

8. A RECTANGULAR PRISM MEASURES 5 CM BY 9.5 CM BY 17.2 CM. WHAT IS THE VOLUME OF THE PRISM? 10. PYRATHE PA.

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UNDERSTANDING THE VOLUME OF A RECTANGULAR PRISM IS A FUNDAMENTAL ASPECT OF GEOMETRY, ESSENTIAL FOR STUDENTS, EDUCATORS, AND PROFESSIONALS WORKING WITH THREE-DIMENSIONAL OBJECTS. IN THIS ARTICLE, WE WILL EXPLORE HOW TO COMPUTE THE VOLUME OF A RECTANGULAR PRISM WITH SPECIFIC DIMENSIONS—5 CENTIMETERS BY 9.5 CENTIMETERS BY 17.2 CENTIMETERS—AND DISCUSS RELATED CONCEPTS TO DEEPEN YOUR UNDERSTANDING OF VOLUME CALCULATIONS.

WHAT IS A RECTANGULAR PRISM?

A RECTANGULAR PRISM, ALSO KNOWN AS A CUBOID, IS A THREE-DIMENSIONAL SHAPE WITH SIX RECTANGULAR FACES. ALL ANGLES IN A RECTANGULAR PRISM ARE RIGHT ANGLES, AND OPPOSITE FACES ARE EQUAL IN DIMENSIONS. THIS SHAPE IS COMMON IN EVERYDAY OBJECTS SUCH AS BOXES, BRICKS, AND STORAGE CONTAINERS.

KEY DIMENSIONS OF A RECTANGULAR PRISM

TO FIND THE VOLUME OF A RECTANGULAR PRISM, YOU NEED ITS THREE DIMENSIONS:

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

IN OUR CASE:

- LENGTH = 5 CM
- WIDTH = 9.5 CM
- HEIGHT = 17.2 CM

UNDERSTANDING THESE MEASUREMENTS IS CRUCIAL BECAUSE THE VOLUME CALCULATION RELIES ON MULTIPLYING THESE THREE DIMENSIONS TOGETHER.

CALCULATING THE VOLUME OF A RECTANGULAR PRISM

THE FORMULA FOR CALCULATING THE VOLUME (V) OF A RECTANGULAR PRISM IS STRAIGHTFORWARD:

VOLUME FORMULA

$$[V = L \times W \times H]$$

WHERE:

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

APPLYING THIS TO OUR SPECIFIC DIMENSIONS:

$$[V = 5, \text{cm} \times 9.5, \text{cm} \times 17.2, \text{cm}]$$

STEP-BY-STEP CALCULATION

1. MULTIPLY LENGTH AND WIDTH:

$$[5 \times 9.5 = 47.5]$$

2. MULTIPLY THE RESULT BY HEIGHT:

$$[47.5 \times 17.2]$$

LET'S COMPUTE THIS:

$$- 47.5 (\times) 17.2:$$

BREAK DOWN 17.2 INTO $10 + 7 + 0.2$ FOR EASIER CALCULATION:

$$- (47.5 \times 10 = 475)$$

$$- (47.5 \times 7 = 332.5)$$

$$- (47.5 \times 0.2 = 9.5)$$

ADD THESE UP:

$$[475 + 332.5 + 9.5 = 817]$$

THEREFORE, THE VOLUME:

$$[V = 817, \text{cm}^3]$$

ANSWER: THE VOLUME OF THE RECTANGULAR PRISM IS 817 CUBIC CENTIMETERS.

UNDERSTANDING THE SIGNIFICANCE OF VOLUME MEASUREMENT

VOLUME MEASURES THE CAPACITY OF A THREE-DIMENSIONAL OBJECT—HOW MUCH SPACE IT OCCUPIES. KNOWING THE VOLUME OF A RECTANGULAR PRISM HAS PRACTICAL APPLICATIONS ACROSS VARIOUS FIELDS:

- STORAGE AND PACKING: ENSURING ITEMS FIT WITHIN CONTAINERS.
- MANUFACTURING: DETERMINING MATERIAL REQUIREMENTS.
- SCIENCE AND ENGINEERING: CALCULATING QUANTITIES OF SUBSTANCES OR DESIGNING PHYSICAL STRUCTURES.
- EDUCATION: ENHANCING SPATIAL REASONING AND UNDERSTANDING GEOMETRIC CONCEPTS.

