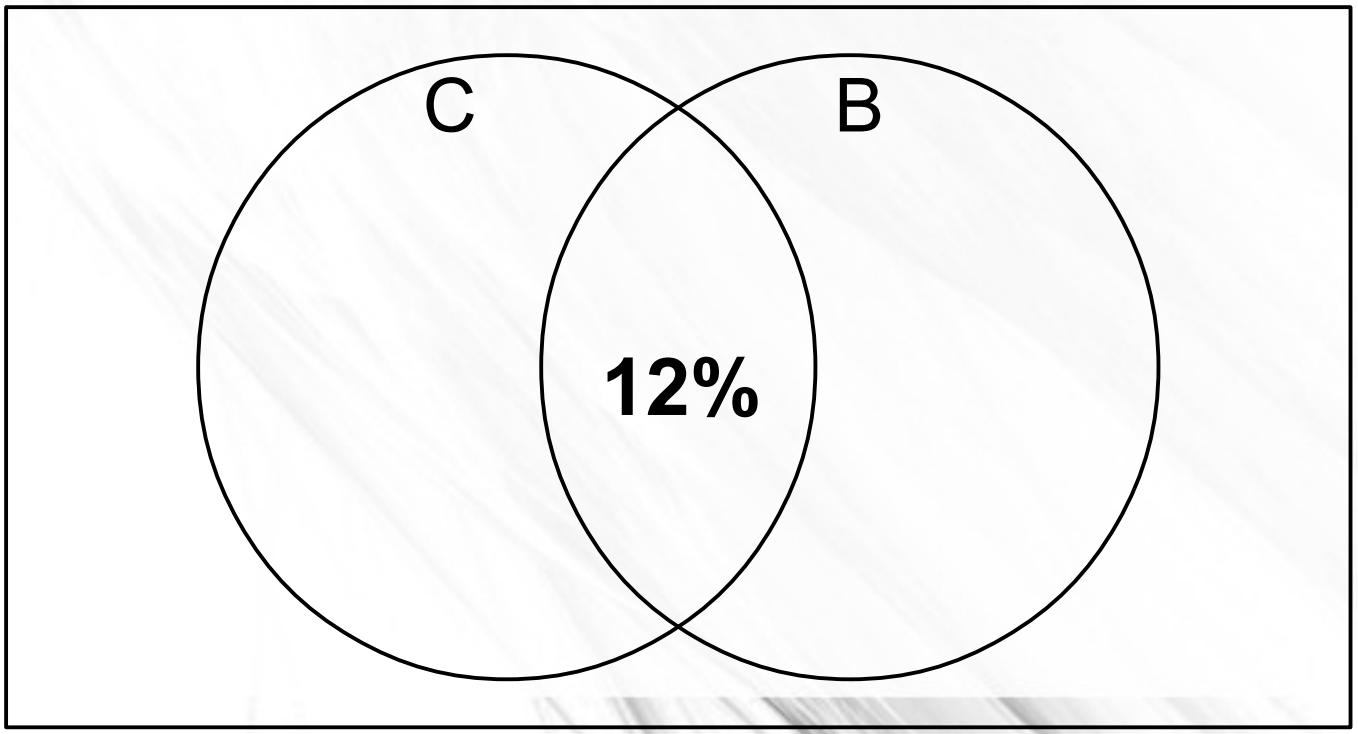
More Probability Problems

- Using the Inclusion-Exclusion Rule to calculate Probabilities (Venn Diagram 2 Areas)
- At a grocery store customers were surveyed: 25% use coupons, 43% bring their own bags, and 12% do both.
- Making a Venn Diagram helps visualize what's going on

