) = 0$

Sit down/Stand up

On/off

Turn Right/Turn Left

Head/Tail

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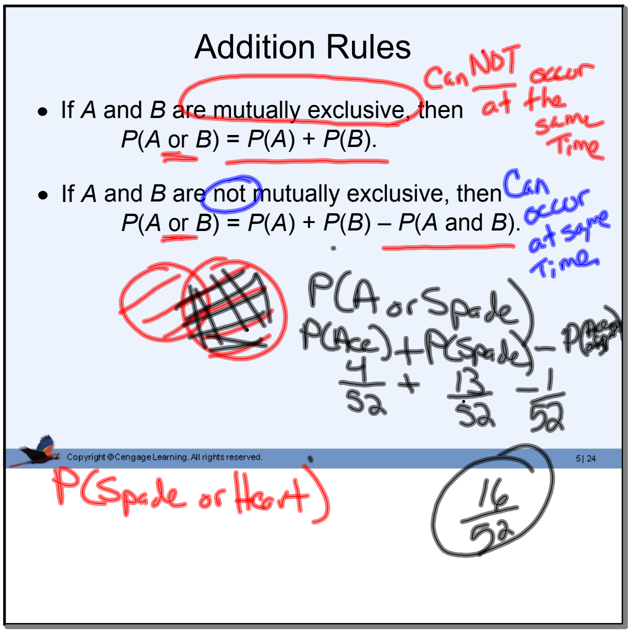

Addition Rules

- If *A* and *B* are mutually exclusive, then
  $P(A \text{ or } B) = P(A) + P(B)$.
- If *A* and *B* are not mutually exclusive, then
  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$.

Can NOT occur at the same Time

Can occur at same Time

P(A or Spade)

P(Ace) + P(Spade) − P(Ace of spade)

$\frac{4}{52} + \frac{13}{52} - \frac{1}{52}$

P(Spade or Heart)

$\frac{16}{52}$

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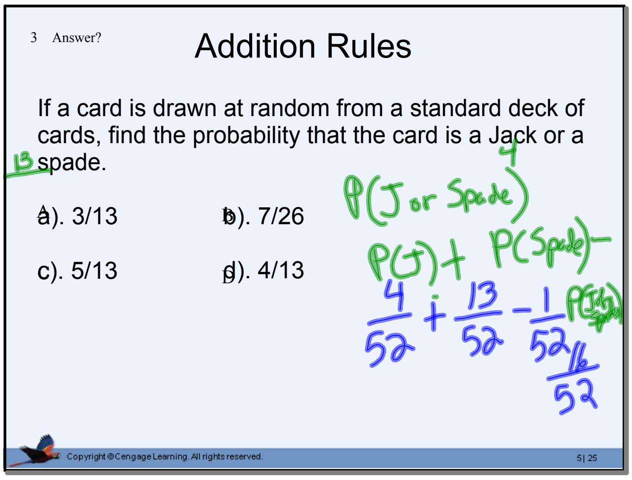

3 Answer?

Addition Rules

If a card is drawn at random from a standard deck of cards, find the probability that the card is a Jack or a spade.

a). 3/13 b). 7/26

c). 5/13 d). 4/13

13 4

P(J or Spade)

P(J) + P(Spade) − P(J of spade)

$\frac{4}{52} + \frac{13}{52} - \frac{1}{52}$

$\frac{16}{52}$

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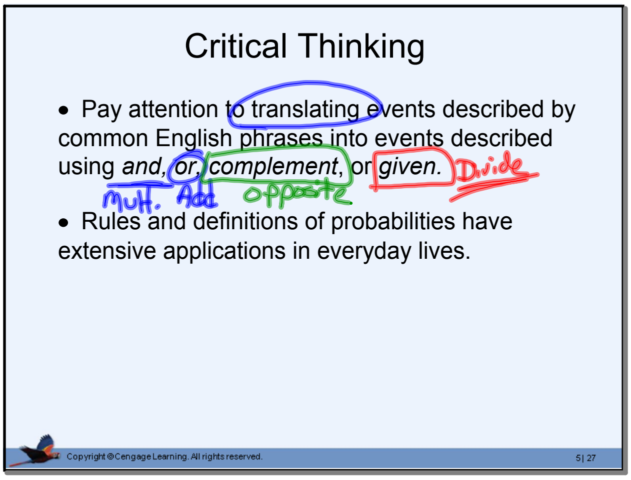

Critical Thinking

- Pay attention to translating events described by common English phrases into events described using *and*, *or*, *complement*, or *given*.
- Rules and definitions of probabilities have extensive applications in everyday lives.

