EASA PPL(A) · THEORY REVISION

The PPL Cheat Sheet
P90 Navigation

The facts that actually get tested in the EASA PPL(A) theory exams, stripped to the bone: definitions, key numbers, formulas, mnemonics and the classic traps for each subject. Built for the night before, the commute, and the last scroll before you walk into the exam hall.

P90 Navigation | **33** memory items

One of 9 subjects; the full set is free at skystudyatpl.com/ppl-cheat-sheet

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P90 Navigation

The Earth and charts, time, direction, magnetism, projections, dead reckoning, the triangle of velocities, the 1-in-60 rule, radio navigation aids.

DIRECTION LADDER: TRUE TO COMPASS (CDMVT)

TRUE	+	MAGNETIC	+	COMPASS	=	STEER
from the chart		apply variation		apply deviation		this heading

Variation West, Magnetic Best (add West)
Variation East, Magnetic Least (subtract East). Same rule for deviation.

1-in-60: 1 degree off after 60 nm = 1 nm off track. Drift = track minus heading.

1 minute of latitude = 1 nautical mile. A great circle is the shortest path; a rhumb line crosses every meridian at the same angle and is a straight line on a Mercator chart.

MUST-KNOW DEFINITIONS AND CONCEPTS

- A **great circle** is the shortest distance between two points on the Earth; a **rhumb line** crosses every meridian at a constant angle and looks straight on a Mercator chart.
- **Latitude** is measured north or south of the equator, **longitude** east or west of the Greenwich meridian; one minute of latitude is one nautical mile.
- **Variation** is the angle between true and magnetic north; **deviation** is the compass error from the aircraft's own magnetism.
- **UTC** is the world time standard; **local mean time (LMT)** changes with longitude at 4 minutes per degree.
- A **Mercator** chart is a cylindrical projection: rhumb lines are straight, scale grows with latitude; a **Lambert** conic chart keeps great circles nearly straight and scale nearly constant.
- **Dead reckoning** predicts position from heading, airspeed, wind and time; the **triangle of velocities** combines the air vector and the wind to give the ground vector.
- **Drift** is the angle between heading and track caused by wind; the **wind correction angle (WCA)** is applied into wind to hold the desired track.
- The **1-in-60 rule** says a 1-degree error over 60 nm puts you about 1 nm off track; it converts across-track distance into an angle to correct.
- **Isogonals** are lines of equal variation on a chart; variation changes slowly year to year (annual change).

KEY NUMBERS, LIMITS AND VALUES

- **1 minute of latitude = 1 nautical mile**; 1 degree of latitude = 60 nm. **1 nm is about 1.85 km** and about 6076 ft.
- Time and longitude: the Earth turns **15 degrees per hour**, so **1 degree = 4 minutes** of time; the sun moves west, so east is ahead in time.
- The **triangle of velocities**: air vector (heading and TAS) plus wind vector gives the ground vector (track and groundspeed); a headwind makes groundspeed less than TAS.
- **Drift = track minus heading.** A wind from the left gives right (starboard) drift, so the track lies right of the heading.
- **1-in-60 rule**: track error in degrees = 60 times (distance off track divided by distance gone); to regain track add the closing angle.
- **Compass dip** is zero at the magnetic equator and 90 degrees at the magnetic poles; the dip drives the turning and acceleration errors.
- **VHF navigation aids (VOR, DME) are line-of-sight**; range increases with height. DME reads slant range, so it over-reads close and high, and reads height when overhead.
- **GNSS (GPS)** needs at least 4 satellites for a 3D fix; RAIM integrity monitoring needs 5, and needs 6 to detect and exclude a faulty satellite.

FORMULAS AND RELATIONSHIPS

- **Speed, distance, time:** distance = speed x time; time = distance divided by speed; speed = distance divided by time.
- **Track error (degrees) = 60 x (distance off track divided by distance gone); total correction = track error + closing angle.**
- **Drift = track minus heading; wind correction angle is applied the opposite way** to hold the desired track.
- **True to compass (CDMVT): apply variation (True to Magnetic) then deviation (Magnetic to Compass); Variation West, Magnetic Best.**

MNEMONICS AND MEMORY ITEMS

- **Variation West, Magnetic Best; Variation East, Magnetic Least.** The same rule runs for deviation.
- **CDMVT**: Compass, Deviation, Magnetic, Variation, True: the ladder to convert between them.
- **1 minute of latitude is 1 nautical mile**: the built-in scale on every chart's latitude edge.
- Time and longitude: **the sun rises in the east, so places east are ahead** in local time. Add 4 minutes per degree of longitude east of Greenwich, subtract going west.
- Drift is **track minus heading**; the wind blows you off, and you turn into it by the same angle (WCA).

COMMON EXAM TRAPS

- **Measure a distance against the latitude scale**, not the longitude scale; only latitude minutes equal nautical miles.
- **Variation West, Magnetic Best**: add westerly variation going from true to magnetic; reverse it going the other way.
- The wind vector is drawn **downwind** (the way the air is going), while a wind is named by where it comes **from**.
- **DME reads slant range**, not ground distance; overhead a beacon it reads your height in nautical miles, never zero.
- On a Mercator chart the **scale grows with latitude**; measure distance at the latitude of your leg, not at the equator.
- **Drift is track minus heading**; getting the sign wrong sends the correction the wrong way.
- A **great circle is shortest** but changes direction constantly; a rhumb line holds a constant heading but is longer, except along a meridian or the equator.

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