1. Fill in the following table of numbers in decimal, binary, octal, and hexadecimal.

base	example				
decimal	10	256	512	32	512
binary	b1010	b10000000	b1000000000	b100000	b1000000000
octal	o12	o400	o1000	o40	o1000
hexadecimal	0xA	0x100	0x200	0x20	0x200

note: why are there duplicate columns?

base	example				
decimal	10	31582	153	196	65535
binary	b1010	b111101101011110	b10011001	b11000100	b1…1 (2^{16})
octal	o12	o75536	o231	o304	o177777
hexadecimal	0xA	0x7B5E	0x99	0xC4	0xFFFF

note: I used expansion steps in a calculator, e.g., o75536:

$$7 \cdot 8^4 + 5 \cdot 8^3 + 5 \cdot 8^2 + 3 \cdot 8^1 + 6 = 31582$$

but then it got tedious rather than insightful, so then I used python.

2. Complete the following: (A:10,B:11,C:12,D:13,E:14,F:15)

```
      0x189                  b1010010100              o743
  +   0x345              +   b0101101011          +   o265
  ─────────              ─────────────────        ─────────
      0x4CE                  b1111111111              o1230


     0xDEAD                  b1111111111              o100
  +  0xBEEF              +             b1          +  o777
  ─────────              ─────────────────        ─────────
    0x19D9C                  b10000000000             o1077


       0x89                  b0111111111              o74
  ×    0xAB              ×   b1000000001          ×   o26
  ─────────              ─────────────────        ─────────
     0x5B83                  b1000000000              o2450
                       +  b1111111100000000000
                          ─────────────────
                          b111111111111111111
```

3. Compute the following sets. The universe for all of these sets is $\mathbf{Z}$, $\mathbf{P}$ is the set of prime numbers, $\mathbf{E}$ is the set of even numbers, and $\mathbf{O}$ is the set of odd numbers.

    (a) $\{1, 2, 3, 5, 8, 13, 21, 35\} \cup \{2, 3, 5, 7, 11, 13, 17, 19\} =$

    (b) $\{1, 2, 3, 5, 8, 13, 21, 35\} \cap \{2, 3, 5, 7, 11, 13, 17, 19\} =$

    (c) $\mathbf{E} \cap \mathbf{O} =$

    (d) $\mathbf{P} \cap \mathbf{E} =$

    (e) $\mathbf{N}' =$

    (f) $\mathbf{E}' \cap \mathbf{O}' =$

    (g) $\{x : y \in \mathbf{N}, x = y^2\} \cap \{x : y \in \mathbf{N}, x = y^3\} =$

    (h) $P(\{1, 2, 3\}) \cap P(\{2, 3, 4\}) =$

4. Give the truth tables for the following. Which are tautologies, and which are satisfiable?

    (a) $a \wedge (b \vee a)$

    (b) $(a \wedge b) \vee (a \wedge b)$

    (c) $a \vee \neg a$

    (d) $\neg(a \vee b)$

    (e) $\neg a \wedge (\neg b)$

    (f) $\neg a \wedge (\neg b \vee c)$