Cipher Challenge 2 Solution:

As the snippet of transmission suggests, the message was encrypted by converting the letters to their ASCII (American Standard Code for Information Interchange) equivalent number. A codeword was added to the plaintext to produce the ciphertext. You can tell by the numbers that the base 10 representation of the ASCII code was used. The [CAPS ONLY] hint was meant to indicate that only capital letters were used (the caps are numbered 65-90) (see for example, <u>http://www.ascii-code.com/</u>)

We don't know how long the code word is, but one might notice that the sequence of numbers 148, 154, 155, 172, 145, 152, 152 repeats several times. We guess that those indicate places where a new message was begun reusing the code word. Thus we can break the code into several messages indicated by the repeating numbers.

1 4 8	1 5 4	1 5 5	1 7 2	1 4 5	1 5 2	1 5 2	1 5 7	1 5 4	1 5 9	1 7 4	1 6 0	1 4 8	1 4 5	1 5 9	1 6 7	1 7 2	1 6 9	1 6 3														
1 4 8	1 5 4	1 5 5	1 7 2	1 4 5	1 5 2	1 5 2	1 6 9	1 5 4	1 7 3	1 7 3	1 4 9	1 5 7	1 4 8	1 5 7	1 5 0	1 7 4	1 6 9	1 6 1	1 5 1	1 4 5	1 4 9	1 5 4	1 7 4	1 6 3	1 5 4	1 4 0	1 4 8	1 5 6	1 5 0	1 5 7	1 5 9	
1 4 8	1 5 4	1 5 5	1 7 2	1 4 5	1 5 2	1 5 2	1 4 6	1 6 7	1 6 3	1 6 8	1 4 7	1 5 3	1 4 0	1 4 9	1 5 8	1 7 4	1 5 9	1 5 3	1 4 2	1 4 6	1 4 5	1 5 1	1 6 6	1 5 5	1 4 3	1 4 4	1 3 5	1 4 5	1 6 8	1 5 9		
1 4 8	1 5 4	1 5 5	1 7 2	1 4 5	1 5 2	1 5 2	1 6 7	1 5 7	1 5 9	1 7 2	1 4 5	1 5 2	1 4 0	1 4 5	1 6 1	1 6 6	1 7 4	1 4 8	1 3 8	1 3 4	1 4 5	1 5 2	1 6 5	1 7 5	1 5 6	1 3 5	1 3 7					
1 4 8	1 5 4	1 5 5	1 7 2	1 4 5	1 5 2	1 5 2	1 4 5	1 6 9	1 7 4	1 6 2	1 4 5	1 3 6	1 3 7	1 5 8	1 6 9	1 7 2	1 5 5	1 5 2	1 5 9	1 4 7	1 5 9	1 7 1	1 5 5	1 6 6	1 4 5	1 5 3	1 5 6					

Although we don't know the length of the code word, we can guess that the columns were encrypted using the same letter. It seems that the first 7 letters of each line correspond to the same plaintext letters and so we start our analysis with column 8. If we assume that the plaintext and codeword both used capital letters, then they were each in the range 65-90. So the largest the codeword letter number (code number) for each column could be is 90 and the smallest is 65. If we subtract 65 and 90 from each number in this column we get a range for the number of the code letter.

Here's the analysis for column 8:

(1) 157: 157-90 = 67 and 157-65=92 – this says the code number is between 67 and 92 - not helpful since we know it is between 65 and 90 already.

- (2) 169: 169-90 = 79 and 169-65=104 this says the code number is greater than or equal to 79
- (3) 146: 146-90=56 and 146-65=81 this says the code number is less than or equal to 81
- (4) 167: 167-90=77 and 167-65=102 this says the code number is greater than or equal to 77
- (5) 145-90=55 and 145-65=80 this says the code number is less than or equal to 80

So from this information we gather by putting (2) and (5) together that the code number used to encrypt column 8 is between 79 and 80 which correspond to the letters o and p.

You will note that we need not look at all the numbers in the column, the tightest bounds will come from looking at the largest and smallest number in the column.

Here's the analysis for column 9:

The largest number is 169 and the smallest is 154:

- (1) 169: 169-90 = 79 and 169-65 = 104
- (2) 154: 154-90=64 and 154-65=89

Putting these together we see that the code number used to encrypt column 9 is between 79 and 89 which correspond to the letters o - y.

If you repeat this analysis for each column you get the following information where an x indicates that that number is a possible code number for the column:

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
65	А							х							х						х	
66	В							Х							х					х	х	х
67	С						х	Х							х					х	х	х
68	D						х	х							х					х	х	х
69	E						х	х	х					х	х	х				х	х	х
70	F					х	х	х	х					х		х				х	х	х
71	G					х	х	х	х					х		х				х		
72	Н					х		х	х					х		х				х		
73						х			х				х	х		х				х		
74	J					х			х				х			х				х		
75	К					х			х				х			х				х		
76	L					х			х				х			х				х		
77	М					х			х				х			х				х		
78	Ν					х			х				х			х				х		
79	0	х	х			х			х	х			х			х						
80	Р	х	х			х			х	х			х			х						
81	Q		х							х			х				х					
82	R		х							х			х				х					
83	S		х							х			х				х					
84	Т		х	х	х					х	х	х					х	х				
85	U		х	х	х					х	х	х					х	х	х			
86	V		х	х	х						х	х					х	х	х			
87	W		х	х	х						х	х						х	х			
88	Х		х	х	х						х	х						х	х			
89	Y		х	х	х						х	Х						х	х			
90	Z			х	х						х	х						х	х			

