

**geom(n, beta) = rand() < beta ? n : geom(n + 1, beta)**

Original function definition

Top-level call

First argument is function itself

**rand()**

1: (%1)

→ %2 = Random.default\_rng()

→ %3 = (%1)(%2, Float64)

→ return %3

Nested call to a non-primitive function

**< (::Float64, ::Float64)**

1: (%1, %2, %3)

→ %4 = Base.lt\_float(%2, %3)

return %4

Conditional branch taken

Typed return value

Nested argument

**+(::Int, ::Int)**

1: (%1, %2, %3)

→ %4 = Base.add\_int(%2, %3)

→ return %4

Primitive function

Nested trace of geom

(geom)(%1, {0.6}, ())... → 4::Int64

Argument values

@1: [Arg:\$1:%1] geom::typeof(geom)

@2: [Arg:\$1:%2] 1::Int64

@3: [Arg:\$1:%3] 0.6::Float64

@4: [\$1:%4] {rand}(), ()... → 0.74::Float64

@1: [Arg:\$1:%1] @4#1 → rand::typeof(rand)

@2: [\$1:%2] {default\_rng}() → (...)

@3: [\$1:%3] @1(@2, {Float64}) → 0.74::Float64

@4: [\$1:&1] return @3 → 0.74::Float64

@5: [\$1:%5] (<)(@4, @3, ())... → false::Bool

@1: [Arg:\$1:%1] @5#1 → <::typeof(<)

@2: [Arg:\$1:%2] @5#2 → 0.74::Float64

@3: [Arg:\$1:%3] @5#3 → 0.6::Float64

@4: [\$1:%4] {lt\_float}(@2, @3) → false::Bool

@5: [\$1:&1] return @4 → false::Bool

@6: [\$1:&1] goto \$2 since @5 == false

@7: [\$2:%6] {+}(@2, {1}, ())... → 2::Int64

@1: [Arg:\$1:%1] @7#1 → +::typeof(+)

@2: [Arg:\$1:%2] @7#2 → 1::Int64

@3: [Arg:\$1:%3] @7#3 → 1::Int64

@4: [\$1:%4] {add\_int}(@2, @3) → 2::Int64

@5: [\$1:&1] return @4 → 2::Int64

@8: [\$2:%7] {geom}(@7, @3, ())... → 4::Int64

@1: [Arg:\$1:%1] @8#1 → geom::typeof(geom)

@2: [Arg:\$1:%2] @8#2 → 2::Int64

@3: [Arg:\$1:%3] @8#3 → 0.6::Float64

@4: [\$1:%4] {rand}() → 0.99::Float64

@5: [\$1:%5] (<)(@4, @3) → false::Bool

@6: [\$1:&1] goto \$2 since @5 == false

@7: [\$2:%6] {+}(@2, {1}) → 3::Int64

@8: [\$2:%7] {geom}(@7, @3) → 4::Int64

@9: [\$2:&1] return @8 → 4::Int64

@9: [\$2:&1] return @8 → 4::Int64

**geom (::Int, ::Float64)**

1: (%1, %2, %3)

%4 = Main.rand()

%5 = %4 < %3

br 2 unless %5

return %2

2:

%6 = %2 + 1

%7 = Main.geom(%6, %3)

return %7

Original IR

Correspondence between IR and tracked statements