Thickness of Components

Thicknesses

The thickness of K'Nex components varies slightly between pieces, believe it or not. Ted has measured a sample of pieces with his micrometer, which is accurate to 1/1000th of a millimetre, and the results appear below:

	Thickness of Pieces (mm)		
	Piece	**Thickness**	**Average**
	Connector	6.05 – 6.20	6.15
	Silver Spacer	9.15 - 9.25	9.20
	Blue Spacer	3.02 - 3.04	3.03
	Tan Interlocking Clip	6.13 - 6.21	6.15
	Black Rod/Connector	6.19 - 6.27	6.25
	Medium Gear	12.40	12.40
	Large Gear	9.40	9.40
	37½mm Wheel	5.94 - 6.25	6.20
	50mm Wheel	12.00	12.00

Available Rod Lengths

When a rod has a connector on each end, as in the side of a cube, or when a rod is inserted through the centre of the opposite faces of a cube, the exposed piece of the rod can have pieces slid onto it (such as a connector or wheel), or pushed onto it (such as a clip).

When making a gearbox (which would typically be done by using a structure the thickness of which was determined by the lengths of blue rods) it is very useful to know what can be fitted onto the exposed part of a rod.

Thickness of Components

The lengths of the exposed rods are as follows (note that only the useful lengths have been included here—ones which would normally be used in practice):

Exposed Lengths of Rods		
Type of Rod	**How Used**	**Exposed Length (mm)**
Blue 55mm	With a connector at each end	38
Yellow 86mm	Through the opposite faces of a structure which uses a blue rod for its thickness	69
Yellow 86mm	With a connector at each end	69
Red 130mm	Through the opposite faces of a structure which uses a yellow rod for its thickness	100

Notes:

When a rod has a connector at each end, its usable length is 17mm less than the length of the rod.

If a cube is built using sides of length L, the internal distance between two opposite faces is L + 14. This represents the available length of a rod which passes through the centre of opposite faces.

How to Determine what Pieces can be Fitted onto a Rod

It seems from the Thickness of Pieces table that some complicated sums might have to be done in order to work out what pieces can be fitted to the exposed length of a rod. However, Ted has invented a short cut!

Instead of using the actual thicknesses of the pieces and the actual lengths of the exposed rods, we can use integral sizes and still get the same answer. These notional sizes are all multiples of 3mm, and a 'Notional Unit' has been defined as 3mm.

These notional sizes and units are as follows:

Thickness of Components

Thickness of Pieces (mm)		
Piece	Notional Thickness (mm)	Notional Units
Connector	6	2
Silver Spacer	9	3
Blue Spacer	3	1
Tan Interlocking Clip	6	2
Black Rod/Connector	6	2
Small / Medium Gear	12	4
Large Gear	9	3
37½mm Wheel	6	2
50mm Wheel	12	4

Thickness of Components

The exposed rod lengths must be corresponding adjusted, and we end up with these:

Exposed Lengths of Rods				
Type of Rod	**How Used**	**Exposed Length (mm)**	**Notional Length**	**Notional Units**
Blue 55mm	With a connector at each end	38	36	12
Yellow 86mm or longer rod	Through the opposite faces of a structure which uses a blue rod for its thickness	69	66	22
Yellow 86mm	With a connector at each end	69	66	22
Red 130mm or longer rod	Through the opposite faces of a structure which uses a yellow rod for its thickness	100	96	32

Examples

Q How many silver spacers could fit on a blue rod with a connector on each end?

A Notional length on exposed rod = 36. Silver spacer has notional thickness of 3. Therefore, the number of spacers is 36 / 3 = 12.

Q You are making a gearbox and the shaft which passes through the centre of the opposite faces of a blue-rod-sided cube is to hold the following components:

- A large yellow gear (82 teeth)
- A small captive blue gear (14 teeth)
- Two tan clips for the gears

How many spacers will be needed to cover the rest of the rod?

A The exposed length of the rod which is to hold the gears is 22 units. The large yellow gear is 3 units thick, the small blue gear is 4 units, and the tan clips are 2 units each—that's 11 units altogether. Therefore, the other 11 units will be filled with spacers. This could be done with 3 silver spacers (which are 3 units thick) and 2 blue ones (which are 1 unit), or 11 blue spacers, say