

# Viewing Distances

People like living at the top of tall buildings or hiking to the top of tall mountains because the views are amazing. From those heights, it is possible to see for great distances before Earth curves away from view at the horizon. For these questions, assume Earth is perfectly spherical with a radius of 6,371,000 meters and that there are no obstacles to the view.

1. If you are standing on Earth's surface, what is the distance from your eye to the horizon?
2. If you were at a height of  $h$  meters above Earth's surface, what would be the distance from your eye to the horizon?
3. Different types of satellites orbit at different heights. Research some types of satellites and find out how high they orbit.
  - a. Choose at least two types of satellites that orbit at different heights. How much of Earth's circumference could each of them see at a time?
  - b. What is the smallest number of satellites that would be needed to see all of the equator at the same time? How high did you assume they would orbit?
4. Choose another body in the solar system besides Earth.
  - a. If you could stand on it, how far would you be able to see?
  - b. Choose a feature on it, like a crater or mountain, or like Jupiter's Great Red Spot. How high above its surface would you need to be in order to see all of that feature?

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1. If you are standing on Earth's surface, what is the distance from your eye to the horizon?
2. If you were on the top floor of one of the Petronas Towers in Malaysia at a height of 370 meters, what would be the distance from your eye to the horizon?
3. If you were at a height of  $h$  meters above Earth's surface, what would be the distance from your eye to the horizon?
4. The International Space Station is 408,773 meters above Earth's surface. If you were an astronaut on the ISS, what fraction of Earth's circumference would you be able to see?
5. How many satellites orbiting at the height of the ISS would be needed in order to see all of the equator at the same time?
6. What is the smallest number of satellites that would be needed to see all of the equator at the same time? How high did you assume they would orbit?