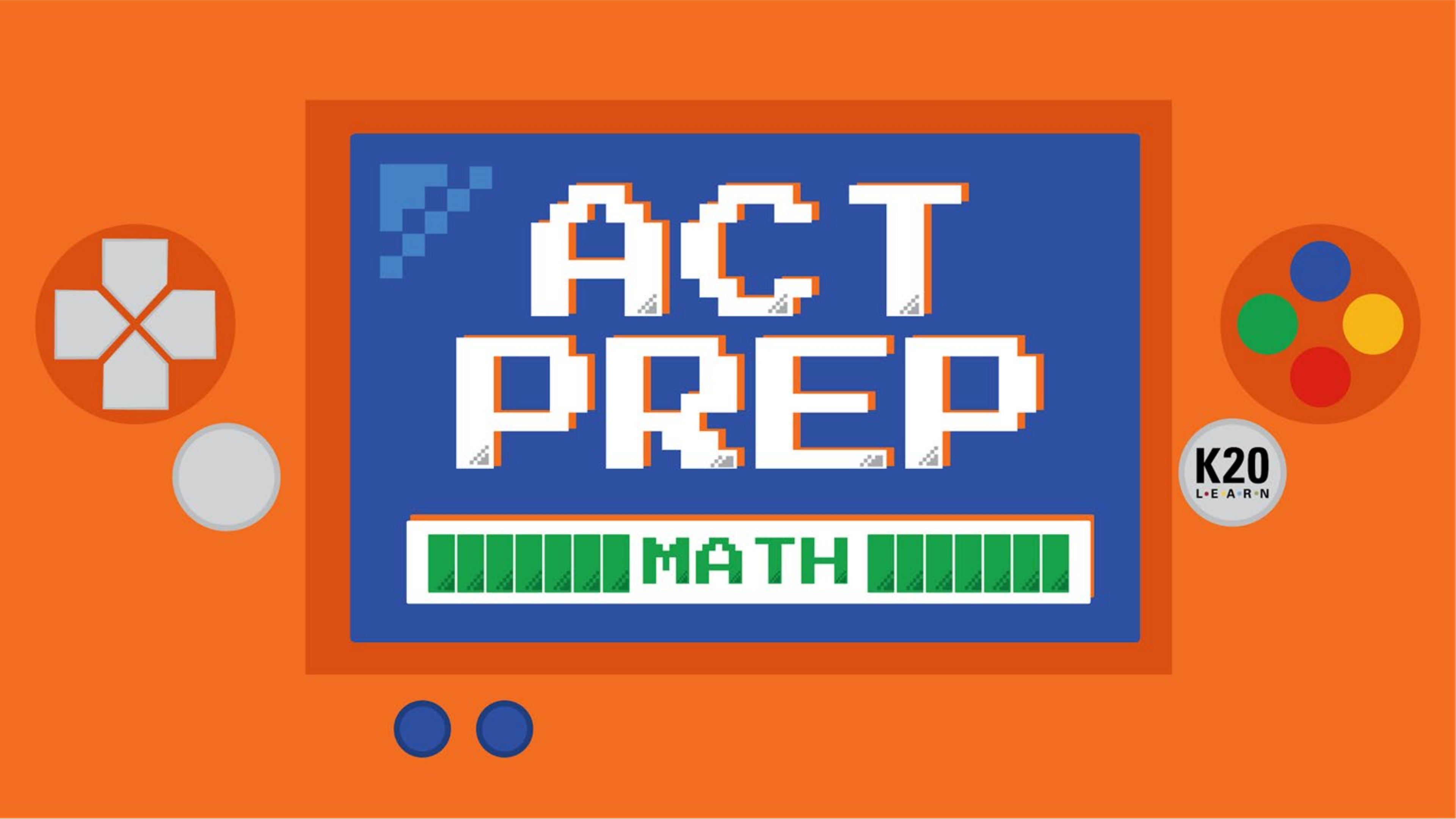
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Power Up: Math ACT Prep, Week 4

Probability

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Bell Ringer: Question 1

What is the likelihood of guessing ***correctly*** on a question from the math portion of the ACT?

Bell Ringer: Question 2

What is the likelihood of guessing ***incorrectly*** on a question from the math portion of the ACT?

Bell Ringer: Question 3

- Does the probability of guessing ***correctly*** increase or decrease if you are guessing from fewer choices?
- In other words, if you could eliminate some options, would the probability of guessing ***correctly*** increase or decrease?

Essential Question

How can I increase my ACT score?

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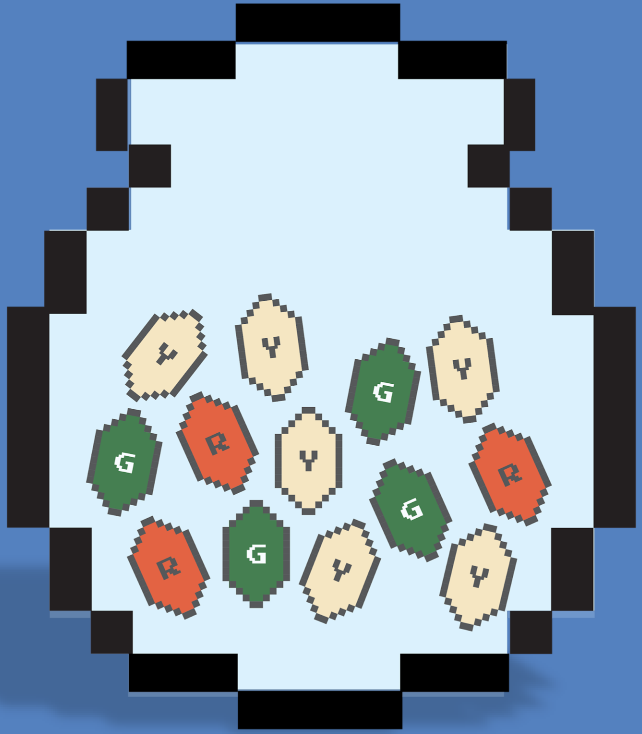
Learning Objectives