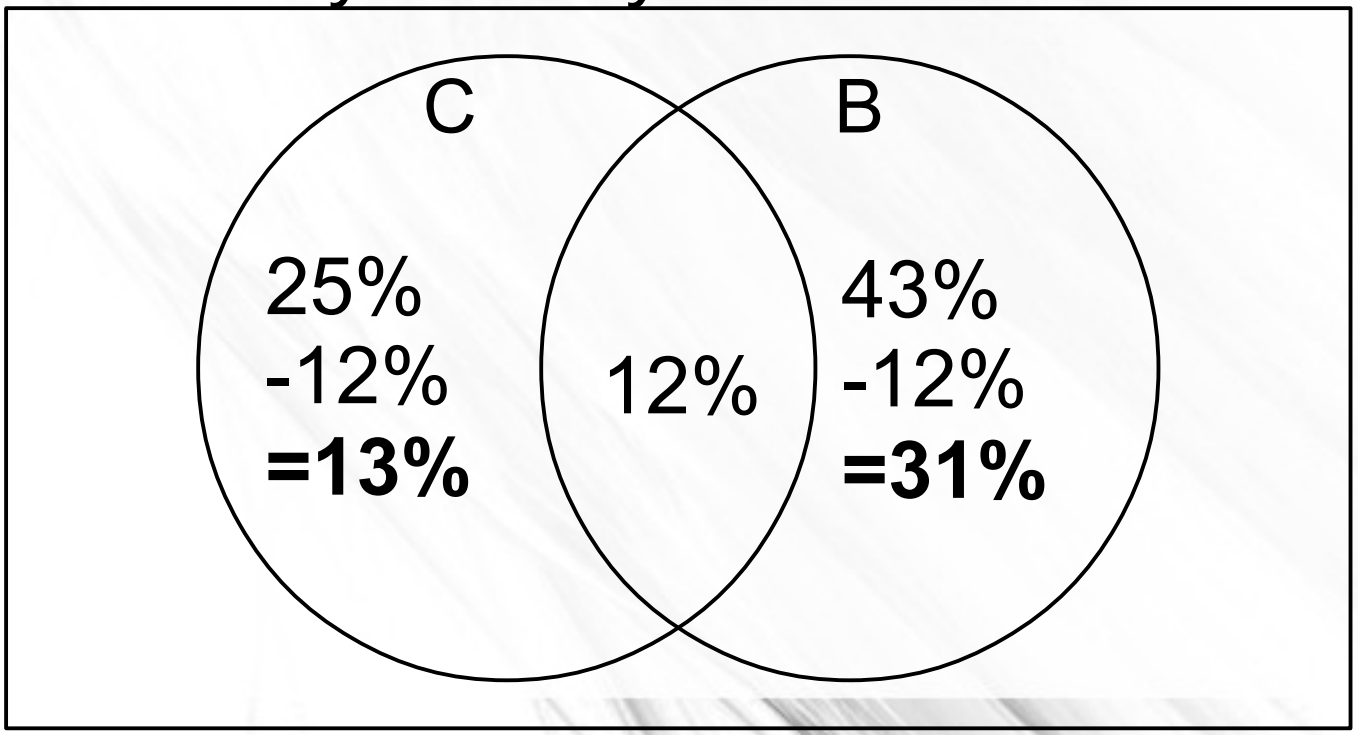
Making the Venn Diagram

- P(Coupon) = 25%, P(Bag)=43%, P(Coupon ∩ Bag) = 12%
- Start with the intersection



