

Function (1A)

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Task: Finding Partial Sums (1)

$$S_n = \sum_{k=1}^n a_k$$

$$a_k = k$$

$$S_1 = \sum_{k=1}^1 k = 1$$

```
printf("S1 = %d \n", S1);
```

$$S_2 = \sum_{k=1}^2 k = 1 + 2$$

```
printf("S2 = %d \n", S2);
```

$$S_3 = \sum_{k=1}^3 k = 1 + 2 + 3$$

```
printf("S3 = %d \n", S3);
```

Task: Finding Partial Sums (2)

$$S_1 = \sum_{k=1}^1 k = 1$$

$$S_2 = \sum_{k=1}^2 k = 1 + 2$$

$$S_3 = \sum_{k=1}^3 k = 1 + 2 + 3$$

```
S1 = 0;  
for (k=1; k<=1; ++k) S1 += k;
```

```
printf("S1 = %d \n", S1);
```

```
S2 = 0;  
for (k=1; k<=2; ++k) S2 += k;
```

```
printf("S2 = %d \n", S2);
```

```
S3 = 0;  
for (k=1; k<=3; ++k) S3 += k;
```

```
printf("S3 = %d \n", S3);
```

Task: Finding Partial Sums (3)

```
input_n = 1;
```

```
{  
    int n = input_n;  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
}
```

```
S1 = S;
```

```
printf("S1 = %d \n", S1);
```

```
input_n = 2;
```

```
{  
    int n = input_n;  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
}
```

```
S2 = S;
```

```
printf("S2 = %d \n", S2);
```

```
input_n = 3;
```

```
{  
    int n = input_n;  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
}
```

```
S3 = S;
```

```
printf("S3 = %d \n", S3);
```

```
int psum (int n)
```

```
{  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
    return S;  
}
```

Task: Finding Partial Sums (4)

```
S1 = psum ( 1 );
```

```
printf("S1 = %d \n", S1);
```

```
S2 = psum ( 2 );
```

```
printf("S1 = %d \n", S2);
```

```
S3 = psum ( 3 );
```

```
printf("S1 = %d \n", S3);
```

```
int psum (int n)  
{  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
    return S;  
}
```

```
input_n = 1;  
S1 = 1;
```

```
input_n = 2;  
S2 = 3;
```

```
input_n = 3;  
S3 = 6;
```

```
input_n = █;  
{  
    int n = input_n;  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
}  
● = S;
```

Function Prototype (1)

```
int psum (int n) ;
```

To inform the compiler that **psum** is the **name of a function** which has one integer type input and whose output type is integer

```
int main (void)
```

```
{  
    int S1, S2, S3;  
  
    S1 = psum ( 1 );  
    printf("S1 = %d \n", S1);  
    S2 = psum ( 2 );  
    printf("S2 = %d \n", S2);  
    S3 = psum ( 3 );  
    printf("S3 = %d \n", S3);  
  
    return 0;  
}
```

Since **psum** identifier is declared, **psum** can be used here.

```
int psum (int n)
```

```
{  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
    return S;  
}
```

What the function **psum** actually does is **defined** here.

Function Prototype (2)

```
int psum (int n)
{
    int S = 0;
    for (k=1; k<=n; ++k) S += k;
    return S;
}
```

→ The function **psum** is defined here.

```
int main (void)
{
    int S1, S2, S3;

    S1 = psum ( 1 );
    printf("S1 = %d \n", S1);
    S2 = psum ( 2 );
    printf("S2 = %d \n", S2);
    S3 = psum ( 3 );
    printf("S3 = %d \n", S3);

    return 0;
}
```

Since **psum** identifier is declared,
psum can be used here.

Function Prototype (3)

src1.c

```
int psum (int n) ;
```

```
int main (void)
```

```
{  
    int S1, S2, S3;  
  
    S1 = psum ( 1 );  
    printf("S1 = %d \n", S1);  
    S2 = psum ( 2 );  
    printf("S2 = %d \n", S2);  
    S3 = psum ( 3 );  
    printf("S3 = %d \n", S3);  
  
    return 0;  
}
```

```
int psum (int n)
```

```
{  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
    return S;  
}
```

src2.c

```
int psum (int n)
```

```
{  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
    return S;  
}
```

```
int main (void)
```

```
{  
    int S1, S2, S3;  
  
    S1 = psum ( 1 );  
    printf("S1 = %d \n", S1);  
    S2 = psum ( 2 );  
    printf("S2 = %d \n", S2);  
    S3 = psum ( 3 );  
    printf("S3 = %d \n", S3);  
  
    return 0;  
}
```

Function Prototype (4)

src3.c

```
int psum (int n) ;
```

```
int main (void)
```

```
{  
    int S1, S2, S3;  
  
    S1 = psum ( 1 );  
    printf("S1 = %d \n", S1);  
    S2 = psum ( 2 );  
    printf("S2 = %d \n", S2);  
    S3 = psum ( 3 );  
    printf("S3 = %d \n", S3);  
  
    return 0;  
}
```

src4.c

```
int psum (int n)
```

```
{  
    int S = 0;  
    for (k=1; k<=n; ++k) S += k;  
    return S;  
}
```

Function Prototype (5)

src5.c

```
#include "src4.h"

int main (void)
{
    int S1, S2, S3;

    S1 = psum ( 1 );
    printf("S1 = %d \n", S1);
    S2 = psum ( 2 );
    printf("S2 = %d \n", S2);
    S3 = psum ( 3 );
    printf("S3 = %d \n", S3);

    return 0;
}
```

src4.c

```
int psum (int n)
{
    int S = 0;
    for (k=1; k<=n; ++k) S += k;
    return S;
}
```

src4.h

```
int psum (int n) ;
```

References

- [1] Essential C, Nick Parlante
- [2] Efficient C Programming, Mark A. Weiss
- [3] C A Reference Manual, Samuel P. Harbison & Guy L. Steele Jr.
- [4] C Language Express, I. K. Chun