

Aim For High School Math!

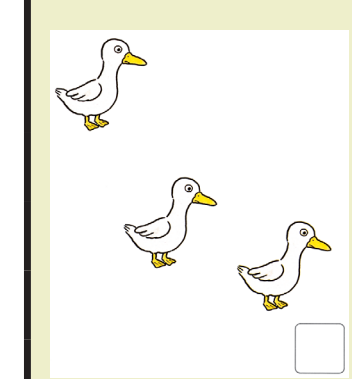


Accuracy is not enough. What we must achieve is "accuracy and speed." Practice more!

7A~5A

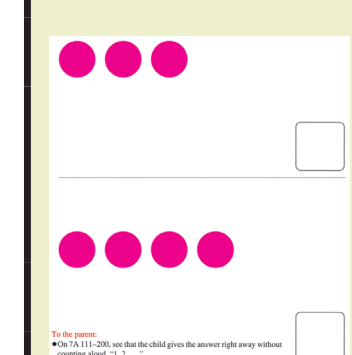
Counting

Count the pictures aloud, "1, 2, 3," while pointing to each one.



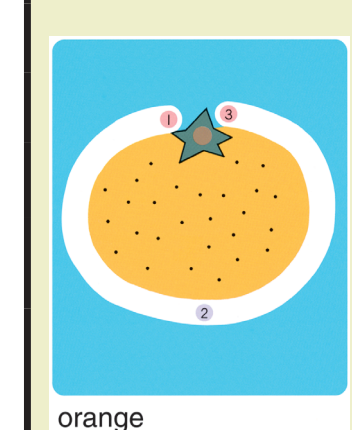
Number of Dots

How many dots are there?



Exercises with Lines

Draw a line from 1 to 3 while saying each number.



4A~A (1st grade)

Number Writing Exercises

•	••	•••	••••	•••••
1	2	3	4	5
1	2	3	4	5

Addition

$$2+1=3$$

$$24+3=27$$

$$8+5=13$$

Subtraction

$$13-5=8$$

B (2nd grade)

C (3rd grade)

Multiplication

$$\begin{array}{r} 39 \\ \times 6 \\ \hline 234 \end{array}$$

$$\begin{array}{r} 39 \\ \times 66 \\ \hline 234 \\ 234 \\ \hline 2574 \end{array}$$

Division

$$21 \div 3 = 7$$

$$\begin{array}{r} 7R8 \\ 15 \overline{)113} \\ \underline{105} \\ 8 \end{array}$$

Fractions

$$\frac{97}{6} = 16\frac{1}{6}$$

$$16\frac{1}{6} = \frac{97}{6}$$

$$\frac{7}{21} = \frac{1}{3}$$

D (4th grade)

E (5th grade)

Operations with Fractions

$$\frac{2}{9} + \frac{5}{9} = \frac{7}{9}$$

$$\frac{1}{3} - \frac{1}{4} = \frac{4}{12} - \frac{3}{12} = \frac{1}{12}$$

$$1\frac{1}{8} + \frac{3}{8} = 1\frac{4}{8} = 1\frac{1}{2}$$

$$3\frac{1}{3} - 2\frac{5}{6} = 3\frac{2}{6} - 2\frac{5}{6} = 2\frac{8}{6} - 2\frac{5}{6} = \frac{3}{6} = \frac{1}{2}$$

$$\frac{3}{4} + \frac{1}{6} = \frac{9}{12} + \frac{2}{12} = \frac{11}{12}$$

$$1\frac{1}{4} + 3\frac{5}{6} = 1\frac{3}{12} + 3\frac{10}{12} = 4\frac{13}{12} = 5\frac{1}{12}$$

$$2\frac{1}{4} \times \frac{2}{3} = \frac{9}{4} \times \frac{2}{3} = \frac{18}{12} = 1\frac{1}{2}$$

$$\frac{8}{21} \div \frac{4}{7} = \frac{8}{21} \times \frac{7}{4} = \frac{2}{3}$$

$$\frac{1}{3} + \frac{1}{4} + \frac{1}{6} = \frac{4}{12} + \frac{3}{12} + \frac{2}{12} = \frac{9}{12} = \frac{3}{4}$$

The Lowest Common Denominator is 12.

