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Quiz yourself: The allowable subtypes in sealed classes

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You should know what the rules say about subclasses being public, protected, and final.

Given the sealed `Bird` class

```
public sealed class Bird permits Sparrow {}
```

Which Sparrow class definitions, when used independently, are valid? Choose two.

A. `non-sealed class Sparrow extends Bird { }`

The answer is A.

B. `public class Sparrow extends Bird { }`

The answer is B.

C. `protected class Sparrow extends Bird { }`

The answer is C.

D. `final class Sparrow extends Bird { }`

The answer is D.

Answer. The normal syntax for a sealed type requires that the type define in the `permits` section the list of allowed direct subtypes. In this question, the `Bird` class enumerates only one allowed direct subclass, which is `Sparrow`.

The direct subtypes of a sealed type are subject to some constraints; they must carry one of the following three listed modifiers, which cause the effects noted:

- `non-sealed`, in which case the non-sealed type can itself have arbitrary subtypes
- `sealed`, in which case this subtype must also declare a nonempty `permits` clause enumerating at least one existent subtype
- `final`, in which case the type must be a concrete class and no further subclasses are allowed

In the code of the question, only options A and D fulfill these requirements; thus, those options are correct.

Option B would be valid as a regular subclass of a `Bird` if the `Bird` class were not sealed. Since `Bird` is sealed, however, `Sparrow` is unacceptable because it fails to satisfy the constraints listed above. From this, you know that option B is incorrect.

Option C is also incorrect because the constraints listed are not met: The `protected` modifier does not satisfy the constraints. In addition, in the question it appears that the classes listed are all top-level classes, and the `protected` modifier may be applied only to fields, methods, constructors, or nested types, *not* to top-level types.

Conclusion. The correct answers are options A and D.

Related quizzes

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- [Quiz yourself: Final classes](#)





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Simon Roberts

Simon Roberts joined Sun Microsystems in time to teach Sun's first Java classes in the UK. He created the Sun Certified Java Programmer and Sun Certified Java Developer exams. He wrote several Java certification guides and is currently a freelance educator who publishes recorded and live video training through Pearson InformIT (available direct and through the O'Reilly Safari Books Online service). He remains involved with Oracle's Java certification projects.

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