Exercise 1

Snippet 1

```
for (int i=0; i < n-1; i++) {
   x[i] = (y[i] + x[i+1]) / 7;
}
```

-loop-carried dependency
-anti dependency

v = ...

... (no store in between)

... = v

to y all accesses are single accesses

Snippet 2

```
for (int i=0; i < n; i++) {
   a = (x[i] + y[i]) / (i+1);
   z[i] = a;
}
f = sqrt(a + k);
```

Inside loop body for a:

-loop-independent dependency

-anti dependency
there is no dependency with the sqrt-statement bc:

"There is a data dependence from statement S to statement S (S depends on S) iff
1) both statements access the same memory location M and at least one of the

statements stores onto it, and
2) there is a feasible run-time execution path from S to S , and
3) there is no S_3 executed between S and S that writes to M.
”

->there is a dependency between a = (x[n-1] + y[n-1]) / (n); and f = sqrt(a + k); for a

(z[n-1] = a; doesn’t write)

->there is no dependency between a = (x[i] + y[i]) / (i+1); and f = sqrt(a + k); for a

for i < n-1, because there is always a write to a in between

->to y, z and k all accesses are single accesses

Snippet 3

```
for (int i=0; i < n; i++) {
  x[i] = y[i] * 2 + b * i;
}
```

```
for (int i=0; i < n; i++) {
  y[i] = x[i]  + a / (i+1);
}
```

-To a and b there are just read accesses

-For all i x is written too and after that read from. So anti dependencies here.

-For all I y is read from and then written to. True dependencies here.

->dependencies are loop-independent so no optimization necessary

compiled with O1

Exercise 1:

Snippet 1:

Unparallelized execution: 0.196829

parallelized execution: 0.136227

Snippet 2:

Unparallelized execution: 0.427086

parallelized execution: 0.367935

Snippet 3:

Unparallelized execution: 0.472995

parallelized execution: 0.125908

compiled with O3

Exercise 1:

Snippet 1:

Unparallelized execution: 0.129387

parallelized execution: 0.136324

Snippet 2:

Unparallelized execution: 0.426582

parallelized execution: 0.368070

Snippet 3:

Unparallelized execution: 0.446751

parallelized execution: 0.126251