

A Rectangular Parking Lot Has A Perimeter Of 820 Ft. The Area Of The Parking Lot Measures 42,000 Ft².

A Rectangular Parking Lot Has A Perimeter Of 820 Ft. The Area Of The Parking Lot Measures 42,000 Ft².

Understanding the dimensions and properties of a parking lot is essential for architects, urban planners, business owners, and facility managers. Whether designing a new parking facility or analyzing an existing one, grasping the relationship between perimeter, area, length, and width helps optimize space utilization, improve traffic flow, and ensure safety compliance. In this article, we delve into the specifics of a rectangular parking lot with a perimeter of 820 feet and an area of 42,000 square feet. We will explore how to determine its length and width, interpret these measurements, and discuss their practical implications.

Fundamentals of Rectangular Parking Lot Dimensions

Before analyzing the specific parking lot, it is important to understand the basic geometric principles that govern rectangles.

Key Properties of Rectangles

- Opposite sides are equal in length.
- The perimeter (P) is the sum of all sides, formula: $P = 2(\text{length} + \text{width})$.
- The area (A) is the product of length and width, formula: $A = \text{length} \times \text{width}$.

These properties form the foundation for calculating unknown dimensions when given certain measurements.

Given Data and Objective

The parking lot in question has:

- Perimeter (P): 820 feet
- Area (A): 42,000 square feet

Our primary goal is to determine the length and width of the parking lot based on these

measurements.

Step-by-Step Calculation of Parking Lot Dimensions

To find the dimensions, we will set variables:

- Let L = length of the parking lot (in feet)
- Let W = width of the parking lot (in feet)

From the given data, the following equations are established:

1. Perimeter Equation:

$$P = 2(L + W) = 820$$

2. Area Equation:

$$A = L \times W = 42,000$$

Step 1: Express one variable in terms of the other

From the perimeter equation:

$$2(L + W) = 820$$

Divide both sides by 2:

$$L + W = 410$$

Express W in terms of L :

$$W = 410 - L$$

Step 2: Substitute into the area equation

Using $W = 410 - L$:

$$A = L \times W = 42,000$$

Substitute W:

$$L \times (410 - L) = 42,000$$

This simplifies to:

$$L \times 410 - L^2 = 42,000$$

Rewrite as a quadratic equation:

$$-L^2 + 410L - 42,000 = 0$$

Multiply through by -1 to make it standard:

$$L^2 - 410L + 42,000 = 0$$

Step 3: Solve the quadratic equation

Quadratic formula:

$$L = [410 \pm \sqrt{(410^2 - 4 \times 1 \times 42,000)}] / 2$$

Calculate discriminant:

$$D = 410^2 - 4 \times 42,000$$

$$D = 168,100 - 168,000$$

$$D = 100$$

Calculate square root:

$$\sqrt{D} = \sqrt{100} = 10$$

Now, find the two possible solutions:

$$L = [410 + 10] / 2 = 420 / 2 = 210$$

$$L = [410 - 10] / 2 = 400 / 2 = 200$$

Step 4: Find corresponding widths

Recall $W = 410 - L$:

- For $L = 210$: $W = 410 - 210 = 200$
- For $L = 200$: $W = 410 - 200 = 210$

Since the order of length and width does not matter in a rectangle, the dimensions are:

Either:

- Length = 210 ft, Width = 200 ft

or

- Length = 200 ft, Width = 210 ft

Practical Interpretation of the Dimensions

The calculations reveal that the parking lot measures approximately 200 to 210 feet in both length and width. These measurements ensure the parking lot meets the specified perimeter and area constraints.

Key Takeaways:

- The parking lot is nearly square, with slight variations in dimensions.
- The total perimeter of 820 ft indicates a substantial boundary, suitable for accommodating a significant number of parking spaces.
- The area of 42,000 ft² translates to approximately 0.97 acres, a sizable parking facility.

Design and Planning Considerations

Understanding the dimensions allows for effective planning and optimization.

Capacity Planning

- Typical parking space size ranges from 180 to 200 square feet.
- Total parking spaces can be estimated:
 - Using the smaller dimension (200 ft), the total area per space (including drive aisles) might be around 300 ft².
 - Approximate number of parking spaces:

Number of spaces $\approx$ Total area / Area per space $\approx 42,000 / 300 \approx 140$

- This provides a rough estimate of parking capacity, aiding in design decisions.

Traffic Flow and Accessibility

- The dimensions influence the layout of aisles, entry/exit points, and pedestrian pathways.
- A nearly square lot simplifies traffic management and reduces congestion.

Compliance and Safety

- Local regulations often specify minimum parking space sizes, aisle widths, and accessible parking requirements.
- Accurate measurements facilitate compliance with ADA standards and safety codes.

Optimizing Parking Lot Design Using Dimensions

To maximize efficiency, consider the following:

1. Parking Space Arrangement

- Parallel, perpendicular, or angled parking depending on available space and traffic flow.
- For example, perpendicular parking maximizes space utilization.

