

# Django Model Relationships

## 1. One-to-One Relationship

- **Definition:** Connects each instance of one model with exactly one instance of another model.
- **Example:**

```
class Profile(models.Model):  
    user = models.OneToOneField(User, on_delete=models.CASCADE)  
    bio = models.TextField()
```

- **Usage:** Use when each instance of one model should have exactly one associated instance in another model.

## 2. One-to-Many Relationship

- **Definition:** Connects each instance of one model with multiple instances of another model.
- **Example:**

```
class Author(models.Model):  
    name = models.CharField(max_length=100)  
  
class Book(models.Model):  
    author = models.ForeignKey(Author, on_delete=models.CASCADE)  
    title = models.CharField(max_length=100)
```

- **Usage:** Use when each instance of one model can have multiple associated instances in another model.

## 3. Many-to-One Relationship

- **Definition:** Connects multiple instances of one model with exactly one instance of another model.
- **Example:**

```
class City(models.Model):  
    name = models.CharField(max_length=100)  
  
class Restaurant(models.Model):  
    city = models.ForeignKey(City, on_delete=models.CASCADE)  
    name = models.CharField(max_length=100)
```

- **Usage:** Use when multiple instances of one model can belong to exactly one instance of another model.

## 4. Many-to-Many Relationship

- **Definition:** Connects multiple instances of one model with multiple instances of another model.
- **Example:**

```
class Student(models.Model):
    name = models.CharField(max_length=100)
    courses = models.ManyToManyField(Course)

class Course(models.Model):
    name = models.CharField(max_length=100)
```

- **Usage:** Use when each instance of one model can relate to multiple instances of another model and vice versa.

## 5. Related Name

- **Definition:** Specifies the name to use for the relation from the related object back to this one.
- **Example:**

```
class Author(models.Model):
    name = models.CharField(max_length=100)

class Book(models.Model):
    author = models.ForeignKey(Author, on_delete=models.CASCADE,
                              related_name='books')
    title = models.CharField(max_length=100)
```

- **Usage:** Provides a custom name to access related objects from the related model.

## Summary

- **One-to-One:** Each instance of one model associates with exactly one instance of another model.
- **One-to-Many:** Each instance of one model associates with multiple instances of another model.
- **Many-to-One:** Multiple instances of one model associate with exactly one instance of another model.
- **Many-to-Many:** Multiple instances of one model can associate with multiple instances of another model.
- **Related Name:** Customizes how related objects are accessed from the related model