A glimpse of auction theory

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Agenda

- Loose end – continuity correction
- A glimpse of auction theory

The Continuity Correction (Idea)

Suppose want to use CLT to estimate $\Pr(28 \leq X \leq 30)$ when X is Binomial (100, 0.3)

Issue: Binomial is discrete, Normal is continuous.

Auctions

- Companies like Google and Facebook make most of their money by selling ads.
- The ads are sold via auction.

Facebook Ads bidding... 🤔 Is this an auction?

Yes! That's the first thing you need to understand to master bidding management of Facebook Ads. **When you're creating a new campaign, you're joining a huge, worldwide auction**.

You'll be competing with hundreds of thousands of advertisers to buy what Facebook is selling: Real estate on the News Feed, Messenger, Audience Network, and mobile apps to display your ads to the users.

An auction is a ...

- Game
  - Players: advertisers
  - Strategy choices for each player: possible bids
  - Rules of the game - made up by Google/Facebook/whoever is running the auction

- What do we expect to happen? How do we analyze mathematically?

Special case: Sealed Bid single item auction

- Say I decide to run an auction to sell my laptop and I let you be the bidders.
- If I want to make as much money as possible - what should the rules of the auction be?

Some possibilities:

- **First price auction:** highest bidder wins; pays what they bid.
- **Second price auction:** highest bidder wins; pays second highest bid.
- **All pay auction:** highest bidder wins: all bidders pay what they bid.

SEALED BID SINGLE ITEM AUCTION

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- **First price auction:** highest bidder wins; pays what they bid.
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Which of these will make me the most money?

Bidder model

Each bidder has a value, say v_i for bidder i.

Bidder is trying to maximize their “utility” -
the value of the item they get - price they pay.