1. What is another way of writing the following expression?

```
x = x * y + z;
```

A. `x *= y + z;`
B. `x *= (y) + z;`
C. `(x *= y) + z;`
D. `x *= (y + z);`
E. None of the above

2. Which of the following statements is correct?

A. A return statement can be used to return the values of more than one variable.
B. After a return statement is executed inside a loop, the loop will proceed to its next iteration (if any).
C. A return statement may only appear at the end of a function.
D. A function may contain any number of return statements.
E. None of the above options is correct.

3. What is printed by the following C program?

```
#include <stdio.h>

int main(void) {

  int a = 500, b = 100, c = 50;

  if ( !(a >= 400) ) {
    b = 300;
  }
  c = 200;

  printf("b = %d; c = %d\n", b, c);

  return 0;
}
```

A. `b = 300; c = 200`
B. `b = 100; c = 50`
C. `b = 300; c = 50`
D. `b = 100; c = 200`
E. None of the above

4. Which of the following statements is/are TRUE about working on sunfire?

   i. To disconnect from sunfire, we can issue command **`logout`** or **`exit`**.
   ii. To compile a C program using **`gcc`**, we must always use the option **`-lm`**.
   iii. The **`rename`** command is used to rename a file.

A. (i) only
B. (ii) only
C. (iii) only
D. (i) and (ii) only
E. (i) and (iii) only

5. What is printed by the following C program?

```
#include <stdio.h>
int f(int x, int y);

int main(void) {

  int a = 10, b = 12;

  f(a, b);
  a = f(b, a);
  printf("a = %d; b = %d\n", a, b);

  return 0;
}

int f(int x, int y) {
  return 3*x - 2*y;
}
```

A. `a = 12; b = 16`
B. `a = 16; b = 12`
C. `a = 16; b = 10`
D. `a = 6; b = 12`
E. `a = 26; b = 6`

6. What is printed by the following C program fragment?

```
float i = 1.5;

switch ( (int)i ) {
  case 1:
    printf("%.1f\n", i);
    break;
  case 2:
    printf("%.1f\n", i);
    break;
  case 3:
    printf("%.1f\n", i);
}
```

A. There is a compilation error.

B. The value 1.0 is printed.

C. The value 1.5 is printed.

D. The value 2.0 is printed

E. None of the above options is correct.

7. What is printed by the following C program fragment?

```
#include <stdio.h>
int f(int i, int j, int k);

int main(void) {
  printf("%d\n", f(4,3,0));
  return 0;
}

int f(int i, int j, int k) {
  if (i > 0 || j/k < 2) {
    return j;
  }
  return i;
}
```

A. 0

B. 3

C. 4

D. 3 4

E. Error, because of division by zero.

8. In a particular physical fitness proficiency test, points are awarded depending on the number of sit-ups performed according to this table.

Number of sit-ups	< 30	30 - 34	35 - 39	40 - 44	>= 45
Points awarded	0	1	2	3	4

Which of the following functions computes the points correctly?

(i)

```
// Precond: situp >= 0
int compute_points(int situp) {

  int points = 0;

  switch (situp) {
    case (situp>29): points = 1; break;
    case (situp>34): points = 2; break;
    case (situp>39): points = 3; break;
    case (situp>44): points = 4; break;
  }

  return points;
}
```

(ii)

```
// Precond: situp >= 0
int compute_points(int situp) {

  int points = 0;

  switch ((situp>29)+(situp>34)+(situp>39)+(situp>44)) {
    case 1: points++; break;
    case 2: points++; break;
    case 3: points++; break;
    case 4: points++; break;
  }

  return points;
}
```

(iii)

```
// Precond: situp >= 0
int compute_points(int situp) {
  int points = 0;
  switch ((situp>29)+(situp>34)+(situp>39)+(situp>44)) {
    case 4: points++;
    case 3: points++;
    case 2: points++;
    case 1: points++;
  }
  return points;
}
```

A. None of (i), (ii) and (iii)

B. Only (ii)

C. Only (iii)

D. Only (i) and (ii)

E. Only (ii) and (iii)

9. Which of the following statements is TRUE for the program below?

```
#include <stdio.h>

int main(void) {

  float a = 1.5, b = 1.55;
  if (a = b) {
    printf("a and b are equal.\n");
  } else {
    printf("a and b are not equal.\n");
  }

  return 0;
}
```

A. Error, because `float` variables cannot be compared.

B. Output cannot be determined, because real numbers cannot be represented accurately.

C. The program receives compilation warning and the output is: `a and b are equal.`

D. The output is: `a and b are not equal.`

E. None of the above

10. What is printed by the following C program?

```
#include <stdio.h>

int main(void) {

  int a = 7, *p;
  double b = 5.99, *q;

  p = &a;
  q = &b;
  *p = *q;
  *q += *p;
  printf("%d, %f\n", a, b);

  return 0;
}
```

