

Kumon Mathematics Program

Level K

Quadratic Functions
Higher Degree Functions
Fractional Functions
Irrational Functions
Exponential Functions

Student Name: _____

Starting Date: _____

Completion Date: Your Goal _____

Jan Apr July Oct

Feb May Aug Nov

Mar June Sep Dec

The goal is based upon your individual abilities. It takes into account the number of pages you are currently able to complete per day and the number of repetitions necessary to ensure mastery of the worksheets.

Goals of Level K

The main goal of Level K is for you to acquire the basic properties of functions (translations, domains and ranges, maximum and minimum values, relationships between graphs and equations & inequalities, etc.) by studying quadratic functions. You will also apply these skills while working with higher degree, fractional, irrational, and exponential functions and graphs. Level K aims to strengthen your ability to work with a variety of functions in preparation for your calculus studies in Level L.

Contents of Level K

Worksheet Number	Section	Worksheet Number	Section
1-20	Review of Functions	121-140	Graphs of Fractional Functions
21-40	Graphs and Equations of Quadratic Functions	141-150	Fractional Equations and Inequalities
41-70	Maxima and Minima of Quadratic Functions	151-160	Graphs of Irrational Functions
71-90	Quadratic Functions, Equations, and Inequalities	161-170	Irrational Equations and Inequalities
91-100	Quadratic Functions and Solutions of Quadratic Equations	171-190	Exponential Functions and Graphs
101-120	Higher Degree Functions, Equations, and Inequalities	191-200	Exponential Equations and Inequalities


Features of Level K


KUMON K 61 a **Maxima and Minima of Quadratic Functions 3** K 61


Time: _____ Date: _____ Name: _____

100%	90%	80%	70%	60%

1. Given the quadratic function $f(x) = (x-a)^2 + 3$ ($0 \leq x \leq 4$), for each different graph shown in exercises (1)–(3), find the range of the value of a . Then, find the minimum value.

(1)  [Sol] $a < \square$ (The axis of symmetry is the left end of the domain.)
And, at $x = \square$ (The left end of the domain is the minimum value.)
Minimum value: $f(\square) = \square$

(2)  [Sol] $a < \square$ (The axis of symmetry is the left end of the domain.)
And, at $x = \square$ (The vertex is the minimum value.)
Minimum value: $f(\square) = \square$

(3)  [Sol] $a < \square$ (The left end of the domain is the axis of symmetry.)
And, at $x = \square$ (The right end of the domain is the minimum value.)
Minimum value: $f(\square) = \square$

You will begin your studies of Level K by reviewing the basics of linear and quadratic functions.

In Worksheets 21-40, you will analyze and draw translations of graphs and determine equations of quadratic functions.

In K41-70, you will obtain the maximum and minimum values of quadratic functions. Pay close attention to both ends of the given domain and the position of the vertex.

Worksheets 71-100 feature equations and inequalities of quadratic functions. In this section you will examine the common points between graphs and the range of solutions of quadratic equations.

KUMON K 162 a **Irrational Equations and Inequalities** K 162

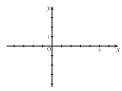
Time: _____ Date: _____ Name: _____

100%	90%	80%	70%	60%

In each exercise, draw the graph and use it to solve the given irrational equation.

Ex. $\sqrt{x+1} = x-2$
[Sol] Squaring both sides of the equation,
 $4 = (x-2)^2$
 $x^2 - 3x = 0$
 $x(x-3) = 0$
 $x = 0, 3$
From the graph, $x = 0$ is an extraneous solution.
Therefore, $x = 3$
[Note] When drawing the graph, first determine the x - and y -axis points of intersection.

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



In Worksheets 101-120, you will study higher degree functions. It is very important that you learn to draw the rough graphs of higher degree functions.

Fractional Functions is the learning focus of Worksheets 121-150. In these sets, you will learn how to determine the equations of asymptotes and use them to draw the graphs of fractional functions.

In K151-170, you will draw graphs of irrational functions and solve irrational equations and inequalities.

Level K concludes with the topic *Exponential Functions*. In Worksheets 171-200, you will simplify expressions, solve equations and draw graphs of exponential functions. Mastery of this section is imperative for smooth progress through your studies of logarithmic functions in Level L.

Instructor's Comments