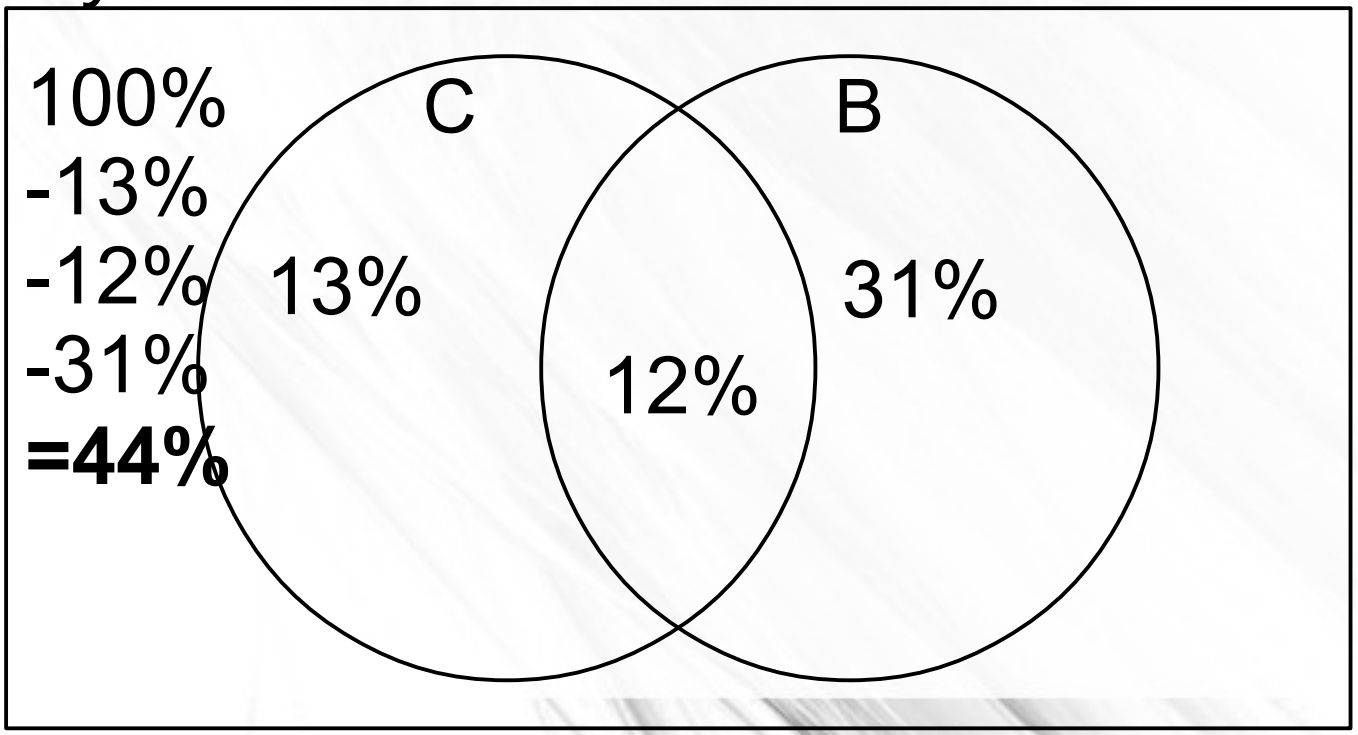
Making the Venn Diagram

- P(Coupon) = 25%, P(Bag)=43%, P(Coupon ∩ Bag) = 12%
- Then work your way out



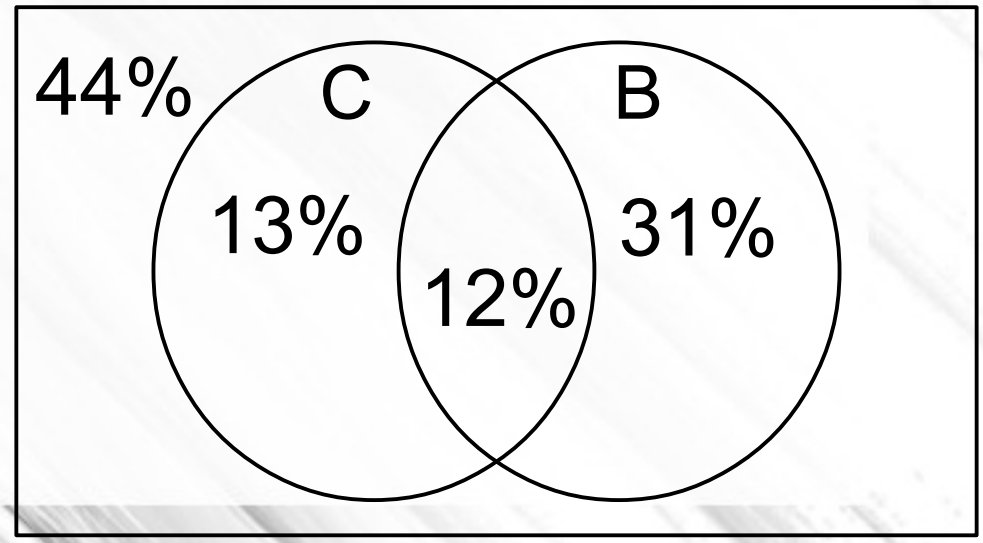
Making the Venn Diagram

- P(Coupon) = 25%, P(Bag)=43%, P(Coupon ∩ Bag) = 12%
- Lastly calculate the % outside the circles



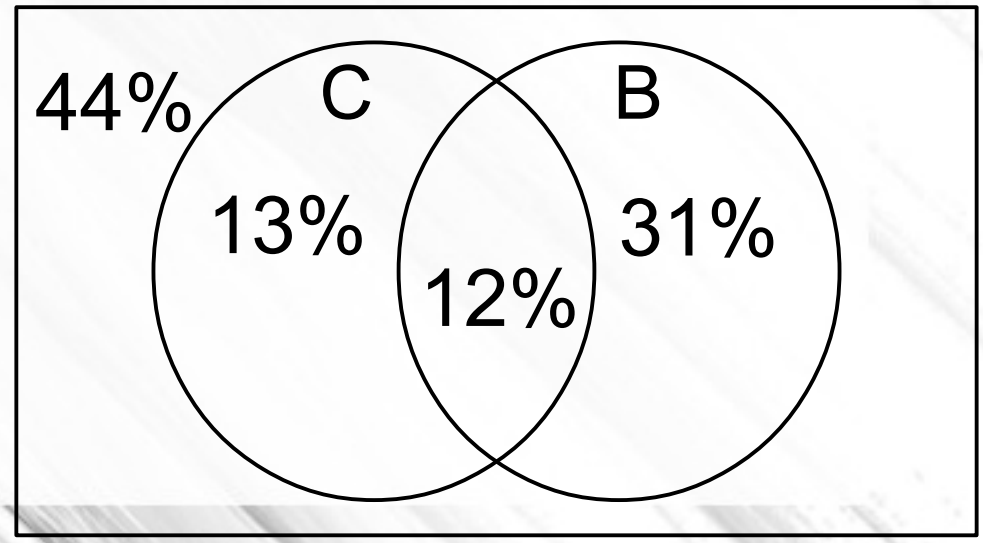
Answering Questions based on the Venn Diagram

