

WHAT IS THE SURFACE AREA OF THE CUBOID BELOW? REMEMBER TO GIVE THE CORRECT UNITS. 8 M 12 M 3 M

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UNDERSTANDING THE SURFACE AREA OF A CUBOID IS FUNDAMENTAL IN VARIOUS FIELDS SUCH AS GEOMETRY, ARCHITECTURE, MANUFACTURING, AND PACKAGING. IT HELPS DETERMINE THE AMOUNT OF MATERIAL NEEDED TO COVER THE OBJECT OR THE EXTENT OF ITS EXTERNAL SURFACE. IN THIS ARTICLE, WE WILL EXPLORE THE CONCEPT OF SURFACE AREA IN DETAIL, FOCUSING ON A SPECIFIC CUBOID WITH DIMENSIONS 8 METERS, 12 METERS, AND 3 METERS. BY THE END, YOU WILL BE ABLE TO COMPUTE THE SURFACE AREA ACCURATELY AND UNDERSTAND ITS SIGNIFICANCE.

WHAT IS A CUBOID?

A CUBOID, ALSO KNOWN AS A RECTANGULAR PRISM, IS A THREE-DIMENSIONAL GEOMETRIC SHAPE WITH SIX RECTANGULAR FACES. ITS CHARACTERISTICS INCLUDE:

- OPPOSITE FACES ARE EQUAL IN SIZE.
- EDGES ARE PERPENDICULAR TO EACH OTHER.
- IT HAS 12 EDGES, 8 VERTICES, AND 6 FACES.

THE DIMENSIONS OF A CUBOID ARE TYPICALLY GIVEN AS LENGTH (L), WIDTH (W), AND HEIGHT (H). FOR OUR SPECIFIC CASE, THESE ARE:

- LENGTH = 8 METERS
- WIDTH = 12 METERS
- HEIGHT = 3 METERS

UNDERSTANDING SURFACE AREA

DEFINITION

SURFACE AREA OF A THREE-DIMENSIONAL OBJECT IS THE TOTAL AREA COVERED BY ITS OUTER SURFACES. IT IS EXPRESSED IN SQUARE UNITS, SUCH AS SQUARE METERS (m^2), SQUARE CENTIMETERS (cm^2), ETC.

SIGNIFICANCE

- DETERMINES THE AMOUNT OF MATERIAL NEEDED FOR COVERING OBJECTS.
- USEFUL IN CALCULATING PAINT, WRAPPING, OR COATING REQUIREMENTS.
- HELPS IN UNDERSTANDING THE EXTERNAL SIZE OF THE OBJECT.

CALCULATING THE SURFACE AREA OF A CUBOID

THE FORMULA FOR THE SURFACE AREA (SA) OF A CUBOID IS:

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$$SA = 2(LW + LH + WH)$$

WHERE:

- (L) = LENGTH
- (W) = WIDTH
- (H) = HEIGHT

APPLYING THE SPECIFIC DIMENSIONS:

$$SA = 2(8 \times 12 + 8 \times 3 + 12 \times 3)$$

STEP-BY-STEP CALCULATION

1. CALCULATE EACH PAIR OF PRODUCTS:

- $(8 \times 12 = 96)$
- $(8 \times 3 = 24)$
- $(12 \times 3 = 36)$

2. SUM THESE PRODUCTS:

- $(96 + 24 + 36 = 156)$

3. MULTIPLY THE SUM BY 2:

- $(2 \times 156 = 312)$

4. FINAL ANSWER:

- SURFACE AREA = 312 SQUARE METERS (m^2)

INTERPRETING THE RESULT

THE SURFACE AREA OF THE CUBOID WITH DIMENSIONS 8 METERS, 12 METERS, AND 3 METERS IS 312 m^2 . THIS MEANS THAT IF YOU WERE TO COVER THE ENTIRE OUTSIDE SURFACE OF THIS CUBOID WITH A MATERIAL LIKE PAINT OR FABRIC, YOU WOULD NEED APPROXIMATELY 312 SQUARE METERS OF MATERIAL, ASSUMING NO WASTAGE OR OVERLAPS.

ADDITIONAL CONSIDERATIONS

UNITS

ALWAYS ENSURE THAT THE UNITS ARE CONSISTENT THROUGHOUT THE CALCULATION. IN THIS CASE, ALL DIMENSIONS ARE IN METERS, SO THE RESULTING SURFACE AREA IS IN SQUARE METERS.

