1. If we want to analyze only players who were regularly involved in the season, how can we use set theory to define eligibility?

We define two sets:

- Set A: Players who averaged more than 20 minutes per game (|A| = 268)
- Set B: Players who played at least 41 games (|B| = 340)

The set of qualified players is their intersection:

- S = A B = 226

This filters out part-time or minimally used players, ensuring valid comparisons.

2. Whats the probability a player is average in 0 or 1 of the 5 main categories?

From the data:

- P(0 categories) = 0.323 (32.3%)
- P(1 category) = 0.363 (36.3%)

So the combined probability:

P(0 or 1 categories) = 0.323 + 0.363 = 0.686 (68.6%)

Most players are average in 1 or no categories statistical balance is rare.

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3. What is the chance the most average player is not selected in 3 random picks?

Lets assume the chance of selecting the target player = 0.5 per trial.

The probability of not selecting them in 3 trials:

P = (1 - 0.5)^3 = 0.125

So there's a 12.5% chance the most average player is overlooked in 3 random attempts.

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4. In how many ways can 9 players be grouped into levels of averageness?

We want to arrange 9 players into groups of 3 (highly average), 5 (moderately average), and 1 (perfectly average):

Use permutations with repetition:

Ways = 9! / (3! * 5! * 1!) = 504

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5. If a player is average in points, how likely are they to also be average in another stat?

From conditional counts:

- P(TRB | PPG) = 0.414
- P(AST | PPG) = 0.276
- P(STL | PPG) = 0.259
- P(BLK | PPG) = 0.190

Conclusion: Being average in one stat doesnt strongly imply averageness elsewhere.

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6. Are points and rebounds independent?

We compare:

- P(PPG) = 58 / 226 = 0.257
- P(TRB) = 65 / 226 = 0.288
- P(PPG TRB) = 24 / 226 = 0.106
- If independent: 0.257 * 0.288 = 0.074

Since 0.106 0.074, they are not independent a weak positive relationship exists.

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7. If a player is average in points, whats the probability theyre a big man?

We apply Bayes Rule:
- P(PPG) = 58 / 226 = 0.257
- P(Big) = 84 / 226 = 0.372
- P(PPG | Big) = 19 / 84 = 0.226

Bayes: P(Big | PPG) = (0.226 * 0.372) / 0.257 = 0.327
So ~32.7% of average scorers are big men.

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8. Whats the expected number of categories a player is average in?

Using the formula:
E(X) = [x * P(x)] = 0*0.323 + 1*0.363 + 2*0.217 + 3*0.075 + 4*0.022
= 1.11
So, the average player is statistically average in ~1.1 categories.

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9. What is the probability of being average in all 5 categories?

Using binomial formula:
n = 5, p = 0.222 (prob. of being average in 1 category)
P(X = 5) = C(5,5) * 0.222^5 = 0.00054
Very rare (<0.1%).

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10. Whats the chance the first average player appears on the 5th try?

Geometric formula:
P = (1-p)^(k-1) * p = (1-0.097)^4 * 0.097 = 0.06449
So, 6.4% chance it takes 5 tries to find the first one.

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11. On average, how many players do you need to find 3 average ones?

Negative binomial expected value:
E(X) = r / p = 3 / 0.097 = 30.93
So expect to examine ~31 players to find 3 average ones.

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12. If 4 players are randomly selected, what's the chance all are average scorers?

Using hypergeometric:
P = [C(58, 4) * C(168, 0)] / C(226, 4) 0.01806
Only ~1.8% of 4-player groups are all average in scoring.

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13. Do blocks follow a Poisson distribution?

Yes the distribution is count-based, right-skewed.
- (bigs) = 0.859
- (non-bigs) = 0.370

Most non-bigs had 0 blocks, which is expected for low- Poisson variables.

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14. How many players fall within 1.5 standard deviations of average PPG?

Tchebysheffs bound:

P(|X - | < 1.5) 1 - 1/k = 1 - 1/2.25 = 0.556
Actual observed: 87.2% much higher than guaranteed bound.

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15. Whats the probability a player is within 15% of average PPG?
Normal model:
= 14.18, = 5.96
Interval: 12.05 X 16.31
P = 0.2788 (27.9%)

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16. What are the expected value and variance for PPG?
Computed from sample:
Mean = 14.18 points per game
Variance = 35.52

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17. What's the chance a player is in the average AST range assuming a uniform distribution?
U(0, 10) width = 10
Interval = [2.77, 3.75] width = 0.98
P = 0.98 / 10 = 0.0979 (9.8%)

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18. Do any NBA stat categories follow a Gamma (or Exponential) distribution?
Yes. Stats that are right-skewed and involve counts of rare events like blocks or steals often resemble a Gamma distribution.
- For example, blocks per game among non-bigs had = 0.370, heavily right-skewed.
- Most players have 0 or 1 block per game, but a few have much higher values, creating the tail.

This shape is typical of Gamma or Exponential distributions, which makes them suitable for modeling rare but variable events in NBA stats.

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19. What’s the probability a player averages over 20 PPG and over 10 RPG?
We define:

A = PPG > 20
B = RPG > 10

P(A) = 68 / 883 ≈ 0.077
P(B) = 20 / 883 ≈ 0.023
P(A ∩ B) = 7 / 883 ≈ 0.0082

So:
P(PPG > 20 and RPG > 10) = P(A ∩ B) = 0.0082

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20. What's the probability a player averages less than 20 PPG and less than 5 RPG?
We define:

X = PTS
Y = TRB
We're solving:
P(X < 20 and Y < 5)
Number of players with PTS < 20 and TRB < 5 = 664
Total players = 883

So:
P(X < 20 and Y < 5) = 664 / 883 ≈ 0.752

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21. What's the probability a player averages exactly 11 PPG?
Since very few players hit exactly 11.000, I looked at a small range: 10.9 ≤ PTS ≤ 11.1

Number of players in this range = 11
Total players = 883

So:
P(PPG ≈ 11) ≈ 11 / 883 = 0.0125

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23. What's the probability a player averages >10 RPG given they average >20 PPG?
We define:

A = PPG > 20
B = RPG > 10
We want:
P(B | A) = P(A ∩ B) / P(A)

P(A ∩ B) = 7 / 883
P(A) = 68 / 883

So:
P(B | A) = (7 / 883) ÷ (68 / 883) = 7 / 68 ≈ 0.105