Homework Review - 13.3

④   AB

~~BA~~

⑧ $_9C_9 = \dfrac{9!}{(9-9)!\,9!} = \dfrac{9!}{9!} = 1$

⑩ $_5P_5 = \dfrac{5!}{(5-5)!} = \dfrac{5!}{1} = 120$

⑫ $_{15}C_8 = \dfrac{15!}{7!\,8!} = \dfrac{\overset{5\cdot 3\cdot 2}{15\cdot 14\cdot 13\cdot 12\cdot 11\cdot 10\cdot 9\cdot 8}}{8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2} = 5\cdot 13\cdot 11\cdot 9 = \underline{6435}$

⑮ $_{13}C_3 = \dfrac{13!}{10!\,3!} = \dfrac{13 \cdot \overset{2}{\cancel{12}} \cdot 11}{\cancel{3 \cdot 2}} = 286$

⑳ $\boxed{_6P_r}$ more

$_6C_r$

ABC

$$\boxed{23} \quad {}_6C_2 = \frac{6!}{4!\,2!} = \frac{\cancel{6}\cdot 5}{\cancel{2}} = 15$$

$$\quad {}_8C_3 = \frac{8!}{5!\,3!} = \frac{8\cdot 7\cdot \cancel{6}}{\cancel{3\cdot 2}} = 56$$

$$15 \cdot 56 = 840$$

$$10\cdot 56 + 5\cdot 56$$

24) $_7C_3 = \dfrac{7!}{4!\,3!} = \dfrac{7 \cdot 6 \cdot 5}{3 \cdot 2} = 35$

S M T W Th F S

$_6C_2 = \dfrac{6!}{4!\,2!} = \dfrac{3 \cdot 6 \cdot 5}{2} = 15$

$P(3\text{ days}, 1 = Fri.) = \dfrac{15}{35} = \dfrac{3}{7}$

Finding Conditional Probabilities:

A and B

A or B

A given B

roll a die – get a 2 or and odd #

roll a die – get a 4 or an even number

What is a conditional probability?

How do we find the number of possible outcomes?
- mutually exclusive events

events that can't **both** happen

- overlapping events

can potentially both happen

Counting Mutually Exclusive Events

roll a 3: $\dfrac{1}{}$

roll an even #: $+\dfrac{3}{4}$

total:

How many ways can one event happen?

How many ways can the other event happen?

Add them together ...

Example: Roll a 3 or an even #

Counting Overlapping Events

roll odd: 3

roll prime: + 4

total: 7

roll both: -3

(4)

How many ways can one event happen?

How many ways can the other event happen?

Add together and subtract the number of ways BOTH events can happen ...

Example: Roll an odd # or a prime #

1, 3, 5   1, 2, 3, 5

1 2 3 4 5 6

Finding the Probability of A or B:

$$P(A \text{ or } B) = \frac{\#}{\text{Sample Space}}$$

$$P(2 \text{ or odd}) = \frac{4}{6}$$

$$= \frac{2}{3}$$

How many ways can the condition be met (mutually exclusive or overlapping...)? $1+3=4$

How many total outcomes are there? 6

Use the probability formula.

Example: Roll a 2 or an odd #

In Exercises 1–4, you draw a card from a bag that contains 4 yellow cards numbered 1–4 and 5 blue cards numbered 1–5. Tell whether the events A *and* B are *mutually exclusive* or *overlapping*. Then find P(A *or* B).

1. **Event A:** You choose a card with an even number. 4
   O
   Event B: You choose a number 4 card. 2
   both: 2   4 + 2 − 2 = 4

2. **Event A:** You choose a yellow card. 4
   M
   Event B: You choose a number 5 card. 1
   4 + 1 = 5

3. **Event A:** You choose a blue number 3 card. 1
   O
   Event B: You choose a blue card. 5
   both: 1   1 + 5 − 1 = 5

4. **Event A:** You choose a card with an odd number. 5
   O
   Event B: You choose a blue card. 5
   both: 3   5 + 5 − 3 = 7

sample space: 9

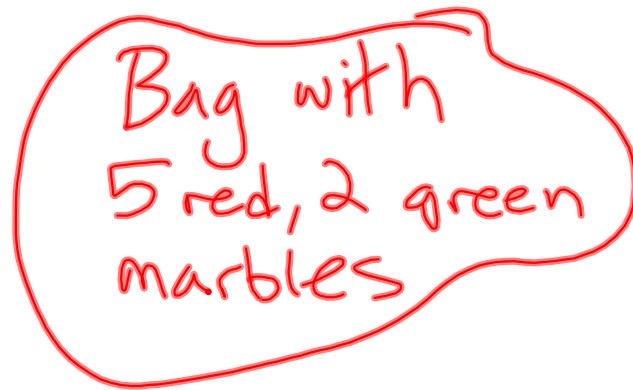① $\frac{4}{9}$ ② $\frac{5}{9}$ ③ $\frac{5}{9}$ ④ $\frac{7}{9}$

Independent vs. Dependent Events

Independent event: one event has no effect on whether the other is likely to happen

 ex. pick a marble & replace

Dependent event: one event CHANGES how likely another is to occur

 ex. pick a marble; don't replace

Bag with 5 red, 2 green marbles

Finding the Probability of A and B:

use logic —
generally: independent if
you replace
dependent if you
don't replace

Are the events independent or
dependent?

Independent:
P(A and B) = P(A) * P(B)

5 red, 2 green

Dependent:
P(A and B) = P(A) * P(B given A)

(A) pick a green
marble

Example - marbles in a bag!

(B) pick a red marble

WITH replacement: independent events

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

$$\frac{2}{7} \cdot \frac{5}{7} = \frac{10}{49}$$

WITHOUT replacement: dependent events

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

5 red   2 green $\frac{2}{7} \cdot \frac{5}{6} = \frac{10}{42}$

5 red   1 green

A bag contains 6 red balls and 5 green balls. You randomly draw one ball, replace it, and randomly draw a second ball.

Event A: The first ball is green.

Event B: The second ball is green.

You write each of the letters of the word BRILLIANT on pieces of paper and place them in a bag. You randomly draw one letter, do not replace it, then randomly draw a second letter.

Event A: The first letter is an L.

Event B: The second letter is a T.

Homework:

p. 864, 2-20 even, 23, 24