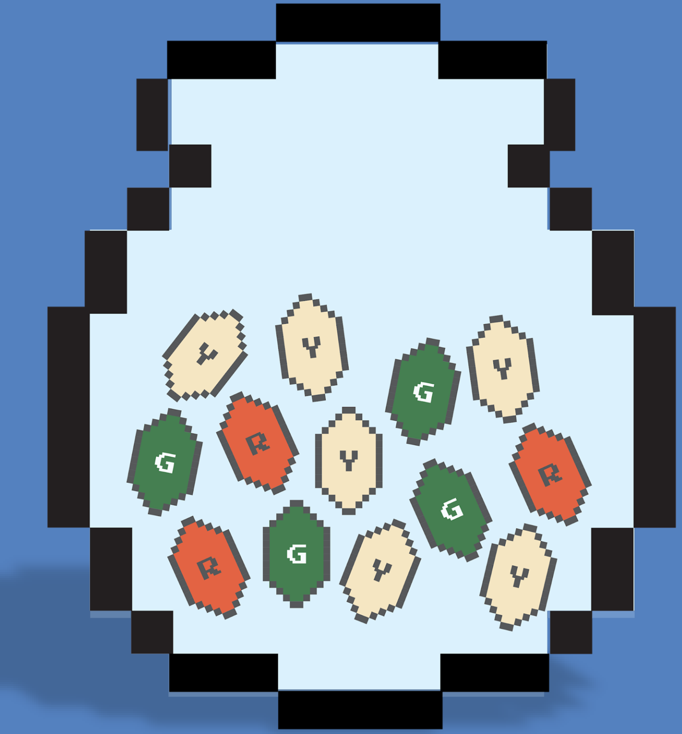
- Determine the probability of an event and the probability of its complement.
- Use a Venn diagram to calculate probability.
- Apply the concept of probability to unique situations.

Probability: The Scientific Study of Uncertainty



- **<u>outcomes</u>:** the results of an experiment
    - <u>example</u>: drawing a gem from a bag

Probability: The Scientific Study of Uncertainty



- **event:** a collection of outcomes; usually represented with capital letters
  - example: Y = drawing yellow gems from a bag

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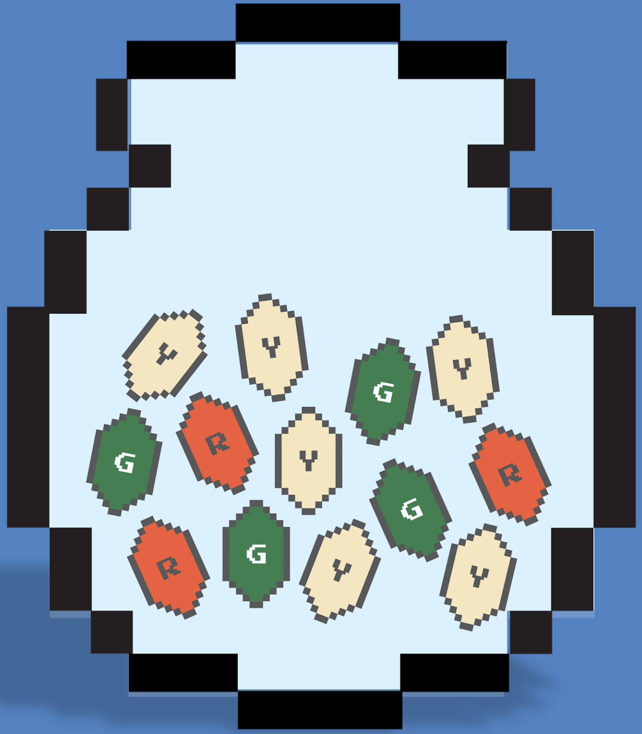
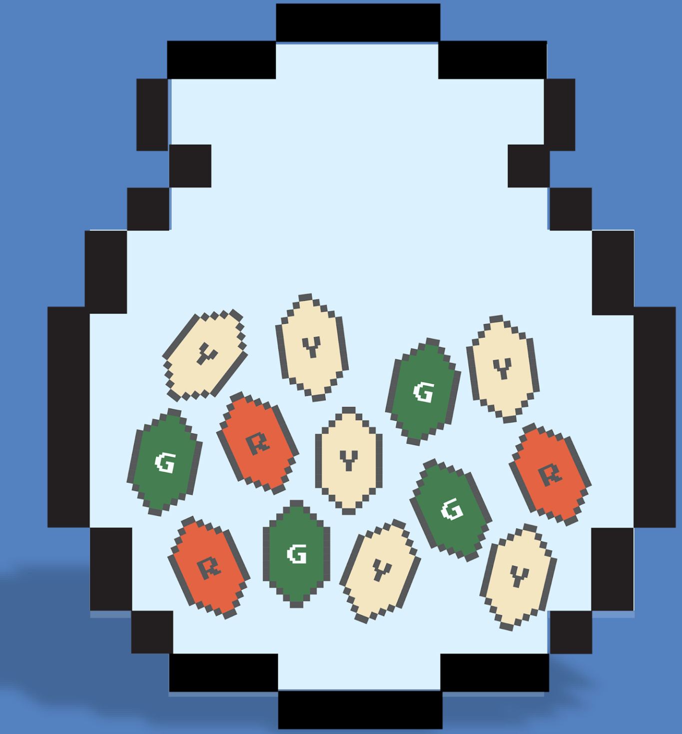
Probability: The Scientific Study of Uncertainty



