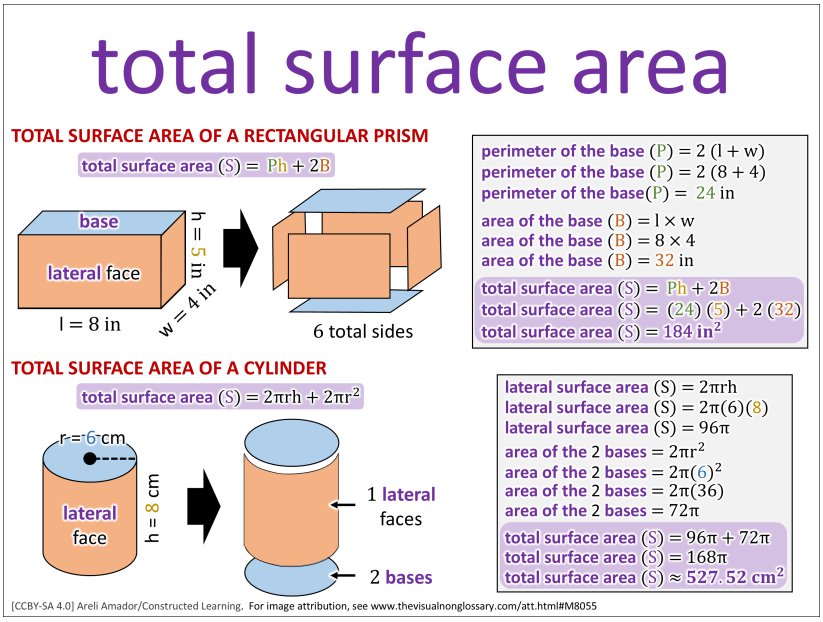
The Visual Non-Glossary™

Covering Every Side

The purpose for reading is to understand how total surface area is calculated for three-dimensional figures and why it is useful in real-world situations.

Look Out For:

- The formula for total surface area and what each part of the formula represents
- How the perimeter of the base and area of the base are calculated and used in the formula
- How total surface area is applied in a real-world situation



When someone makes a box or wraps an object, they need to know how much material will cover the outside. This measurement is called **total surface area**. **Total surface area** is the total of all the outside faces added together. It is different from volume because volume measures the space inside a figure. Knowing **total surface area** helps people figure out how much material they need. Think about a rectangular prism that is 8 inches long, 4 inches wide, and 5 inches tall. To cover that box, the **total surface area** needs to be found.

To find the **total surface area**, the formula S = Ph + 2B is used. P is the **perimeter of the base**, h is the height, and B is the **area of the base**. First, find the **perimeter of the base**: P = 2(8 + 4). That equals 24 inches. Next, find the **area of the base**: B = 8 × 4. That equals 32 square inches. Finally, put those numbers into the formula: S = (24)(5) + 2(32). The **total surface area** is 184 square inches. That means 184 square inches of material would cover every side of the box.

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Now think about a different situation. A company needs to cover the outside of a cylindrical candle before shipping it. The cylinder has a radius of 4 inches and a height of 10 inches. The formula for the **total surface area** of a cylinder is $S = 2\pi rh + 2\pi r^2$. In this formula, $2\pi rh$ finds the **lateral** surface area of the curved side. The $2\pi r^2$ finds the area of the two circular **bases**. The company must calculate the **total surface area** before cutting any material.

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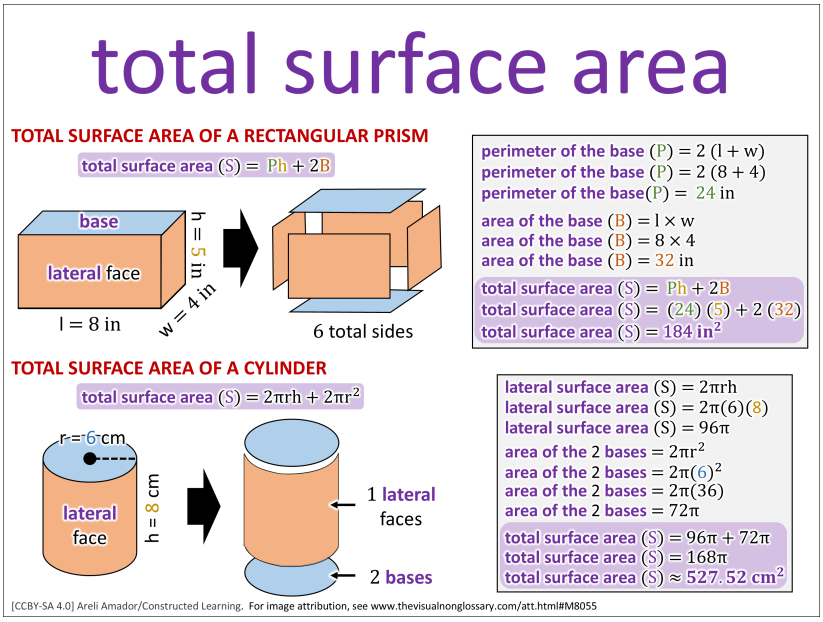

When someone builds a storage box, paints furniture, or wraps an object in material, they need to know how much surface covers the outside of a three-dimensional figure. This measurement is called **total surface area**. Unlike volume, which measures the space inside a figure, **total surface area** measures the sum of the areas of all outside faces. Knowing the total surface area of an object helps people figure out exactly how much material they will need to cover every side. Consider a rectangular prism with a length of 8 inches, a width of 4 inches, and a height of 5 inches. To find out how much material is needed to cover that box completely, the total surface area must be calculated.