2. Drive Aisle Configuration

- Aisles should be at least 24 feet wide for two-way traffic.
- The total width of the lot must accommodate aisles and parking spaces comfortably.

3. Landscaping and Lighting

- Proper planning ensures safety, aesthetics, and adherence to zoning laws.

4. Entry and Exit Points

- Strategic placement minimizes bottlenecks and enhances safety.

Conclusion: Key Takeaways and Practical Implications

Understanding the precise dimensions of a parking lot with a perimeter of 820 feet and an area of 42,000 square feet is essential for effective design and management. The calculations show that such

a lot measures approximately 200 to 210 feet in both length and width, making it nearly square-shaped. This configuration offers a balanced approach for capacity, traffic flow, and safety.

By mastering the relationship between perimeter, area, length, and width, planners and stakeholders can optimize space, improve user experience, and ensure compliance with safety standards. Whether constructing a new parking lot or analyzing an existing one, these geometric principles provide valuable insights to inform all stages of planning and development.

Additional Resources for Parking Lot Design

- International Building Code (IBC): Standards for parking lot design and safety
- American Planning Association (APA): Guidelines for urban planning and parking management
- Parking Design Manuals: Detailed best practices for layout, signage, and accessibility
- Software Tools: CAD programs and parking lot calculators for precise planning

In summary, understanding how to derive the dimensions of a parking lot based on given perimeter and area measurements is a fundamental skill in infrastructure planning. The mathematical approach outlined here can be adapted for various lot sizes and shapes, supporting efficient, safe, and compliant parking solutions.

Frequently Asked Questions

What are the length and width of the parking lot if its perimeter is 820 ft and area is 42,000 ft²?

Let length be L and width be W . From the perimeter: $2(L + W) = 820$, so $L + W = 410$. From the area: $L \times W = 42,000$. Solving these simultaneously gives the dimensions approximately as $L \approx 280$ ft and $W \approx 150$ ft.

How can you find the dimensions of a rectangle given perimeter and area?

Use the perimeter to find the sum of length and width ($L + W$), then use the area equation ($L \times W$) to set up a system of equations. Solving these yields the dimensions of the rectangle.

What is the importance of knowing both perimeter and area in planning a parking lot?

Knowing both helps determine the shape and size for optimal space utilization, ensuring the parking lot fits designated space and meets capacity requirements efficiently.

Can the parking lot be a perfect square? Why or why not?

To be a perfect square with the given perimeter and area, the dimensions must satisfy both conditions. In this case, the dimensions approximate to a rectangle, not a perfect square, since a square with perimeter 820 ft would have sides of 205 ft, resulting in an area of 42,025 ft², very close but not exactly 42,000 ft².

How do you verify the correctness of the calculated dimensions?

Check that the sum of length and width equals half the perimeter (410 ft), and that their product equals the area (42,000 ft²). If both conditions are satisfied, the dimensions are correct.

What practical considerations are there when designing a parking lot with these dimensions?

Designers need to consider vehicle sizes, space for maneuvering, accessibility, and safety regulations while ensuring the dimensions meet the calculated measurements.

If the parking lot's length is 280 ft, what is its width?

Using the sum of length and width: $280 + W = 410$, so $W = 410 - 280 = 130$ ft.

What is the approximate width of the parking lot based on the given data?

The width is approximately 150 ft, calculated from the equations solving for both dimensions simultaneously.

Additional Resources

A Rectangular Parking Lot Has A Perimeter Of 820 Ft. The Area Of The Parking Lot Measures 42,000 Ft².

Understanding the dimensions and characteristics of a parking lot is crucial not only for efficient space utilization but also for planning infrastructure, ensuring safety, and optimizing operational costs. In this analysis, we delve into the details of a rectangular parking lot with a specified perimeter of 820 feet and an area of 42,000 square feet. By examining the fundamental geometric principles involved, calculating the dimensions, and exploring their implications, we aim to provide a comprehensive understanding of this parking facility.

Understanding the Basic Geometric Properties

Perimeter and Area: Definitions and Significance

Perimeter refers to the total length of the boundary enclosing a two-dimensional shape. For a rectangle, it is the sum of all four sides, which can be calculated as:

$$P = 2 \times (\text{length} + \text{width})$$

Area measures the surface covered by the shape, expressed in square units. For a rectangle, it is the product of its length and width:

$$A = \text{length} \times \text{width}$$

In the context of a parking lot, these measurements are critical for various reasons:

- Perimeter helps in fencing, boundary marking, and understanding the overall extent of the parking area.
- Area indicates the parking capacity, influencing the number of parking spaces, traffic flow, and design planning.