- **probability:** the likelihood an event will happen
  - example: The likelihood of drawing a yellow gem, $P(Y)$, from a bag is $6/13$.

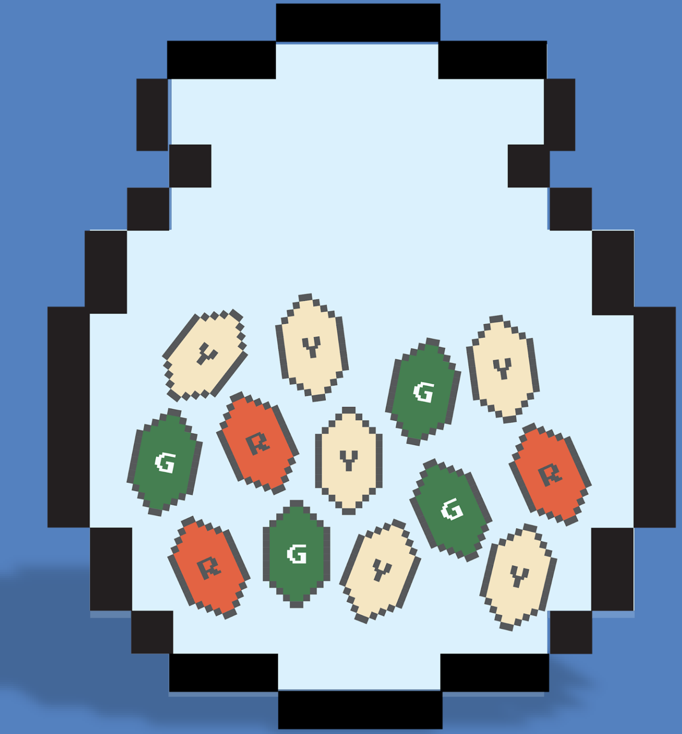
$$P(Y) = \frac{6}{13}$$

Probability: The Scientific Study of Uncertainty

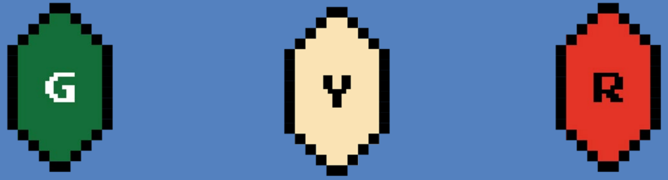


- Events are **<u>mutually exclusive</u>** if the events cannot occur at the same time.
  - Can you draw one gem from the bag that is both green and red? No.

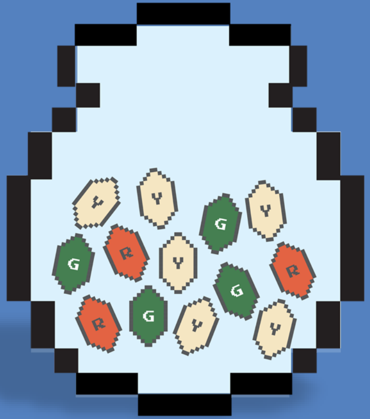
Mutually Exclusive Events



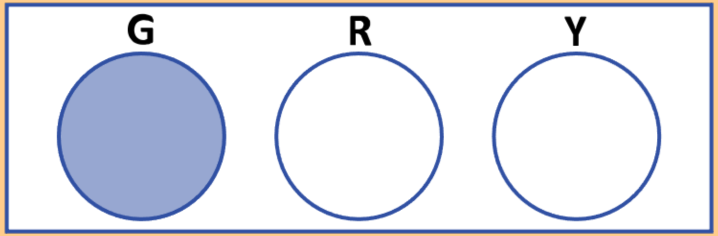
- Let G = drawing a green gem from the bag.
- How many ways can each event occur? (drawing each colored gem)