A. 5, 10.990000

B. 5, 11.980000

C. 5, 5.000000

D. 6, 11.990000

E. 7, 5.990000

11. What is the final value of `a`?

```
int a = 2, b = 6;
int *ptr1, *ptr2;

ptr1 = &b;
ptr2 = &a;

*ptr1 += *ptr2;
ptr1 = ptr2;
ptr2 = ptr1;
*ptr1 += *ptr2;
```

A. 10

B. 8

C. 6

D. 4

E. 12

12. What is printed by the following C program fragment?

```
#include <stdio.h>
void g(int *i, int *j);

int main(void) {
  int a = 2, b = 3;
  g(&a, &b);
  printf("%d %d\n", a, b);
  return 0;
}

void g(int *i, int *j) {
  int a, b = *j;
  for (a = *i; a < 12; a += b) {
    (*j)++;
  }
}
```

A. 2 3
B. 14 3
C. 2 7
D. 2 13
E. 14 7

13. In logic, there is a Boolean operator called the exclusive OR (XOR) which gives the result true if and only if one of the operands is true (see truth table below).

A	B	A XOR B
false	false	false
false	true	true
true	false	true
true	true	false

Which of the following expression is equivalent to the XOR operator?

A. `(!A || !B)`
B. `(!(A && B))`
C. `((A && !B) && (!A && B))`
D. `((A && B) || (!A && !B))`
E. `((A || B) && (!A || !B))`

14. Assuming that **n** is a positive integer, consider the following four functions.

```
int f1(int n) {
  int a, sum = 0;
  for (a = 1; a <= n; a++) {
    sum += a;
  }
  return sum;
}
```

```
int f2(int n) {
  int sum = 0;
  while (n > 0) {
    sum += n;
    n--;
  }
  return sum;
}
```

```
int f3(int n) {
  int sum = 0;
  do {
    sum += n;
    n--;
  } while (n >= 0);
  return sum;
}
```

```
int f4(int n) {
  return n*(1+n)/2;
}
```

Which of the following statements is TRUE?

A. Given a positive **n**, **f1** and **f2** will return different values.

B. Given a positive **n**, **f1** and **f3** will return different values.

C. Given a positive **n**, **f2** and **f4** will return different values.

D. Given a positive **n**, **f3** and **f4** will return different values.

E. Given a positive **n**, all the four functions will return the same value.

15. What does the following function return, given an integer **n** where **n** >= 2?

```
int func(int n){
  int i = 2;
  while (i < n){
    if ( !(n%i) ) {
      return 0;
    } else {
      return 1;
    }
    i++;
  }
  return 1;
}
```

A. It always returns 0.

B. It always returns 1.

C. It returns 1 if **n** is a prime number, or 0 otherwise.

D. It returns 1 if **n** is a composite number, or 0 otherwise.

E. None of the above options is correct.

16. What is printed by the following C program fragment?

```
int i, j;
for (i = 3; i >= 0; i--) {
  for (j = 0; j < i; j++) {
    printf("*");
  }
}
printf("\n");
```

A.
```
******
```

B.
```
**
**
**
```

C.
```
*
**
***
```

D.
```
***
**
*
```

E. None of the above

17. Based on the code below, which of the following statements can be used to replace the code in the box, to produce the same result?

```
int i, j, sum = 0;
for (i = 0; i < n; i++) {
  for (j = i; j < n; j++) {
    sum++;
  }
}
printf("%d\n", sum);
```

A. `sum += i;`
B. `sum += n - i;`
C. `sum += n;`
D. `sum *= n;`
E. `sum += n*(n-1)/2;`

18. Given the following program fragment, assuming that **`n`** is a positive integer and its value does not cause an overflow on **`count`**.

```
int count = 0, a, b;

for (a = n; a > 0; a--) {
  for (b = n/2; b > 0; b--) {
    count++;
  }
}
```

Which of the following statements is equivalent to the code above?

A. `int count = 2 * n;`
B. `int count = n * n;`
C. `int count = n * n / 2;`
D. `int count = n * (n / 2);`
E. `int count = n * (n – 1) / 2;`

19. What is printed by the following C program?

```
#include <stdio.h>

int main(void) {

  int x = 0, y, count = 0;

  count = x = 0;
  while (x < 10) {
    y = 10 - x;
    while (y > x) {
      count++;
      y--;
    }
    x += 2;
  }
  printf("count = %d\n", count);

  return 0;
}
```

A. `count = 10`

B. `count = 15`

C. `count = 18`

D. `count = 21`

E. `count = 30`

20. What does the following function **`f()`** compute?

```
// Precond: n >= 0
int f(int a, int n) {

  int i;
  for (i = 1; i <= n; i++) {
    a = a + a;
  }

  return a;
}
```

A. $2an$

B. a^n

C. $2a^n$

D. $2^n a$

E. a^{2n}

Suggested answers:

1. E
2. D
3. D
4. E
5. B
6. C
7. B
8. C
9. C
10. A
11. D
12. C
13. E
14. E
15. E
16. A
17. B
18. D
19. C
20. D