

```
1.  /*****
2.  *  binary.c
3.  *
4.  *  David J. Malan
5.  *  malan@harvard.edu
6.  *
7.  *  Displays a number in binary.
8.  *
9.  *  Demonstrates bitwise operators.
10. *****/
11.
12. #include <cs50.h>
13. #include <stdio.h>
14.
15. int main(void)
16. {
17.     // prompt user for number
18.     int n;
19.     do
20.     {
21.         printf("Non-negative integer please: ");
22.         n = GetInt();
23.     }
24.     while (n < 0);
25.
26.     // print number in binary
27.     for (int i = sizeof(int) * 8 - 1; i >= 0; i--)
28.     {
29.         int mask = 1 << i;
30.         if (n & mask)
31.         {
32.             printf("1");
33.         }
34.         else
35.         {
36.             printf("0");
37.         }
38.     }
39.     printf("\n");
40. }
```

```
1. /**
2.  * capitalize-0.c
3.  *
4.  * David J. Malan
5.  * malan@harvard.edu
6.  *
7.  * Capitalizes a given string.
8.  *
9.  * Demonstrates casting and iteration over strings as arrays of chars.
10. */
11.
12. #include <cs50.h>
13. #include <stdio.h>
14. #include <string.h>
15.
16. int main(void)
17. {
18.     // get line of text
19.     string s = GetString();
20.
21.     // capitalize text
22.     for (int i = 0, n = strlen(s); i < n; i++)
23.     {
24.         if (s[i] >= 'a' && s[i] <= 'z')
25.         {
26.             printf("%c", s[i] - ('a' - 'A'));
27.         }
28.         else
29.         {
30.             printf("%c", s[i]);
31.         }
32.     }
33.     printf("\n");
34. }
```

```
1. /**
2.  * capitalize-1.c
3.  *
4.  * David J. Malan
5.  * malan@harvard.edu
6.  *
7.  * Capitalizes a given string.
8.  *
9.  * Demonstrates islower and toupper.
10. */
11.
12. #include <cs50.h>
13. #include <ctype.h>
14. #include <stdio.h>
15. #include <string.h>
16.
17. int main(void)
18. {
19.     // get line of text
20.     string s = GetString();
21.
22.     // capitalize text
23.     for (int i = 0, n = strlen(s); i < n; i++)
24.     {
25.         if (islower(s[i]))
26.         {
27.             printf("%c", toupper(s[i]));
28.         }
29.         else
30.         {
31.             printf("%c", s[i]);
32.         }
33.     }
34.     printf("\n");
35. }
```

```
1. /**
2.  * capitalize-2.c
3.  *
4.  * David J. Malan
5.  * malan@harvard.edu
6.  *
7.  * Capitalizes a given string.
8.  *
9.  * Demonstrates further simplification of code with toupper.
10. */
11.
12. #include <cs50.h>
13. #include <ctype.h>
14. #include <stdio.h>
15. #include <string.h>
16.
17. int main(void)
18. {
19.     // get line of text
20.     string s = GetString();
21.
22.     // capitalize text
23.     for (int i = 0, n = strlen(s); i < n; i++)
24.     {
25.         printf("%c", toupper(s[i]));
26.     }
27.     printf("\n");
28. }
```

```
1. /*****
2.  * tolower.c
3.  *
4.  * David J. Malan
5.  * malan@harvard.edu
6.  *
7.  * Converts an uppercase character to lowercase.
8.  *
9.  * Demonstrates bitwise operators.
10. *****/
11.
12. #include <cs50.h>
13. #include <ctype.h>
14. #include <stdio.h>
15.
16. int main(void)
17. {
18.     // prompt user for an uppercase character
19.     char c;
20.     do
21.     {
22.         printf("Uppercase character please: ");
23.         c = GetChar();
24.     }
25.     while (c < 'A' || c > 'Z');
26.
27.     // print number in lowercase
28.     printf("%c\n", c | 0x20);
29.
30.     // that's all folks
31.     return 0;
32. }
```

```
1. /*****
2.  * toupper.c
3.  *
4.  * David J. Malan
5.  * malan@harvard.edu
6.  *
7.  * Converts a lowercase character to uppercase.
8.  *
9.  * Demonstrates bitwise operators.
10. *****/
11.
12. #include <cs50.h>
13. #include <ctype.h>
14. #include <stdio.h>
15.
16. int main(void)
17. {
18.     // prompt user for a lowercase character
19.     char c;
20.     do
21.     {
22.         printf("Lowercase character please: ");
23.         c = GetChar();
24.     }
25.     while (c < 'a' || c > 'z');
26.
27.     // print number in lowercase
28.     printf("%c\n", c & 0xdf);
29.
30.     // that's all folks
31.     return 0;
32. }
```