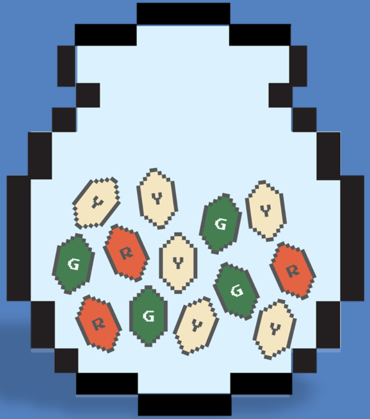
Mutually Exclusive Events



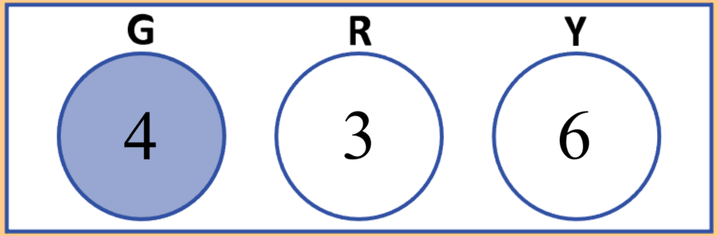
- Probability of Event A
- $P(A) = \dfrac{\textit{number of ways event A can occur}}{\textit{total number of possible outcomes}}$

What is the probability of drawing a green gem?	$P(G) =$	**Total Gems: ___** 

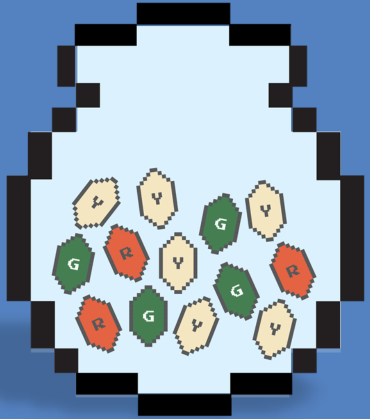
Mutually Exclusive Events



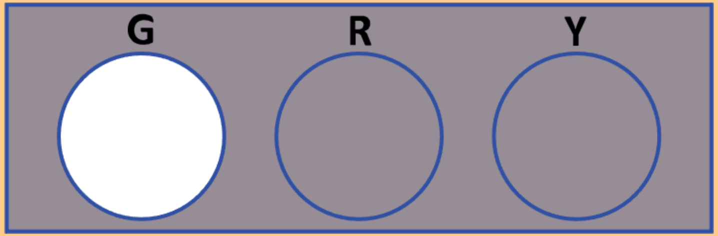
- Probability of Event A
- $$P(A)=\frac{\textit{number of ways event A can occur}}{\textit{total number of possible outcomes}}$$

What is the probability of drawing a green gem?	$P(G)=\frac{4}{13}$	Total Gems: $\underline{13}$ 

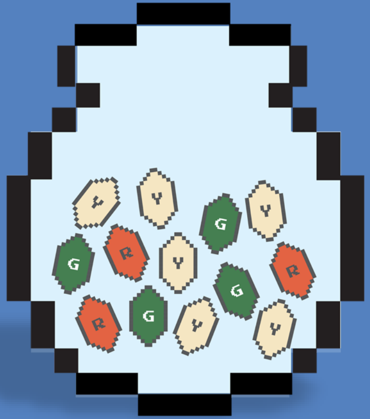
Mutually Exclusive Events



- Probability of the complement of event A
- $P(A') = 1 - P(A)$

What is the probability of drawing a gem that is not green?	$P(G') =$	Total Gems: ___ 

Mutually Exclusive Events

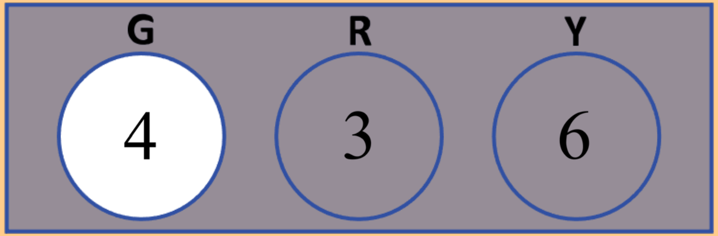


- Probability of the Complement of Event A
- $P(A') = 1 - P(A)$

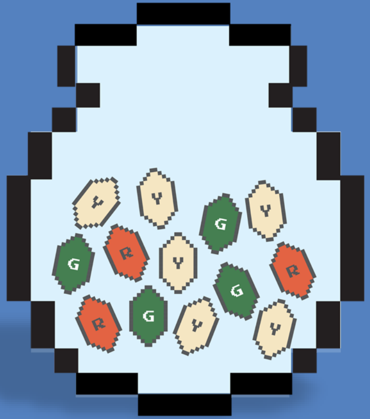
What is the probability of drawing a gem that is not green?

