Ⓦ 2. The following program fragments illustrate the logical operators. Show the output produced by each, assuming that `i`, `j`, and `k` are `int` variables.

```
(a) i = 10; j = 5;
    printf("%d", !i < j);
(b) i = 2; j = 1;
    printf("%d", !!i + !j);
(c) i = 5; j = 0; k = -5;
    printf("%d", i && j || k);
(d) i = 1; j = 2; k = 3;
    printf("%d", i < j || k);
```

*3. The following program fragments illustrate the short-circuit behavior of logical expressions. Show the output produced by each, assuming that `i`, `j`, and `k` are `int` variables.

```
(a) i = 3; j = 4; k = 5;
    printf("%d ", i < j || ++j < k);
    printf("%d %d %d", i, j, k);
(b) i = 7; j = 8; k = 9;
    printf("%d ", i - 7 && j++ < k);
    printf("%d %d %d", i, j, k);
(c) i = 7; j = 8; k = 9;
    printf("%d ", (i = j) || (j = k));
    printf("%d %d %d", i, j, k);
(d) i = 1; j = 1; k = 1;
    printf("%d ", ++i || ++j && ++k);
    printf("%d %d %d", i, j, k);
```

Ⓦ *4. Write a single expression whose value is either −1, 0, or +1, depending on whether `i` is less than, equal to, or greater than `j`, respectively.

Section 5.2

*5. Is the following `if` statement legal?

```
if (n >= 1 <= 10)
  printf("n is between 1 and 10\n");
```

If so, what does it do when `n` is equal to 0?

Ⓦ *6. Is the following `if` statement legal?

```
if (n == 1-10)
  printf("n is between 1 and 10\n");
```

If so, what does it do when `n` is equal to 5?

7. What does the following statement print if `i` has the value 17? What does it print if `i` has the value −17?

```
printf("%d\n", i >= 0 ? i : -i);
```

8. The following `if` statement is unnecessarily complicated. Simplify it as much as possible. (*Hint:* The entire statement can be replaced by a single assignment.)

```
if (age >= 13)
  if (age <= 19)
    teenager = true;
  else
    teenager = false;
else if (age < 13)
  teenager = false;
```