AP COMPUTER SCIENCE

UNIT 9

LESSON 3:

Is-a and Has-a Relationships

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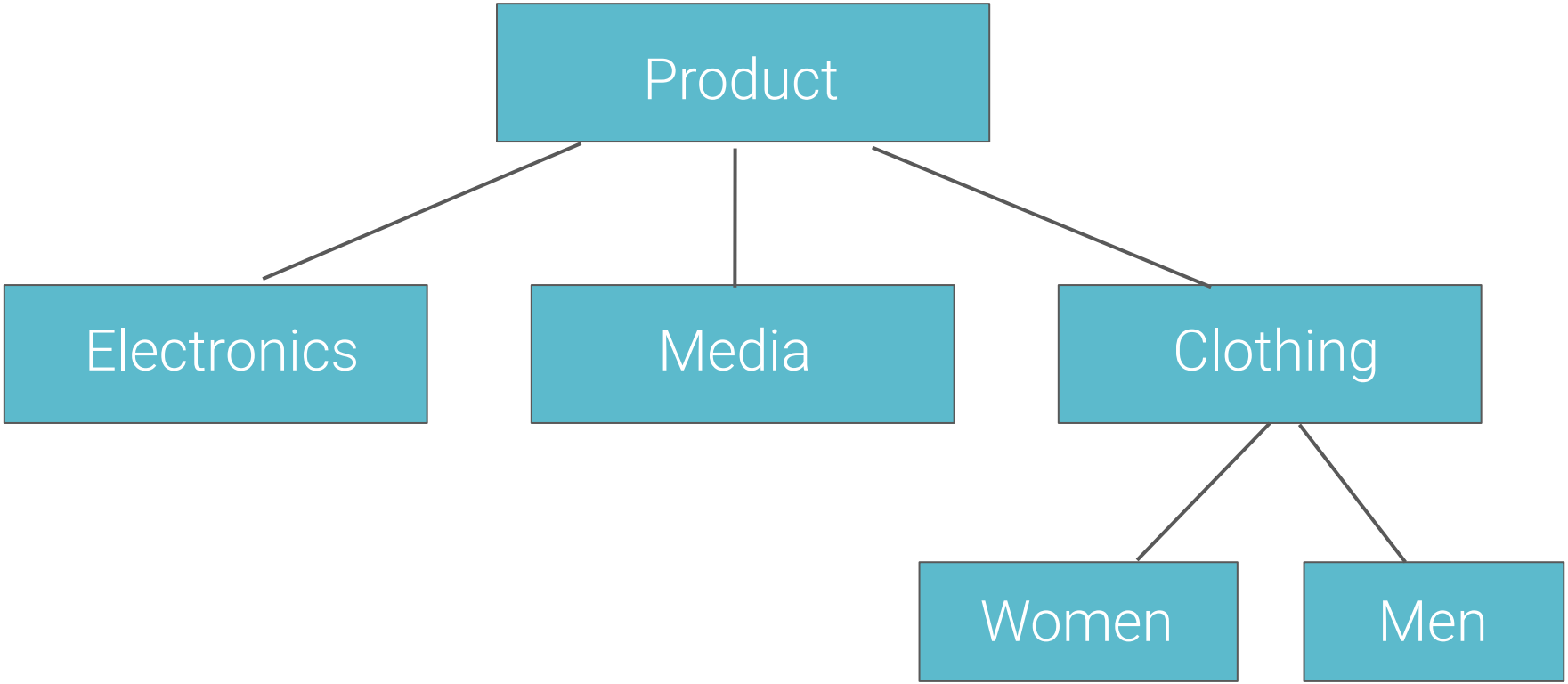
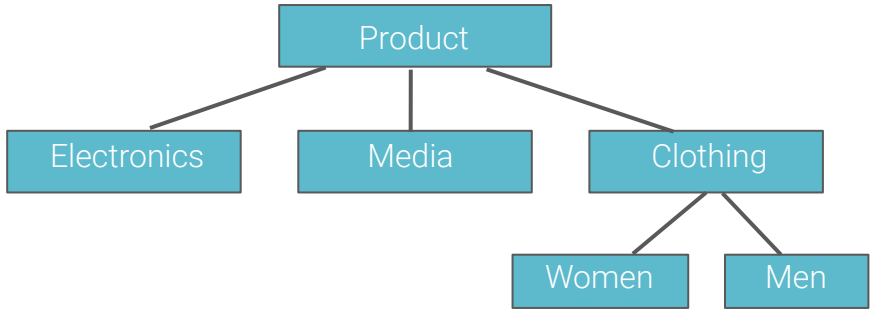
Learning Objectives

