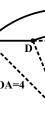
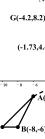
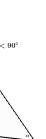
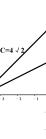
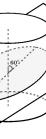
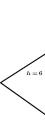
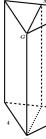
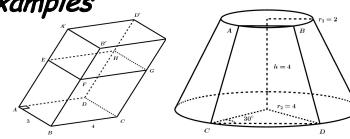


# We-Math 2.0

## Examples



## Fundamental Skills

- Observe natural images
- Measure
- Count
- Find patterns...
- Plane shape recognition: Identify basic geometric shapes from natural or architectural images.
- Angles and proportions: Measure or estimate angles, length proportions...

**Solid Figures and Spatial Relationships**

Level-1: Fundamental Mathematical Skills  
Level-2: Fundamental Skills  
Knowledge Point: Observe Real-world Scene Images  
Principle: Solid Figures and Spatial Relationships

Q: As shown in the figure, the diagram is a crystal structure. Which solid is formed by the six particles on the surface?

## Plane geometry

- Definition of line segment
- Definition of straight line
- Definition of ray
- Calculating the area of a circle...
- Circle area calculation formula:  
 $S = \pi r^2$   
in polar coordinates  
 $S = \int_0^{2\pi} \int_0^r pdp d\theta$
- Area and circumference relationship:  
 $S = \frac{C^2}{4\pi}$

**Properties of Diagonals**

Level-1: Geometry  
Level-2: Plane Geometry  
Level-3: Basic Plane Figures  
Level-4: Parallelogram  
Knowledge Point: Properties of Rectangle  
Principle: Properties of Diagonals

Q: If the radius of the semicircle in the figure is doubled and the side length of the square remains unchanged, find the area of the figure at this time.

## Numbers and Quantities

- Definition of integers
- Definition of fractions
- Understanding the number axis...
- A fraction is composed of a numerator, a denominator, and a fraction line, representing a part of a whole
- Basic properties of fractions: The value of a numerator and denominator remains unchanged when multiplied together unless the number is zero.  $a/b = a/b (b \neq 0)$

**Common Denominator of Fractions**

Level-1: Fundamental Mathematical Skills  
Level-2: Numbers and Quantities  
Knowledge Point: Definition of Fractions  
Principle: Common Denominator of Fractions

Q: As shown in the figure, when the ratios of the shaded areas of the two squares are added together, what is the value of the common denominator after expressing both ratios with a common denominator?

## Solid geometry

- Definition of cone
- Structural features of cone
- Section of cone
- Volume of cylinder...
- The surface area of a cube is  
 $S = 6a^2$
- Comparative analysis: Difference from the surface area of a sphere  
 $S = 4\pi r^2$
- The surface area of a cube is larger under the same volume...

**Oblique Section**

Level-1: Geometry  
Level-2: Solid Geometry  
Level-3: Basic Solid Figures  
Level-4: Prism  
Knowledge Point: Section of Prism  
Principle: Oblique Section

Q: As shown in the figure, a plane cuts a regular hexagonal cross-section from a cube. What is the area of this regular hexagon?

## Basic Calculation Methods

- Four operations on complex numbers
- Conversion between exponential and logarithmic expressions
- Definition of square...
- Integer addition definition: the operation of combining two numbers into one number, addend + addend = sum, knowing the sum and one addend, we can find the other addend
- Integer subtraction definition: the operation of finding the other addend when the sum of two addends and one of the addends is known, minuend - substrahend = difference, subtraction and addition are inverse operations...

**Basic Concept of Subtraction**

Level-1: Fundamental Mathematical Skills  
Level-2: Basic Calculation Methods  
Level-3: Four Basic Operations  
Knowledge Point: Concept of Subtraction  
Principle: Basic Concept of Subtraction

Q: Given that there were originally 12 circles, after removing the circles within the dashed lines, how many circles remain?

## Analytical geometry

- Definition of polar coordinate system
- Definition of plane rectangular coordinate system
- Representation and equation of straight line
- Distance formula between two points...
- The distance formula between two points in the rectangular coordinate system: The distance between two points in the plane  $A(x_1, y_1)$  and  $B(x_2, y_2)$
- The distance formula between two points in the rectangular coordinate system in space: The distance between two points in three dimensions  $A(x_1, y_1, z_1)$  and  $B(x_2, y_2, z_2)$

**Tangent Length Problem from Fixed Point outside Circle**

Level-1: Geometry  
Level-2: Analytic Geometry  
Level-3: Circle  
Level-4: Prism  
Knowledge Point: Equation of Tangent to a Circle  
Principle: Tangent Length Problem from Fixed Point outside Circle

Q: P is a moving point on circle  $O_2$ . The line  $PA$  is tangent to circle  $O_1$  at point A. What is the maximum length of  $PA$ ?