ADDITIONAL CONSIDERATIONS IN VOLUME CALCULATION

WHEN CALCULATING VOLUME, KEEP IN MIND THE FOLLOWING:

- UNITS CONSISTENCY: ENSURE ALL MEASUREMENTS ARE IN THE SAME UNITS BEFORE CALCULATING.
- ROUNDING: ROUND THE FINAL RESULT APPROPRIATELY BASED ON CONTEXT—E.G., TO TWO DECIMAL PLACES FOR PRECISION.
- DIMENSION ACCURACY: USE PRECISE MEASUREMENTS FOR ACCURATE VOLUME CALCULATIONS.

EXAMPLE PROBLEMS TO REINFORCE LEARNING

HERE ARE SOME PRACTICE PROBLEMS SIMILAR TO THE MAIN EXAMPLE:

1. CALCULATE THE VOLUME OF A RECTANGULAR PRISM WITH DIMENSIONS 8 CM, 6.5 CM, AND 12 CM.
2. A BOX MEASURES 10 CM BY 15 CM BY 20 CM. WHAT IS ITS VOLUME?
3. IF A RECTANGULAR PRISM HAS A VOLUME OF 1500 cm^3 , AND ITS LENGTH AND WIDTH ARE 10 CM AND 15 CM RESPECTIVELY, WHAT IS ITS HEIGHT?

SOLUTIONS:

1. $(V = 8 \times 6.5 \times 12 = 8 \times 6.5 = 52)$, THEN $(52 \times 12 = 624, \text{cm}^3)$
2. $(V = 10 \times 15 \times 20 = 3000, \text{cm}^3)$
3. $(H = \frac{V}{L \times W} = \frac{1500}{10 \times 15} = \frac{1500}{150} = 10, \text{cm})$

REAL-WORLD APPLICATIONS OF RECTANGULAR PRISM VOLUME CALCULATIONS

UNDERSTANDING HOW TO COMPUTE THE VOLUME OF A RECTANGULAR PRISM HELPS IN NUMEROUS REAL-WORLD SCENARIOS, SUCH AS:

- DESIGNING PACKAGING: ENSURING PRODUCTS FIT INTO BOXES APPROPRIATELY.
- CONSTRUCTION: CALCULATING THE AMOUNT OF CONCRETE OR OTHER MATERIALS NEEDED FOR RECTANGULAR STRUCTURES.
- LOGISTICS: ESTIMATING SPACE FOR CARGO AND STORAGE UNITS.
- PUBLIC HEALTH: DETERMINING THE CAPACITY OF CONTAINERS FOR LIQUIDS OR GASES.

CONCLUSION

CALCULATING THE VOLUME OF A RECTANGULAR PRISM IS A FUNDAMENTAL YET ESSENTIAL SKILL IN GEOMETRY WITH NUMEROUS PRACTICAL APPLICATIONS. AS DEMONSTRATED WITH THE EXAMPLE OF A PRISM MEASURING 5 CM BY 9.5 CM BY 17.2 CM, THE PROCESS INVOLVES STRAIGHTFORWARD MULTIPLICATION OF THE THREE DIMENSIONS. THE VOLUME IN THIS CASE IS 817 CUBIC CENTIMETERS. MASTERY OF SUCH CALCULATIONS ENHANCES SPATIAL REASONING, AIDS IN PROBLEM-SOLVING, AND SUPPORTS VARIOUS PROFESSIONAL AND EDUCATIONAL ENDEAVORS.

REMEMBER TO ALWAYS VERIFY YOUR MEASUREMENTS, MAINTAIN UNIT CONSISTENCY, AND PERFORM CALCULATIONS CAREFULLY TO ENSURE ACCURATE RESULTS. WHETHER YOU'RE WORKING ON ACADEMIC PROBLEMS OR REAL-WORLD PROJECTS, UNDERSTANDING HOW TO FIND THE VOLUME OF RECTANGULAR PRISMS IS A VALUABLE MATHEMATICAL SKILL.

FREQUENTLY ASKED QUESTIONS

WHAT IS THE FORMULA TO FIND THE VOLUME OF A RECTANGULAR PRISM?