$$P(G') = 1 - \frac{4}{13} = \frac{9}{13}$$

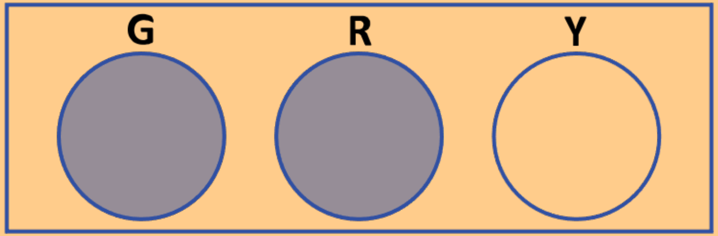
Total Gems: $\underline{13}$



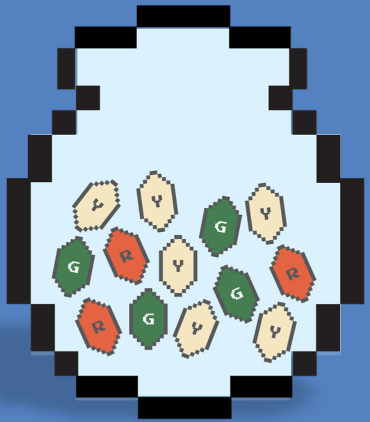
Mutually Exclusive Events



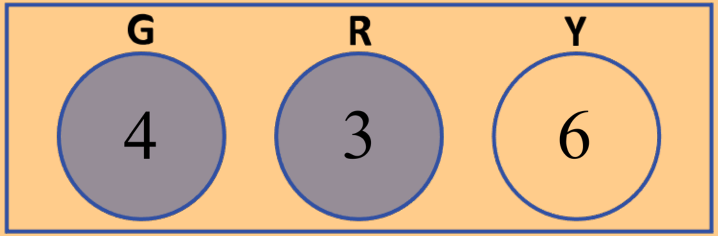
- Probability of Event A or Event B
- $P(A \text{ or } B) = P(A) + P(B)$

What is the probability of drawing a green *or* red gem?	$P(G \text{ or } R) =$	Total Gems: ___ 

Mutually Exclusive Events

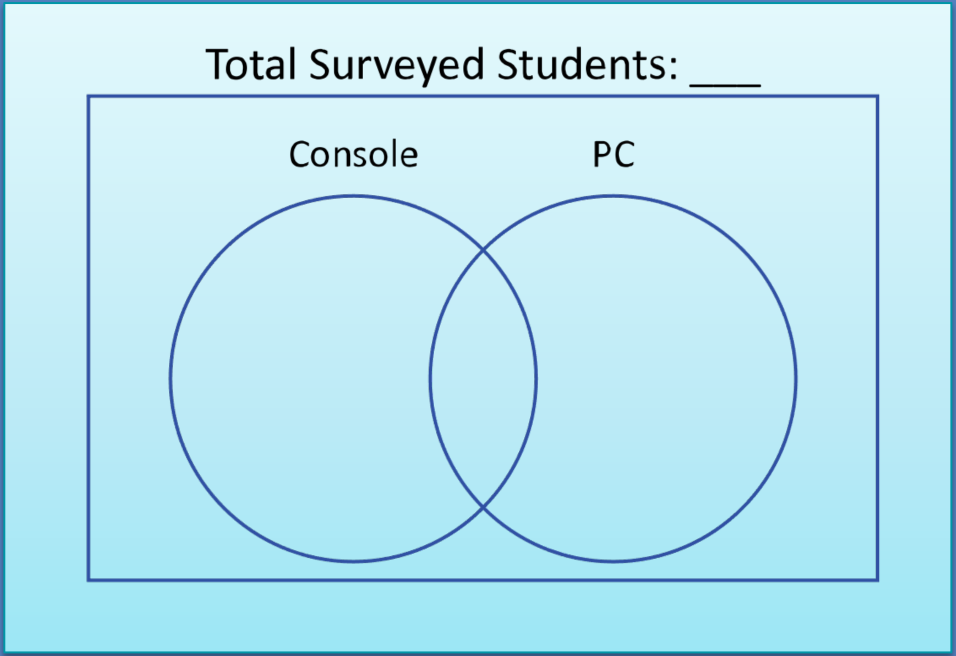


- Probability of Event A or Event B
- $P(A \text{ or } B) = P(A) + P(B)$

What is the probability of drawing a green *or* red gem?	$P(G \text{ or } R) = P(G) + P(R)$ $= \frac{4}{13} + \frac{3}{13} = \frac{7}{13}$	Total Gems: 13 

NOT Mutually Exclusive Events

A survey asked 100 students on what device they played video games. The results showed that 50 students play video games on their console, 45 students play video games on their PC, and 15 students play video games on their console and PC.



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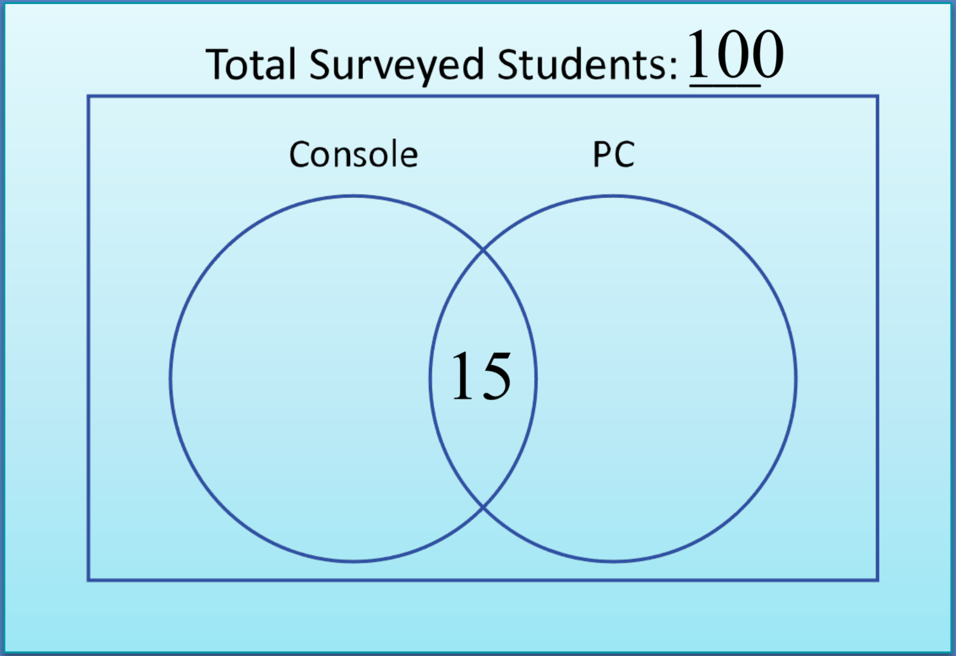