- Gain a deeper understanding of complex class hierarchies and inheritance in constructors
- See worked examples of AP Computer Science A exam questions on inheritance

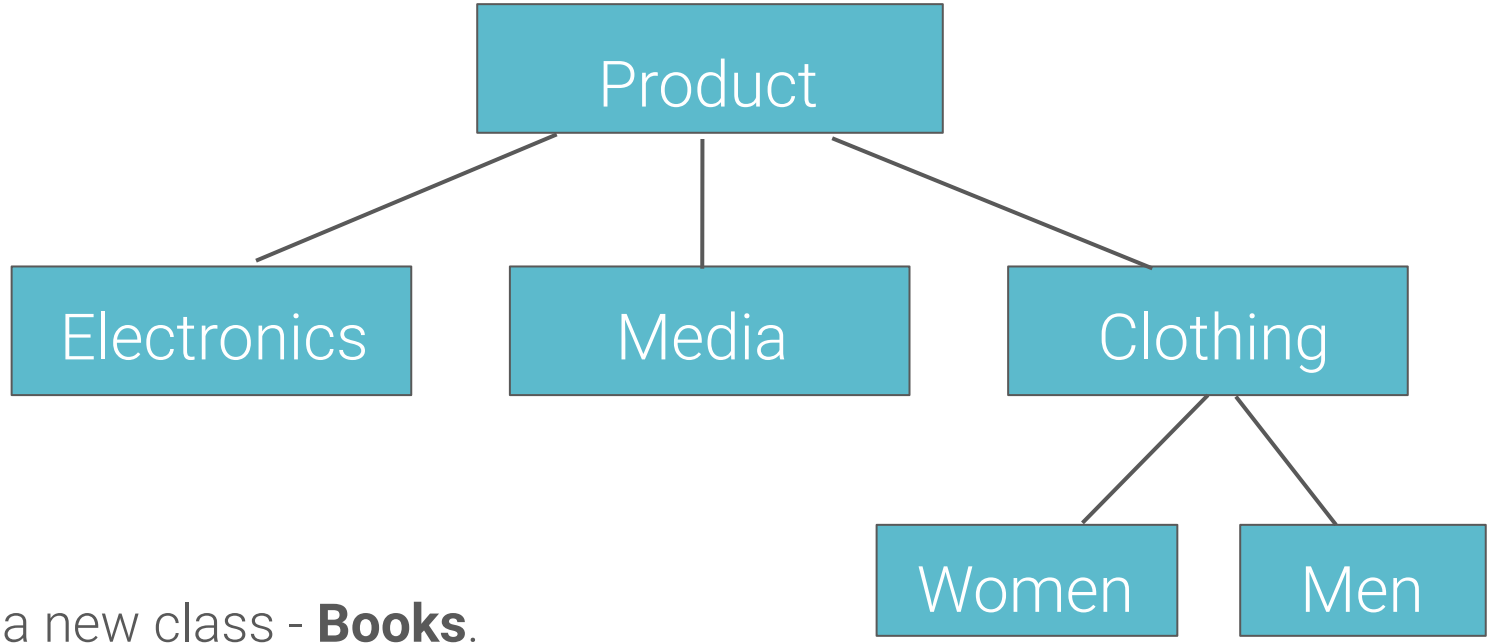

Product
Electronics
Media
Clothing
Women
Men

Consider the following hierarchy of products sold by an online store.