REAL-WORLD APPLICATIONS

- CONSTRUCTION: ESTIMATING THE AMOUNT OF SIDING OR PAINT NEEDED FOR A BUILDING.
- PACKAGING: CALCULATING THE MATERIAL REQUIRED FOR CREATING BOXES.
- MANUFACTURING: DETERMINING SURFACE COATINGS FOR MANUFACTURED PARTS.

EXAMPLES AND PRACTICE PROBLEMS

EXAMPLE 1:

CALCULATE THE SURFACE AREA OF A CUBOID WITH DIMENSIONS 5 M, 7 M, AND 2 M.

SOLUTION:

$$SA = 2(5 \times 7 + 5 \times 2 + 7 \times 2) = 2(35 + 10 + 14) = 2(59) = 118 \text{ m}^2$$

PRACTICE PROBLEM:

A STORAGE BOX HAS DIMENSIONS 10 METERS (LENGTH), 4 METERS (WIDTH), AND 6 METERS (HEIGHT). WHAT IS ITS SURFACE AREA?

ANSWER:

$$SA = 2(10 \times 4 + 10 \times 6 + 4 \times 6) = 2(40 + 60 + 24) = 2(124) = 248 \text{ m}^2$$

SUMMARY

- THE SURFACE AREA OF A CUBOID DEPENDS ON ITS LENGTH, WIDTH, AND HEIGHT.
- THE FORMULA $SA = 2(LW + LH + WH)$ SIMPLIFIES CALCULATIONS.
- FOR THE GIVEN DIMENSIONS (8 M, 12 M, 3 M), THE SURFACE AREA IS 312 M².
- ACCURATE UNIT MANAGEMENT ENSURES PRECISE RESULTS.
- UNDERSTANDING SURFACE AREA IS ESSENTIAL FOR PRACTICAL APPLICATIONS LIKE MATERIAL ESTIMATION, CONSTRUCTION, AND MANUFACTURING.

CONCLUSION

CALCULATING THE SURFACE AREA OF A CUBOID IS A STRAIGHTFORWARD YET CRUCIAL TASK. IT INVOLVES UNDERSTANDING THE GEOMETRIC SHAPE, APPLYING THE RIGHT FORMULA, AND ENSURING CONSISTENT UNITS. THE EXAMPLE WITH DIMENSIONS 8 METERS, 12 METERS, AND 3 METERS ILLUSTRATES THE PROCESS CLEARLY. REMEMBER, ALWAYS DOUBLE-CHECK YOUR CALCULATIONS AND UNITS TO ENSURE ACCURACY IN PRACTICAL SCENARIOS. WHETHER YOU'RE A STUDENT, ARCHITECT, OR ENGINEER, MASTERING SURFACE AREA CALCULATIONS EMPOWERS YOU TO MAKE INFORMED DECISIONS ABOUT MATERIAL REQUIREMENTS AND DESIGN CONSIDERATIONS.

NOTE: ALWAYS CONSIDER ADDING A MARGIN FOR WASTE OR OVERLAPS WHEN PLANNING FOR REAL-WORLD APPLICATIONS.

FREQUENTLY ASKED QUESTIONS

WHAT IS THE SURFACE AREA OF A CUBOID WITH DIMENSIONS 8 M, 12 M, AND 3 M?

THE SURFACE AREA IS 396 SQUARE METERS.

How do you calculate the surface area of a cuboid with sides 8 meters, 12 meters, and 3 meters?

Use the formula $2(LB + BH + LH)$: $2(8 \times 12 + 12 \times 3 + 8 \times 3) = 2(96 + 36 + 24) = 2(156) = 312$ square meters.

What is the total surface area of a cuboid measuring 8 m, 12 m, and 3 m?

The total surface area is 312 square meters.

If a cuboid has dimensions 8 meters, 12 meters, and 3 meters, what is its surface area in square meters?

The surface area is 312 m².

Are the units for surface area of the cuboid with dimensions 8 m, 12 m, and 3 m in square meters?

Yes, the surface area is 312 square meters (m²).

Can you provide the formula used to find the surface area of a cuboid with given dimensions?

Yes, the formula is $\text{Surface Area} = 2(LB + BH + LH)$, where L, B, and H are length, breadth, and height respectively.

