

Commercial Pilot Exam Preparation Guide – 2019

Section 4 – Navigation Questions Question 50, Page 157

This question asks you to calculate the clearance above a ridge, and provides the following information to you:

Ridge height:	5,000 ft ASL
Indicated altitude:	7,000 ft
Outside Air Temperature:	-20 °C
Altimeter setting:	29.42" Hg
Weather station elevation:	3,500 ft ASL

To calculate clearance above the ridge, you can break the problem down into the basic steps:

1. Calculate the pressure altitude of the aircraft
2. Determine the true altitude of the aircraft
 - a. Determine the indicated altitude above the weather station
 - b. Determine the true altitude above the weather station
 - c. Determine the true altitude correction
 - d. Determine the true altitude of the aircraft
3. Determine the clearance above the ridge

1. Calculate the pressure altitude of the aircraft

DEFINITION

Pressure altitude is your indicated altitude corrected for non-standard pressure.

Pressure altitude is very easy to determine using the following formula;

$$\text{Pressure Altitude} = (\text{Indicated Altitude}) + ((\text{Standard Altimeter Setting} - \text{Actual Altimeter Setting}) \times 1000)$$

$$\begin{aligned} \text{Pressure altitude} &= \text{Indicated altitude} + \text{Pressure altitude correction} \\ &= 7,000' + ([\text{Standard Altimeter Setting} - \text{Actual Altimeter Setting}] \times 1,000) \\ &= 7,000' + ([29.92'' \text{ Hg} - 29.42'' \text{ Hg}] \times 1,000) \\ &= 7,000' + (0.5'' \text{ Hg} \times 1,000) \\ &= 7,000' + (+500') \\ &= 7,500' \end{aligned}$$

The aircraft's pressure altitude is 7,500 ft.

2. Determine the true altitude of the aircraft

DEFINITION

True altitude is your indicated altitude corrected for non-standard temperature between the weather reporting station elevation and the aircraft altitude.

You can easily determine true altitude using your electronic flight calculator or circular slide rule (eg. E6B), except most E6B's assume that the weather station elevation is 0 ft. You need to manually compensate for this.

If you just plug your pressure altitude and the true air temperature into the E6B calculator then you will not get the right answer! This is because the E6B assumes that the weather station is at sea level (0 ft), while in this case the weather station is actually at an elevation of 3,500 ft ASL. The non-standard temperature only causes an error on the air between the weather station elevation and the aircraft altitude, so the error is smaller than if the weather station was at sea level.

This means that to calculate the true altitude of the aircraft, you must calculate the true altitude correction to compensate for the error because of non-standard temperature between the weather station elevation and the aircraft altitude.

2. Determine the true altitude of the aircraft

2.a. Determine the indicated altitude above the weather station

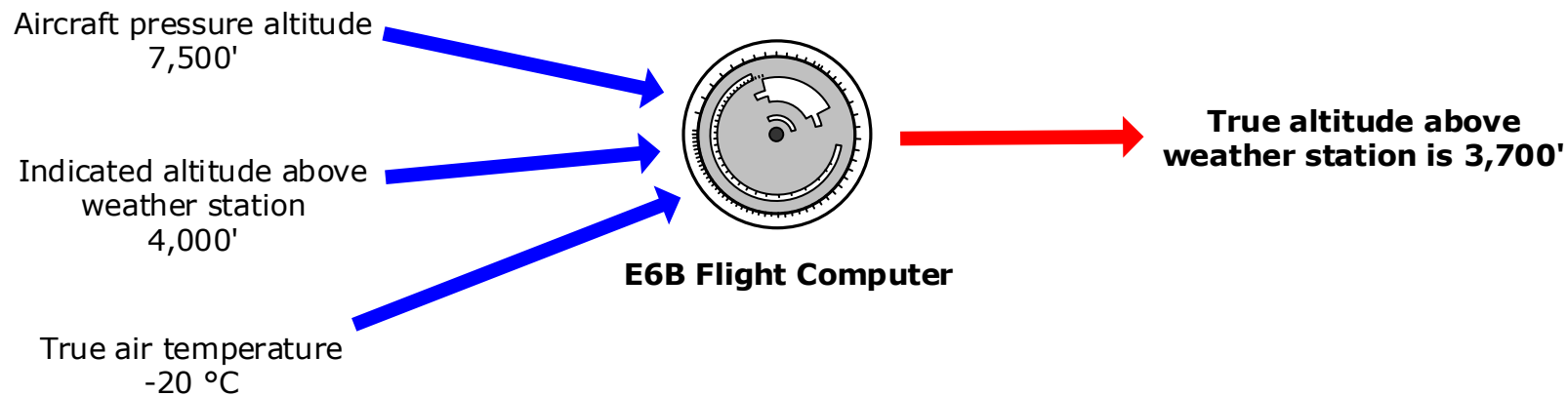
Calculating the indicated altitude above the weather station is very simple! You just find the difference between the aircraft's indicated altitude and the elevation of the weather station.

$$\begin{aligned}\text{Indicated altitude above weather station} &= \text{Aircraft indicated altitude} - \text{Weather station elevation} \\ &= 7,000' - 3,500' \\ &= 4,000'\end{aligned}$$

The indicated altitude above the weather station is 4,000 ft

2.b. Determine the true altitude above the weather station

To determine the true altitude above the weather station you need to use your E6B flight computer:



2. Determine the true altitude of the aircraft

2.c. Determine the true altitude correction

Now that you know the indicated and true altitudes above the weather station, the difference between those two numbers is the true altitude correction which you need to determine the aircraft's true altitude.

$$\begin{aligned}\text{True altitude correction} &= \text{True altitude above weather station} - \text{Indicated altitude above weather station} \\ &= 3,700' - 4,000' \\ &= -300'\end{aligned}$$

The true altitude correction is -300 ft

2.d. Determine the true altitude of the aircraft

Now you can simply add the true altitude correction to your indicated altitude and this will be the true altitude of the aircraft.

$$\begin{aligned}\text{Aircraft true altitude} &= \text{Indicated altitude} + \text{True altitude correction} \\ &= 7,000' + (-300') \\ &= 6,700'\end{aligned}$$

The aircraft's true altitude is 6,700 ft

3. Determine the clearance above the ridge

Determining the clearance above the ridge is simply a matter of finding the difference between the aircraft's true altitude and the ridge height.

$$\begin{aligned}\text{Clearance} &= \text{Aircraft true altitude} - \text{Ridge height} \\ &= 6,700' - 5,000' \\ &= 1,700'\end{aligned}$$

The clearance above the ridge is closest to answer a) 1,750 ft

