

Problem 1. Gandalf says that he’s figured out Saruman’s number system, and he shows some numbers to Saruman. “Ha, those aren’t my numbers!” says Saruman. “They are — I’ve just written them in a different form!” Gandalf replies. “Here, I’ve translated some numbers for you — can you figure out the conversion rule?”

Gandalf	Saruman	Gandalf	Saruman
(14235)	43521	(12)(3564)	215364
(124)(365)	246135	(136524)	136524
(12)(34)(56)	214365	(16)	623451
(234)(56)	134265	(3654)	126345
(1)	123	(23)	132
(12)	213	(123)	231
(132)	312	(13)	321
(12)	21	(123)	231
(1234)	2341	(12345)	23451
(12687354)	26514837	(168)(25734)	65427831
(157824)(36)	54617382	(23645)(78)	13652487
(126)(37)	26745138	(12)	21345678
(1742)(586)	71328546	(1247563)	24176358

Problem 2. “But Gandalf,” says Saruman, “you’ve translated (12) in three different ways!” Can you explain to Saruman why this happened?

Problem 3. Can you translate the following numbers?

3214	(152)(34)
1423	(132)
2134	(1342)
4321	(12543)
68513742	(17628345)
27413856	(243)(78)
34186257	(132)(45678)
62158347	(23)(568)
12345	(13)(24)
423156	(16)(23)(58)
54321	(12345)
654321	(18)