The precise pilot does not fly by rules of thumb, axioms, or formulas.
But there are times when knowledge of an approximate way to calculate things or knowledge of a simple rule can pay big dividends.

Takeoff Performance

A 1° C change in temperature from ISA will increase or decrease the takeoff ground roll by 10%.

Takeoff distance increases by 15% for each 1000′ DA (Density Altitude) above sea level

Rotation speed Vr is equal to approximately 1.15 times Vs

A headwind of 10% takeoff speed will reduce ground roll by 20%

A 10% change in aircraft weight will result in a 20% change in takeoff distance.

The maximum crosswind component is approximately equal to 0.2 x Vs1

Abort the takeoff if 70% of takeoff speed is not reached within 50% of the available runway.

Available engine horsepower decreases 3% for each 1000’ of altitude above sea level.

Fixed Pitch, Non turbo aircraft - Climb performance decreases 8% for each 1000’ DA above sea level.

Variable Pitch, Non turbo aircraft – Climb performance decreases 7% for each 1000’ DA above sea level.

Expect to lose 1” of manifold pressure every 1000’ in a climb.

TAS increase 2% for each 1000’ in a climb.

Standard temperature decreases 2° for each 1000’

Flight Manoeuvres

Use ½ the bank angle for the lead rollout heading.
    i.e 30° of bank angle
    Start rollout 15° before desired heading.

To make a **6° change** in heading, use a standard rate turn then immediately level the wings.

To make a **3° change** in heading use ½ standard rate turn.

The diameter of the “cone of confusion” while passing over a VOR or NDB in NM is ½ the altitude in thousands.
    Eg Altitude = 6000′
    6000 ÷ 2 = 3 NM

Maneuvering speed Va = 1.7 x Vs1

Va decreases 1% for each 2% reduction in weight

Vy decreases ½ to 1kt for each 1000’ DA

Vy Vx and Vg (best glide) decrease ½ kt for each 100lbs under MGW

at gross weight. To calculate speeds for lighter weights, decrease the speed by half the percentage of the weight decrease. For example, flying a 3,000-pound-gross airplane at 2,400 pounds, a 20-percent reduction in weight, reduce the applicable speeds by 10 percent to hold the margins the same as at gross.

Much more to follow soon.........

What are the 2 most important things in flying??

The NEXT 2 things you are going to do.......

forecast, it means that the weather may become worse than forecast — especially if the temperature aloft is warmer than forecast. Higher temperature means the atmosphere can hold more moisture. More southerly and stronger winds mean there is a stronger than forecast low or front or trough to the west, heading your way (Northern Hemisphere only).

70 knots is 118 feet per second, and 60 is 101 fps. So if the approach speed should have been 60 knots and is 70, and if it takes five seconds to dissipate the extra speed, the airplane will have traveled about 550 feet in the float. No firm rule of thumb, but 10 knots extra on the approach speed usually uses about 500 extra feet of runway.

The air is conditionally **unstable** if the temperature drops more than 2° per 1,000 feet on ascent.

When the surface wind shifts to the north or northeast after passage of a cold front, that front may well be back as a warm front in a day or so.

To descend 500 feet per minute to the destination, start the descent 5 miles out for each 1,000 feet to be lost if the groundspeed is 150 knots. For each 30 knots in either direction, add or subtract 100 fpm. At 180 knots, you'd need 600 fpm; at 450 knots, 1,500 fpm.

A VOR course deviation indicator reflects 10° off course when full scale in either direction. One degree equals 1 mile when the aircraft is 60 miles from the station, so if you are 60 miles out with a full scale, you are 10 miles off course. If 30 miles out and a half scale (5°), you would be 2.5 miles off course.

Performance speeds — such as maneuvering, approach, and climb speeds — are often given in the POH only for operations

Vr = 1.15 x Vs

$$TAS = IAS\ (kts) + \frac{FL}{2}$$

FL 300, IAS = 240
TAS = 240 + 150 = 390 Kts

Flight Planning / Navigation

Best Cruise climb speed is the difference between Vx and Vy and add this to Vy.

Eg Vx = 65, Vy 75
Difference is 10kts
10kts + Vy 75
=85Kts

Enroute Wind Correction Angle – first find the Max Wind Correction Angle (WCA max) as if the wind were a direct 90° crosswind. For practical purposes assume max drift is at 60° to track

$$WCA\ (max) = \frac{Wind\ Velocity}{NM\ per\ minute}$$

Wind = 20Kts
Airplane Speed = 120Kts
WCA(max) = 20 ÷ 2
WCA(max) = 10°

Now find the Wind Correction Angle WCA for the actual forecast wind direction.

WCA = WCA(max) x sine of the wind angle

E.g.Wind 330° at 20 kts
Course 360°
Wind Angle = 10° x 0.5 (sine 30°)
WCA = 5°
Heading = 355°

<u>Estimation of Wind Drift and Groundspeed</u>

To estimate drift for each 10Kts of windspeed that you are flying.

Maximum drift is when the wind is 90° to the track. For practical purposes assume max drift is at 60° to track

To estimate max drift assess the wind angle as a proportion of 60.