It appears that code numbers 3 and 4 might repeat at 10 and 11 and again at 17 and 18. Since these numbers differ by 7, this suggests the codeword is 7 letters long. Working on that assumption we get that columns 1, 8, and 15 were encrypted with the same code number. Likewise 2, 9 and 16 were encrypted with the same code number, etc. Putting the information from the columns together we can eliminate more possibilities and get the following choices for each letter in the code word.

1	2	3	4	5	6	7
0	Q	Т	U	I	E	В
Р	R	U	V	J	F	С
	S	V	W	К		D
	т	W	Х	L		E
	U	Х	Y	М		
		Y	Z	Ν		
		Z				

The next step is to find the codeword. After some guess and checking one will find the code word to be "PUZZLED". In ASCII, P=80, U= 85, Z = 90, Z=90, L = 76, E = 69, D=68. So now we need to subtract this from the ciphertext then translate back to letters using the ASCII table.

Cipher	148	154	155	172	145	152	152	157	154	159	174						
Code	80	85	90	90	76	69	68	80	85	90	90						
Plain	68	69	65	82	69	83	84	77	69	69	84						
Letters	D	Е	А	R	Е	S	Т	М	Е	Е	Т						
	160	148	145	159	167	172	169	163									
	76	69	68	80	85	90	90	76									
	84	79	77	79	82	82	79	87									
	Т	0	Μ	0	R	R	0	W									
Cipher	148	154	155	172	145	152	152	169	154	173	173	149	157	148	157	150	174
Code	80	85	90	90	76	69	68	80	85	90	90	76	69	68	80	85	90
Plain	68	69	65	82	69	83	84	89	69	83	83	73	88	80	77	65	84
Letters	D	Е	А	R	Е	S	Т	Y	Е	S	S	I	Х	Р	М	А	Т
	169	161	151	145	149	154	174	163	154	140	148	156	150	157	159		
	90	76	69	68	80	85	90	90	76	69	68	80	85	90	90		
	79	85	82	77	69	69	84	73	78	71	80	76	65	67	69		
	0	U	R	Μ	E	E	Т	I	Ν	G	Ρ	L	А	С	E		
						4 - 0	150	146	107	100	100	4 4 7	450	4 4 0		150	474
Cipher	148	154	155	172	145	152	152	146	167	163	168	147	153	140	149	158	174
Cipher Code	148 80	154 85	155 90	172 90	145 76	152 69	152 68	140 80	85	163 90	168 90	147 76	153 69	140 68	149 80	158 85	174 90
•																	
Code	80	85	90	90	76	69	68	80	85	90	90	76	69	68	80	85	90
Code Plain	80 68	85 69	90 65	90 82	76 69	69 83	68 84	80 66	85 82	90 73	90 78	76 71	69 84	68 72	80 69	85 73	90 84
Code Plain Letters	80 68 D	85 69 E	90 65 A	90 82 R	76 69 E	69 83 S	68 84 T	80 66 B	85 82 R	90 73 I	90 78 N	76 71 G	69 84 T	68 72 H	80 69	85 73	90 84
Code Plain Letters Cipher	80 68 D 159	85 69 E 153	90 65 A 142	90 82 R 146	76 69 E 145	69 83 S 151	68 84 T 166	80 66 B 155	85 82 R 143	90 73 I 144	90 78 N 135	76 71 G 145	69 84 T 168	68 72 H 159	80 69	85 73	90 84
Code Plain Letters Cipher Code	80 68 D 159 90	85 69 E 153 76	90 65 A 142 69	90 82 R 146 68	76 69 E 145 80	69 83 S 151 85	68 84 T 166 90	80 66 B 155 90	85 82 R 143 76	90 73 I 144 69	90 78 N 135 68	76 71 G 145 80	69 84 T 168 85	68 72 H 159 90	80 69	85 73	90 84
Code Plain Letters Cipher Code Plain	80 68 D 159 90 69	85 69 E 153 76 77	90 65 A 142 69	90 82 R 146 68 78	76 69 E 145 80 65	69 83 S 151 85 66	68 84 T 166 90 76	80 66 B 155 90 65	85 82 R 143 76 67	90 73 I 144 69 75	90 78 N 135 68 67	76 71 G 145 80 65	69 84 T 168 85 83	68 72 H 159 90 69	80 69	85 73	90 84
Code Plain Letters Cipher Code Plain Letters	80 68 D 159 90 69 E	85 69 153 76 77 M	90 65 A 142 69 73 I	90 82 R 146 68 78 N	76 69 145 80 65 A	69 83 5 151 85 66 B	68 84 166 90 76 L	80 66 155 90 65 A	85 82 R 143 76 67 C	90 73 144 69 75 K	90 78 N 135 68 67 C	76 71 145 80 65 A	69 84 T 168 85 83 S	68 72 H 159 90 69 E	80 69 E	85 73 I	90 84 T
