



*Full credit is given to the above companies including the OS that this PDF file was generated!*

## ***Red Hat Enterprise Linux Release 9.2 Manual Pages on 'BN\_mod\_sqrt.3oss1' command***

***\$ man BN\_mod\_sqrt.3oss1***

BN\_ADD(3oss1)                    OpenSSL                    BN\_ADD(3oss1)

### NAME

BN\_add, BN\_sub, BN\_mul, BN\_sqr, BN\_div, BN\_mod, BN\_nnmod, BN\_mod\_add,  
BN\_mod\_sub, BN\_mod\_mul, BN\_mod\_sqr, BN\_mod\_sqrt, BN\_exp, BN\_mod\_exp,  
BN\_gcd - arithmetic operations on BIGNUMs

### SYNOPSIS

```
#include <openssl/bn.h>
```

```
int BN_add(BIGNUM *r, const BIGNUM *a, const BIGNUM *b);
```

```
int BN_sub(BIGNUM *r, const BIGNUM *a, const BIGNUM *b);
```

```
int BN_mul(BIGNUM *r, BIGNUM *a, BIGNUM *b, BN_CTX *ctx);
```

```
int BN_sqr(BIGNUM *r, BIGNUM *a, BN_CTX *ctx);
```

```
int BN_div(BIGNUM *dv, BIGNUM *rem, const BIGNUM *a, const BIGNUM *d,  
          BN_CTX *ctx);
```

```
int BN_mod(BIGNUM *rem, const BIGNUM *a, const BIGNUM *m, BN_CTX *ctx);
```

```
int BN_nnmod(BIGNUM *r, const BIGNUM *a, const BIGNUM *m, BN_CTX *ctx);
```

```
int BN_mod_add(BIGNUM *r, BIGNUM *a, BIGNUM *b, const BIGNUM *m,  
              BN_CTX *ctx);
```

```
int BN_mod_sub(BIGNUM *r, BIGNUM *a, BIGNUM *b, const BIGNUM *m,  
              BN_CTX *ctx);
```

```
int BN_mod_mul(BIGNUM *r, BIGNUM *a, BIGNUM *b, const BIGNUM *m,  
              BN_CTX *ctx);
```

```
int BN_mod_sqr(BIGNUM *r, BIGNUM *a, const BIGNUM *m, BN_CTX *ctx);
```

```
BIGNUM *BN_mod_sqrt(BIGNUM *in, BIGNUM *a, const BIGNUM *p, BN_CTX *ctx);
```

```
int BN_exp(BIGNUM *r, BIGNUM *a, BIGNUM *p, BN_CTX *ctx);
```

```
int BN_mod_exp(BIGNUM *r, BIGNUM *a, const BIGNUM *p,  
              const BIGNUM *m, BN_CTX *ctx);
```

```
int BN_gcd(BIGNUM *r, BIGNUM *a, BIGNUM *b, BN_CTX *ctx);
```

## DESCRIPTION

`BN_add()` adds `a` and `b` and places the result in `r` ("`r=a+b`"). `r` may be the same BIGNUM as `a` or `b`.

`BN_sub()` subtracts `b` from `a` and places the result in `r` ("`r=a-b`"). `r` may be the same BIGNUM as `a` or `b`.

`BN_mul()` multiplies `a` and `b` and places the result in `r` ("`r=a*b`"). `r` may be the same BIGNUM as `a` or `b`. For multiplication by powers of 2, use `BN_lshift(3)`.

`BN_sqr()` takes the square of `a` and places the result in `r` (" $r=a^2$ "). `r` and `a` may be the same `BIGNUM`. This function is faster than `BN_mul(r,a,a)`.

`BN_div()` divides `a` by `d` and places the result in `dv` and the remainder in `rem` (" $dv=a/d, rem=a\%d$ "). Either of `dv` and `rem` may be `NULL`, in which case the respective value is not returned. The result is rounded towards zero; thus if `a` is negative, the remainder will be zero or negative. For division by powers of 2, use `BN_rshift(3)`.

`BN_mod()` corresponds to `BN_div()` with `dv` set to `NULL`.

`BN_nnmod()` reduces `a` modulo `m` and places the nonnegative remainder in `r`.

`BN_mod_add()` adds `a` to `b` modulo `m` and places the nonnegative result in `r`.

`BN_mod_sub()` subtracts `b` from `a` modulo `m` and places the nonnegative result in `r`.

`BN_mod_mul()` multiplies `a` by `b` and finds the nonnegative remainder respective to modulus `m` (" $r=(a*b) \bmod m$ "). `r` may be the same `BIGNUM` as `a` or `b`. For more efficient algorithms for repeated computations using the same modulus, see `BN_mod_mul_montgomery(3)` and `BN_mod_mul_reciprocal(3)`.

`BN_mod_sqr()` takes the square of `a` modulo `m` and places the result in `r`.

`BN_mod_sqrt()` returns the modular square root of `a` such that " $in^2 = a \pmod{p}$ ". The modulus `p` must be a prime, otherwise an error or an incorrect "result" will be returned. The result is stored into `in` which can be `NULL`. The result will be newly allocated in that case.

`BN_exp()` raises `a` to the `p`-th power and places the result in `r` ("`r=a^p`"). This function is faster than repeated applications of `BN_mul()`.

`BN_mod_exp()` computes `a` to the `p`-th power modulo `m` ("`r=a^p % m`"). This function uses less time and space than `BN_exp()`. Do not call this function when `m` is even and any of the parameters have the `BN_FLG_CONSTTIME` flag set.

`BN_gcd()` computes the greatest common divisor of `a` and `b` and places the result in `r`. `r` may be the same `BIGNUM` as `a` or `b`.

For all functions, `ctx` is a previously allocated `BN_CTX` used for temporary variables; see `BN_CTX_new(3)`.

Unless noted otherwise, the result `BIGNUM` must be different from the arguments.

## RETURN VALUES

The `BN_mod_sqrt()` returns the result (possibly incorrect if `p` is not a prime), or `NULL`.

For all remaining functions, 1 is returned for success, 0 on error. The return value should always be checked (e.g., "`if (!BN_add(r,a,b)) goto err;`"). The error codes can be obtained by `ERR_get_error(3)`.

## SEE ALSO

`ERR_get_error(3)`, `BN_CTX_new(3)`, `BN_add_word(3)`, `BN_set_bit(3)`

## COPYRIGHT

Copyright 2000-2022 The OpenSSL Project Authors. All Rights Reserved.

Licensed under the Apache License 2.0 (the "License"). You may not use this file except in compliance with the License. You can obtain a copy in the file LICENSE in the source distribution or at <https://www.openssl.org/source/license.html>.

3.0.7

2023-07-13

BN\_ADD(3ossl)