

Ve 280

Programming and Introductory Data Structures

enum

Learning Objectives:

Know when to use enum type

Know how to use enum type

Categorizing Data

Introducing enums

- In addition to single constants, we may need to categorize data.

- For example, there are four different suits in cards:

- Clubs



- Diamonds



- Hearts



- Spades



- You could encode each of these as a separate integer like:

```
const int CLUBS = 0;
```

```
const int DIAMONDS = 1;
```

```
// and so on...
```

Categorizing Data

Introducing enums

```
const int CLUBS = 0;  
const int DIAMONDS = 1;
```

- Unfortunately, encoding information this way is not very convenient.

- For example, consider the predicate `isRed()`

```
bool isRed(int suit);  
// REQUIRES: suit is one of Clubs,  
//           Diamonds, Hearts,  
//           or Spades  
// EFFECTS:  returns true if the color  
//           of this suit is red.
```

Categorizing Data

Introducing enums

```
const int CLUBS = 0;
const int DIAMONDS = 1;

bool isRed(int suit);
// REQUIRES: suit is one of Clubs,
//           Diamonds, Hearts, or Spades
// EFFECTS:  returns true if the color
//           of this suit is red.
```

- This is annoying, since we **need** this REQUIRES clause; not all integers encode a suit.
- There is a better way: the **enumeration** (or **enum**) type.

Categorizing Data

enums

- You can define **an enumeration type** as follows:

```
enum Suit_t {CLUBS, DIAMONDS,  
             HEARTS, SPADES};
```

- To define **variables of this type** you say:

```
enum Suit_t suit;
```

- You can initialize them as:

```
enum Suit_t suit = DIAMONDS;
```

- Once you have such an enum type defined, you can use it as an argument, just like anything else.
- Enums are passed by-value, and can be assigned.

Categorizing Data

enums

- With enum, the specification for the function `isRed()` can be simplified by removing the `REQUIRES` clause.

```
bool isRed(enum Suit_t s);  
// EFFECTS:  returns true if the color  
//           of this suit is red.
```

Categorizing Data

enums

```
bool isRed(enum Suit_t s) {  
    switch (s) {  
        case DIAMONDS:  
        case HEARTS:  
            return true;  
            break;  
        case CLUBS:  
        case SPADES:  
            return false;  
            break;  
        default:  
            assert(0);  
            break;  
    }  
}
```

Categorizing Data

enums

- If you write

```
enum Suit_t {CLUBS, DIAMONDS,  
             HEARTS, SPADES};
```

then numerically

```
CLUBS = 0, DIAMONDS = 1,  
HEARTS = 2, SPADES = 3
```

- Using this fact, it will sometimes make life easier

```
enum Suit_t s = CLUBS;  
const string suitname[] = {"clubs",  
                           "diamonds", "hearts", "spades"};  
cout << "suit s is " << suitname[s];
```




Which statements are true?

Select all the correct answers.

- **A.** `HEARTS == 2*DIAMONDS`.
- **B.** Integer operations are valid over enum values.
- **C.** if `c` is of type `Suit_t`, then `c = 2*HEARTS` is valid.
- **D.** if `t` is an array, then `t[2*HEARTS]` is valid.



References

- **enum**
 - C++ Primer, 4th Edition, Chapter 2.7