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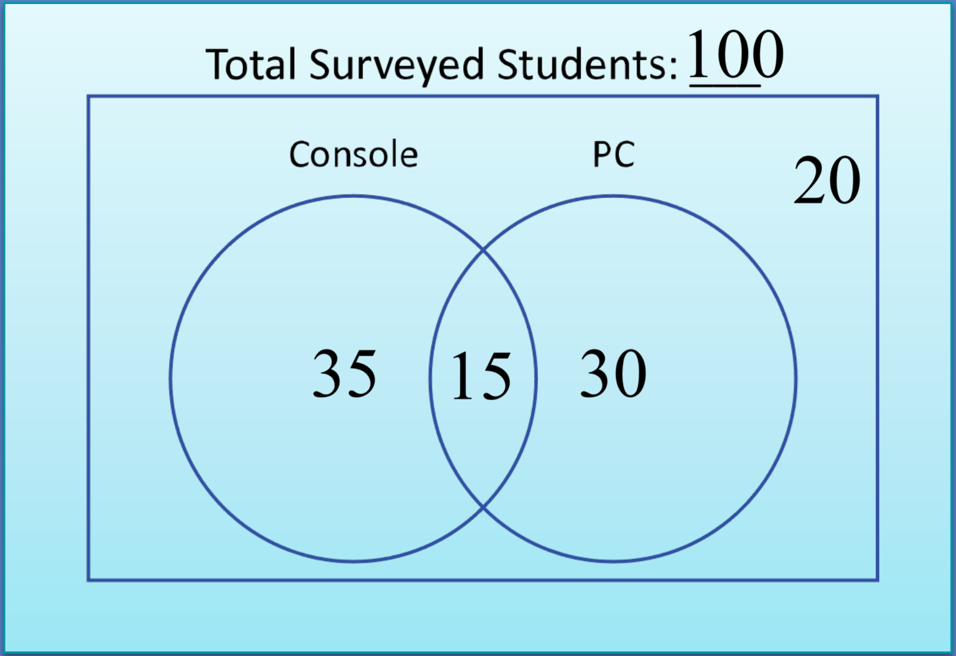
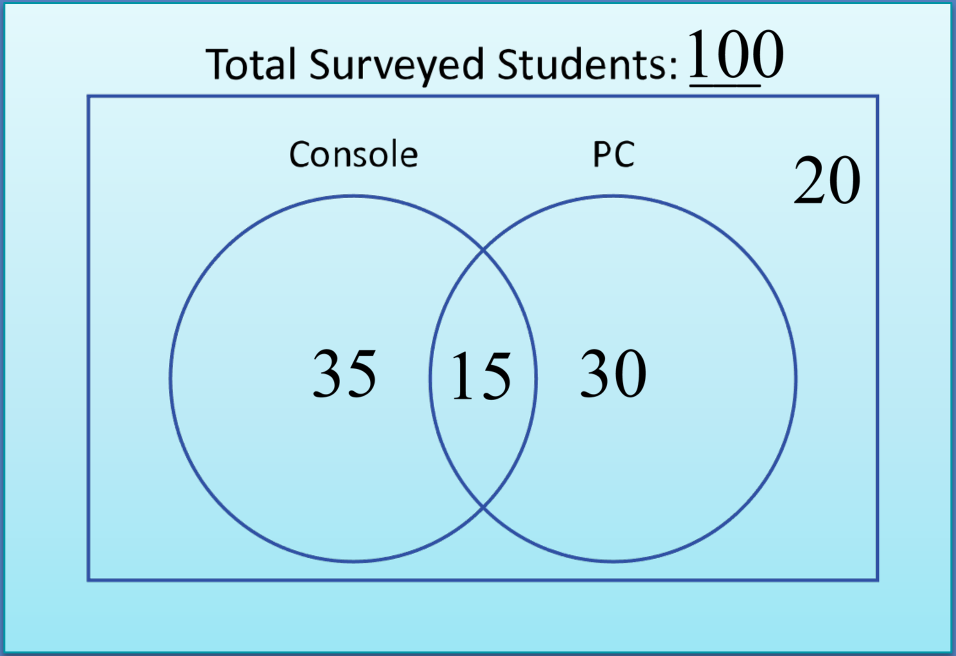
A survey asked 100 students on what device they played video games. The results showed that 50 students play video games on their console, 45 students play video games on their PC, and 15 students play video games on their console and PC.



