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Chapter 3

Multiplication and Division

3.1 Multiplying to 7 x 7

Multiplication is simply adding a number repeatedly. Therefore, it is a good idea to understand the concept through addition. Once the concept is grasped, memorize the times table, as it is a great tool for doing multiplication and division.

Adding

e.g. 3 x 4 = ____

"3 x 4" means "adding three 4's" (or "adding four 3's").

4 + 4 + 4 = 12

So, 3 x 4 = **12** .

Counting Forward

e.g. 3 x 4 = ____

Start at 0. Count forward by 4 three times.

$0 \xrightarrow{+4} 4 \xrightarrow{+4} 8 \xrightarrow{+4} \mathbf{12}$

So, 3 x 4 = **12** .

Times Table	1	2	3	4	5	6	7
1	1 x 1 = 1	1 x 2 = 2	1 x 3 = 3	1 x 4 = 4	1 x 5 = 5	1 x 6 = 6	1 x 7 = 7
2	2 x 1 = 2	2 x 2 = 4	2 x 3 = 6	2 x 4 = 8	2 x 5 = 10	2 x 6 = 12	2 x 7 = 14
3	3 x 1 = 3	3 x 2 = 6	3 x 3 = 9	3 x 4 = 12	3 x 5 = 15	3 x 6 = 18	3 x 7 = 21
4	4 x 1 = 4	4 x 2 = 8	4 x 3 = 12	4 x 4 = 16	4 x 5 = 20	4 x 6 = 24	4 x 7 = 28
5	5 x 1 = 5	5 x 2 = 10	5 x 3 = 15	5 x 4 = 20	5 x 5 = 25	5 x 6 = 30	5 x 7 = 35
6	6 x 1 = 6	6 x 2 = 12	6 x 3 = 18	6 x 4 = 24	6 x 5 = 30	6 x 6 = 36	6 x 7 = 42
7	7 x 1 = 7	7 x 2 = 14	7 x 3 = 21	7 x 4 = 28	7 x 5 = 35	7 x 6 = 42	7 x 7 = 49

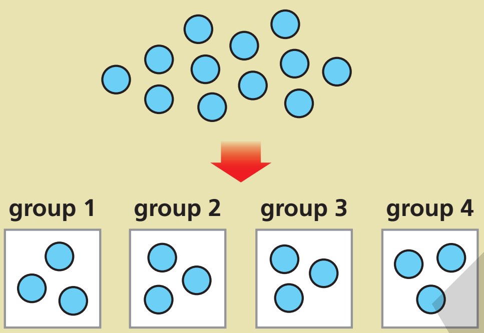
3.2 Dividing to 49 ÷ 7

Division is closely related to multiplication. Before trying division, ensure that you have a thorough understanding of multiplication.

Using Counters

e.g. 12 ÷ 4 = ____

Put 12 counters into 4 equal groups.



Each group has **3** counters.

So, 12 ÷ 4 = **3** .

Using Subtraction

e.g. 12 ÷ 4 = ____

Subtract 4 from 12 repeatedly until you reach 0.

$$\begin{array}{r} 12 \\ -\ 4 \\ \hline 8 \\ -\ 4 \\ \hline 4 \\ -\ 4 \\ \hline 0 \end{array}$$

subtracted **3** times

So, 12 ÷ 4 = **3** .

Counting Backward

e.g. 12 ÷ 4 = ____

Start at 12. Count backward by 4 until you reach 0.

$12 \xrightarrow{-4} 8 \xrightarrow{-4} 4 \xrightarrow{-4} 0$

counted backward 3 times

So, 12 ÷ 4 = **3** .

Using Multiplication

e.g. 12 ÷ 4 = ____

Think 4 times what number is 12?

4 x **3** = 12

So, 12 ÷ 4 = **3** .

Application

① *Don wants to build 4 towers of equal height using all of his 15 blocks. Is this possible? If not, how many towers can he build?*

Solution:

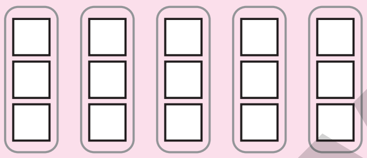
Build 4 towers.