Deriving the Dimensions of the Parking Lot

Given Data:

- Perimeter, $P = 820$, ft
- Area, $A = 42,000$, ft^2

Step 1: Establishing the Equations

Let:

- L = length of the parking lot
- W = width of the parking lot

From the perimeter:

$$2(L + W) = 820 \rightarrow L + W = 410$$

From the area:

$$L \times W = 42,000$$

Step 2: Expressing One Variable in Terms of the Other

From the perimeter equation:

$$W = 410 - L$$

Substitute into the area equation:

$$L \times (410 - L) = 42,000$$

Simplify:

$$410L - L^2 = 42,000$$

Rearranged into a standard quadratic form:

$$L^2 - 410L + 42,000 = 0$$

Step 3: Solving the Quadratic Equation

Using the quadratic formula:

$$L = \frac{410 \pm \sqrt{(410)^2 - 4 \times 1 \times 42,000}}{2}$$

Calculate discriminant:

$$D = 410^2 - 4 \times 42,000 = 168,100 - 168,000 = 100$$

Square root of discriminant:

$$\sqrt{100} = 10$$

Calculate the two solutions:

$$L = \frac{410 \pm 10}{2}$$

$$L = \frac{410 + 10}{2} = \frac{420}{2} = 210 \text{ ft}$$

$$L = \frac{410 - 10}{2} = \frac{400}{2} = 200 \text{ ft}$$

Correspondingly, the widths are:

- When $L = 210$ ft:

$$W = 410 - 210 = 200 \text{ ft}$$

- When $L = 200$ ft:

$$W = 410 - 200 = 210 \text{ ft}$$

Conclusion: The parking lot dimensions are approximately 200 ft by 210 ft, with either dimension serving as length or width depending on orientation.

Implications of the Dimensions

Design Flexibility and Space Utilization

The close proximity of length and width (200 ft and 210 ft) indicates a nearly square shape, which is advantageous for several reasons:

- Maximized capacity: Near-square shapes tend to optimize space for parking spaces per unit area.
- Ease of layout planning: Uniform dimensions simplify the arrangement of parking lanes, aisles, and pedestrian pathways.
- Accessibility: Symmetric design facilitates easier entry and exit points.

Capacity Analysis and Parking Space Calculation

To assess the parking capacity, one must consider standard parking space dimensions:

- Typical parking space: approximately 9 ft wide by 18 ft long.
- Including aisles and maneuvering space, the effective area per parking space is often about 200-220 sq ft.

Given the total area:

$$\lfloor \text{Number of parking spaces} \rfloor \approx \frac{42,000 \text{ ft}^2}{200 \text{ ft}^2} = 210$$

This rough estimate suggests the parking lot can accommodate approximately 200 to 210 vehicles, assuming efficient layout and minimal obstructions.

Design Considerations and Practical Applications

Traffic Flow and Safety

The shape and size of the parking lot influence vehicle movement:

- Proper lane width (typically 12-24 ft) ensures smooth flow.

- Adequate space between rows prevents congestion.
- Clear signage and markings enhance safety and navigation.

Environmental and Regulatory Factors

- Drainage planning must accommodate the 820 ft perimeter, ensuring water runoff does not cause flooding.
- Lighting, security, and accessibility compliance are essential for operational safety.
- Green space and landscaping considerations may affect total usable area.

Cost Implications

- Larger perimeter increases fencing and boundary materials costs.
- Efficient use of space reduces the need for expansion or additional land acquisition.
- Maintenance costs correlate with total surface area and complexity.

Conclusion and Broader Context

The analysis of this rectangular parking lot, with its perimeter of 820 feet and area of 42,000 square feet, exemplifies how fundamental geometric principles underpin practical infrastructure planning. The derived dimensions—approximately 200 ft by 210 ft—highlight a nearly square layout optimized for capacity and operational efficiency. Such detailed understanding informs not just design and construction but also long-term maintenance, safety protocols, and environmental considerations.

In urban planning and commercial development, precise measurements like these are vital for harmonizing functionality with spatial constraints. As cities grow and transportation needs evolve, the ability to accurately interpret and utilize such geometric data becomes increasingly valuable. Whether for a shopping mall, corporate campus, or public parking facility, comprehending the interplay between perimeter, area, and spatial arrangement ensures that parking solutions meet current demands while remaining adaptable for future expansion.

Ultimately, this case underscores the importance of integrating mathematical rigor with practical design, ensuring that parking lots serve their intended purpose efficiently, safely, and sustainably.

[A Rectangular Parking Lot Has A Perimeter Of 820 Ft The Area Of The Parking Lot Measures 42 000 Ft2](#)

A Rectangular Parking Lot Has A Perimeter Of 820 Ft The Area Of The Parking Lot Measures 42 000 Ft2

Related Articles

- [A Low-pass Filter Consists Of A 103?F Capacitor In Series With A 166? Resistor. The Circuit Is Driven](#)
- [A\) Darren Scored A Mark Of 57 On The Miller Analogies Test. This Test Had A Mean Of 50 And A Standard](#)
- [At Issue, A Fully-continuous Whole Life Insurance Policy With Benefit \\$10,000 Is Issued To A Life Age](#)

[Back to Home](#)