Airspeed	**60 Kts**	**70 Kts**	**80 Kts**	**90 Kts**	**100 Kts**	**110 Kts**	**120 Kts**	**150 Kts**
Max Drift for each 10kt of Wind	10°	9°	7°	6°	6°	5°	5°	4°

Examples:

Air Speed	100kts	100kts
Heading	360°	360°
Wind	300° / 20kts	330° / 10
Wind Angle =	More than 60°	Wind Angle 30° (½ of Max Drift)
Max Drift =	12°	3°

OAT = 13° C ISA = 3° C
DA = 6000 + 120 (13-3)
DA = 6000 + 120 * 10
DA = 6000 + 1200
DA = 7200′

Weight has no effect on max glide range or ratio.

Weight has an effect on max glidespeed.

Reduce glide speed by 5% for each 10% decrease in gross weight.

Tailwinds increase glide range, Headwinds decrease glide range.

10° - 25° of flaps add more lift than drag; 25°- 40° flaps add more drag than lift.

Maximum glidespeed = Minimum Drag = Maximum endurance, remember this if low on fuel.

The radius of a standard rate turn in metres = TAS x 10

Most structural icing occurs between 0° to -10°

Dew point of 10° = Enough moisture for a severe thunderstorm.

The ability of the atmosphere to hold moisture doubles with each 11° Celsius temperature rise.

Difference in Dew point and temperature x 400ft is where you will find visible moisture. i.e. cloud base.

When the wind aloft is more southerly and stronger than

Quick Tips

On a **multi engine** aircraft – a 50% loss of thrust results in a loss of 80% of climb performance.

On an **ILS approach** – One dot on the Localiser is approximately 300ft at the outer marker. 100ft at the middle marker.

One dot on the glide slope is approximately 50ft at outer marker and 8ft at the middle marker.

ADF Flying – 1° deviation of the ADF needle is equal to 100ft per NM

Compass Flying – Overshoot North – Undershoot South
UNOS

Compass Flying - Accelerate North – Decelerate South
ANDS

Weight & Balance – An airplane will be more stable and stall at a higher airspeed with a forward CG location.

Weight & Balance – An airplane will be less stable and stall at a lower airspeed with an aft CG location.

Density Altitude increases or decreases 120ft for each 1°C that varies from ISA

DA = PA + 120 (OAT – ISA)
DA = Density Altitude
PA = Pressure Altitude
OAT = Outside Air Temperature
ISA = international Standard Temperature
E.g. PA = 6000′

To estimate Ground Speed

Angle of Wind	**Up to 30°**	**45°**	**60°**	**75°**	**90°**
Proportion of total wind on Nose or Tail	Max	¾	½	¼	Nil

Examples			
Windspeed	20kts	10kts	20Kts
Wind angle	60°	60°	75°
Groundspeed	±10kts	± 5Kts	± 5kts
Timing =	±10 Secs	± 5 Secs	± Secs

Increase speed by 10% when flying into a headwind and decrease by 5% with a tailwind

For maximum TAS and Range, Load the airplane as close to the aft Centre of Gravity limit as allowable

Descent Planning

One in Sixty Vertical Navigation. One degree climb or descent angle closely equals 100'/ Nm.

This is because 1 Nm in 60 Nm is also 6076'/ 60 Nm = 100' / Nm
Glide Angle = 3°
Distance to Runway = 1 Nm
3 x 100' = 300ft Height above runway

To determine the NM distance to start a 3° enroute descent.
Divide the altitude to lose (in Flight Levels) by 3

NM = Flight Level / 3

e.g. Altitude to lose = 6,000 (FL 60)
60 / 3 = 20 nm to start descent

OR To determine the NM distance to start a 3° enroute descent.

Multiply to altitude to descend (in 1000’s) by 3 and add 10%
6 x 3 = 18
add 10% = 1.8 (2)
18 + 2 = 20 nm

For a 3° Rate of Descent (ROD) multiply your groundspeed by 5.
Descent Groundspeed = 120
120 x 5 = 600 fpm ROD

OR For a 3° Rate of Descent (ROD) take half your groundspeed and add a zero.
Descent Groundspeed
120 x ½ = 60
600 fpm ROD

Climb Planning

Add 1 minute to your flight plan for every 1000′ climb to cruise altitude.
Cruise altitude = 8000′
Time to add = 8 mins to ETE

To find the Rate of Climb required (ROC) multiply the % gradient by the groundspeed.
% Gradient = 3.3%
Groundspeed = 120 Kts
3.3 x 120 = 400fpm

To find the Feet per Minute (FPM), multiply the gradient % by 60
3.3 % Gradient x 60
= 200 fpm

Approach & Landing

A 10% change in airspeed will cause a 20% change in stopping distance.

A narrow runway may give the appearance of being longer, a wide runway may give the appearance of being short.

A slippery or wet runway may increase your landing distance by 50%.

Use Vso x 1.3 (Vref) for approach speed over the threshold.

Plan to touchdown in the first ⅓ of the runway or go around.

For each knot of airspeed above Vref over the numbers, the touchdown point will be 100ft further down the runway.

For each 1000’ increase in field elevation above Sea Level, stopping distance increases by 4%.