What is the importance of correct units when calculating the surface area of a cuboid?

Using correct units (square meters) ensures accurate measurement and proper understanding of the surface area in real-world applications.

If the dimensions of a cuboid are 8 meters, 12 meters, and 3 meters, what is the surface area in square meters?

The surface area is 312 m².

How does changing the dimensions of the cuboid affect its surface area?

Increasing any dimension increases the surface area proportionally, as the surface area depends on all three dimensions.

Additional Resources

What is the surface area of the cuboid below? Remember to give the correct units. 8 m x 12 m x 3 m

Understanding the surface area of a three-dimensional object is fundamental in various fields ranging from architecture and engineering to manufacturing and science. When it comes to cuboids—also known as rectangular prisms—the calculation of surface area provides essential insights into material requirements, cost estimations, and spatial considerations. In this comprehensive article, we delve into the concept of surface area, specifically focusing on a cuboid with dimensions 8 meters, 12 meters, and 3 meters. We will explore the formulae, step-by-step calculations, practical applications, and nuanced considerations to provide a thorough understanding of this geometric measure.

INTRODUCTION TO CUBOIDS AND SURFACE AREA

WHAT IS A CUBOID?

A CUBOID IS A THREE-DIMENSIONAL GEOMETRIC SHAPE CHARACTERIZED BY SIX RECTANGULAR FACES. IT IS A TYPE OF PRISM WHERE ALL ANGLES ARE RIGHT ANGLES, AND OPPOSITE FACES ARE CONGRUENT RECTANGLES. CUBOIDS ARE COMMON IN EVERYDAY LIFE—THINK OF BOXES, ROOMS, BRICKS, AND MANY STORAGE CONTAINERS.

KEY FEATURES OF A CUBOID INCLUDE:

- LENGTH (L)
- WIDTH (W)
- HEIGHT (H)

THESE DIMENSIONS ARE ESSENTIAL FOR CALCULATING SURFACE AREA, VOLUME, AND OTHER PROPERTIES.

WHY IS SURFACE AREA IMPORTANT?

SURFACE AREA SIGNIFIES THE TOTAL AREA COVERED BY THE OUTER SURFACES OF A THREE-DIMENSIONAL OBJECT. IT IS CRITICAL IN:

- DETERMINING THE AMOUNT OF MATERIAL NEEDED FOR COVERING OR PAINTING
- CALCULATING HEAT TRANSFER IN THERMAL APPLICATIONS
- ESTIMATING PACKAGING AND SHIPPING COSTS
- DESIGNING OBJECTS FOR AESTHETIC OR FUNCTIONAL PURPOSES

IN ESSENCE, UNDERSTANDING SURFACE AREA HELPS OPTIMIZE RESOURCE USE AND FUNCTIONAL DESIGN.

DIMENSIONS OF THE CUBOID IN QUESTION

THE SPECIFIC DIMENSIONS PROVIDED ARE:

- LENGTH (L) = 12 METERS
- WIDTH (W) = 8 METERS
- HEIGHT (H) = 3 METERS

THESE MEASUREMENTS DEFINE THE SIZE AND SHAPE OF THE CUBOID UNDER CONSIDERATION.

CALCULATING THE SURFACE AREA OF A CUBOID

THE GENERAL FORMULA

THE SURFACE AREA (SA) OF A CUBOID CAN BE CALCULATED USING THE FORMULA:

$$SA = 2(LW + LH + WH)$$

WHERE:

- L = LENGTH
- W = WIDTH
- H = HEIGHT

THIS FORMULA SUMS THE AREAS OF ALL SIX RECTANGLES (FACES) BY CALCULATING THE AREAS OF THREE PAIRS OF OPPOSITE FACES AND MULTIPLYING THE SUM BY 2.