13	14	15	
9	10	11	12
5	6	7	8
1	2	3	4

does not have the same number of blocks as the others

So, Don cannot build 4 towers.

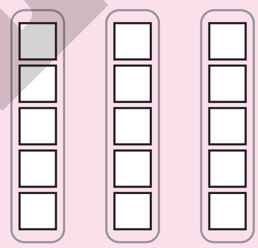
Towers he can build:



1 2 3 4 5

5 towers of 3 blocks

or



1 2 3

3 towers of 5 blocks

Don can build 5 towers or 3 towers.

② I picked 12 apples and I want to share them equally with my friends. What is the greatest number of friends I can share these with so that each of us gets at least 2 apples?

Solution:

In order to share with the greatest number of friends, each person must get the fewest apples, which is 2.

$12 \div 2 = 6$

6 people can share the apples.

Since the girl gets a share too, she can share the apples with 5 friends.

Chapter 6

Properties of Triangles

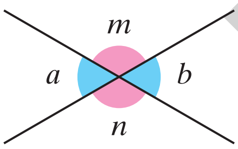
6.1 Related Angles

In this unit, you will learn about angle relationships among intersecting lines, parallel lines, and transversals. There are six major types of angle pairs that you need to know. You can draw intersecting lines, parallel lines, and transversals and measure the angles formed. Then identify the angle pairs and their relationships. Additionally, you will learn that the sum of all angles in a triangle is always 180˚. You will then apply this concept to solve problems related to the angles of a triangle.

6 Major Types of Angle Pairs

Angle Relationships for Intersecting Lines

1. **Opposite Angles**



$\angle a = \angle b$

$\angle m = \angle n$

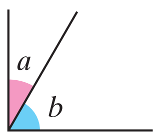
opposite angles:

$\angle a$ and $\angle b$

$\angle m$ and $\angle n$

2. **Complementary Angles**

- 2 angles that add up to 90˚



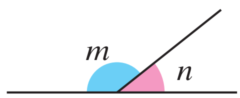
$\angle a + \angle b = 90^\circ$

complementary angles:

$\angle a$ and $\angle b$

3. **Supplementary Angles**

- 2 angles that add up to 180˚



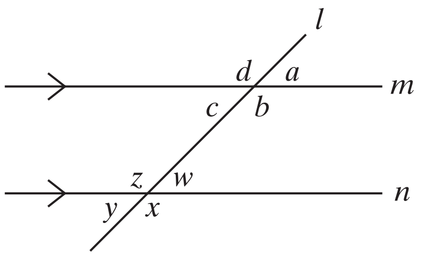
$\angle m + \angle n = 180^\circ$

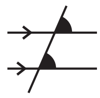
supplementary angles:

$\angle m$ and $\angle n$

Angle Relationships for Parallel Lines and Transversals

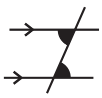
Parallel Lines and Transversals



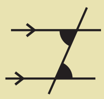
4. **Corresponding Angles** 
("F" angles)

Corresponding angles are congruent and have the same position along the parallel lines and the transversal.

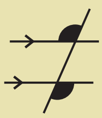
e.g.
$\angle a = \angle w$
$\angle b = \angle x$
$\angle c = \angle y$
$\angle d = \angle z$

5. **Alternate Angles** 
("Z" angles)

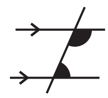
Alternate angles are congruent and are on opposite sides of the transversal.


interior alternate angles

e.g. $\angle c = \angle w$
$\angle b = \angle z$


exterior alternate angles

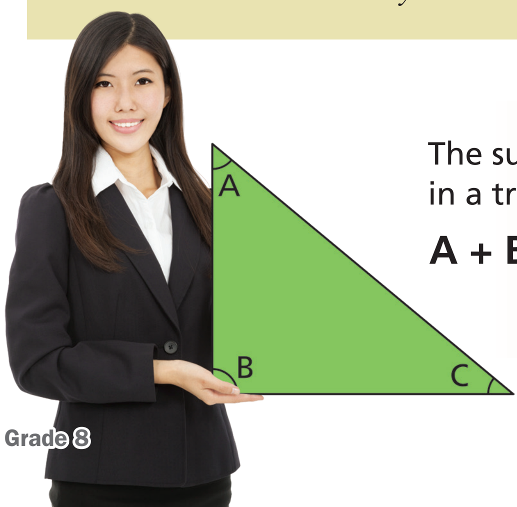
e.g. $\angle d = \angle x$
$\angle a = \angle y$

