5.1

4.1

14.

a. $13 \cdot 11 \bmod 14 = 10$

b $8 \cdot 3 \bmod 19 = 5$

17.

b. $\lceil n/k \rceil = \lfloor (n-1)/k \rfloor + 1$

Two cases. One where $n \% k = 0$

One where $n \% k \neq 0$

At

$k = 2$ and $n = 4$.

$\lceil 4/2 \rceil = \lfloor 3/2 \rfloor + 1$

$2 = 1 + 1$

At $k = 2$ and $n=5$

$\lceil 5/2 \rceil = \lfloor 4/2 \rfloor + 1$

$3 = 2 + 1$

3. a. $P(1) = 1^2 = 1$.

b. $1 = \frac{1 \cdot 2 \cdot 3}{6}$

c. Show $P(x+1)$ is true given $P(x)$

d. prove you are all the same thing

e

$+ (x+1)^2 = \frac{(x+1)(x+2)(2x+3)}{6}$

Substitute $= (x+1)^2$

5.1

Let $T(x)$ mean train station stops at x

1. Basic: $T(0)$ = true because first station

Inductive: $T(x)$ = true if $T(x-1)$ = true

At $T(0+1)$, true because $T(0)$ = true

20.

$F(x) = n! > 3^n$

At $x = 7$

$7! = 2853$

At $x+1$

$n! \cdot (n+1)$ vs $3 \cdot 3^n$

And $(n+1) > 3$

5.2.

1. Let $P(x)$ = You can run x miles

$P(0)$ = true

$P(1)$ = true

$P(2)$ = true

~~$P(k)$ = true iff $P(k-2)$~~

Inductive Step:

Assuming that $P(1), P(2) \ldots P(k)$ is true

$P(k+1)$ is true because $P(k-1)$ is true.

3.

$P(18)$ = true because $6 \cdot 3$

$P(19)$ = true because $5 \cdot 2 + 3 \cdot 3$

$P(20)$ = true because $5 \cdot 4$

$P(21)$ = true because $7 \cdot 3$

b. Assume that $P(18), P(19), P(20) \ldots P(k)$ is true,

c. Prove that $P(k+1)$ must be true.

d. For $k \geq 21$, we know $P(18) \ldots P(k)$ is true.

$P(k)$ is true if $P(k-3)$ is true. It is

e. After 18, you can always build on top of the previous ks. Also, 18 is $LCM(3,5) + min(3,5) = 18$.

5.2

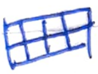
7. And 0, 2 can be formed too.

Any amount ≥ 4 can be formed with 2s and 5s.

Basic step:

$P(4) = \text{true}$ 2.2

$P(5) = \text{true}$ 5.1



inductive hypothesis

Assume $P(4), P(5) \ldots P(k)$ is true.

Step:

Prove $P(k+1)$ is true. We know $P(k-1)$ is true

so $P(k+1)$ is also true.

10.

There will be N-1 breaks required.

$P(1) = 0$

Assume $P(1) \ldots P(2) \ldots P(k)$ are all valid.

For $C(k+1)$, we add one more column to the end of the bar. Break it off, and you get $1 + P(k)$.

Since $P(k)$ is true, $P(k+1)$ is also true

5.3

1.

a. $f(1)=3$, $f(2)=5$, $f(3)=7$, $f(4)=9$

b. $f(1)=3$, $f(2)=9$, $f(3)=27$, $f(4)=81$

5.

a. No becase for $N=1$, $f(1-2)=f(-1)$ is undefing

b. Yes. $f(x)=-x+1$.

Assume $f(0)=1$

Then assuming $f(0), f(1), \ldots f(k)$ is true

Prove $f(k+1)$ is true.

$P(k+1)$ is true if $f(k)$ is true, so they are both true

c. For $n\geq 2$, $f(x)=-x+4$

13. $f_1 = 1$

$f_2 = 1$

$f_3 = f_1 + f_2 = 3$

$f_4 = f_2 + (f_1 + f_2)$

$f_5 = (f_1 + f_2) + f_2 + \cancel{f_3}(f_1 + f_2)$

$f_6 = f_5 + f_4$

$f(k+1) = f(k) + f(k-1)$ and given that $f(1), f(2) \ldots f(k)$ is true

2.

$f(1)=$ true

a. $f(x)=f(x)+2$

b. $f(x)=3^x$

c. idk

5.4

1. To find 5!,

find 5 · 4!

find 4 · 3!

find 3 · 2!

find 2 · 1!

find 1

return 2

return 6

return 24

return 120.

5.

m = 5, n = 11, b = 3

mp(3, 11, 5)

5(mp(3, 5, 5)^2 mod 5)

5 mp(3, 2, 5)^2

5 mp(1)

return 1.

11. int Mmin(array index)

return min(Mmin(array, index+1), array[index])

}

23. uh... return X · x ?

45. {b d a f g h z p o k}

{b d a f g} {h z p o k}

{b d a} {f g} {h z p} {o k}

{b} {d a} {f} {g} {h} {z p} {o} {k}

{a b d} {f g} {h p z} {k o}