Mult. Add opposite Divide

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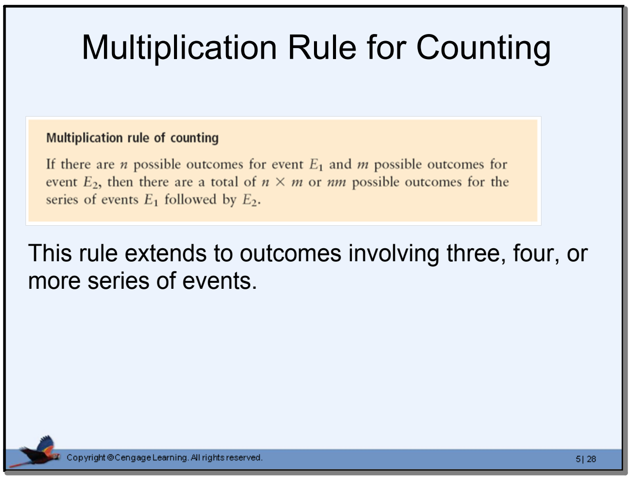
Get out 1) pg. 164 - 165 to correct.
2) 5.2 vocabulary

Let's do the fill in the blank FIRST!!

① 5.2 Vocab Wed
② Review 5.1-5.2 Review
Thur ③ Pp. 180-184 1-8, 13, 14, 17, 18, 20 & 21
May 4th ④ 5.3 Vocab

May 1-7:11 AM



Multiplication Rule for Counting

Multiplication rule of counting

If there are n possible outcomes for event E_1 and m possible outcomes for event E_2, then there are a total of $n \times m$ or nm possible outcomes for the series of events E_1 followed by E_2.

This rule extends to outcomes involving three, four, or more series of events.

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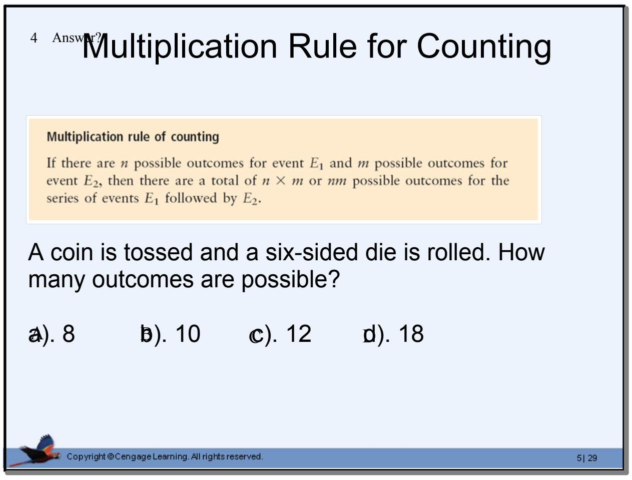

4 Answer?

Multiplication Rule for Counting

Multiplication rule of counting

If there are n possible outcomes for event E_1 and m possible outcomes for event E_2, then there are a total of $n \times m$ or nm possible outcomes for the series of events E_1 followed by E_2.

A coin is tossed and a six-sided die is rolled. How many outcomes are possible?

a). 8 b). 10 c). 12 d). 18

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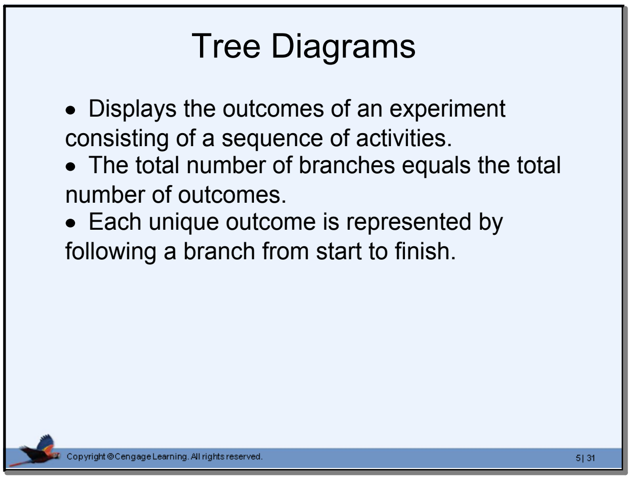

Tree Diagrams

- Displays the outcomes of an experiment consisting of a sequence of activities.
- The total number of branches equals the total number of outcomes.
- Each unique outcome is represented by following a branch from start to finish.