Code Plain Letters Cipher Code Plain Letters Cipher	80 68 D 159 90 69 E 148	85 69 153 76 77 M	90 65 142 69 73 I	90 82 R 146 68 78 N 172	76 69 145 80 65 A 145	69 83 5 151 85 66 B 152	68 84 166 90 76 L 152	80 66 155 90 65 A 167	85 82 143 76 67 C 157	90 73 144 69 75 K 159	90 78 N 135 68 67 C 172	76 71 145 80 65 A 145	69 84 168 85 83 S 152	68 72 H 159 90 69 E 140	80 69 E 145	85 73 I	90 84 T
Code Plain Letters Cipher Code Plain Letters Cipher Code	80 68 D 159 90 69 E 148 80	85 69 153 76 77 M 154 85	90 65 142 69 73 I 155 90	90 82 R 146 68 78 N 172 90	76 69 145 80 65 A 145 76	69 83 151 85 66 B 152 69	68 84 166 90 76 L 152 68	80 66 155 90 65 A 167 80	85 82 143 76 67 C 157 85	90 73 144 69 75 K 159 90	90 78 N 135 68 67 C 172 90	76 71 145 80 65 A 145 76	69 84 168 85 83 S 152 69	68 72 H 159 90 69 E 140 68	80 69 E 145 80	85 73 I 161 85	90 84 T
Code Plain Letters Cipher Code Plain Letters Cipher Code Plain	80 68 D 159 90 69 E 148 80 68	85 69 153 76 77 M 154 85 69	90 65 142 69 73 1 155 90 65	90 82 R 146 68 78 N 172 90 82	76 69 145 80 65 A 145 76 69	69 83 151 85 66 B 152 69 83	68 84 166 90 76 L 152 68 84	80 66 155 90 65 A 167 80 87	85 82 143 76 67 C 157 85 72	90 73 144 69 75 K 159 90 69	90 78 N 135 68 67 C 172 90 82	76 71 145 80 65 A 145 76 69	69 84 168 85 83 S 152 69 83	68 72 H 159 90 69 E 140 68 72	80 69 E 145 80 65	85 73 I 161 85 76	90 84 T 166 90 76
Code Plain Letters Cipher Code Plain Letters Cipher Code Plain Letters	80 68 D 159 90 69 E 148 80 68 D	85 69 153 76 77 M 154 85 69 E	90 65 142 69 73 1 155 90 65 A	90 82 R 146 68 78 N 172 90 82 R	76 69 145 80 65 A 145 76 69 E	69 83 151 85 66 B 152 69 83 S	68 84 166 90 76 L 152 68 84 T	80 66 155 90 65 A 167 80 87 W	85 82 143 76 67 C 157 85 72 H	90 73 144 69 75 K 159 90 69 E	90 78 N 135 68 67 C 172 90 82 R	76 71 145 80 65 A 145 76 69	69 84 168 85 83 S 152 69 83	68 72 H 159 90 69 E 140 68 72	80 69 E 145 80 65	85 73 I 161 85 76	90 84 T 166 90 76
Code Plain Letters Cipher Code Plain Letters Cipher Code Plain Letters Cipher	80 68 D 159 90 69 E 148 80 68 D 174	85 69 153 76 77 M 154 85 69 E 148	90 65 142 69 73 1 55 90 65 A 138	90 82 R 146 68 78 N 172 90 82 R 134	76 69 145 80 65 A 145 76 69 E 145	69 83 151 85 66 B 152 69 83 S 152	68 84 7 166 90 76 L 152 68 84 T 165	80 66 90 65 A 167 80 87 W 175	85 82 143 76 67 C 157 85 72 H 156	90 73 144 69 75 K 159 90 69 E 135	90 78 N 135 68 67 C 172 90 82 R 137	76 71 145 80 65 A 145 76 69	69 84 168 85 83 S 152 69 83	68 72 H 159 90 69 E 140 68 72	80 69 E 145 80 65	85 73 I 161 85 76	90 84 T 166 90 76

Cipher	148	154	155	172	145	152	152	145	169	174	162	145	136	137	158	169	172
Code	80	85	90	90	76	69	68	80	85	90	90	76	69	68	80	85	90
Plain	68	69	65	82	69	83	84	65	84	84	72	69	67	69	78	84	82
Letters	D	Е	А	R	Е	S	Т	А	т	Т	Н	Е	С	Е	Ν	Т	R
Cipher	155	152	159	147	159	171	155	166	145	153	156						
Code	90	76	69	68	80	85	90	90	76	69	68						
Plain	65	76	90	79	79	86	65	76	69	84	88						
Letters	А	1	7	0	0	V	А	1	Е	т	x						

Message 1: Dearest Meet tomorrow

Message 2: Dearest Yes six pm at our meeting place

Message 3: Dearest Bring the item in a black case

Message 4: Dearest Where shall the back up be

Message 5: Dearest At the central zoo valet x