$ OddsCipher_

ODDSCIPHER LIBRARY · REFERENCE DOCUMENT

The Odds Conversion & Implied-Probability Reference

Every format, every formula — decimal, fractional, American, and the probability inside a price

2026 edition · updated 2026-07-19 · oddscipher.com/library · educational reference — not an app, not picks

1 · What each odds format means

The three odds formats describe the same payout in different notation. Decimal states the total return per one unit staked, stake included. Fractional states profit per stake, stake excluded. American states profit on a 100 stake for a plus price, or the stake needed to win 100 for a minus price. Confusing these grammars is the single most common conversion error.

The same even-money price across formats

Format	Meaning	Even-money example
Decimal	Total return per 1 unit, stake included	2.00
Fractional	Profit / stake, stake excluded	1/1 (evens)
American	Profit on 100 (+) or stake to win 100 (–)	+100 / –100

2 · Conversion formulas, all six directions

Decimal is the hub. Route any price through decimal and the other conversions become mechanical.

```
# decimal D to American
if D >= 2.00:  American = (D − 1) x 100      # plus price
if D <  2.00:  American = −100 / (D − 1)     # minus price

# decimal D to fractional
fractional = (D − 1)                        # as a fraction in lowest terms

# fractional a/b to decimal
D = (a / b) + 1

# American to decimal
if +A:  D = (A / 100) + 1
if −A:  D = (100 / A) + 1
```

Worked: decimal 2.50 is a plus price, so American = (2.50 - 1) x 100 = +150. Decimal 1.50 is a minus price, so American = -100 / (1.50 - 1) = -200. Round American results to the nearest whole number; books never display fractional American prices.

3 · Implied probability from any format

Convert to decimal, then take the reciprocal. This is the raw probability, before the book's margin is removed.

```
# raw implied probability from decimal D
p_raw = 1 / D
  # D = 2.00 -> 50.0%
  # D = 1.50 -> 66.7%

# shortcuts from American price A
minus (-A):  p_raw = A / (A + 100)     # -200 -> 66.7%
plus  (+A):  p_raw = 100 / (A + 100)   # +150 -> 40.0%
```

4 · The fair (no-vig) adjustment

Because the book adds a margin, the raw implied probabilities of every outcome in a market sum to more than 100 percent. That excess is the overround. To recover the book's margin-free estimate, normalise: divide each raw probability by the sum of all sides.

```
# book percentage = sum of every side's raw implied probability
book_pct = sum(1 / D_i)  over all outcomes i
overround = book_pct - 100%        # in percentage points

# fair (no-vig) probability, proportional method
p_fair_i = p_raw_i / book_pct
  # raw 54.0% and 50.7% (sum 104.7%)
  #   fair = 51.6% and 48.4%   (sums to 100%)
```

5 · Overround for two-way and multi-way markets

The method is identical whatever the number of outcomes: reciprocal of each price, sum, compare to 100 percent. A symmetric two-way market at 1.91 each sums to 104.71 percent — an overround of 4.71 points. A three-way market sums three prices; an outright with twenty runners sums twenty. All figures here are illustrative teaching examples.

A symmetric two-way market at decimal 1.91 (illustrative)

Side	Decimal	Raw implied probability

Side	Decimal	Raw implied probability
A	1.91	1 / 1.91 = 52.36%
B	1.91	1 / 1.91 = 52.36%
Sum	—	104.71%

6 · Quick-lookup conversion table

Common prices aligned across formats. Probabilities are raw (pre-margin).

Common prices across formats (raw implied probability)

Decimal	Fractional	American	Raw probability
1.50	1/2	-200	66.7%
1.67	4/6	-150	60.0%
1.91	10/11	-110	52.4%
2.00	1/1	+100	50.0%
2.50	6/4	+150	40.0%
3.00	2/1	+200	33.3%
4.00	3/1	+300	25.0%

7 · Rounding traps

- American is coarse: a displayed -115 covers a small band of true decimal prices, so a converted decimal may sit a hair from the book's internal number.
- Chaining compounds error: convert once, directly, from the most precise format the book gives you.
- Fractional reduction hides precision: treat a fraction as exact only when it is the book's own quoted fraction.

The practical rule: pick one canonical format for your own math — decimal, almost always — convert into it once, and only convert out for display.

Risk notice. This is an educational reference document, not a betting app, software, account, or picks service. All prices and probabilities are illustrative teaching examples chosen to demonstrate the math; they are not claims about any real market or event, and nothing here is betting advice. 21+ where applicable. If gambling stops being fun, help is available 24/7: 1-800-522-4700 · ncpgambling.org.