1. **At what altitude would the temperature be 10°C, given that the temperature at sea level is 25°C and the lapse rate is 6.5°C per 1 km?**

Altitude = (Temperature at sea level − Target Temperature) / Lapse Rate
= (25°C - 10°C) / 6.5°C/km
= 2.31 km **(Ans:)**

2. A geologist wants to find out the height of a mountain in feet. He knows that the temperature at the base of the mountain is 77ºF and the temperature at the top is 24.8ºF. What is the total height of the mountain?

a) 14,500 km
b) 14,500 feet
c) 18,792 km
d) 18, 792 feet

Ans: - b) 14,500 feet

Lapse Rate in feet = Change of 3.6ºF for every 1,000 feet.

º ℎ ⟶ 77 − 24. 8 ⟶ 52. 2
º 3. 6 →1, 000
º 52. 2 →1,000
3.6 ×52. 2 →14, 500

3. Calculate the rise in temperature as a hiker descends from the top of a mountain of height 2 km above the ground, to its base which is 0.5 km above the ground.

Ans: 9.75ºC

Lapse Rate in km = Change of 6.5ºC for every 1 km.

ℎ ⟶ 2 − 0. 5 ⟶ 1. 5

º 1 → 6. 5
º 1. 5 → 6.5 1 ×1. 5→9. 75

4. The temperature at sea level is 30°C, and the lapse rate varies with altitude. The lapse rate is 6.5°C change per 1 km for the first 2 km, then changes to 4.5°C per 1 km for the next 3 km. What is the temperature at an altitude of 5 km?

Here,
For the first 2 km: Temperature decrease = 2km × (-6.5°C/km) = -13°C
For the next 3 km: Temperature decrease = 3 km × (-4.5°C/km) = -13.5°C
Total temperature decrease = (-13°C) + (-13.5°C) = -26.5°C
So, temperature at 5 km = 30°C - 26.5°C = 3.5°C **(Ans:)**

5. If the temperature at an altitude of 1 mile is 50°F, what would be the temperature

at an altitude of 3 miles, considering the standard lapse rate of 3.6°F per 1000 ft?
Given, Temperature at 1 mile = 50°F
Changes of altitude = 3 miles - 1 miles = 2 miles
We know, 1 mile = 5280 feet
So, at 2 miles: Altitude = 2 × 5280 = 10560 feet
Given, the standard lapse rate, 3.6°F temperature decrease per 1000 ft altitude At 10560 ft altitude, the decrease of temperature is = (3.6°F/1000 ft * 10560) = 38.016 °F So, temperature at 3 miles = 50°F − 38.016 °F = 11.98°F **(Ans:)**

6. **A balloon is blown up and released from ground level. The Balloon will instantly pop when at a height of 18,000 feet. If the ground temperature is 102ºF, at what temperature will the balloon pop?**

Ans: 37.2ºF

Lapse Rate in feet = Change of 3.6ºF for every 1,000 feet.

$^{\circ} 1,000$ ********** $\rightarrow 3.6^{\circ}$
$^{\circ} 18,000$ ********** $\rightarrow \frac{3.6}{1000} \times 18,000 \rightarrow 64.8^{\circ}$

$^{\circ}$ **h********** ***** ********** $\rightarrow 102 - 64.8 \rightarrow 37.2^{\circ}$
So, the balloon will pop at 37.2°

7. A hiker wants to find out the change in temperature when ascending a mountain. He knows that the base of the mountain is at a height of 1,000 feet and the top of the mountain is at a height of 14,500 feet. What is the total temperature change as one climbs the mountain? Mention whether it is positive or negative.

Ans: - 48.6ºF

Lapse Rate in feet = Change of 3.6ºF for every 1,000 feet.

h******** ***** **********$\rightarrow 14,500$ ********** $- 1,000$ ********** $\rightarrow 13,500$ **********

$^{\circ} 1,000$ ********** $\rightarrow 3.6^{\circ}$
$^{\circ} 13,500$ ********** $\rightarrow \frac{3.6}{1000} \times 13,500 \rightarrow 48.6^{\circ}$

As the hiker is going up the mountain, the temperature is decreasing, and thus the temperature change is - 48.6ºF, and is negative.

8. In a mountainous region, the lapse rate is affected by the presence of waterbodies. At an altitude of 1.5 km, the temperature is 16.8°C. If the temperature changes by 2°C for every kilometer above 1.5 km, what would be the temperature at

an altitude of 3.8 km?

Here,

At 1.5 km temperature is = 16.8°C

Changes of distance(altitude) = 3.8 km - 1.5 km = 2.3 km

Now, Temperature change (decrease) from 1.5 km to 3.8 km = (2°C/km) × 2.3 km = 4.6°C

So, Temperature at 3.8 km = 16.8°C - 4.6°C =12.2°C **(Ans:)**

9. A drone is used to capture images from high altitudes. It can fly up to an elevation where the temperature is -2.5ºC. If the temperature at ground level is 30ºC, then what is the maximum elevation the drone can fly up to?

Ans: 5 km

Lapse Rate in km = Change of 6.5ºC for every 1 km.

To calculate the maximum elevation, we must first calculate the change in temperature when going from the ground to the max height.

º ℎ ⟶ $30 - (-2.5) \rightarrow 30 + 2.5 \rightarrow 32.5$

Using the temperature change, we can apply the lapse rate rule to calculate the maximum elevation.

º 6.5 → 1

º $32.5 \rightarrow \frac{1}{6.5} \times 32.5 \rightarrow 5$

10. A hawk flies from a tree 100 feet in height, to an elevation of 11,350 feet. Calculate the drop in temperature, in F, as it flies from 100 feet to 11,350 feet.

Ans: 40.5ºF

Lapse Rate in feet = Change of 3.6ºF for every 1,000 feet.

ℎ ⟶ $11,350$ -100 $\rightarrow 11,250$

º $1,000$ → 3.6

º $11,250$ $\rightarrow \frac{3.6}{1000} \times 11,250 \rightarrow 40.5$