To find the **total surface area** of the rectangular prism, the formula S = Ph + 2B is used, where P represents the **perimeter of the base**, h represents the height, and B represents the **area of the base**. First, the perimeter of the base is calculated by adding the length and width, then multiplying by 2: P = 2(8 + 4), giving a perimeter of 24 inches. Next, the **area of the base** is found by multiplying the length by the width:

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B = 8 × 4, giving an area of 32 square inches. Finally, these values are substituted into the formula: S = (24)(5) + 2(32), which gives a **total surface area** of 184 square inches. This means that 184 square inches of material would be needed to cover every face of that rectangular prism, including the top, bottom, and all four sides.

Now consider a different situation. A company needs to wrap the outside of a cylindrical candle before shipping it. The cylinder has a radius of 4 inches and a height of 10 inches. To find the **total surface area** of a cylinder, the formula $S = 2\pi rh + 2\pi r^2$ is used, where r represents the radius, h represents the height, $2\pi rh$ represents the **lateral** surface area of the curved side, and $2\pi r^2$ represents the area of the two circular **bases**. The company must calculate the **total surface area** of the cylinder to know exactly how much wrapping material is needed before cutting anything.

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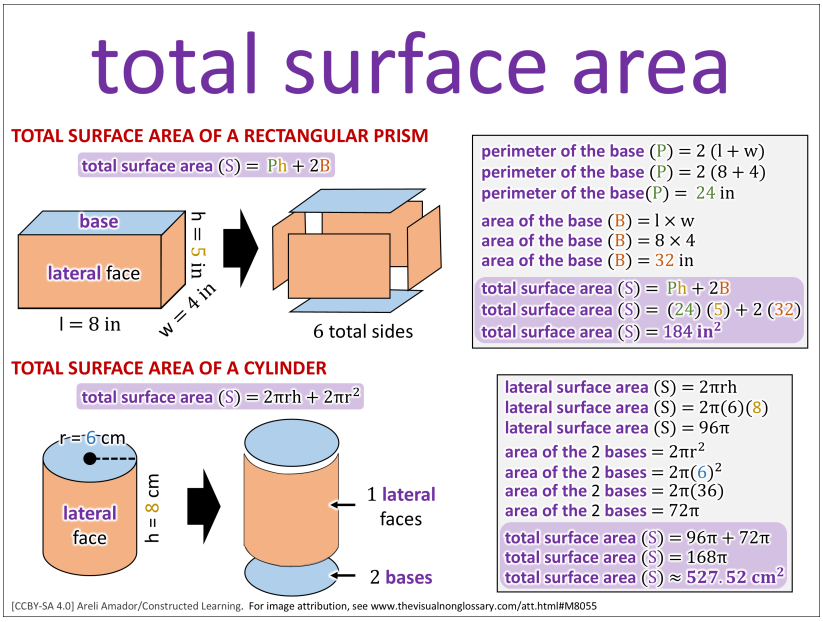

Whether building a storage container, applying paint to furniture, or preparing a product for shipment, knowing how much material is needed to cover the outside of a three-dimensional figure is an important and practical skill. This measurement is known as **total surface area**, which represents the sum of the areas of all exterior faces of a solid figure. Unlike volume, which measures the space contained inside a figure, **total surface area** focuses on the outer boundary of the figure, making the two measurements distinct in both meaning and application. Being able to calculate total surface area accurately helps people determine exactly how much material they need without wasting resources. Consider a rectangular prism with a length of 8 inches, a width of 4 inches, and a height of 5 inches, where the goal is to find how much material would be needed to cover the entire figure.

To calculate the **total surface area** of the rectangular prism, the formula S = Ph + 2B is applied, where P represents the **perimeter of the base**, h represents the height, and B represents the **area of the base**. First, the **perimeter of the base** is

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found by adding the length and width and multiplying by 2: $P = 2(8 + 4)$, which produces a perimeter of 24 inches. Next, the **area of the base** is determined by multiplying the length by the width: $B = 8 \times 4$, giving a base area of 32 square inches. Finally, substituting these values into the formula $S = (24)(5) + 2(32)$ yields a **total surface area** of 184 square inches, which represents the total amount of material needed to cover all six faces of the rectangular prism.

Now consider a situation involving a curved surface rather than flat faces. A company needs to wrap the exterior of a cylindrical candle before shipping it to customers. The cylinder has a radius of 4 inches and a height of 10 inches. Because a cylinder has both a curved **lateral** surface and two circular **bases**, the formula $S = 2\pi rh + 2\pi r^2$ accounts for both components separately before combining them into the **total surface area**. The company must calculate the **total surface area** of the cylinder before cutting any wrapping material to ensure complete coverage with no waste.