HANTEN EXPERIENCE · X005

Shared Birthday

How many people does it take before two of them probably share a birthday?

PLAYERS

Any group, from 2 people to a whole class

TIME

About 20 minutes

YOU NEED

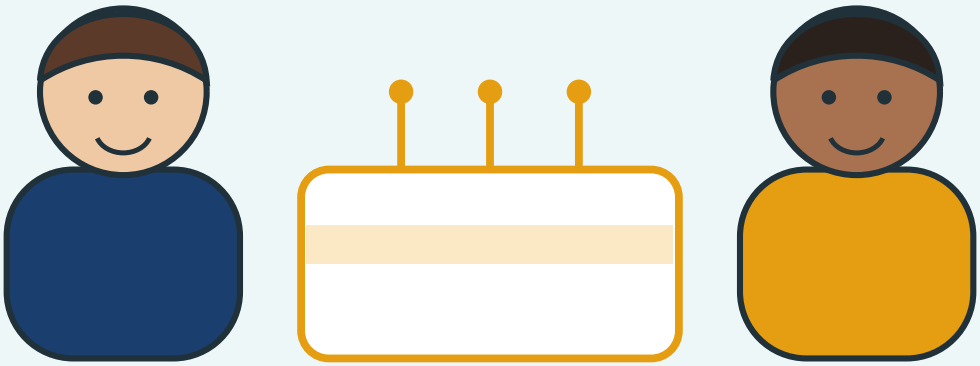
This deck, an answer sheet and a pencil for each group

START WITH CARD 1

Keep the cards in order. Don't peek ahead.

START HERE

How many people does it take before there's a 50/50 chance that two share a birthday?



12 | 23 | 56 | 183 | 253

COMMIT

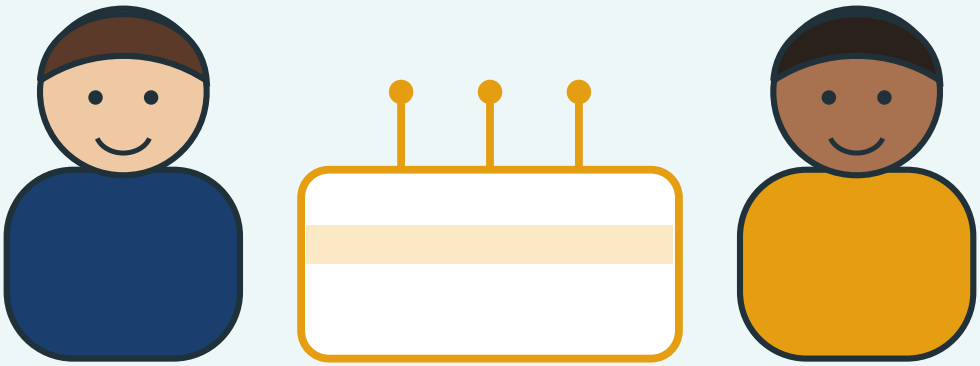
Commit before Card 2.

FIRST REVEAL

23

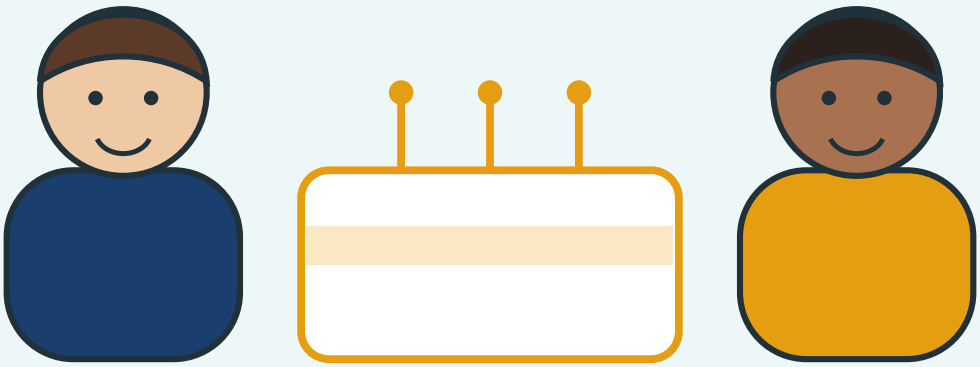
people

With 23 people, the chance of a shared birthday is already about 50.7%.



COMMIT AGAIN

How many people before the chance of a shared birthday passes 99%?



31

57

104

253

350

COMMIT

Commit before Card 4.

SECOND REVEAL

57

people

With only 57 people, the chance is already just over 99%.

A group of 366 would make a match guaranteed. It's almost certain long before that.

WHAT'S HIDING?

How can the chance grow so fast?

What might be hiding inside a group of 23 people?

Look at more than the people themselves.

