Variable types

Integer Types

- The basic unit of information in a computer is a bit.
  - A bit can be in one of two states (either a 1 or a 0)
- A group of eight bits is called a byte
  - Since each bit can be either a 1 or 0, a byte can be in 2x2x2x2x2x2x2x2=256 states.

Four integer types

Type	Size (in bits)	Range
byte	8	$(-2^{7}$ to $+2^{7}-1)$
short	16	$(-2^{15}$ to $+2^{15}-1)$
int	32	$(-2^{31}$ to $+2^{31}-1)$
long	64	$(-2^{63}$ $+2^{63}-1)$

Other primitive types

- In addition to the four integer types, there are four other primitive types of values:
  - Float
  - Double
  - Char
  - boolean

Floating point types

- Used to store values with decimals

Type	Size (in bits)	Approximate Range
float	32	$(-3.4 \times 10^{38}$ to $+3.4 \times 10^{38})$
double	64	$(-1.8 \times 10^{308}$ to $+1.8 \times 10^{308})$

2 remaining primitive types

Types	example
boolean	true/false
char	‘a’, ‘4’, ‘$’, etc. 2^{16} different characters (same as short)

Conversions

- Java typically permits conversions from one type to another if it should be safe to make the conversion.
- For example
  - A byte value can be assigned to int variable because any byte value (8 bit) can be represented by an int variable
- This is a widening conversion because the new representation has a wider range

Other widening conversions

From	To
byte	short, int, long, char, float, double
short	int, long, char, double
char	int, long, float, double
int	long, float, double
long	float, double
float	double

Narrowing Conversions

- Because data can be lost in narrowing conversions, you need to be careful.
  - Ensure that your value will fit in the narrowing variable.

Casting

- To perform a narrowing conversion, you need to cast the variable
  - To cast, write the name of the desired type, in parenthesis, in front of the value to be converted

  - E.g.

double x = 2.2;

float y=(float) x;