

**NAME**

BN\_rand\_ex, BN\_rand, BN\_priv\_rand\_ex, BN\_priv\_rand, BN\_pseudo\_rand, BN\_rand\_range\_ex, BN\_rand\_range, BN\_priv\_rand\_range\_ex, BN\_priv\_rand\_range, BN\_pseudo\_rand\_range - generate pseudo-random number

**SYNOPSIS**

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

```
int BN_rand_ex(BIGNUM *rnd, int bits, int top, int bottom,
               unsigned int strength, BN_CTX *ctx);
```

```
int BN_rand(BIGNUM *rnd, int bits, int top, int bottom);
```

```
int BN_priv_rand_ex(BIGNUM *rnd, int bits, int top, int bottom,
                   unsigned int strength, BN_CTX *ctx);
```

```
int BN_priv_rand(BIGNUM *rnd, int bits, int top, int bottom);
```

```
int BN_rand_range_ex(BIGNUM *rnd, const BIGNUM *range, unsigned int strength,
                    BN_CTX *ctx);
```

```
int BN_rand_range(BIGNUM *rnd, const BIGNUM *range);
```

```
int BN_priv_rand_range_ex(BIGNUM *rnd, const BIGNUM *range, unsigned int strength,
                         BN_CTX *ctx);
```

```
int BN_priv_rand_range(BIGNUM *rnd, const BIGNUM *range);
```

The following functions have been deprecated since OpenSSL 3.0, and can be hidden entirely by defining **OPENSSL\_API\_COMPAT** with a suitable version value, see **openssl\_user\_macros(7)**:

```
int BN_pseudo_rand(BIGNUM *rnd, int bits, int top, int bottom);
```

```
int BN_pseudo_rand_range(BIGNUM *rnd, const BIGNUM *range);
```

**DESCRIPTION**

**BN\_rand\_ex()** generates a cryptographically strong pseudo-random number of *bits* in length and security strength at least *strength* bits using the random number generator for the library context associated with *ctx*. The function stores the generated data in *rnd*. The parameter *ctx* may be NULL in which case the default library context is used. If *bits* is less than zero, or too small to accommodate the requirements specified by the *top* and *bottom* parameters, an error is returned. The *top* parameters specifies requirements on the most significant bit of the generated number. If it is **BN\_RAND\_TOP\_ANY**, there is no constraint. If it is **BN\_RAND\_TOP\_ONE**, the top bit must be one. If it is **BN\_RAND\_TOP\_TWO**, the two most significant bits of the number will be set to 1, so that the product of two such random numbers will always have  $2 \cdot \text{bits}$  length. If *bottom* is

**BN RAND\_BOTTOM\_ODD**, the number will be odd; if it is **BN RAND\_BOTTOM\_ANY** it can be odd or even. If *bits* is 1 then *top* cannot also be **BN RAND\_TOP\_TWO**.

**BN\_rand()** is the same as **BN\_rand\_ex()** except that the default library context is always used.

**BN\_rand\_range\_ex()** generates a cryptographically strong pseudo-random number *rnd*, of security strength at least *strength* bits, in the range  $0 \leq rnd < range$  using the random number generator for the library context associated with *ctx*. The parameter *ctx* may be NULL in which case the default library context is used.

**BN\_rand\_range()** is the same as **BN\_rand\_range\_ex()** except that the default library context is always used.

**BN\_priv\_rand\_ex()**, **BN\_priv\_rand()**, **BN\_priv\_rand\_rand\_ex()** and **BN\_priv\_rand\_range()** have the same semantics as **BN\_rand\_ex()**, **BN\_rand()**, **BN\_rand\_range\_ex()** and **BN\_rand\_range()** respectively. They are intended to be used for generating values that should remain private, and mirror the same difference between **RAND\_bytes(3)** and **RAND\_priv\_bytes(3)**.

## NOTES

Always check the error return value of these functions and do not take randomness for granted: an error occurs if the CSPRNG has not been seeded with enough randomness to ensure an unpredictable byte sequence.

## RETURN VALUES

The functions return 1 on success, 0 on error. The error codes can be obtained by **ERR\_get\_error(3)**.

## SEE ALSO

**ERR\_get\_error(3)**, **RAND\_add(3)**, **RAND\_bytes(3)**, **RAND\_priv\_bytes(3)**, **RAND(7)**, **EVP RAND(7)**

## HISTORY

- ⊕ Starting with OpenSSL release 1.1.0, **BN\_pseudo\_rand()** has been identical to **BN\_rand()** and **BN\_pseudo\_rand\_range()** has been identical to **BN\_rand\_range()**. The **BN\_pseudo\_rand()** and **BN\_pseudo\_rand\_range()** functions were deprecated in OpenSSL 3.0.
- ⊕ The **BN\_priv\_rand()** and **BN\_priv\_rand\_range()** functions were added in OpenSSL 1.1.1.
- ⊕ The **BN\_rand\_ex()**, **BN\_priv\_rand\_ex()**, **BN\_rand\_range\_ex()** and **BN\_priv\_rand\_range\_ex()** functions were added in OpenSSL 3.0.

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