6. **Consecutive Interior Angles** 
("C" angles)

Consecutive interior angles are on the same side of the transversal and are supplementary.

e.g. $\angle b$ and $\angle w$
$\angle b + \angle w = 180^\circ$

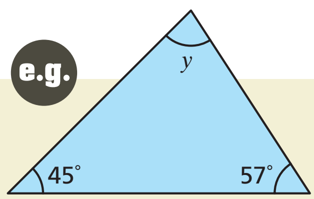
$\angle c$ and $\angle z$
$\angle c + \angle z = 180^\circ$



The sum of the angles in a triangle is 180°.

A + B + C = 180°

e.g.



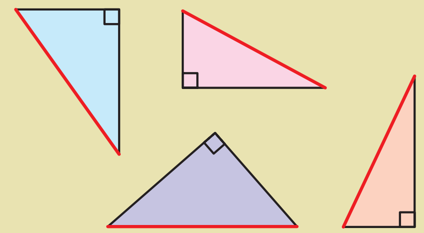
$y + 45^\circ + 57^\circ = 180^\circ$
$y = 78^\circ$

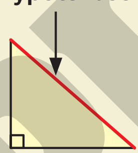
6.2 Pythagorean Relationship

The Pythagorean relationship is an important mathematical concept that relates the lengths of the three sides of a right triangle. In this unit, you will learn to apply this relationship to solve problems involving right triangles and other geometric problems.

Before introducing the Pythagorean relationship, make sure you are able to identify the hypotenuse of a right triangle.

e.g.

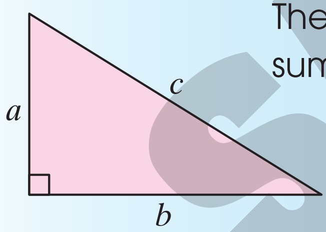




Hypotenuse

- the longest side of a right triangle
- the side opposite to the right angle

The Pythagorean Relationship

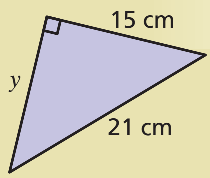


The square of the hypotenuse is equal to the sum of the squares of the other two sides.

$$a^2 + b^2 = c^2$$

Remember that the Pythagorean relationship can be applied to right triangles only!

e.g. Find the perimeter of the triangle.



Think: **1st** Find the missing side. "21 cm" is the hypotenuse.
2nd Add the three sides to find the perimeter.

1st

$$y^2 + 15^2 = 21^2$$
$$y^2 + 225 = 441$$
$$y^2 = 216$$
$$y = 14.7$$

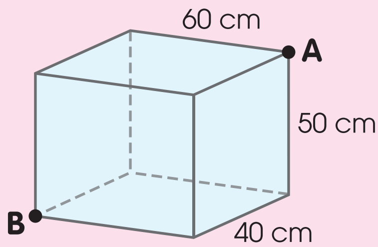
2nd

$$P = 14.7 + 15 + 21$$
$$= 50.7$$

The perimeter is **50.7** cm.

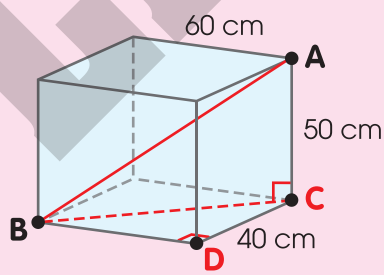
Application

What is the length of Diagonal AB?



Solution:

Label Vertices C and D to help visualize the diagonals and the right triangles they form.



We need to use the Pythagorean relationship twice.

1st Find the diagonal of the base BC.

2nd Find Diagonal AB.

1st Diagonal BC

$BC^2 = 60^2 + 40^2$

$BC^2 = 5200$

$BC = 72.11$

2nd Diagonal AB

$AB^2 = (72.11)^2 + 50^2$

$AB^2 = 7700$

$AB = 87.75$

The length of Diagonal AB is 87.75 cm.