

Aptitude Formula Sheet

Percentages

Situation	Fast rule
x percent of y	$x/100$ multiplied by y
Percentage change	$(\text{new} - \text{old}) / \text{old}$ multiplied by 100
Increase a then decrease b	net percent = $a - b - ab/100$
Successive increases a and b	net percent = $a + b + ab/100$
If A is x percent more than B	$A = B(1 + x/100)$
If A is x percent less than B	$A = B(1 - x/100)$

Important: +20% then -20% gives a net -4%, not zero.

Useful fraction-to-percent conversions:

Fraction	Percent
1/2	50%
1/3	33.33%
1/4	25%
1/5	20%
1/6	16.67%
1/8	12.5%
1/10	10%
1/12	8.33%
1/16	6.25%

Ratio, proportion and averages

- If $A:B = a:b$ and total is T, then $A = T$ multiplied by $a/(a+b)$.
- To combine $A:B = a:b$ and $B:C = c:d$, make the two B values equal first.
- Average = total/count.

- New average after adding x: new total = old average multiplied by old count + x.
- Weighted average = sum of value multiplied by weight / sum of weights.

Profit, loss and discount

- Profit = SP – CP.
- Profit percent = profit/CP multiplied by 100.
- Loss percent = loss/CP multiplied by 100.
- Discount = MP – SP.
- Discount percent = discount/MP multiplied by 100.
- Two discounts a and b: equivalent discount = $a + b - \frac{ab}{100}$.

Simple and compound interest

- SI = $\frac{PRT}{100}$.
- Amount with SI = P + SI.
- CI amount after n years = $P(1 + \frac{r}{100})^n$.
- For two years, CI – SI = $P(\frac{r}{100})^2$.

Time and work

- If A finishes a job in x days, one-day work = $\frac{1}{x}$.
- Together, add work rates: $\frac{1}{x} + \frac{1}{y}$.
- Time = $\frac{1}{\text{combined rate}}$.
- If workers and days have equal efficiency, workers multiplied by days is constant.
- Pipes: inlet rates are positive; outlet/leak rates are negative.

Speed, distance and time

- Distance = speed multiplied by time.
- Speed = distance/time.
- Average speed for equal distances at speeds x and y = $\frac{2xy}{x+y}$.
- Convert km/h to m/s: multiply by $\frac{5}{18}$.
- Convert m/s to km/h: multiply by $\frac{18}{5}$.
- Relative speed: add for opposite directions; subtract for same direction.
- Train passing a pole: train length/speed.
- Train passing a platform: (train length + platform length)/speed.

Mixtures

Use alligation for two quantities:

quantity of cheaper : quantity of dearer = (dearer price – mean price) : (mean price – cheaper price).

For concentration, write the amount of pure substance, not only the total mixture.

Number system

- For two numbers: HCF multiplied by LCM = product, only when the two numbers are positive integers.
- Divisibility: 2 last digit even; 3 digit sum divisible by 3; 4 last two digits divisible by 4; 5 last digit 0/5; 9 digit sum divisible by 9; 11 alternating digit sum divisible by 11.
- Remainder after division: keep reducing at each arithmetic step.
- Unit digit cycles: 2 → 2,4,8,6; 3 → 3,9,7,1; 4 → 4,6; 7 → 7,9,3,1; 8 → 8,4,2,6; 9 → 9,1.

Permutation, combination and probability

- $n! = n(n-1)(n-2)\dots 1$.
- Permutations: $nPr = \frac{n!}{(n-r)!}$.
- Combinations: $nCr = \frac{n!}{r!(n-r)!}$.
- Probability = favourable outcomes/total equally likely outcomes.
- "At least one" is often easier as $1 - \text{probability}(\text{none})$.

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