- What is the probability a random shopper:
  - Uses coupons but does not bring a bag
  - Uses coupons or brings a bag
  - Doesn't use coupons or bring a bag



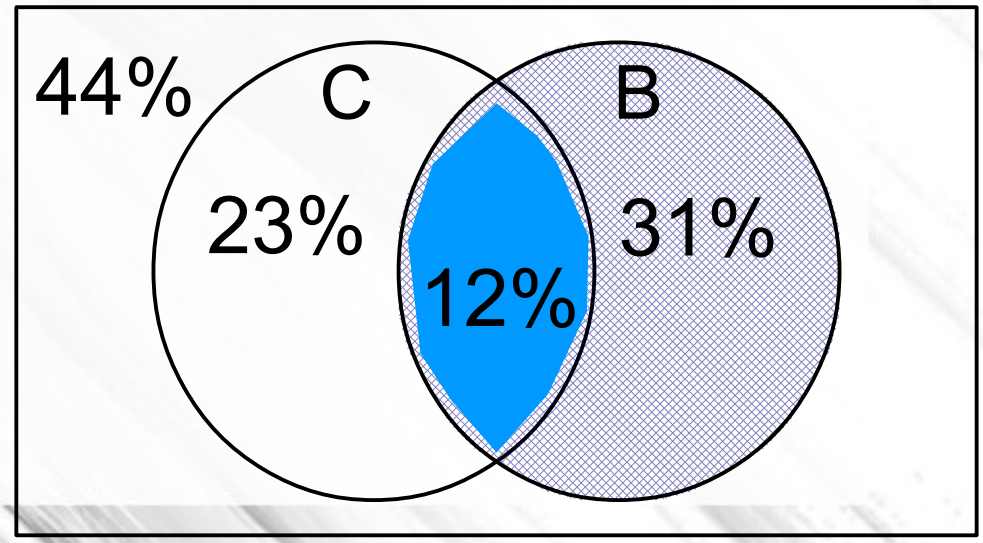
Answering Questions based on the Venn Diagram

- What is the probability a random shopper:
  - Uses coupons given that he brings a bag?
  - Brings a bag given that he doesn't use coupons
  - Are these two events (using coupons and bringing a bag) independent?



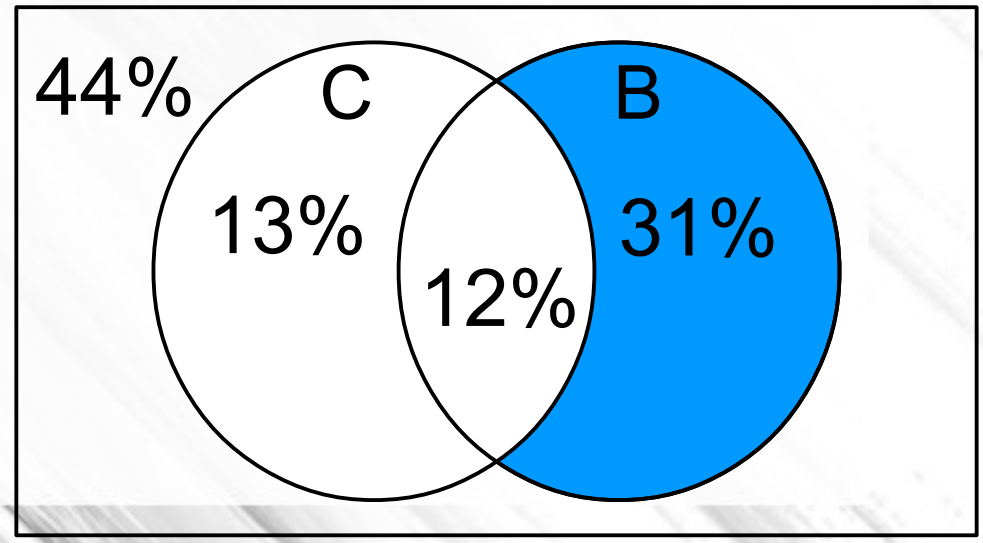
Answering Questions based on the Venn Diagram

- P(C|B)=?
  - Use the formula P(C|B) = P(C∩B) / P(B)
  - P(C|B) = .12 / .43 ≈ .279



Answering Questions based on the Venn Diagram

- $P(B|C^C)=?$
  - Use the formula $P(B|C^C) = P(B \cap C^C) / P(C^C)$
  - $P(C|B) = .31 / .75 \approx .413$



Answering Questions based on the Venn Diagram

- Are bringing a bag and using coupons independent?
  - If they are independent, then you can check 3 ways: $P(C \cap B)=P(C)*P(B)$, $P(C|B)=P(C)$, or $P(B|C)=P(B)$
  - $P(C \cap B)=.12$
  - $P(C)*P(B)=.1075$
- They are NOT independent.