1. Expressions. 1 point each, 18 points total. For each Java expression in the left hand column, indicate the result of the expression in the right hand column.
You must show a value of the appropriate type. For example, 7.0 rather than 7 for a double and "7" instead of 7 for a String. Answers that do not indicate the data type correctly are wrong.

A. `3 * 4 + 2 * 2 - 1` — 15

B. `2 / 4 + 6 / 4` — 1

C. `1.5 / .3 + 6 / 4` — 6.0

D. `25 % 8 + 1.5 * 2` — 4.0

E. `40 % 10 + 17 % 10` — 7

F. `"ut" + "cs" + 1 + "dh"` — "utcs1dh"

G. `2 + 3 + "cr" + 2 + 2` — "5cr22"

H. `"cp" + (3 * 3) + "x" + (2 / 4)` — "cp9x0"

I. `4 - 6 + "gdc" + 5 + "1 + 2"` — "-2gdc51 + 2"

J. `3 * 2 * 4 / 5 % 2` — 0

K. `0 % 10 + 5 / 2 + 1.5` — 3.5

L. `1 + 5 * 0 + "hi" + 1.5` — "1hi1.5"

M. `1.5 + 2 * 3` — 7.5

The `Math` methods `ceil`, `floor`, `sqrt`, `pow`, and `abs` all return `double`s.

N. `Math.abs(-3.5) + Math.max(2.5 + 2, 3.5 * 2)` — 10.5

O. `Math.ceil(-1.75) + Math.floor(2.5)` — 1.0

P. `Math.min(Math.max(.5, 1), Math.min(1.5, 0.5))` — 0.5

Q. `Math.pow(2, 4)` — 16.0

R. `(int)((1.99 * 5)) + (double) 6 / 4` — 10.9

double x = 6/4

2. Code tracing. 2 points each, 18 points total. Place you answer in the box to the right of the code. If the code results in a compiler or runtime error, state the kind of error that occurs.

A. What is output by the following code when it is run?

```
int xa = 2;
int ya = 3 + xa * 2;
xa++;
ya -= (ya + xa);
xa *= 2 + 1;
System.out.print(xa + " " + ya);
```

9 -3

B. What is output by the following code when it is run?

```
int xb = 3;
xb++;
xb = xb + 2;
double ab = xb / 4;
ab -= 2 * xb;
System.out.print(xb + " " + ab);
```

6 -11.0

C. What is output by the following code when it is run?

```
int xc = 3;
for(int i = 1; i <= 3; i++)
     int yc = i * 2;
     xc = xc + yc;
}
System.out.print(xc);
```

15

D. What is output by the following code when it is run?

```
double ad = 1.5;
double bd = -ad;
ad *= 3;
bd = -1 - bd;
System.out.print(ad +  " " + bd);
```

4.5 -0.5

E. What is output by the following code when it is run?

```
String se = "xe";
int xe = 3;
int ye = 4;
xe++;
ye = xe;
xe = ye;
se = ye + se + xe;
System.out.print(xe + " " + se);
```

4 4xe4

F. How many asterisks does the following code print out?
Don't show the output. Simply state the number of asterisks that are printed out when the code runs.

```
for(int i = -5; i <= 3; i++) {
     System.out.print("*");
}
```

9

G. How many asterisks does the following code print out?
Don't show the output. Simply state the number of asterisks that are printed out when the code runs.

```
for(int ig = 1; ig <= 8; ig++) {
     for(int jg = 5; jg > 0; jg--) {
          System.out.print("*");
          System.out.print("*");
     }
}
```

80

8×10

H. How many asterisks does the following code print out?
Don't show the output. Simply state the number of asterisks that are printed out when the code runs.

```
for(int ih = 0; ih < 4; ih++) {
     System.out.print("*");
     for(int jh = 0; jh < ih; jh++) {
          System.out.print("*");
     }
     System.out.print("*");
     for(int jh = 0; jh < 3; jh++) {
          System.out.print("*");
     }
     System.out.print("*");
}
```

30

6

24+1+2+3

I. What is output by the following code when it is run?

```
double ai = 1.7;
double bi = -2.5;
if(ai <= Math.abs(bi))
     System.out.print("A");
if(Math.pow(1.7, 5.0) > 1)
     System.out.print("B");
if(Math.floor(ai) > Math.ceil(bi))
     System.out.print("C");
if(Math.floor(bi) < Math.ceil(bi))
     System.out.print("D");
```

3. Syntax errors. 10 points. Each of the following code snippets contains a syntax error. Explain what the syntax error is in a single sentence.