Four Operations with Fractions and Decimals

$$3\frac{1}{5} \div 0.48 \times 1.2 = \frac{16}{5} \div \frac{48}{100} \times 1\frac{2}{10} = \frac{16}{5} \div \frac{12}{25} \times 1\frac{1}{5}$$

$$= \frac{16}{5} \times \frac{25}{12} \times \frac{6}{5} = 8$$

$$\frac{5}{6} \times \frac{1}{3} - \frac{7}{12} \times \frac{1}{3} = \frac{5}{18} - \frac{7}{36} = \frac{10}{36} - \frac{7}{36} = \frac{3}{36} = \frac{1}{12}$$

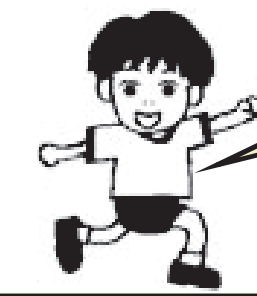
$$\left(\frac{5}{6} - \frac{7}{12}\right) \times \frac{1}{3} = \left(\frac{10}{12} - \frac{7}{12}\right) \times \frac{1}{3} = \frac{3}{12} \times \frac{1}{3} = \frac{1}{12}$$

$$15\frac{1}{2} - \left[12\frac{1}{3} - \left(5\frac{1}{4} - 3\frac{2}{3}\right)\right] = 15\frac{1}{2} - \left[12\frac{1}{3} - \left(5\frac{3}{12} - 3\frac{8}{12}\right)\right]$$

$$= 15\frac{1}{2} - \left[12\frac{4}{12} - 1\frac{7}{12}\right]$$

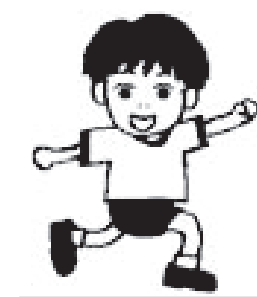
$$= 15\frac{1}{2} - 10\frac{3}{4}$$

$$= 4\frac{3}{4}$$



Do you know this? Whether you can learn Junior High School Math well depends on how well you master fractions. Put more effort into Level E!

F (6th grade)



From now on, we are going to study Algebraic Expressions. x and y appear here. Be sure to read the examples and explanations very carefully, and to write the intermediate steps thoroughly and correctly!

G (Pre-Algebra/Algebra I)

Calculation of Positive and Negative Numbers

$$\frac{3}{4} - \frac{1}{6} = \frac{9}{12} - \frac{2}{12} = \frac{7}{12}$$

$$2\frac{1}{4} \times \left(-\frac{2}{3}\right) = -\frac{9}{4} \times \frac{2}{3} = -1\frac{1}{2}$$

Values of Algebraic Expressions

Find the value of each expression when $x = -\frac{1}{4}$ and $y = \frac{1}{6}$.

[Sol] $3x - y = 3 \times \left(-\frac{1}{4}\right) - \frac{1}{6} = -\frac{3}{4} - \frac{1}{6} = -\frac{11}{12}$

Simplifying Algebraic Expressions

$$\frac{1}{3}a - \frac{1}{4}a = \frac{4}{12}a - \frac{3}{12}a = \frac{1}{12}a$$

Linear Equations of One Variable

$$5x - 13 = -8x + 26$$

$$5x + 8x = 26 + 13$$

$$13x = 39$$

$$x = \frac{39}{13} = 3$$

$$\frac{3}{4}x - 2 = \frac{x}{6} + \frac{1}{3}$$

[Sol] Multiply by 12, the lowest common denominator on both sides.

$$9x - 24 = 2x + 4$$

$$7x = 28$$

$$x = 4$$

H (Algebra I)

Simultaneous Linear Equations in Two Variables

$$\begin{cases} 5x + 7y = 3 & \text{①} \\ 3x + 14y = 6 & \text{②} \end{cases}$$

[Sol] First we must eliminate one of the variables, by using the LCM of the coefficients of this variable in the two given equations.

$$\text{①} \times 2: \begin{cases} 10x + 14y = 6 & \text{③} \\ 3x + 14y = 6 & \text{②} \end{cases}$$

$$\text{③} - \text{②}: 7x = 0$$

$$x = 0$$

Substituting this into ①,

$$y = \frac{3}{7}$$

$$(x, y) = \left(0, \frac{3}{7}\right)$$

Inequalities

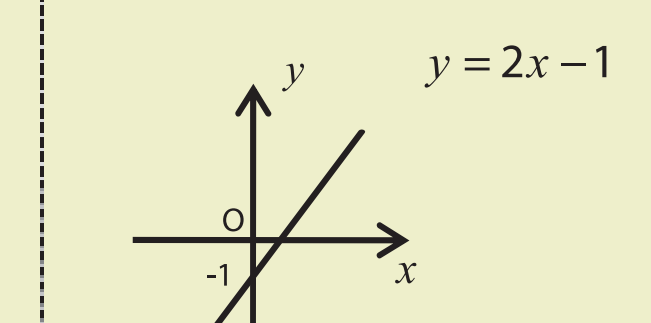
$$5x - 13 > -8x + 26$$

$$5x + 8x > 26 + 13$$

$$13x > 39$$

$$x > 3$$

Functions and Graphs



Polynomials

$$-4xy(3x^2 - xy + 2y^2)$$

$$= -12x^3y + 4x^2y^2 - 8xy^3$$

I (Algebra I/II)