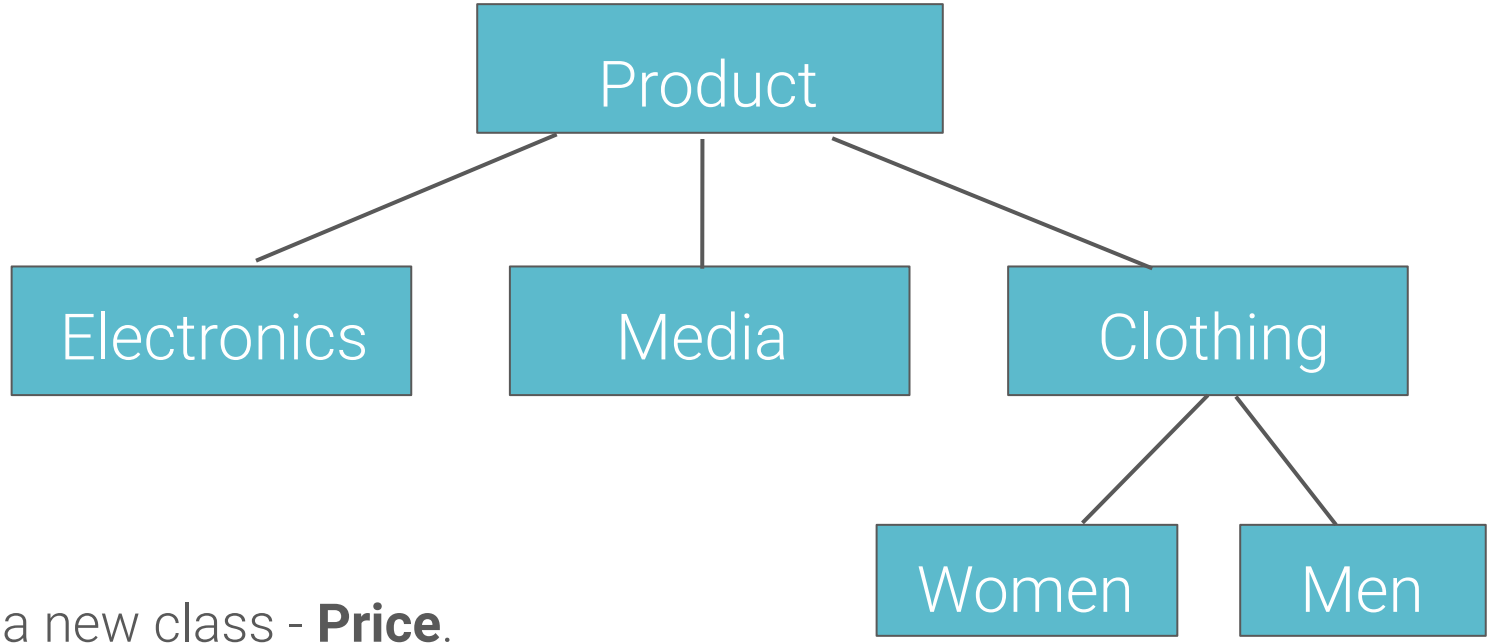
The following class headers show the relationship of the classes

```
public class Product

public class Electronics extends Product
public class Media extends Product
public class Clothing extends product

public class Women extends Clothing
public class Men extends Clothing
```



Want to add a new class - **Books**.

Where should it go?



Want to add a new class - **Price**.

Where should it go?

```
public class Clothing extends Product
{
     public Clothing ()
     {
          System.out.print("B");
     }
...
public class Women extends Clothing
{
     public Women ()
     {
          System.out.println("A");
     }
//...
```

What is output by:

`Women w = new Women ();` ?

A. A
B. B
C. AB
D. BA
E. ABA

Polymorphism - a parent can take the shape of any of its child classes.

```
//Declaring an ArrayList
ArrayList<Product> products = new ArrayList<Product>();
//Declaring a Method
public static void buy(Product p)
```

Polymorphism - Run Time Versus Compile Time

```
Product shirt = new Clothing();
int shirtPrice = shirt.getPrice();
```

Consider two situations:

1. Clothing has a getPrice() method and Product does not.
2. Clothing and Product both have a getPrice() method.