A.

```
for(int final = 0; final < 10; final++) {
      int x = 10;
      System.out.print(x++ * 10);
}
// What causes the syntax error?
```

B.

```
String st = "";
int x = 5;
int y = -3;
st = x * y + "res-" + x - y + "x" + "\\\n";
System.out.print(st + x);
// What causes the syntax error?
```

C.

```
int yg;
yg = 3;
int 2x = yg * 10;
System.out.print(Math.pow(yg, 2x));
// What causes the syntax error?
```

D.

```
int m = 3;
int n;
int _o = 5;
m *= m + _o;
System.out.print(m);
// What causes the syntax error?
```

E.

```
double ah = 12;
int xh = ah / 4;
double bh = xh * 3;
for(int i = 0; i < ah; i++)
      System.out.print("**");
// What causes the syntax error?
```

4. Programing and Loops. 20 points. Write a Java method to produce the following output. The method relies on a parameter named `size`.

When the parameter `size` is 3 the output is:

```
--*--
-***-
*****
```

lines = size

When the parameter `size` is 5 the output is:

```
----*----
---***---
--*****--
-*******-
*********
```

q4(4)

Complete your method, including the method header, in the space provided:

```
public static void q4 (int size) {
    for(int line = 0; line <= size ; line++) {
        for(int dash = 0; dash < size - 1 - line; dash++) {
            print("-");
        }
        for(int star = 0; star < 1 + 2*line; star++) {
            print("*");
        }
        for(int dash = 0; dash < size - 1 - line; dash++) {
            print("-");
        }
        println();
    }
}
```

int numDashes = size - 1

init

(line - 1)

init

don't do this

More room for question 4 on next page.

/. Method Tracing and Parameters Simulation. 10 points.

Consider the following methods that are all part of the same program:

```
public static void a(int x, int y) {
    int z = x;
    x *= 2;
    y /= 2;
    System.out.print(x + " " + y + " " + z);
    x = z - 2;
}

public static int b(int x, int y) {
    y = x - y;
    x++;
    return x * y;
}

public static int c(int x, int y) {
    int r = b(x, y);
    int s = b(y, x);
    r += 2 + x;
    s = y - s;
    return r + s;
}

public static int d(int i) {
    i--;
    i *= 2;
    System.out.print(i + " ");
    return i - 2;
}
```

A. Given the methods above, what is output by the following code?

```
int xa = 2;
int ya = 3;
a(xa, ya);
System.out.print(xa + " " + ya);
```

4 1 2 2 3

B. Given the methods above, what is output by the following code?

```
int xb = -2;
int yb = b(xb, 4);
xb = b(2, yb);
System.out.print(xb + " " + yb);
```

-12 6

C. Given the methods above, what is output by the following code?

```
int xc = 2;
int yc = 1;
int zc = b(xc, yc) + c(yc, xc);
System.out.print(xc + " " + yc + " " + zc);
```

2 1 3

D. Given the methods on the previous page, what is output by the following code?

```
int xd = 3;
int yd = 2;
int zd = d(xd + yd);
xd = b(zd, yd);
System.out.print(xd + " " + yd + " " + zd);
```

8 2 8 2 6

E. Given the methods on the previous page, what is output by the following code?

```
int ze = 3;
int xe = d(ze);
System.out.print(ze + " " + d(xe) + " " + b(xe, ze) + " " + d(ze));
```

4 2 4 3 0 -3 2