

CSPB 3155 - Reckwerdt - Principles of Programming Languages

[Dashboard](#) / [My courses](#) / [2244:CSPB 3155](#) / [Week 8: CPS and Trampolines](#) / [Quiz # 7](#)

Started on Thursday, 11 July 2024, 3:56 PM

State Finished

Completed on Thursday, 11 July 2024, 3:59 PM

Time taken 2 mins 44 secs

Marks 20.00/20.00

Grade 10.00 out of 10.00 (100%)

Question 1

Correct

Mark 5.00 out of 5.00

Complete the missing portions of CPS transform for the program below?

```
def fun(x: Int): Int = if (x <= 10)
                        x - 5
                        else
                        fun( fun( x- 5) - 4)
```

We would like to do a CPS transform, complete the missing pieces by matching the ID to the correct answer.

```
def fun_k[T] (x: Int, k: __1__ => T): T = {
  if ( x <= 10) {
    __2__
  } else {
    fun_k( __3__, (v) => ( fun_k( __4__, (v2) => __5__ ) )
  }
}
```

What should blank number 1 be? ✓

What should blank number 2 be? ✓

What should blank number 3 be? ✓

What should blank number 4 be? ✓

What should blank number 5 be? ✓

Your answer is correct.

The correct answer is: What should blank number 1 be? → Int,

What should blank number 2 be? → k(x-5),

What should blank number 3 be? → x-5,

What should blank number 4 be? → v-4,

What should blank number 5 be? → k(v2)

Correct

Marks for this submission: 5.00/5.00.

Question 2

Correct

Mark 5.00 out of 5.00

Consider the function below in scala

```
def fun (x : Int) : Int = {
  if ( x %2 == 0)
    bar (x - 2)
  else
    fun( x - bar(x-1)) + 2
}
```

Let bar_k be the CPS version of bar. Fill in missing parts for the CPS transformation of fun below.

```
def fun_k[T](x : Int, k: Int => T) : T = {
```

```
  if (x % 2 == 0)
```

```
    __1__
```

```
  else
```

```
    __2__ ( __3__ , v => { __4__ ( __5__ , v2 => k(v2+2) ) } )
```

```
}
```

Suggestion: Write out the CPS transform on paper before attempting this question.

Blank number 1: ✓

Blank Number 2: ✓

Blank Number 3: ✓

Blank Number 4: ✓

Blank Number 5: ✓

Your answer is correct.

The correct answer is:

Blank number 1: → bar_k(x-2, k),

Blank Number 2: → bar_k, Blank Number 3: → x-1,

Blank Number 4: → fun_k,

Blank Number 5: → x - v

Correct

Marks for this submission: 5.00/5.00.

Question 3

Correct

Mark 10.00 out of 10.00

Consider the Scala function **foo** shown below:

```
def foo[A](l:List[A], f:A => Boolean):Int = l match {
  case Nil => 0
  case h::t => {
    if (f(h)) {
      foo(t,f) + 1
    }
    else {
      foo(t,f)
    }
  }
}
```

(A)

Which of the following statements best describes what the function foo does?

- ☐ It returns a list of elements of l that return true when passed to f
- ☐ It applies f to all the elements of the list l and returns the list of return values
- ☒ It counts how many elements of the list l return true when passed to f ✓
- ☐ It counts how many elements of the list l return false when passed to f

Mark 2.00 out of 2.00

The correct answer is: It counts how many elements of the list l return true when passed to f

(B)

What is the value returned by the following calls to the function foo (write a 1 digit number):

- What is the value of `foo(List(2,2,3,4), (x) => x % 3 == 0)`: ✓
- What is the value of `foo(List('t','r','e','n','t'), (x) => x == 't')`: ✓

(C)

Now let us complete a function **foo_k** as the k-transform of this function to use Continuation passing style to resolve all non-tail recursion from the function **foo**:

```
def foo_k[A](l:List[A], f:A => Boolean, k:  ✓ ):Int = l match {
  case Nil =>  ✓
  case h::t => {
    if (f(h)) {
      foo_k(t,f,  ✓ )
    }
    else {
       ✓
    }
  }
}
```

(D)

Determine the value of the following calls to the CPS version of `foo_k`. (write a 1 digit number):

- What is the value of `foo_k(List(2,2,3,4), (x) => x % 3 == 0, (y) => y)`: ✓
- What is the value of `foo_k(List('t','r','e','n','t'), (x) => x == 't', (y) => y * 2)`: ✓

Correct

Marks for this submission: 10.00/10.00.