Multiplication of Polynomials

$$(x+5)(x+8)$$

$$= x^2 + 5x + 8x + 40$$

$$= x^2 + 13x + 40$$

Factorization

$$6a(x-y) + 9b(x-y)$$

$$= 3(x-y)(2a+3b)$$

$$x^2 + 13x + 40$$

$$= (x+5)(x+8)$$

Square Roots

$$\sqrt{18} + \sqrt{50} = 3\sqrt{2} + 5\sqrt{2} = 8\sqrt{2}$$

$$\frac{1}{\sqrt{3}+1} = \frac{\sqrt{3}-1}{(\sqrt{3}+1)(\sqrt{3}-1)} = \frac{\sqrt{3}-1}{2}$$

Quadratic Equations

$$x^2 + 13x + 40 = 0$$

$$(x+5)(x+8) = 0$$

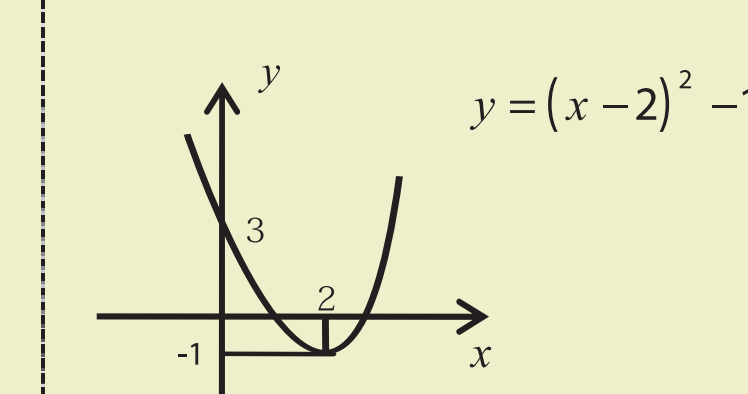
$$x = -5, -8$$

$$3x^2 + 9x - 2 = 0$$

$$x = \frac{-9 \pm \sqrt{9^2 - 4 \times 3 \times (-2)}}{2 \times 3}$$

$$= \frac{-9 \pm \sqrt{105}}{6}$$

Graphs of Quadratic Functions



The Pythagorean Theorem

$$x^2 = 4^2 + 3^2$$

$$= 16 + 9$$

$$= 25$$

$$x = 5$$

J (Algebra II)

Expansion of Polynomial Products

$$(a+b+c)^2$$

$$= a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

Factorization

$$2x^2 - 2y^2 - z^2 + 3yz + zx - 3xy$$

$$= 2x^2 - (3y-z)x - (2y^2 - 3yz + z^2)$$

$$= (2x+y-z)(x-2y+z)$$

Fractional Expressions

$$\frac{x+1}{x^2-x-2} = \frac{x+1}{(x-2)(x+1)} = \frac{1}{x-2}$$

Irrational Numbers

$$\sqrt{5+2\sqrt{6}} = \sqrt{3} + \sqrt{2}$$

Quadratic Equations and Complex Numbers

$$2x^2 + 5x + 4 = 0$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times 4}}{2 \times 2}$$

$$= \frac{-5 \pm \sqrt{-7}}{4} = \frac{-5 \pm \sqrt{7}i}{4}$$

Discriminant & Root-Coefficient Relationship

Determine the value of k for which the following equation has a repeated solution.

$$3x^2 - 8x + k = 0$$

[Sol] $D' = 4^2 - 3k$

$$16 - 3k = 0$$

$$k = \frac{16}{3}$$

The Factor Theorem

Solve the following equation.

$$2x^3 - x^2 - 15x + 18 = 0$$

[Sol] Let $P(x) = 2x^3 - x^2 - 15x + 18$

From $P(2) = 0$,

$$P(x) = (x-2)(2x^2 + 3x - 9)$$

$$= (x-2)(x+3)(2x-3) = 0$$

$$x = 2, -3, \frac{3}{2}$$