THE VOLUME OF A RECTANGULAR PRISM IS FOUND BY MULTIPLYING ITS LENGTH, WIDTH, AND HEIGHT: $\text{VOLUME} = \text{LENGTH} \times \text{WIDTH} \times \text{HEIGHT}$.

How do you calculate the volume of a rectangular prism with dimensions 5 cm, 9.5 cm, and 17.2 cm?

Multiply the three dimensions: $5 \text{ cm} \times 9.5 \text{ cm} \times 17.2 \text{ cm}$ to get the volume.

What is the volume of a rectangular prism measuring 5 cm by 9.5 cm by 17.2 cm?

The volume is $5 \times 9.5 \times 17.2 = 817.4$ cubic centimeters.

Why is understanding the volume of a rectangular prism important in real-world applications?

It helps in calculating the capacity for storage, packaging, and designing objects like boxes, tanks, and containers.

Can the volume of a rectangular prism be expressed in other units besides cubic centimeters?

Yes, if the dimensions are converted to meters, the volume can be expressed in cubic meters, or in inches for cubic inches, etc.

What is the significance of accurately calculating the volume of a prism in practical scenarios?

Accurate volume calculations ensure efficient use of space, proper material estimation, and cost-effective design in manufacturing and construction.

Additional Resources

A rectangular prism measures 5 cm by 9.5 cm by 17.2 cm. What is the volume of the prism? Understanding how to calculate the volume of a rectangular prism is a fundamental skill in geometry that finds applications across various fields—from engineering and architecture to everyday problem-solving. When presented with dimensions such as 5 cm, 9.5 cm, and 17.2 cm, the task becomes straightforward: determine the total three-dimensional space occupied by the prism. In this comprehensive guide, we will explore the concept of volume in rectangular prisms, demonstrate step-by-step calculations, and discuss practical implications and tips for solving similar problems.

Introduction to Rectangular Prisms

A rectangular prism, also known as a cuboid, is a three-dimensional geometric figure with six rectangular faces, twelve edges, and eight vertices. It is characterized by its length, width, and height—each representing the dimensions along the three perpendicular axes.

Key features of a rectangular prism:

- Opposite faces are equal and rectangular.
- Edges meet at right angles (perpendicular to each other).
- Its volume measures the total space enclosed within its boundaries.

Understanding the fundamental properties of a rectangular prism allows us to approach problems involving its dimensions methodically.

THE CONCEPT OF VOLUME IN A RECTANGULAR PRISM

VOLUME IS THE MEASURE OF THE THREE-DIMENSIONAL SPACE OCCUPIED BY A SOLID OBJECT. FOR A RECTANGULAR PRISM, THE VOLUME IS CALCULATED BY MULTIPLYING ITS THREE DIMENSIONS:

VOLUME FORMULA:

$$V = \text{LENGTH} \times \text{WIDTH} \times \text{HEIGHT}$$

WHERE:

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

THIS FORMULA IS DERIVED FROM THE IDEA THAT THE VOLUME OF A RECTANGULAR PRISM IS EQUIVALENT TO STACKING LAYERS OF A TWO-DIMENSIONAL RECTANGLE ALONG THE THIRD DIMENSION.

STEP-BY-STEP CALCULATION OF THE PRISM'S VOLUME

GIVEN THE DIMENSIONS:

- LENGTH (L = 17.2) CM
- WIDTH (W = 9.5) CM
- HEIGHT (H = 5) CM

NOTE: THE ORDER OF DIMENSIONS DOES NOT AFFECT THE VOLUME CALCULATION; ONLY THEIR NUMERICAL VALUES MATTER.

STEP 1: WRITE DOWN THE FORMULA

$$V = L \times W \times H$$

STEP 2: SUBSTITUTE THE GIVEN DIMENSIONS

$$V = 17.2 \times 9.5 \times 5$$

STEP 3: PERFORM THE MULTIPLICATION SEQUENTIALLY

- FIRST, MULTIPLY (17.2) AND (9.5):

$$17.2 \times 9.5 =$$

TO MULTIPLY THESE:

$$17.2 \times 9.5 = (17.2 \times 10) - (17.2 \times 0.5)$$

OR DIRECTLY:

$$17.2 \times 9.5 = (17.2 \times 9) + (17.2 \times 0.5)$$

CALCULATIONS:

$$17.2 \times 9 = 154.8$$

$$17.2 \times 0.5 = 8.6$$

SUM:

$$154.8 + 8.6 = 163.4$$

- NOW MULTIPLY THE RESULT BY 5:

$$163.4 \times 5 =$$

$$163.4 \times 5 = (163.4 \times 4) + (163.4 \times 1) = 653.6 + 163.4 = 817$$

RESULT:

$$V = 817 \text{ CUBIC CENTIMETERS (CM}^3\text{)}$$

FINAL ANSWER: THE VOLUME OF THE PRISM IS 817 CM³.

