Problem 1.

y:= x

[y=a]

x:= x+2

[y=a+2]

y:= x * y

[y=(a+2)a]   assuming b to be one more variable

[y=(a^2+2a)]

y:= y+1

[y=(a^2+2a)+1]

[y=(a+1)^2]

Problem 2

[x=1 ∧ y=2 ∧ z=3] P [x=2 ∧ y=3 ∧ z=1]

[x=1 ∧ y=2 ∧ z=3]

t: =x

t=1

x=1

y=2

z=3

x:=y

t=1

x=2

y=2

z=3

y::   y=3

t=1   =1

x=2   [x=2 ∧ y=3 ∧ z=1]

y=3

=3

:=t

t=1

Problem 3

$[x = a \wedge 0 \leq a < 10]\ p\ [x = (a+1) \bmod 10]$

$[x = a \wedge 0 \leq a < 10]$

```
if x<9 {
        x:=x+1
}
else
{
    x:=0
}
```

a is the integer
when a still less than 9

x: =x+1

$[x = (a+1)]$

$[x = (a+1) \bmod 10]$ //mod10 is the added to limit the number if integer is greater than 10 then it will modulus by 10

Problem 4

$[T]\ p\ [z = |x-y|]$

```
if x>y {
        z:=x-y
}
else
{
   z:=y-x
}
```

In both cases when there are two integers if they subtract and have absolutely, they get the same answer and not depending on which one is greater. $[z = |x-y|]$

Problem 5

$[x=a \wedge a \geq 0]\, P\, [z=2^a]$

$[x=a \wedge a \geq 0]$

```
z:=1;
  while x>0 {
          z:=2*z;
          x:=x-1
  }
```

a is any integer that is greater than 0

Problem 6

$[x=100]\, P\, [z=10000]$

$[x=100]$

```
z:=0;
 k:=x;
```

$[k=100]$

```
while k>0 {
 z:=z+x;
 k=k-1;
}
```

$k=100, 98, 97, \ldots, 1$

$z = 100+99+98+97+\ldots+1$

$[z=10000]$

Problem 7

$[n \geq 0]\, sq(n)\, [z=n^2]$

$[n \geq 0]$

```
sq(k){
if k==0{
        z:=0
        // this shows that when recurssion of else condition give value 0 back, this program will declare
           z value to 0
}
else
{
   sq(k-1); //it will call function as a recurtion until it reach 0
   z:=z+2*k-1
 }
}
```