# Digital Storage – Octal and Hexadecimal

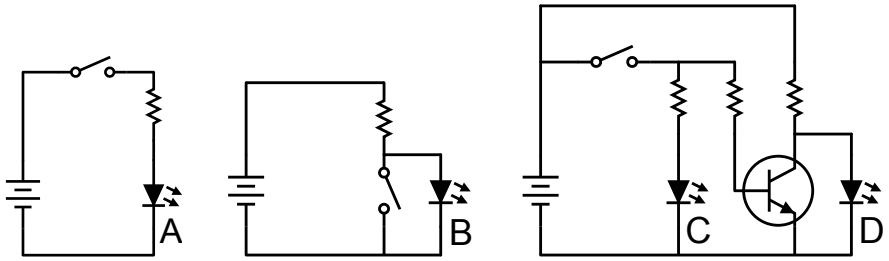


**Data Storage – Zeros and Ones**

1. Write the name of a semiconductor device that can be used as a switch and is one of the basic building blocks of modern digital electronic circuits?

***transistor***

2. For the light-emitting diodes (LED) labelled A through D in the circuits to the left, state whether it is "***on***" or "***off***" when the manual switch in the circuit is open and when it is closed closed.




| | A | B | C | D |
|---|---|---|---|---|
| Switch is opened: | *off* | *on* | *off* | *on* |
| Switch is closed: | *on* | *off* | *on* | *off* |

**Digital Storage – Number Systems**

3. Count in octal. Write the octal equivalent below each decimal number.

| **Decimal** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Octal** | *0* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | *17* | *20* | *21* | *22* | *23* | *24* |

4. Addition and multiplication of octal numbers. Fill in the boxes with the appropriate values.

$$\begin{array}{r} 417 \\ +235 \\ \hline 0654 \end{array} \qquad \begin{array}{r} 637 \\ +547 \\ \hline 1406 \end{array} \qquad \begin{array}{r} 765 \\ +567 \\ \hline 1554 \end{array}$$

$$\begin{array}{r} 376 \\ \times 25 \\ \hline 2366 \\ 07740 \\ \hline 12326 \end{array} \qquad \begin{array}{r} 702 \\ \times 57 \\ \hline 6116 \\ 43120 \\ \hline 51236 \end{array}$$

**Octal Multiplication Table**

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
|---|---|---|---|---|---|---|---|
| **1** | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **2** | 2 | 4 | 6 | 10 | 12 | 14 | 16 |
| **3** | 3 | 6 | 11 | 14 | 17 | 22 | 25 |
| **4** | 4 | 10 | 14 | 20 | 24 | 30 | 34 |
| **5** | 5 | 12 | 17 | 24 | 31 | 36 | 43 |
| **6** | 6 | 14 | 22 | 30 | 36 | 44 | 52 |
| **7** | 7 | 16 | 25 | 34 | 43 | 52 | 61 |

5. Show the steps to convert the given octal number into decimal.

$$0362 = 3 \times 8^{2} + 6 \times 8^{1} + 2 \times 8^{0}$$
$$= 192 + 48 + 2$$
$$= 242$$

# Digital Storage – Octal and Hexadecimal



**Digital Storage – Number Systems: Hexadecimal**

6. Count in hexadecimal. Write the hexadecimal equivalent below each decimal number.

| Decimal | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hexadecimal | *0* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *A* | *B* | *C* | *D* | *E* | *F* | *10* | *11* | *12* | *13* | *14* |

7. Addition and multiplication of hexadecimal numbers. Fill in the boxes with the appropriate values.

```
  D1E     ABC
+ 7E2   + DEF
------  ------
 1500    18AB
```

```
  A1D
×  37
------
 46CB
1E570
------
22C3B
```

**Hexadecimal Multiplication Table**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| **2** | 2 | 4 | 6 | 8 | A | C | E | 10 | 12 | 14 | 16 | 18 | 1A | 1C | 1E |
| **3** | 3 | 6 | 9 | C | F | 12 | 15 | 18 | 1B | 1E | 21 | 24 | 27 | 2A | 2D |
| **4** | 4 | 8 | C | 10 | 14 | 18 | 1C | 20 | 24 | 28 | 2C | 30 | 34 | 38 | 3C |
| **5** | 5 | A | F | 14 | 19 | 1E | 23 | 28 | 2D | 32 | 37 | 3C | 41 | 46 | 4B |
| **6** | 6 | C | 12 | 18 | 1E | 24 | 2A | 30 | 36 | 3C | 42 | 48 | 4E | 54 | 5A |
| **7** | 7 | E | 15 | 1C | 23 | 2A | 31 | 38 | 3F | 46 | 4D | 54 | 5B | 62 | 69 |
| **8** | 8 | 10 | 18 | 20 | 28 | 30 | 38 | 40 | 48 | 50 | 58 | 60 | 68 | 70 | 78 |
| **9** | 9 | 12 | 1B | 24 | 2D | 36 | 3F | 48 | 51 | 5A | 63 | 6C | 75 | 7E | 87 |
| **A** | A | 14 | 1E | 28 | 32 | 3C | 46 | 50 | 5A | 64 | 6E | 78 | 82 | 8C | 96 |
| **B** | B | 16 | 21 | 2C | 37 | 42 | 4D | 58 | 63 | 6E | 79 | 84 | 8F | 9A | A5 |
| **C** | C | 18 | 24 | 30 | 3C | 48 | 54 | 60 | 6C | 78 | 84 | 90 | 9C | A8 | B4 |
| **D** | D | 1A | 27 | 34 | 41 | 4E | 5B | 68 | 75 | 82 | 8F | 9C | A9 | B6 | C3 |
| **E** | E | 1C | 2A | 38 | 46 | 54 | 62 | 70 | 7E | 8C | 9A | A8 | B6 | C4 | D2 |
| **F** | F | 1E | 2D | 3C | 4B | 5A | 69 | 78 | 87 | 96 | A5 | B4 | C3 | D2 | E1 |

8. Show the steps to convert the given hexadecimal number into decimal.

0 x 5 A D = 5 × $16^2$ + 10 × $16^1$ + 13 × $16^0$

= 1280 + 160 + 13

= 1453

9. Show the steps to convert the given decimal number into hexadecimal using the division method.

decimal hex

2 9 8 9 ÷ 1 6 = 186 R 13 = D

186 ÷ 1 6 = 11 R 10 = A

11 ÷ 1 6 = 0 R 11 = B

final answer

0 x B A D

10. Convert the hexadecimal numbers to decimal, and the decimal number to hexadecimal: Show your work in the box.

a) **0x63**

*99*

b) **0xF1**

*241*

c) **127**

*0x7F*

d) **273**

*0x111*