# Pig: *A Dice Game of Pressing Your Luck*

Many games ask you to "press your luck." Think of classics like blackjack (take another card, or quit before you bust?), *Wheel of Fortune* (spin again, or solve the puzzle?), *Who Wants to Be a Millionaire?* (try the next question, or bank your winnings?), and *Deal or No Deal* (deal, or no deal?). Perhaps the simplest of all such games is Pig.

On your turn, **roll a pair of dice as many times as you wish, adding their sum to your score each time, and stopping whenever you want**.

23 points? That'll do, Dice. That'll do.
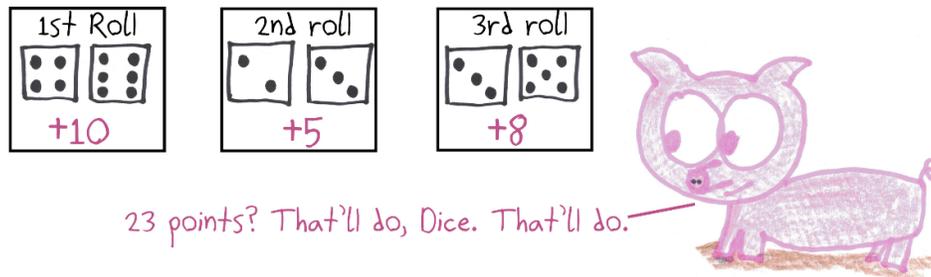
There are some bonuses: **doubles score twice their sum** (e.g., 5 + 5 scores 20), and even better, **snake eyes (i.e., 1 + 1) score 25**.
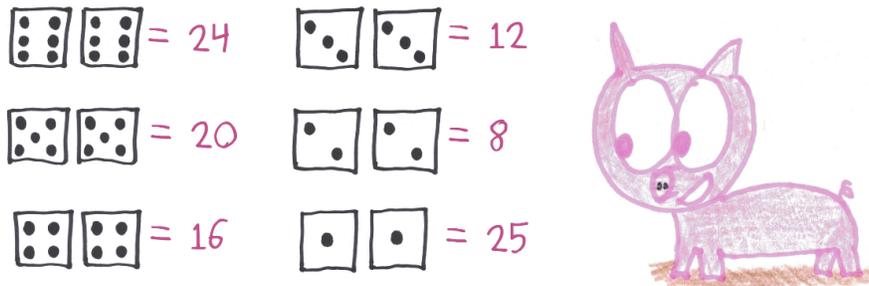
But watch out: if you **roll a 1 plus any other number, then you lose possession of the dice** with zero points to show for it. This happens on roughly 28% of rolls.

I got greedy. I acted like... I don't know, some kind of gluttonous animal.
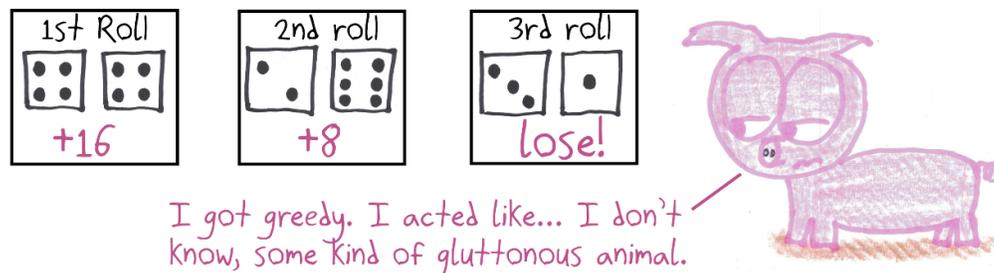
Pig offers a dynamic you see in dating, investing, and mountaineering: Do I stop now, or keep going? Settle for what I've got, or seek greater glory at the risk of disaster? The difference in Pig is that there's a right answer, an optimal way of maximizing your average score.

What is it? Spoilers after a blank page.

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OH WAIT, NOW I'VE WRITTEN SOMETHING ON IT

CRAP

UH… WHAT I MEAN IS, "THIS PAGE INTENTIONALLY LEFT BLANK EXCEPT FOUR LINES OF TEXT"

Optimizing Pig

First, a flawed approach: commit to a certain number of rolls each turn. "I shall roll N times, then stop, no matter what my score is." A little single-variable calculus turns up the optimal value of $1/(\ln 18 - \ln 13)$, or roughly 3.07 rolls. In other words, roll 3 times, then quit. This delivers about 11.5 points on average.

Thing is, who cares how many times you've rolled? What matters is your score. A better rule takes the form: "I shall roll until I reach score X, then stop, no matter how many rolls it takes me." An elementary probability calculation reveals the optimal number is 26.5. Thus, with 26 points or fewer, keep rolling. With 27 or more, bank them. This strategy outperforms the "roll three times" strategy by an average of about 0.4 points per turn.