How Hex Code Colors Work – and How to Choose Colors Without A Color Picker

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No matter what kind of coding project you are undertaking, chances are that at some point you're going to start working with colors. This is particularly true if – as many people do – you learn to code using HTML to design web pages.

When you first start out designing in color, you'll likely be using some kind of graphical interface to choose the colors you want to use before you apply them to the various elements in your page.

As you grow more confident in using HTML, though, and as you start to look at the code itself rather than just your graphical editor, you will notice that the colors you pick are denoted by some strange looking codes such as #ff0000.

These codes are called Hex color codes, and they are a fundamental part of the way that both HTML and CSS work. Learning how they function will not only save you a lot of time, it will also make your code faster, more elegant, and more reliable.

In this guide, we'll take you through everything you need to know about hex color codes, and show you how to use them in your own project.

What Does Hexadecimal Mean?

First, let's look at the "hex" part of the term "hex color code". Hex, in this context, stands for "hexadecimal", a number system in which there are 16 basic numerals, rather than the more familiar 10.

This is the number system used by HTML, and many other programming languages for that matter, and so it is the way in which colors are recorded in the language.

Hexadecimal, as the name suggests, is a way of encoding a base 16 number system. Decimal, our regular number system you're already familiar with, is base 10. Hexadecimal uses the same numerals as the regular system for the first 10 numbers (so 0 – 9) and then swaps to letters, so the numbers 10 – 15 are encoded using the letters A – F.

As an interesting aside, the primary reason that hexadecimal is used is because it possesses a natural link to the binary system that is used by your computer at a more basic level.

Binary numbers are commonly expressed as a power of 2, and 16 is 2^4. This makes it easy to convert between hexadecimal and binary (though we won't be doing that today).

You don't need to know this to use hex color codes, but it might come in handy the next time you want to impress someone.

What Components Make Up a Color?

How do we use the hexadecimal system to encode colors in RGB?

Colors that are displayed on a computer screen are made up of three components, which correspond to the three colors that are present in each pixel of your screen. If you look really, really closely (or you have an ancient screen) you'll be able to see them – red, green, and blue.

RGB values of the same three colors

Source

As a consequence, the way that we encode colors is to specify how much light each of the red, green, and blue (RGB) parts of your pixels should give out. So, for instance, an RGB value (a type of value used in many different software systems) might look like this: RGB (255, 0, 0).

255 is the maximum value for a component, and so this value indicates that the first component (red, or R) should be at maximum, and the other two should be at minimum. And that will give us (you've guessed it) pure red.

(Incidentally, the reason that 255 is the maximum value is also related to the ease of using this value [or, actually, 256 including 0] in binary. 256 is 2^8. But that's another factoid you really don't need to know.)

The observant readers among you will already have spotted that, even at this stage, it's pretty simple to work with colors in this form. Black, as an RGB value, is RGB (0,0,0), and white is RGB (255,255,255). Green? That's right, RGB (0,255,0).

How Hex Colors Work

Now that we know how colors work, we can look at a real hex color code. Take, for example, #ff0000, and let's combine our knowledge from above to work out what it means.

Take a look at your hexadecimal table, and you'll see that "FF" translates to "255" in standard, base-10 encoding.

00	0	20	32	40	64	60	96	80	128	A0	160	C0	192	E0	224
01	1	21	33	41	65	61	97	81	129	A1	161	C1	193	E1	225
02	2	22	34	42	66	62	98	82	130	A2	162	C2	194	E2	226
03	3	23	35	43	67	63	99	83	131	A3	163	C3	195	E3	227
04	4	24	36	44	68	64	100	84	132	A4	164	C4	196	E4	228
05	5	25	37	45	69	65	101	85	133	A5	165	C5	197	E5	229
06	6	26	38	46	70	66	102	86	134	A6	166	C6	198	E6	230
07	7	27	39	47	71	67	103	87	135	A7	167	C7	199	E7	231
08	8	28	40	48	72	68	104	88	136	A8	168	C8	200	E8	232
09	9	29	41	49	73	69	105	89	137	A9	169	C9	201	E9	233
0A	10	2A	42	4A	74	6A	106	8A	138	AA	170	CA	202	EA	234
0B	11	2B	43	4B	75	6B	107	8B	139	AB	171	CB	203	EB	235
0C	12	2C	44	4C	76	6C	108	8C	140	AC	172	CC	204	EC	236
0D	13	2D	45	4D	77	6D	109	8D	141	AD	173	CD	205	ED	237
0E	14	2E	46	4E	78	6E	110	8E	142	AE	174	CE	206	EE	238
0F	15	2F	47	4F	79	6F	111	8F	143	AF	175	CF	207	EF	239
10	16	30	48	50	80	70	112	90	144	B0	176	D0	208	F0	240
11	17	31	49	51	81	71	113	91	145	B1	177	D1	209	F1	241
12	18	32	50	52	82	72	114	92	146	B2	178	D2	210	F2	242
13	19	33	51	53	83	73	115	93	147	B3	179	D3	211	F3	243
14	20	34	52	54	84	74	116	94	148	B4	180	D4	212	F4	244
15	21	35	53	55	85	75	117	95	149	B5	181	D5	213	F5	245
16	22	36	54	56	86	76	118	96	150	B6	182	D6	214	F6	246
17	23	37	55	57	87	77	119	97	151	B7	183	D7	215	F7	247
18	24	38	56	58	88	78	120	98	152	B8	184	D8	216	F8	248
19	25	39	57	59	89	79	121	99	153	B9	185	D9	217	F9	249
1A	26	3A	58	5A	90	7A	122	9A	154	BA	186	DA	218	FA	250
1B	27	3B	59	5B	91	7B	123	9B	155	BB	187	DB	219	FB	251
1C	28	3C	60	5C	92	7C	124	9C	156	BC	188	DC	220	FC	252
1D	29	3D	61	5D	93	7D	125	9D	157	BD	189	DD	221	FD	253
1E	30	3E	62	5E	94	7E	126	9E	158	BE	190	DE	222	FE	254
1F	31	3F	63	5F	95	7F	127	9F	159	BF	191	DF	223	FF	255

Source

This should be a clue. The two first characters of this hex color code (and, in fact, all hex color codes) refer to the red component, and here the value is 255. The second two characters refer to the green component, and the last two to the blue.

