5. Read the response:

```
try (InputStream in = connection.getInputStream()) {
    // Read from in
}
```

A common use case is to post form data. The `URLConnection` class automatically sets the content type to `application/x-www-form-urlencoded` when writing data to a HTTP URL, but you need to encode the name/value pairs:

```
URL url = ...;
URLConnection connection = url.openConnection();
connection.setDoOutput(true);
try (var out = new OutputStreamWriter(
        connection.getOutputStream(), StandardCharsets.UTF_8)) {
    Map<String, String> postData = ...;
    boolean first = true;
    for (Map.Entry<String, String> entry : postData.entrySet()) {
        if (first) first = false;
        else out.write("&");
        out.write(URLEncoder.encode(entry.getKey(), "UTF-8"));
        out.write("=");
        out.write(URLEncoder.encode(entry.getValue(), "UTF-8"));
    }
}
try (InputStream in = connection.getInputStream()) {
    ...
}
```

9.3.2 The HTTP Client API

The HTTP client API provides another mechanism for connecting to a web server which is simpler than the `URLConnection` class with its rather fussy set of stages. More importantly, the implementation supports HTTP/2.

An `HttpClient` can issue requests and receive responses. You get a client by calling

```
HttpClient client = HttpClient.newHttpClient();
```

Alternatively, if you need to configure the client, use a builder API like this:

```
HttpClient client = HttpClient.newBuilder()
    .followRedirects(HttpClient.Redirect.ALWAYS)
    .build();
```

That is, you get a builder, call methods to customize the item that is going to be built, and then call the `build` method to finalize the building process. This is a common pattern for constructing immutable objects.

Follow the same pattern for formulating requests. Here is a `GET` request:

```
HttpRequest request = HttpRequest.newBuilder()
    .uri(new URI("https://horstmann.com"))
    .GET()
    .build();
```

The URI is the "uniform resource identifier" which is, when using HTTP, the same as a URL. However, in Java, the `URL` class has methods for actually opening a connection to a URL, whereas the `URI` class is only concerned with the syntax (scheme, host, port, path, query, fragment, and so on).

When sending the request, you have to tell the client how to handle the response. If you just want the body as a string, send the request with a `HttpResponse.BodyHandlers.ofString()`, like this:

```
HttpResponse<String> response
    = client.send(request, HttpResponse.BodyHandlers.ofString());
```

The `HttpResponse` class is a template whose type denotes the type of the body. You get the response body string simply as

```
String bodyString = response.body();
```

There are other response body handlers that get the response as a byte array or a file. One can hope that eventually the JDK will support JSON and provide a JSON handler.

With a `POST` request, you similarly need a "body publisher" that turns the request data into the data that is being posted. There are body publishers for strings, byte arrays, and files. Again, one can hope that the library designers will wake up to the reality that most `POST` requests involve form data or JSON objects, and provide appropriate publishers.

In the meantime, to send a form post, you need to URL-encode the request data, just like in the preceding section.

```
Map<String, String> postData = ...;
boolean first = true;
var body = new StringBuilder();
for (Map.Entry<String, String> entry : postData.entrySet()) {
    if (first) first = false;
    else body.append("&");
    body.append(URLEncoder.encode(entry.getKey(), "UTF-8"));
    body.append("=");
    body.append(URLEncoder.encode(entry.getValue(), "UTF-8"));
}
HttpRequest request = HttpRequest.newBuilder()
    .uri(httpUrlString)
    .header("Content-Type", "application/x-www-form-urlencoded")
    .POST(HttpRequest.BodyPublishers.ofString(body.toString()))
    .build();
```

Note that, unlike with the `URLConnection` class, you need to specify the content type for forms.

Similarly, for posting JSON data, you specify the content type and provide a JSON string.

The `HttpResponse` object also yields the status code and the response headers.

```
int status = response.statusCode();
HttpHeaders responseHeaders = response.headers();
```

You can turn the `HttpHeaders` object into a map:

```
Map<String, List<String>> headerMap = responseHeaders.map();
```

The map values are lists since in HTTP, each key can have multiple values.

If you just want the value of a particular key, and you know that there won't be multiple values, call the `firstValue` method:

```
Optional<String> lastModified = headerMap.firstValue("Last-Modified");
```

You get the response value or an empty optional if none was supplied.

TIP: To enable logging for the `HttpClient`, add this line to `net.properties` in your JDK:

```
jdk.httpclient.HttpClient.log=all
```

Instead of `all`, you can specify a comma-separated list of `headers`, `requests`, `content`, `errors`, `ssl`, `trace`, and `frames`, optionally followed by `:control`, `:data`, `:window`, or `:all`. Don't use any spaces.

Then set the logging level for the logger named `jdk.httpclient.HttpClient` to `INFO`, for example by adding this line to the `logging.properties` file in your JDK:

```
jdk.httpclient.HttpClient.level=INFO
```

9.4 Regular Expressions

Regular expressions specify string patterns. Use them whenever you need to locate strings that match a particular pattern. For example, suppose you want to find hyperlinks in an HTML file. You need to look for strings of the pattern `<a href="...">`. But wait—there may be extra spaces, or the URL may be enclosed in single quotes. Regular expressions give you a precise syntax for specifying what sequences of characters are legal matches.

In the following sections, you will see the regular expression syntax used by the Java API, and how to put regular expressions to work.