NOT Mutually Exclusive Events

1) …probability …neither …console nor PC?

$$P(neither) = \frac{20}{100} = 0.2$$

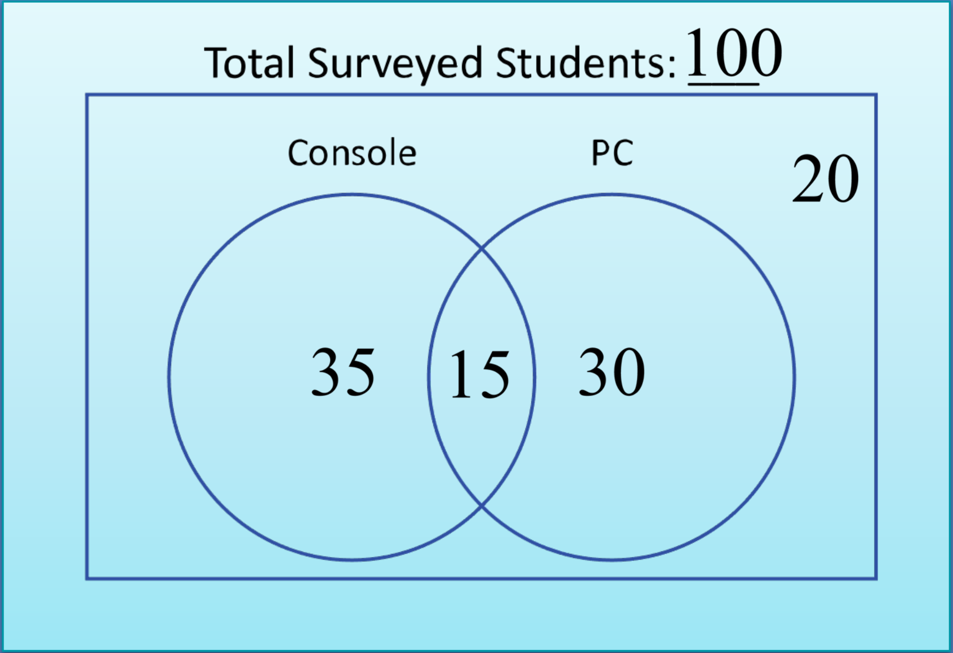


NOT Mutually Exclusive Events

2) ...probability ...either ...console or PC?

$$P(C\ or\ PC) = \frac{35+15+30}{100}$$

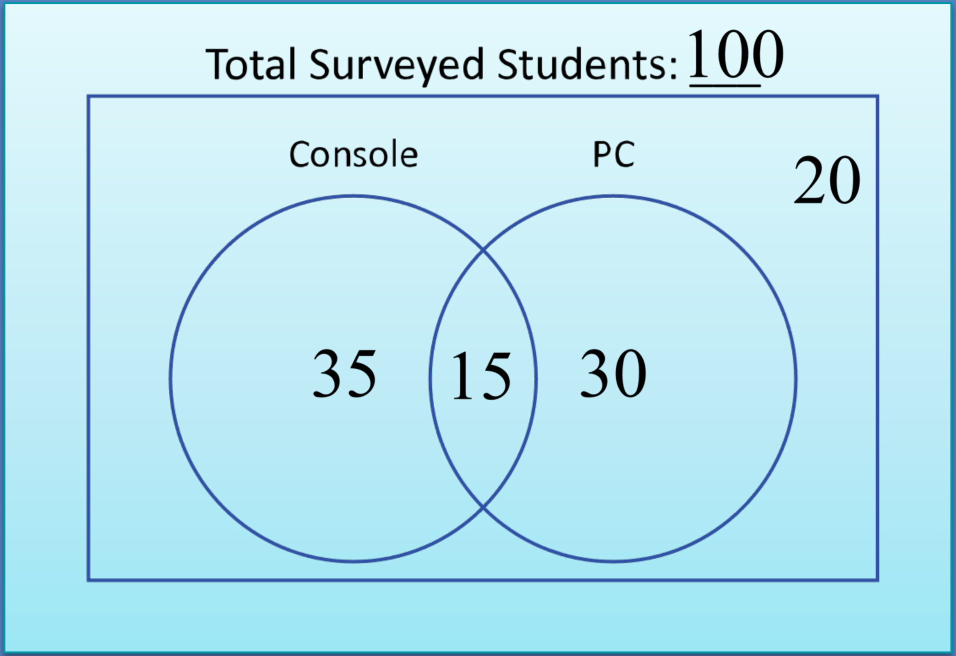
$$= \frac{80}{100} = 0.8$$



NOT Mutually Exclusive Events

3) …probability …either console or PC, but not both?