From here, you can work out what #ff0000 means when translated to a color – it's the same as RGB (255,0,0). That is, pure red. Similarly, #ff00ff indicates maximum red and blue simultaneously, which produces magenta:

It's at this point that you might start to recognize the value and elegance of hex color codes. Because they use hexadecimal, and because 255 is the maximum value for a component, every possible color can be expressed using just 6 digits.

This system also means that there are a huge range of colors available, because each component can take on any value from 0 to 255. Do the math on the number of possible different combinations, and you'll find that there are 16,777,216 colors available.

How to Use Hex Code Abbreviations

At this point, since you understand hex color codes, you can begin to use them in your web projects instead of using a color picker on your graphical interface.

However, before we get to that, it's important to realize that these two options are not the only ones open to you.

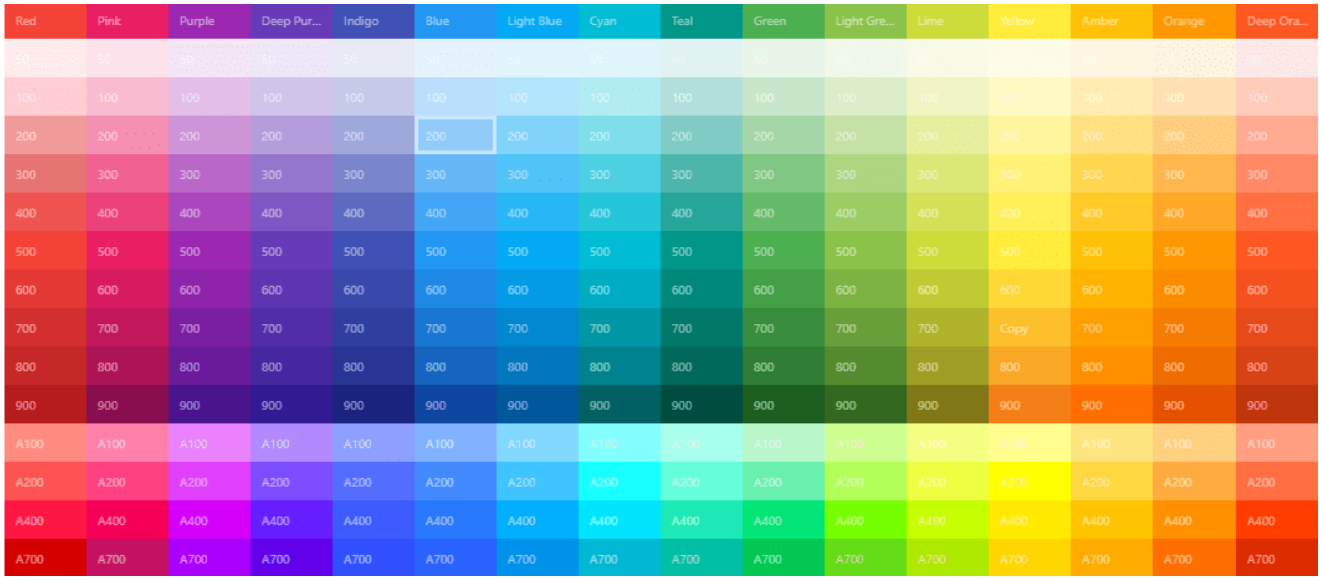
HTML, because it was designed to be easy to use, also allows you to use abbreviated hex codes. Red, which is #FF0000 in hex code, can be shortened to #F00. That is, one digit for red, one digit for green, one digit for blue. Browsers will interpret #FF0000 and #F00 as exactly the same color.

This reduces the total number of possible colors to around 4,000. However, it has other advantages.

Just as you can use shorthand to optimize CSS delivery, encoding your colors using abbreviations can improve the performance of your web pages. This might not be visible when working with small pages, but can have a significant impact as your projects get more complex.

How to Use Your Own Hex Codes

At this point, you should be ready to start using hex codes instead of the color picker on your web design software. Most web builders will allow you to enter a hex code instead of clicking a color with a mouse, and taking this approach has several key advantages.



Source

One is that it's easier to keep track of which colors you are using. When designing using a color picker, it's easy to accidentally use a color that is very close, and therefore all but indistinguishable, from the one you actually want.

This means that before you know it, your pages are in two similar but distinct shades of red. Using a hex code means you'll get the same color every time.

Secondly, using hex codes allows you a fine level of control over your colors that is not possible with a color picker.

No color picker can contain all 16 million colors available to you when using HTML, but by writing your own color codes you can increment the shades that are available to you one value at a time.

Third, an understanding of the way that colors work on a computer screen is invaluable when it comes to designing web pages, or in fact any piece of software. With just a little insight into the way that your devices interpret code and displays colors, you can begin using hex codes to mix colors, and also ensure that the color you want to display is the one that actually appears on your users' screens.

Going further

Playing around with hex color codes in HTML might be fun, but it also has a serious objective. Almost all image manipulation software uses the same encoding, and so learning how hex color codes work will add a useful and fundamental skill to your coding knowledge.

Take a look at how JPG works, for instance, and now you'll already be familiar with some of the terminology. The next time you build a web page, drop the color picker, and code your colors by hand.

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