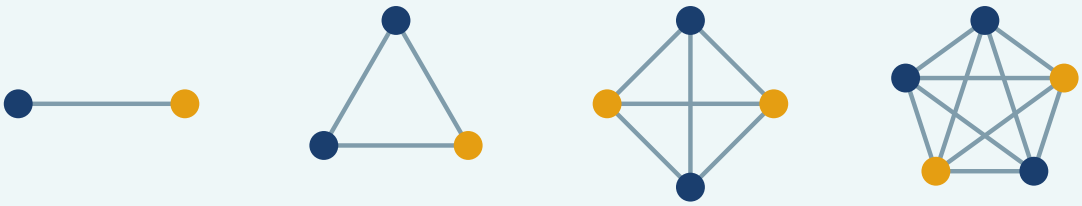
COMMIT

Commit to an explanation before Card 6.

WHAT WAS HIDING

253

different pairs among 23 people



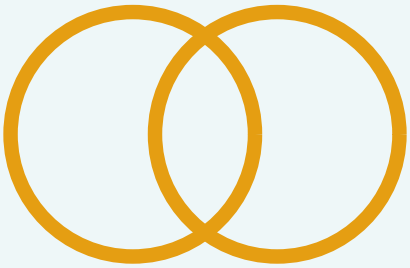
2 people	3 people	4 people	5 people
1 pair	3 pairs	6 pairs	10 pairs

Every line is a pair who could share a birthday.
Each new person pairs with everyone already there.

23 people make 253 pairs:
253 chances for a match.

QUICK TRANSFER

Would the answer still be 23 for wedding anniversaries?



YES

NO

COMMIT

Commit before Card 8.

ANNIVERSARY REVEAL

2

can be enough

**If a married couple is in the group,
those two already share an anniversary.**

The birthday math assumes every birthday is random and separate. Pairs that aren't random change everything.

FLIP IT

64 teams enter a single-elimination tournament.



A small bracket: 8 of the 64 teams shown.

How many games must be played to crown one champion?

COMMIT

Commit before Card 10.

TOURNAMENT REVEAL

63

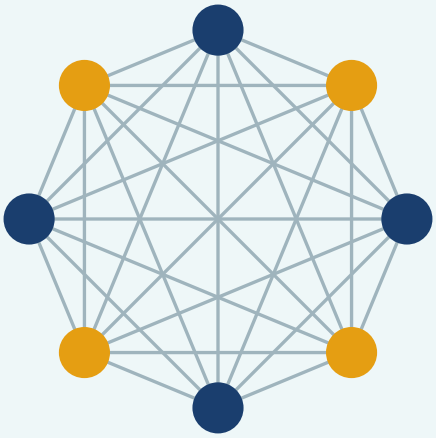
games

64 › 32 › 16 › 8 › 4 › 2 › 1

Every game knocks out one team. 63 teams must lose to leave one champion.

SAME 64 TEAMS. DIFFERENT RULE.

Now every team plays every other team exactly once.



A few teams shown. Every pair plays.

How many games will be played?

COMMIT

Estimate. Commit before Card 12.

SECOND TOURNAMENT REVEAL

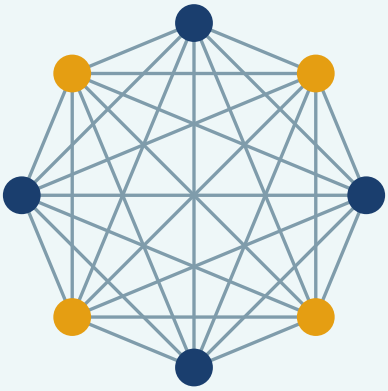
2,016

games



Elimination

7 games



Everyone plays

28 games

The same 8 teams both ways. With all 64 teams: 63 games vs. 2,016.

Elimination counts the teams that lose. Playing everyone counts every pair.

LOOK BACK

23 PEOPLE

253 possible pairs

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64 TEAMS

2,016 possible pairings

The surprise wasn't the number of people or teams. Where else might something be hiding in the pairs?

BEHIND THE EXPERIENCE · READ LAST

WHY THE NUMBERS GROW

1. PAIRS GROW FASTER THAN GROUPS

Each person pairs with everyone else. Multiply, then divide by 2, because A-B and B-A are the same pair.

23 × 22 ÷ 2 = 253

64 × 63 ÷ 2 = 2,016

2. WHY THE CHANCE RISES SO QUICKLY

Find the chance that every birthday is different, then subtract from 100%. With 23 people that is 365/365 × 364/365 × … × 343/365, about 49.3%, so a match is about 50.7%.

3. ASSUMPTIONS

365 equally likely birthdays, no February 29, no twins. Real birthdays cluster a little, which makes matches slightly more likely.

Source: standard birthday-problem math (Wolfram MathWorld, "Birthday Problem").
See the exhibit: hanten.app/exhibits/H005