STEP-BY-STEP CALCULATION

APPLYING THE FORMULA TO OUR SPECIFIC DIMENSIONS:

1. CALCULATE THE AREA OF THE TWO LENGTH-BY-WIDTH FACES:

- $\text{AREA} = LW = 12 \text{ m} \times 8 \text{ m} = 96 \text{ m}^2$

2. CALCULATE THE AREA OF THE TWO LENGTH-BY-HEIGHT FACES:

- $\text{AREA} = LH = 12 \text{ m} \times 3 \text{ m} = 36 \text{ m}^2$

3. CALCULATE THE AREA OF THE TWO WIDTH-BY-HEIGHT FACES:

- $\text{AREA} = WH = 8 \text{ m} \times 3 \text{ m} = 24 \text{ m}^2$

4. SUM THESE AREAS:

- $\text{TOTAL} = 96 \text{ m}^2 + 36 \text{ m}^2 + 24 \text{ m}^2 = 156 \text{ m}^2$

5. MULTIPLY BY 2 (SINCE EACH PAIR OF FACES APPEARS TWICE):

- $\text{SURFACE AREA} = 2 \times 156 \text{ m}^2 = 312 \text{ m}^2$

THEREFORE, THE TOTAL SURFACE AREA OF THE CUBOID IS 312 SQUARE METERS.

PRACTICAL CONSIDERATIONS AND UNITS

UNITS AND MEASUREMENT ACCURACY

IT'S IMPORTANT TO MAINTAIN CONSISTENT UNITS THROUGHOUT CALCULATIONS. IN THIS CASE, ALL MEASUREMENTS ARE IN METERS, RESULTING IN SURFACE AREA EXPRESSED IN SQUARE METERS (m^2). THIS CONSISTENCY ALLOWS FOR PRECISE APPLICATION IN REAL-WORLD SCENARIOS, SUCH AS MATERIAL ESTIMATION OR SPATIAL PLANNING.

NOTE: WHEN DIMENSIONS ARE GIVEN IN DIFFERENT UNITS, CONVERSION IS NECESSARY BEFORE CALCULATING.

APPLICATIONS OF THE CALCULATED SURFACE AREA

KNOWING THE SURFACE AREA ENABLES PROFESSIONALS TO:

- DETERMINE HOW MUCH PAINT OR COATING IS REQUIRED TO COVER THE CUBOID
- ESTIMATE THE AMOUNT OF MATERIAL NEEDED FOR WRAPPING OR INSULATION
- CALCULATE HEAT TRANSFER RATES IF USED IN THERMAL APPLICATIONS
- DESIGN PACKAGING THAT FITS OR PROTECTS THE OBJECT ADEQUATELY

EXAMPLE: IF A PROTECTIVE PAINT COSTS \$10 PER m^2 , THEN PAINTING THE ENTIRE SURFACE WOULD COST:

- $312 \text{ m}^2 \times \$10/\text{m}^2 = \$3,120$

ADVANCED INSIGHTS AND ANALYTICAL PERSPECTIVES

IMPACT OF DIMENSIONAL CHANGES

UNDERSTANDING HOW CHANGES IN DIMENSIONS AFFECT SURFACE AREA IS VITAL. FOR INSTANCE:

- INCREASING THE LENGTH OR WIDTH WILL PROPORTIONALLY INCREASE THE SURFACE AREA.
- THE SURFACE AREA SCALES LINEARLY WITH EACH DIMENSION; DOUBLING ANY DIMENSION DOUBLES THE AREA OF THE CORRESPONDING FACES.

IMPLICATION: SMALL MODIFICATIONS IN SIZE CAN SIGNIFICANTLY IMPACT MATERIAL COSTS AND COVERAGE REQUIREMENTS.

COMPARISON WITH OTHER GEOMETRIC PROPERTIES

- VOLUME: THE VOLUME OF THE CUBOID IS CALCULATED AS $L \times W \times H = 12 \text{ m} \times 8 \text{ m} \times 3 \text{ m} = 288 \text{ m}^3$.
- SURFACE AREA TO VOLUME RATIO: THIS RATIO HELPS ASSESS INSULATION NEEDS OR MATERIAL EFFICIENCY. FOR THIS CUBOID:
- $SA/V = 312 \text{ m}^2 / 288 \text{ m}^3 \approx 1.083 \text{ m}^{-1}$

A HIGHER RATIO INDICATES MORE SURFACE AREA RELATIVE TO VOLUME, WHICH IS RELEVANT IN THERMAL INSULATION AND SURFACE TREATMENT CONSIDERATIONS.

DESIGN OPTIMIZATION

IN ENGINEERING, OPTIMIZING THE DIMENSIONS FOR MINIMAL SURFACE AREA RELATIVE TO VOLUME CAN LEAD TO MATERIAL SAVINGS. FOR EXAMPLE, IN CONTAINER DESIGN, MINIMIZING SURFACE AREA REDUCES MATERIAL COSTS AND WEIGHT WHILE MAINTAINING CAPACITY.

