Achievable

GRE DUMP SHEET

Data analysis, counting, and probability

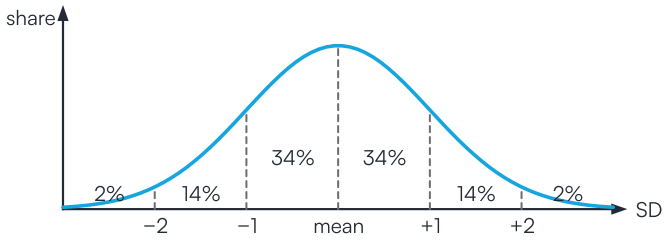
Center and spread

- **Mean** (the GRE's "average") $= \frac{\text{sum}}{\text{count}}$, so **sum = mean × count**: four quizzes averaging 85, then a 90: $\frac{340+90}{5} = 86$
- **Median:** the middle value once sorted (an even count: the mean of the middle two). **Mode:** the most frequent (ties allowed). **Range** = greatest − least
- **Weighted average:** each value × its weight (weights sum to 1), added: $85(0.2) + 82(0.6) + 90(0.2) = 84.2$

Percentiles and spread

- **Percentile:** the 81st is above about 81% of the data; the median is the 50th
- Q_1, Q_2, Q_3: the 25th, 50th (median) and 75th percentiles; find Q_1 and Q_3 as the medians of the lower and upper halves
- **IQR** $= Q_3 - Q_1$, the middle 50%: not the range. Shifting every value changes neither
- **Box plot:** whiskers to the least and greatest, box from Q_1 to Q_3, a line at the median
- **Standard deviation:** the spread about the mean; the bigger it is, the more spread out the data

The normal curve



- −1 SD: **16th** percentile; +1 SD: **84th**; +2 SD: **98th**
- Tires, mean 60,000 mi, SD 750: 98% go past 58,500 (−2 SD)

Data interpretation sets

- Several questions on the **same table or graph**
- **Scan** the data, **read** the question, **find** the numbers, **do** the math, **reread** the question
- Check titles, axes, units (thousands? billions?) and footnotes
- **Graphs are drawn to scale:** estimate by sight; watch broken scales and bars not starting at 0
- **Percent change** $= \frac{\text{change}}{\text{original}}$; **percent of a whole** $= \frac{\text{part}}{\text{whole}}$

Venn diagrams and tables

- **Total** = only A + only B + both + neither: count the overlap once. A number in a region counts that region alone
- **Union** $A \cup B$: in either, or both. **Intersection** $A \cap B$: in both
- **Could be?** Try the extremes, no overlap and the most overlap, then keep every region a whole number
- **Two-way table:** rows and columns add to their totals; fill in a line missing one value

Counting

- **The blanks method:** one blank per decision, its number of options, then multiply: 5 drinks, 10 foods: $\underline{5} \times \underline{10} = 50$
- **Permutations** (order matters) $\frac{n!}{(n-k)!}$: 5 in a line, $5! = 120$. **Combinations** (order doesn't) $\binom{n}{k} = \frac{n!}{k!\,(n-k)!}$: 4 of 9 coins, $\frac{9 \cdot 8 \cdot 7 \cdot 6}{4 \cdot 3 \cdot 2 \cdot 1} = 126$
- $0! = 1$; a fixed position is no choice; "A before B" keeps half the orders: $\frac{4!}{2} = 12$

Probability

Rule	Formula	Example
Basic	$\frac{\text{favorable}}{\text{total}}$, from 0 to 1	Equally likely outcomes: dice, coins, cards
Not	$1 - P(A)$	20% blue: 80% not blue
And, independent	$P(A) \times P(B)$	A 6, then an odd roll: $\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$
And, without replacement	$P(A) \times P(B \text{ after } A)$	2 blue of 3 blue, 5 red: $\frac{3}{8} \times \frac{2}{7} = \frac{3}{28}$
Or, mutually exclusive	$P(A) + P(B)$	Consonant or A: $\frac{21}{26} + \frac{1}{26} = \frac{11}{13}$
Or, overlapping	$P(A) + P(B) - P(A \text{ and } B)$	Heart or king: $\frac{13+4-1}{52} = \frac{4}{13}$
At least one	$1 - P(\text{none})$	3 bulbs, 10% each: $1 - 0.9^3 = 0.271$, not 30%
Groups	Count both with combinations	2 women, 1 man of 4 W, 5 M: $\frac{\binom{4}{2}\binom{5}{1}}{\binom{9}{3}} = \frac{30}{84} = \frac{5}{14}$