```
$Assumptions = W > 0
```

$$W > 0$$

```
eq = rest == W * (q ^ n - q ^ L) / (q ^ n - 1) /. n → -Log[1 - (q - 1) W / rate] / Log[q]
```

$$\text{rest} == \frac{W\left(-q^L + \frac{1}{1-\frac{(-1+q)\,W}{\text{rate}}}\right)}{-1 + \frac{1}{1-\frac{(-1+q)\,W}{\text{rate}}}}$$

```
eq2 = Simplify[eq]
```

$$\text{rest} == \frac{\text{rate} - q^L\,\text{rate} + (-1+q)\,q^L\,W}{-1+q}$$

```
Solve[eq2 /. L → 36 /. rest → 22.5 /. W → 49 /. rate → 1.01961, q]
```

$$\{\{q \to -0.978944\}, \{q \to -0.964076 - 0.169964\,i\}, \{q \to -0.964076 + 0.169964\,i\},$$
$$\{q \to -0.919926 - 0.334765\,i\}, \{q \to -0.919926 + 0.334765\,i\}, \{q \to -0.847834 - 0.489397\,i\},$$
$$\{q \to -0.847834 + 0.489397\,i\}, \{q \to -0.749991 - 0.629164\,i\}, \{q \to -0.749991 + 0.629164\,i\},$$
$$\{q \to -0.629369 - 0.749819\,i\}, \{q \to -0.629369 + 0.749819\,i\}, \{q \to -0.489634 - 0.8477\,i\},$$
$$\{q \to -0.489634 + 0.8477\,i\}, \{q \to -0.335032 - 0.919833\,i\}, \{q \to -0.335032 + 0.919833\,i\},$$
$$\{q \to -0.170259 - 0.96403\,i\}, \{q \to -0.170259 + 0.96403\,i\}, \{q \to -0.000321992 - 0.978952\,i\},$$
$$\{q \to -0.000321992 + 0.978952\,i\}, \{q \to 0.169616 - 0.96415\,i\}, \{q \to 0.169616 + 0.96415\,i\},$$
$$\{q \to 0.334393 - 0.92008\,i\}, \{q \to 0.334393 + 0.92008\,i\}, \{q \to 0.489003 - 0.848091\,i\},$$
$$\{q \to 0.489003 + 0.848091\,i\}, \{q \to 0.628751 - 0.750387\,i\}, \{q \to 0.628751 + 0.750387\,i\},$$
$$\{q \to 0.749398 - 0.629968\,i\}, \{q \to 0.749398 + 0.629968\,i\}, \{q \to 0.847298 - 0.49056\,i\},$$
$$\{q \to 0.847298 + 0.49056\,i\}, \{q \to 0.919548 - 0.33658\,i\}, \{q \to 0.919548 + 0.33658\,i\},$$
$$\{q \to 0.964453 - 0.173434\,i\}, \{q \to 0.964453 + 0.173434\,i\}, \{q \to 1.00772\}\}$$

```
(0.00772) * 12
```

0.09264

```
1.0077188558231032`^12
```

1.09666

```
1.02^12
```

1.26824

```
Solve[24 * z / (24 - 11 z) == x, z]
```

$$\left\{\left\{z \to \frac{24\,x}{24 + 11\,x}\right\}\right\}$$

```
24 * z / (24 - 11 z) /. z → .24
```

```
0.2696629213483146` / 12
```

0.0224719

```
24 x / (24 + 11 x) /. x → 0.1268250301319696`
```

```
0.11985791274253633` / 12
```

```
0.00998816
```

```
a = Series[(1 + z / 12) ^ 12 - 1, {z, 0, 5}]
```

$$z + \frac{11\ z^2}{24} + \frac{55\ z^3}{432} + \frac{55\ z^4}{2304} + \frac{11\ z^5}{3456} + O[z]^6$$

```
b = Series[24 * z / (24 - 11 z), {z, 0, 5}]
```

$$z + \frac{11\ z^2}{24} + \frac{121\ z^3}{576} + \frac{1331\ z^4}{13\,824} + \frac{14\,641\ z^5}{331\,776} + O[z]^6$$

```
a - b
```

$$-\frac{143\ z^3}{1728} - \frac{1001\ z^4}{13\,824} - \frac{13\,585\ z^5}{331\,776} + O[z]^6$$