PRACTICAL APPLICATIONS AND IMPLICATIONS

KNOWING HOW TO COMPUTE THE VOLUME OF A RECTANGULAR PRISM IS HIGHLY USEFUL IN MANY REAL-WORLD CONTEXTS:

- PACKAGING AND SHIPPING: DETERMINING THE CAPACITY OF BOXES TO OPTIMIZE STORAGE.
- CONSTRUCTION: CALCULATING THE AMOUNT OF MATERIAL NEEDED FOR BUILDING STRUCTURES LIKE CONCRETE BLOCKS OR STORAGE TANKS.
- MANUFACTURING: ESTIMATING THE VOLUME OF RAW MATERIALS OR PRODUCTS.
- EDUCATION: DEVELOPING SPATIAL REASONING AND UNDERSTANDING THREE-DIMENSIONAL MEASUREMENT.

BY MASTERING THESE CALCULATIONS, PROFESSIONALS AND STUDENTS CAN APPROACH COMPLEX PROBLEMS INVOLVING THREE-DIMENSIONAL OBJECTS CONFIDENTLY.

TIPS AND COMMON MISTAKES TO AVOID

1. ENSURE UNITS ARE CONSISTENT:

ALWAYS CHECK THAT ALL DIMENSIONS ARE IN THE SAME UNIT BEFORE MULTIPLYING.

2. ORDER OF MULTIPLICATION:

THE ORDER DOESN'T MATTER IN MULTIPLICATION, BUT PERFORMING CALCULATIONS STEP-BY-STEP CAN HELP PREVENT ERRORS.

3. USE PARENTHESES FOR CLARITY:

WHEN DOING MULTI-STEP CALCULATIONS, PARENTHESES CLARIFY THE ORDER OF OPERATIONS.

4. PAY ATTENTION TO DECIMAL POINTS:

WHEN WORKING WITH DECIMAL DIMENSIONS, DOUBLE-CHECK YOUR MULTIPLICATION TO AVOID MISPLACING THE DECIMAL.

ADDITIONAL PRACTICE PROBLEMS

TO REINFORCE UNDERSTANDING, CONSIDER PRACTICING WITH SIMILAR PROBLEMS:

- FIND THE VOLUME OF A RECTANGULAR PRISM MEASURING 8 CM BY 12.5 CM BY 20 CM.
- A BOX HAS DIMENSIONS 3.2 FT BY 4.5 FT BY 2 FT. WHAT IS ITS VOLUME IN CUBIC FEET?
- A STORAGE CONTAINER MEASURES 2 M BY 3 M BY 4 M. CALCULATE ITS CAPACITY IN CUBIC METERS.

CONCLUSION

CALCULATING THE VOLUME OF A RECTANGULAR PRISM, SUCH AS ONE MEASURING 5 CM BY 9.5 CM BY 17.2 CM, IS A FUNDAMENTAL YET ESSENTIAL SKILL IN GEOMETRY. BY APPLYING THE STRAIGHTFORWARD FORMULA $(V = L \times W \times H)$, YOU CAN DETERMINE THE TOTAL SPACE OCCUPIED BY THE OBJECT WITH CONFIDENCE. REMEMBER TO VERIFY YOUR UNITS, PERFORM THE MULTIPLICATION CAREFULLY, AND PRACTICE REGULARLY WITH DIFFERENT DIMENSIONS TO BECOME PROFICIENT. WHETHER APPLIED IN ACADEMIC SETTINGS, PROFESSIONAL TASKS, OR EVERYDAY SCENARIOS, UNDERSTANDING THE VOLUME OF RECTANGULAR PRISMS EQUIPS YOU WITH A VALUABLE MATHEMATICAL TOOL FOR SPATIAL REASONING AND PROBLEM-SOLVING.

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