**Area Problem of Focal Triangle**

Level-1: Geometry  
Level-2: Analytic Geometry  
Level-3: Conic Sections  
Level-4: Hyperbola  
Knowledge Point: Triangle Formed by Foci and a Point on Hyperbola  
Principle: Area Problem of Focal Triangle

Q: P is a moving point on circle  $O_2$ . The line  $PA$  is tangent to circle  $O_1$  at point A. What is the maximum length of  $PA$ ?

## Probability

- Definition of random events
- Relationships between random events
- Calculation of random events
- Definition of random variables
- Definition of distribution functions
- Calculation of geometric probability models
- One-dimensional continuous variables and their distribution...

**Calculation in One-Dimensional Geometric Probability Model**

Level-1: Probability and Statistics  
Level-2: Probability  
Level-3: Calculation of Probability  
Knowledge Point: Calculation in Geometric Probability Model  
Principle: Calculation in One-Dimensional Geometric Probability Model

Q: What is the probability that the pinball lands at position AB after pulling the launcher? (Answer as a fraction)

## Vectors

- Concept of vectors
- Modulus of vectors
- The magnitude of a vector
- ...
- Vector modulus: the size (length) of a vector, denoted as  $\|\alpha\|$ , the modulus of an n-dimensional vector is

**Coordinate Representation of 3D Vector**

Level-1: Algebra  
Level-2: Vectors  
Knowledge Point: Coordinate Representation of Vectors  
Principle: Coordinate Representation of 3D Vector

Q: As shown in the figure, based on the coordinates of point A in the figure, the coordinates of vector  $\overrightarrow{SOA}$  are \_\_\_\_\_.

**Practical Applications of Necessary Condition**

Level-1: Algebra  
Level-2: Logic  
Level-3: Necessary and Sufficient Conditions  
Knowledge Point: Practical Applications of Necessary Condition  
Principle: Practical Applications of Necessary Condition

Q: In the circuit, what is the necessary condition for the circuit in the figure to operate normally?

## Statistics

- Differences between different sampling methods
- Choose appropriate survey and sampling methods
- Classification addition counting principle
- Step-by-step multiplication counting principle
- Calculation of the number of combinations...

**Practical Application of Counting Problems**

Level-1: Probability and Statistics  
Level-2: Statistics  
Level-3: Principles of Counting  
Level-4: Addition and Multiplication Principles  
Knowledge Point: Counting Problems in Practical Situations  
Principle: Practical Application of Counting Problems

Q: As shown in the figure, Jack needs to walk from home to school along the line segments. How many different shortest routes are there in total?

## Linear algebra

- Definition of matrix
- Basic operations on matrix
- Complex operations on matrix
- ...
- Matrix addition: Add two matrices and add corresponding elements.

**Matrix Addition**

Level-1: Algebra  
Level-2: Linear Algebra  
Level-3: Vectors and Matrices  
Level-4: Matrix  
Knowledge Point: Basic Operations of Matrices  
Principle: Matrix Addition

Q: As shown in the figure, according to the rules of matrix addition,  $a+b+c = \begin{pmatrix} 2 & 3 \\ 4 & 6 \end{pmatrix} + \begin{pmatrix} 6a & 3 \\ -6 & b \end{pmatrix} = \begin{pmatrix} 2 & 6 \\ -7 & 2 \end{pmatrix}$

## Graph theory

- Basic concepts of graphs
- Basic concepts of trees
- Graph traversal
- ...
- A tree is an undirected graph that is connected. There are no cycles in a tree. When a tree has n vertices, it has exactly  $(n-1)$  edges.
- Summation of a sequence
- Definition of a geometric sequence
- Definition of a linear function
- ...
- The basic form of a linear function: a function of the form  $y = kx + b$  where  $k$  and  $b$  are constants and  $k \neq 0$

**Depth-First Search of Graph**

Level-1: Algebra  
Level-2: Graph Theory  
Level-3: Basic Elementary Functions  
Level-4: Quadratic Function  
Knowledge Point: Depth-First Search of Graph  
Principle: Methods for Solving Quadratic Functions

Q: As shown in the figure, starting from vertex A, what is the order of visiting vertices in a depth-first search (DFS)?

**Methods for Solving Quadratic Functions**

Level-1: Algebra  
Level-2: Functions and Equations  
Level-3: Graph  
Level-4: Quadratic Function  
Knowledge Point: Graph Traversal  
Principle: Methods for Solving Quadratic Functions

Q: The quadratic function passes through the points in the figure. Find the equation of this quadratic function.