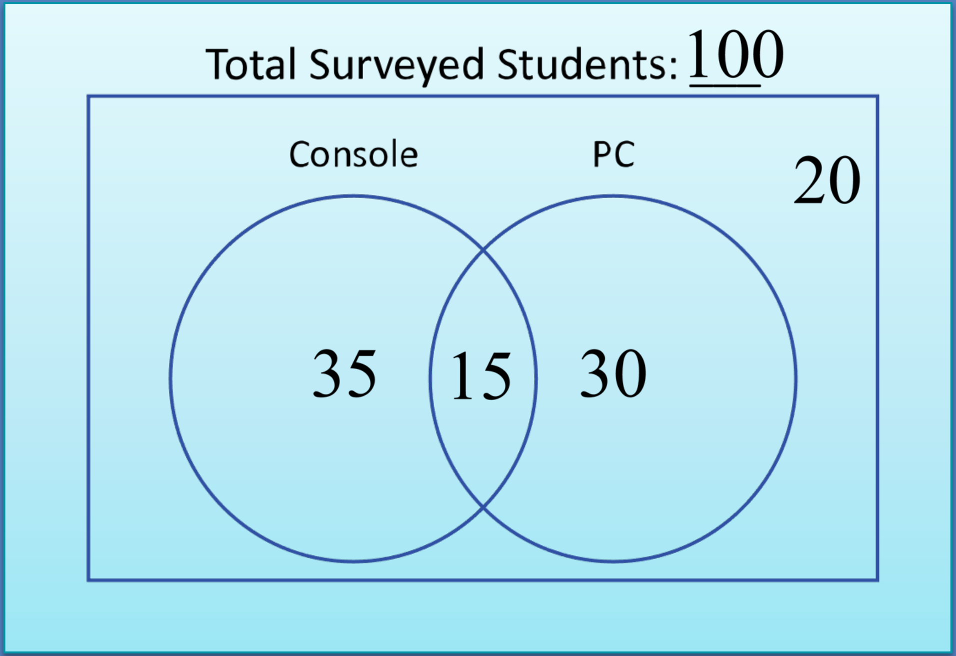
$$P = \frac{35+30}{100} = \frac{65}{100} = 0.65$$



NOT Mutually Exclusive Events

4) …probability …not …console?

$$P = \frac{30 + 20}{100} = \frac{50}{100} = 0.5$$



Test-Taking Tip

What should my final answer look like?

- Glance at the multiple-choice options:
  - Is the test asking for a decimal, a fraction, a percentage, etc.?
  - Do I need to simplify my work?

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Exit Ticket

Leave your paper face down until the timer starts.

[5-Minute Timer]

Exit Ticket (Answers)

1) C
2) G
3) E
4) H
5) E

Remember, it is 100% okay to not get 100% of the questions right on the ACT.

What was your percentage goal from week 1?

Exit Ticket (Solution 1)

A jar contains 20 tokens, 2 red, 8 yellow, 4 green, and 6 blue. What is the probability of randomly selecting 1 token that is not yellow?

$$P(not\ \ yellow) = \frac{12}{20} = \boxed{\frac{3}{5}}$$

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ACT PREP

Exit Ticket (Solution 2)

A bag contains 8 blue marbles, 5 green marbles, and 9 purple marbles. How many additional blue marbles must be added to the 22 marbles already in the bag so that the probability of randomly drawing a blue marble is $\frac{3}{5}$?

$$now: P(B) = \frac{8}{22}$$

$$goal: P(B) = \frac{8+b}{22+b} = \frac{3}{5}$$

$$\Rightarrow 22 + b = multiple\ of\ 5$$

$$\frac{8+(8)}{22+(8)} = \frac{16}{30} = \frac{8}{15}$$

$$\frac{8+(13)}{22+(13)} = \frac{21}{35} = \frac{3}{5}$$

Exit Ticket (Solution 3)

The probability of Event R will occur is 0.4. The probability that Event T will occur is 0.5. Given that Events R and T are mutually exclusive, what is the probability that Event R or Event T will occur?

$$P(R\ or\ T)=P(R)+P(T)=0.4+0.5=\boxed{0.9}$$

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Exit Ticket (Solution 4)

A 52-card deck contains 4 suits: 13 hearts, 13 diamonds, 13 clubs, and 13 spades. Which of the following expressions gives the probability of drawing, at random and without replacement, a heart on the 1st draw, a club on the 2nd draw, and a heart on the third draw?

$$P(\heartsuit, \clubsuit, \text{then } \heartsuit) = \frac{13}{52} \cdot \frac{13}{(52-1)} \cdot \frac{(13-1)}{(52-2)} = \boxed{\frac{13}{52} \cdot \frac{13}{51} \cdot \frac{12}{50}}$$

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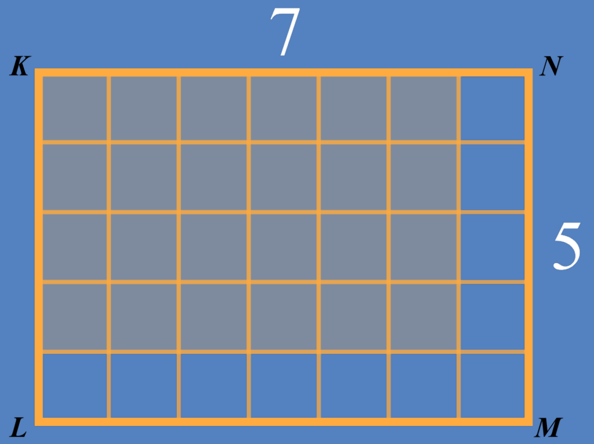
Exit Ticket (Solution 5)

In the figure, all of the small squares are equal in area, and the **area of rectangle $KLMN$ is 1 square unit**. If a ball were thrown at rectangle $KLMN$ and all of the small squares have the same probability of being hit, what is the probability of the ball hitting the shaded region?



$$P = \frac{\text{area of shaded}}{\text{total area}}$$

$$= \frac{\left(\frac{6}{7}\right)\left(\frac{4}{5}\right)}{1} = \boxed{\frac{24}{35}}$$

You Powered Up!

Achievement Unlocked:

Probability

ACT PREP

K20 L•E•A•R•N