REAL-WORLD APPLICATIONS AND CASE STUDIES

CONSTRUCTION AND ARCHITECTURE

IN BUILDING DESIGN, CALCULATING THE SURFACE AREA OF STRUCTURAL ELEMENTS ENSURES PROPER MATERIAL ESTIMATION FOR WALLS, FLOORS, AND CEILINGS. FOR INSTANCE, PLANNING A WAREHOUSE WITH AN $8 \text{ m} \times 12 \text{ m}$ FOOTPRINT AND 3 m HEIGHT REQUIRES PRECISE SURFACE AREA CALCULATIONS TO DETERMINE PAINT, INSULATION, AND FINISHING COSTS.

MANUFACTURING AND PACKAGING

MANUFACTURERS OF BOXES OR SHIPPING CONTAINERS USE SURFACE AREA CALCULATIONS TO DETERMINE MATERIAL NEEDS AND PACKAGING EFFICIENCY. A CUBOID OF THE SPECIFIED DIMENSIONS COULD BE A SHIPPING BOX, AND KNOWING ITS SURFACE AREA ASSISTS IN COST AND RESOURCE PLANNING.

ENVIRONMENTAL AND ENERGY CONSIDERATIONS

IN ENVIRONMENTAL ENGINEERING, SURFACE AREA INFLUENCES HEAT EXCHANGE RATES. AN OBJECT WITH A LARGER SURFACE AREA RELATIVE TO ITS VOLUME LOSES OR GAINS HEAT MORE RAPIDLY, AFFECTING ENERGY EFFICIENCY IN THERMAL SYSTEMS.

SUMMARY AND KEY TAKEAWAYS

- THE SURFACE AREA OF A CUBOID WITH DIMENSIONS 8 METERS, 12 METERS, AND 3 METERS IS 312 SQUARE METERS.
- THE CALCULATION RELIES ON THE FORMULA: $SA = 2(LW + LH + WH)$.
- CONSISTENT UNITS ARE ESSENTIAL FOR ACCURACY; IN THIS CASE, ALL MEASUREMENTS ARE IN METERS, LEADING TO SURFACE AREA IN SQUARE METERS.
- PRACTICAL APPLICATIONS SPAN CONSTRUCTION, MANUFACTURING, THERMAL MANAGEMENT, AND RESOURCE ESTIMATION.
- CHANGES IN DIMENSIONS PROPORTIONALLY IMPACT SURFACE AREA, INFLUENCING MATERIAL COSTS AND DESIGN EFFICIENCY.

CONCLUSION

UNDERSTANDING THE SURFACE AREA OF A CUBOID IS A FUNDAMENTAL ASPECT OF GEOMETRIC ANALYSIS WITH WIDE-RANGING PRACTICAL IMPLICATIONS. THE SPECIFIC CALCULATION FOR THE GIVEN DIMENSIONS—8 METERS, 12 METERS, AND 3 METERS—DEMONSTRATES A STRAIGHTFORWARD YET VITAL PROCESS THAT INFORMS VARIOUS INDUSTRY PRACTICES. WHETHER ESTIMATING THE AMOUNT OF PAINT NEEDED, DESIGNING EFFICIENT PACKAGING, OR ASSESSING HEAT TRANSFER, ACCURATE SURFACE AREA CALCULATIONS ARE INDISPENSABLE TOOLS IN ENGINEERING AND DESIGN. BY MASTERING THESE PRINCIPLES, PROFESSIONALS CAN OPTIMIZE RESOURCE USE, IMPROVE SAFETY, AND ENHANCE AESTHETIC AND FUNCTIONAL QUALITIES OF THEIR PROJECTS.

IN SUMMARY, THE SURFACE AREA OF THE CUBOID MEASURING 8 METERS BY 12 METERS BY 3 METERS IS 312 SQUARE METERS, A CRITICAL FIGURE FOR NUMEROUS REAL-WORLD APPLICATIONS.

What Is The Surface Area Of The Cuboid Below Remember To Give The Correct Units 8 M12 M3 M

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Related Articles

- [Determine The Slope Of The Tangent Line To The Circle \$X^2+y^2 = 1\$ At The Point \$\(1/2, 1/2\)\$.](#)
- [What Is The Volume Of This Cylinder?Use 3.14 And Round Your Answer To The Nearest Hundredth.](#)
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