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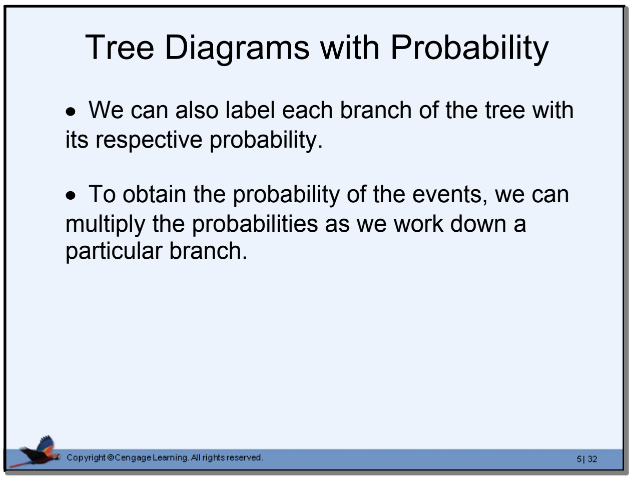

Tree Diagrams with Probability

- We can also label each branch of the tree with its respective probability.
- To obtain the probability of the events, we can multiply the probabilities as we work down a particular branch.

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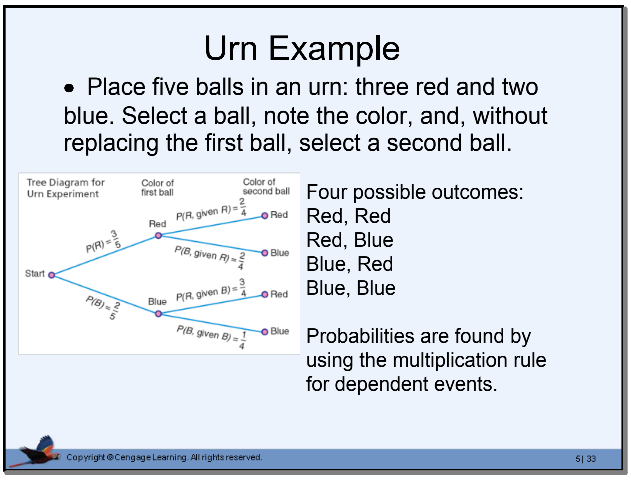

Urn Example

- Place five balls in an urn: three red and two blue. Select a ball, note the color, and, without replacing the first ball, select a second ball.

Four possible outcomes:
Red, Red
Red, Blue
Blue, Red
Blue, Blue

Probabilities are found by using the multiplication rule for dependent events.

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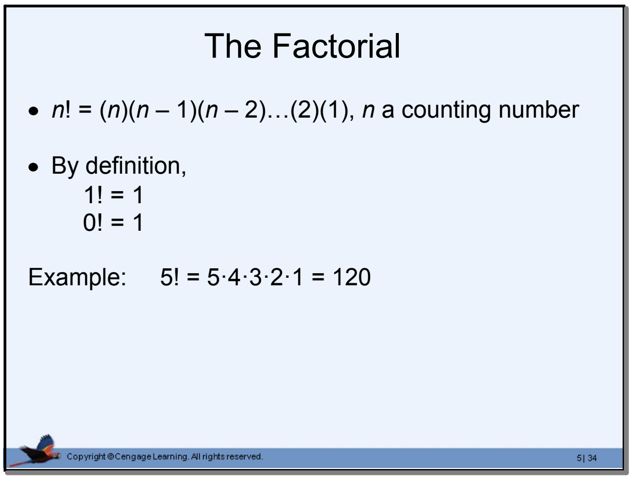

The Factorial

- *n*! = (*n*)(*n* – 1)(*n* – 2)…(2)(1), *n* a counting number
- By definition,
  - 1! = 1
  - 0! = 1

Example: 5! = 5·4·3·2·1 = 120

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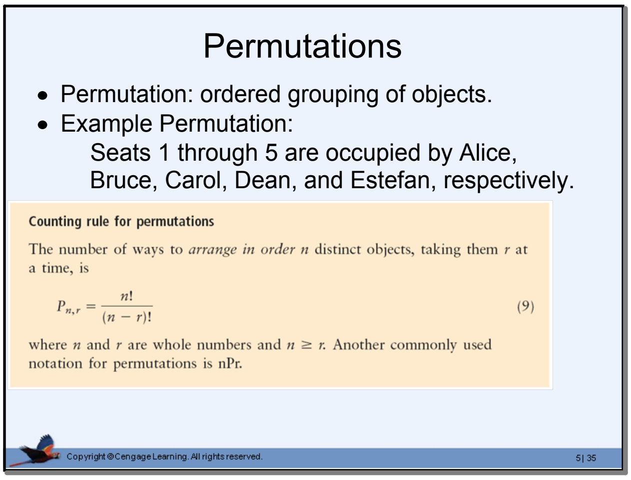

Permutations

- Permutation: ordered grouping of objects.
- Example Permutation:
  - Seats 1 through 5 are occupied by Alice, Bruce, Carol, Dean, and Estefan, respectively.

