enum class

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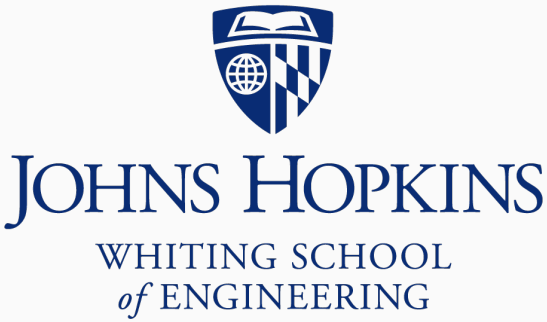

Source markdown available at github.com/BenLangmead/c-cpp-notes

enum class

We have often used integers to describe *categorical* data

```
#include <stdlib.h>

int main() {
    void *memory = malloc(1000000);
    if(memory == NULL) {
        return 1; // failure
    }
    // do something with memory
    return 0; // success
}
```

Returning 0 means “success”, 1 means “failure”

enum class

```
struct Card {
    int rank; // 1=ace, 2=two, ..., 10=ten
              // 11=jack, 12=queen, 13=king
    int suit; // 0=heart, 1=club, 2=diamond, 3=spade

    Card(int r, int s) : rank(r), suit(s) { }
};
```

`int` has advantages; e.g. we can compare ranks with `<`

Also has disadvantages:

- Mapping between `int`s and suits is arbitrary
- If we mix up `rank` and `suit` – e.g. `Card c(3, 13)` – compiler can't catch it

`enum class`

`enum class` creates a *categorical* type

(C & C++ have an older mechanism called simply `enum` that we won't discuss here)

enum class

```
#include <iostream>

using std::cout;  using std::endl;

enum class Suit {
    HEART, CLUB, DIAMOND, SPADE
};

struct Card {
    int rank; // 1=ace, 11=jack, 12=queen, 13=king
    Suit suit;

    Card(int r, Suit s) : rank(r), suit(s) { }
};

int main() {
    Card c(1, Suit::CLUB); // ace of clubs
    cout << "c.suit = " << (int)c.suit << endl;
    return 0;
}
```

enum class

```
$ g++ -c enum_1.cpp -std=c++11 -pedantic -Wall -Wextra
$ g++ -o enum_1 enum_1.o
$ ./enum_1
c.suit = 1
```

Behind the scenes, an `enum class` is really an `int`

- Starts at 0, so `HEART=0`, `CLUB=1`, `DIAMOND=2`, `SPADE=3`

C++ will refuse to implicitly convert between `enum class` and `int`; we had to explicitly cast for cout

```
cout << "c.suit = " << (int)c.suit << endl;
```

enum class

```
// *** cards.h ***

enum class Suit { HEART, CLUB, DIAMOND, SPADE };

enum class Rank {
    // "= 1" to start numbering at 1 instead of 0
    ACE = 1, TWO, THREE, FOUR, FIVE, SIX, SEVEN,
    EIGHT, NINE, TEN, JACK, QUEEN, KING
};

struct Card {
    Rank rank;
    Suit suit;

    Card(Rank r, Suit s) : rank(r), suit(s) { }
};
```

enum class

```
// *** cards.cpp ***

#include <iostream>
#include "cards.h"

using std::cout;  using std::endl;

int main() {
    Card c1(Rank::SEVEN, Suit::HEART);
    Card c2((Rank)10, Suit::DIAMOND);
    cout << "c1=" << (int)c1.rank << ", s=" << (int)c1.suit << endl;
    cout << "c2=" << (int)c2.rank << ", s=" << (int)c2.suit << endl;
    return 0;
}

$ g++ -c cards.cpp -std=c++11 -pedantic -Wall -Wextra
$ g++ -o cards cards.o
$ ./cards
c1=7, s=0
c2=10, s=2
```

enum class

We get a compiler error if we mix up rank & suit

```
#include <iostream>
#include "cards.h"

using std::cout;  using std::endl;

int main() {
    Card c1(Suit::HEART, Rank::SEVEN); // oops!
    cout << "c1=" << (int)c1.rank << ", s=" << (int)c1.suit << endl;
    return 0;
}
```

enum class

```
$ g++ -c cards_error.cpp -std=c++11 -pedantic -Wall -Wextra
cards_error.cpp: In function 'int main()':
cards_error.cpp:7:37: error: no matching function for call to 'Card::Card(Suit,
Rank)'
     Card c1(Suit::HEART, Rank::SEVEN); // oops!
                                     ^
In file included from cards_error.cpp:2:0:
cards.h:15:5: note: candidate: Card::Card(Rank, Suit)
     Card(Rank r, Suit s) : rank(r), suit(s) { }
     ^~~~
cards.h:15:5: note:   no known conversion for argument 1 from 'Suit' to 'Rank'
cards.h:11:8: note: candidate: constexpr Card::Card(const Card&)
 struct Card {
        ^~~~
cards.h:11:8: note:   candidate expects 1 argument, 2 provided
cards.h:11:8: note: candidate: constexpr Card::Card(Card&&)
cards.h:11:8: note:   candidate expects 1 argument, 2 provided
```