

2011 Solutions

(E) BrokEnglish! (1/3)

E1.

It's quite clear what happened to Spencer's message. Letter sequences in his message which correspond to the codes in his program were replaced by language names. One thing that stands out right away is that once a code is replaced by a language name, if the language name contains the code for some other language name, that code is sometimes (but not always!) replaced with the corresponding language name.

Working backwards, we can see that the original message was:

h	e	y	,	c	h	r	i	s	!	w	h	e	n	y	o	u	g	e	t	
a		f	r	e	e	m	o	m	e	n	t	,	c	h	e	c	k	o	u	
t	t	h	i	s	n	i	c	e		l	i	t	t	l	e	p	r	o	g	r
a	m	i	w	r	o	t	e	.	-	-	s	p	e	n	c	e	r			

(Spacing, capitalization, and punctuation were irrelevant to your score on this question.)

E2.

The key to finding the answer is to realize that when a code is replaced by a language name, if the language name contains the code for some other language name, that code is sometimes replaced with a language name, but it is **not always** replaced by a language name. To figure out the order, we need to look at words in which one or more substitution has already occurred, and look for additional sequences which could have been substituted but have not been substituted, or at words in which one of two substitutions could have occurred, and note which substitution was given precedence

The first thing to notice is that in 'FrEnglishcHebrewe', 'is' was not substituted for 'Icelandic.' From this, it is clear that 'is' is substituted before 'en', because if 'is' were substituted after 'en', the substitution for 'Icelandic' would have occurred.

It is also clear that one of the steps in the formation of 'FrEnglishcHebrewe' was 'Frenchee', which contains both the sequences 'ch' and 'he.' From this we can see that the substitution of 'he' occurs before the substitution of 'ch.'

Next, notice that the word 'when' became 'whEnglish', although 'wHebrewn' was also a possibility. This shows that 'en' is substituted before 'he'.

Examining the longest word in the message, 'ChamorRomanianrlCHebrewcHebrewnlandic', three things are clearly evident:



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1. 'ch' is substituted before 'ro'
2. 'is' is substituted before 'ce'
3. 'ce' is substituted before 'he'

Closer consideration of this word also reveals that 'en' is substituted before 'ce.' It can be hypothesized that one of the steps of the formation of this word would have been 'ChamorRomanianrlChechenlandic', in which the sequence 'en' occurs. We already know that 'en' is substituted before 'he', so the fact that 'en' is not substituted here must mean that 'en' is substituted before 'ce.'

The order has now been determined.

Answer:

f r then i s then e n then c e then h e then c h then r o.

E3.

This question is very simple: it just asks us to substitute the codes in the order discovered in E2. However, if the correct order was not discovered in E2, it was impossible to answer this question correctly.

Answer:

F	r	E	n	g	I	i	s	h	c	H	e	b	r	e	w	s	h		f	I	C	H	e
b	r	e	w	c	H	e	b	r	e	w	n	l	a	n	d	i	C	h	a	m	o	r	R
o	m	a	n	i	a	n		F	r	E	n	g	I	i	s	h	C	h	a	m	o	r	R
o	m	a	n	i	a	n	o	m	c	o	n	c	E	n	g	I	i	s	h	t	r	a	
t	e																						

(Spacing, capitalization, and punctuation were irrelevant to your score on this question.)

E4.

The key to answering this question is to consider which replaceable sequences are contained in which language names, and to order them in such a way so that in any case, the maximum number of possible substitu-



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tions will occur.

It is given that 'ro' is substituted last.

'ce' needs to be substituted after 'is,' because 'Icelandic' is the only language which contains 'ce.'

Both 'he' and 'ch' need to be substituted after 'ce', because 'Chechen' contains both of these sequences, but 'ch' must be substituted before 'he', because the result, 'CHebrewChamorRomanianen', is longer than 'CHebrewcHebrewn.'

'is' needs to be substituted after 'en', because 'is' is contained in 'English.'

'fr' needs to be substituted before 'en', because 'en' is contained in 'French.'

The order has now been determined.

Answer:

f r then e n then i s then c e then c h then h e then r o.

Grading:

E1: 5/2 points for the correct answer.

E2: 1/3 point per pair of languages in the correct order, -1/3 per pair in the wrong order (0 if either piece of the pair was unlisted). Minimum 0.

E3: 5/2 points for the correct answer.

E4: 1/3 point per pair of languages in the correct order, -1/3 per pair in the wrong order (0 if either piece of the pair was unlisted). Minimum 0.

Total: 15 points

