

Hexadecimal Conversions

Decimal	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hexadecimal	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

In this activity, you will practice converting 8-bit RGB (red, green, and blue) color codes from decimal (RRR, GGG, BBB) to hexadecimal notation (#RRGGBB) using long division. Divide each decimal number in the triplet by 16, the base number for hexadecimal notation. The remainder will be an integer less than 16 (0 to 15) and will represent a single hexadecimal digit (0 to F). The quotient will become the dividend in the next step, and long division is repeated to find the next hexadecimal digit. Repeat until the quotient is zero. Follow this process for each of the three colors (RGB). For more information about decimal and hexadecimal notation and their place values, read the “Decimal, Hexadecimal, and Binary Number Systems Overview” sheet.

Color	8-Bit RGB Triplet	
	Decimal Color Code	Hexadecimal Color Code
White	255, 255, 255	#FFFFFF
Bright yellow	247, 252, 32	#F7FC20
Orange		
Indigo		
Violet		

- In the 8-Bit RGB Triplet chart above, you must find the decimal color code for the given colors using a computer or a table provided by the teacher, then convert the decimal RGB color code to hexadecimal notation using long division.
- Review the example below, then practice with the given colors. For the blank rows in the Color column, choose your own colors and fill in the chart accordingly. Be sure to show your work on a separate sheet of paper.

Example for converting an 8-bit RGB triplet from decimal to hexadecimal

To determine the hexadecimal color code for bright yellow, divide each decimal number (247, 252, 32) by 16. Use a table like the one below to organize the dividend, divisor, quotient, and remainder for each step. Start with the red integer value 247.

- Divide 247 by 16. Determine the quotient, or how many times 16 divides evenly into 247, and then find the remainder. The remainder is your first hexadecimal digit, or the digit in the ones (16^0) place. The quotient will be used as the dividend in the next step.

$$247 \div 16 = 15 \text{ remainder } 7$$

- Divide 15 by 16. Determine how many times 16 divides evenly into 15, and then find the remainder. The remainder is your next hexadecimal digit or the digit in the sixteens (16^1) place.

$$15 \div 16 = 0 \text{ remainder } 15$$

- Since the quotient is zero, stop dividing. There are two place values in this hexadecimal number. Use the table at the top of the page to replace any numbers greater than nine (10 to 15) with the appropriate hexadecimal digit (A to F).


$$15 \text{ is equal to hexadecimal digit } F$$

- Put the two hexadecimal digits (7 and F) together starting with the 7 in the ones place (16^0) and the F in the sixteens place (16^1) to form the two-digit hexadecimal number.

F7


- Check your work by doing the steps above in reverse. In base 16, the number F7 has two digits. Reading from right to left, 7 is in the ones (16^0) place and F is in the sixteens (16^1) place. Convert hexadecimal F to the decimal equivalent, 15. Multiply each digit by its corresponding place value and find the sum.

$$F7 = (15 \times 16) + (7 \times 1) = 240 + 7 = 247$$

Dividend	Divisor	Quotient	Remainder	Hexadecimal equivalent
247	16	15	7	7
15	16	0 	15	F


Now repeat the five steps above for the green integer value 252.

- $252 \div 16 = 15$ remainder 12
- $15 \div 16 = 0$ remainder 15
- 12 is equivalent to hexadecimal digit C and 15 is equivalent to hexadecimal digit E.
- FC** is the hexadecimal number for 252.
- $FC = (15 \times 16) + (12 \times 1) = 240 + 12 = 252$

Dividend	Divisor	Quotient	Remainder	Hexadecimal equivalent
252	16	15	12	C
15	16	0 	15	F

Now repeat the five steps above for the blue integer value 32.

- $32 \div 16 = 2$ remainder 0
- $2 \div 16 = 0$ remainder 2
- Both digits are less than 10, so this hexadecimal number will not include any letters (A to F).
- 20** is the hexadecimal number for 32.
- $20 = (2 \times 16) + (0 \times 1) = 32 + 0 = 32$

Dividend	Divisor	Quotient	Remainder	Hexadecimal equivalent
32	16	2	0	0
2	16	0 	2	2

Put all three hexadecimal pairs together in the same order as the RGB color (247, 252, 32); the hexadecimal color code is **#F7FC20**.