Counting rule for permutations

The number of ways to *arrange in order* *n* distinct objects, taking them *r* at a time, is

$$P_{n,r} = \frac{n!}{(n-r)!} \qquad (9)$$

where n and r are whole numbers and $n \geq r$. Another commonly used notation for permutations is nPr.

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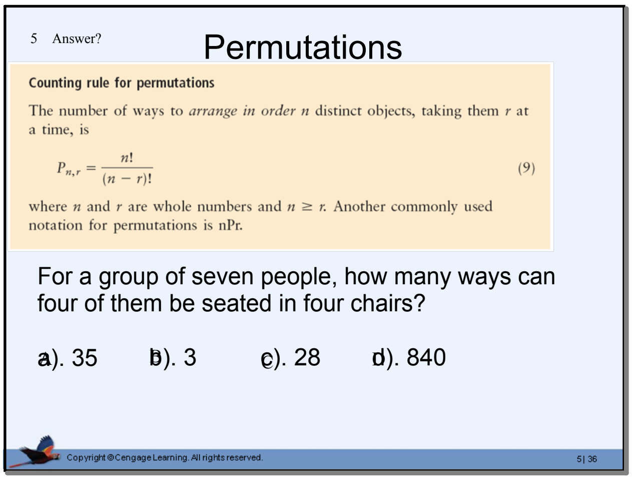

5 Answer?

Permutations

Counting rule for permutations

The number of ways to *arrange in order* n distinct objects, taking them r at a time, is

$$P_{n,r} = \frac{n!}{(n-r)!} \qquad (9)$$

where n and r are whole numbers and $n \geq r$. Another commonly used notation for permutations is nPr.

For a group of seven people, how many ways can four of them be seated in four chairs?

a). 35 b). 3 c). 28 d). 840

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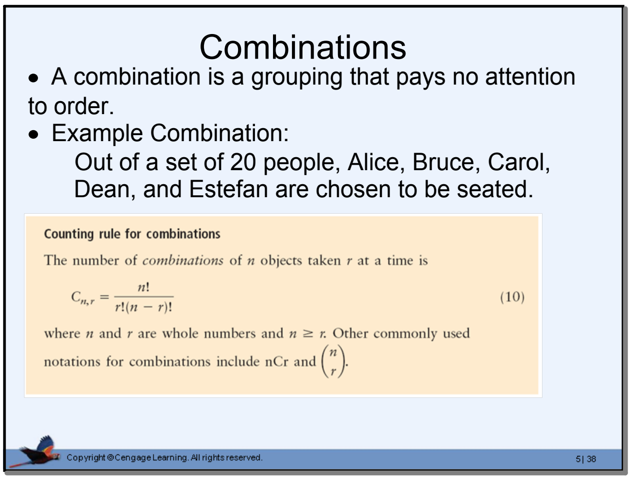

Combinations

- A combination is a grouping that pays no attention to order.
- Example Combination:
  Out of a set of 20 people, Alice, Bruce, Carol, Dean, and Estefan are chosen to be seated.

Counting rule for combinations

The number of *combinations* of n objects taken r at a time is

$$C_{n,r} = \frac{n!}{r!(n-r)!} \qquad (10)$$

where n and r are whole numbers and $n \geq r$. Other commonly used notations for combinations include nCr and $\binom{n}{r}$.

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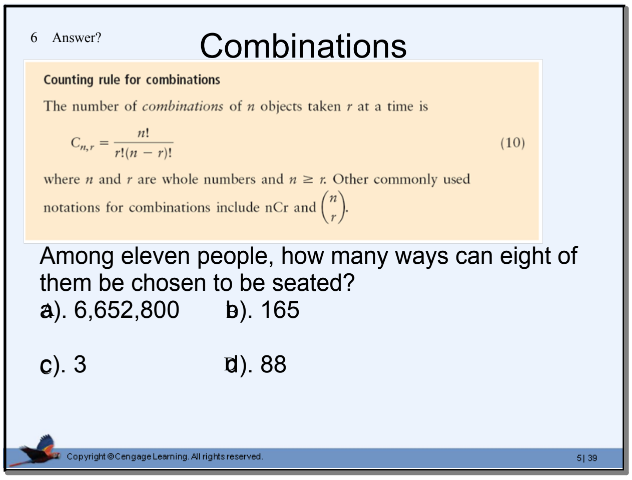

6 Answer?

Combinations

Counting rule for combinations

The number of *combinations* of n objects taken r at a time is

$$C_{n,r} = \frac{n!}{r!(n-r)!} \qquad (10)$$

where n and r are whole numbers and $n \geq r$. Other commonly used notations for combinations include nCr and $\binom{n}{r}$.

Among eleven people, how many ways can eight of them be chosen to be seated?

a). 6,652,800 b). 165

c). 3 d). 88

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