

# Types, inference, and F# data types

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# Introduction

```
(λ(p:Boolean) (q:Boolean)→((p Boolean) q) p)
)
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```
(λ(p:Boolean) (q:Boolean)→(((p Boolean) q) p)
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(λ(p:Boolean) (q:Boolean)→(((p Boolean) q) p))
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(λ(p:Boolean) (q:Boolean)→(((p Boolean) q) p))
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(λ(p:Boolean) (q:Boolean)→(((p Boolean) q) p))
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(λ(p:Boolean) (q:Boolean)→(((Boolean Boolean)  
q) Boolean))
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(λ(p:Boolean) (q:Boolean)→(((Boolean Boolean)  
  q) Boolean))
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(λ(p:Boolean) (q:Boolean)→(((Boolean Boolean)  
  q) Boolean))
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(λ(p:Boolean) (q:Boolean)→  
  (((Boolean Boolean) q) Boolean))
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(λ(p: Boolean) (q: Boolean) →  
  ((Boolean Boolean) q) Boolean))
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(λ(p: Boolean) (q: Boolean) →  
  (((Boolean Boolean) q) Boolean))
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(λ(p: Boolean) (q: Boolean) → (((Boolean Boolean)  
  Boolean) Boolean))
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(λ(p:Boolean) (q:Boolean)→(((Boolean Boolean)  
 Boolean) Boolean))
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(λ(p:Boolean) (q:Boolean)→(((Boolean Boolean)  
  Boolean) Boolean))
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(λ(p:Boolean) (q:Boolean)→(((Boolean Boolean)  
  Boolean) Boolean))
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(λ(p:Boolean) (q:Boolean)→(((Boolean Boolean)  
    Boolean) Boolean))
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(λ(p:Boolean) (q:Boolean)→(((Boolean Boolean)  
Boolean) Boolean))
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(λ(p:Boolean) (q:Boolean)→((((∀α ⇒(α→α→α))  
Boolean) Boolean) Boolean))
```

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(λ(p:Boolean) (q:Boolean)→(((∀α ⇒(α→α→α))  
  Boolean) Boolean) Boolean))
```

```
(λ(p:Boolean) (q:Boolean)→((((∀α ⇒(α→α→α))  
    Boolean) Boolean) Boolean))
```

```
(λ(p:Boolean) (q:Boolean)→((((∀α ⇒(α→α→α))  
    Boolean) Boolean) Boolean))
```



```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α))  
  Boolean) Boolean) Boolean))
```

```
(λ(p:Boolean) (q:Boolean)→((((∀α ⇒(α→α→α))  
  Boolean) Boolean) Boolean))
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```
(λ(p:Boolean) (q:Boolean)→((((∀α ⇒(α→α→α))  
  (∀α ⇒(α→α→α)) ) Boolean) Boolean))
```

```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α))  
  (∀α ⇒ (α → α → α))) Boolean) Boolean))
```

```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α))  
  (∀α ⇒ (α → α → α))) Boolean) Boolean))
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```
(λ(p: Boolean) (q: Boolean) → ((  
  ((∀α ⇒ (α → α → α)) (∀α ⇒ (α → α → α))) Boolean)  
  Boolean))
```

```
(λ(p:Boolean) (q:Boolean)→((  
  ((∀α ⇒(α→α→α)) (∀α ⇒(α→α→α))) Boolean)  
  Boolean))
```

```
(λ(p:Boolean) (q:Boolean)→((  
  ((∀α ⇒(α→α→α)) (∀α ⇒(α→α→α))) Boolean)  
  Boolean))
```

```
(λ(p:Boolean) (q:Boolean)→((  
  ((∀α ⇒(α→α→α))→(∀α ⇒(α→α→α))→(∀α ⇒(α→α→α))  
  Boolean) Boolean))
```

```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α))) Boolean)  
  Boolean))
```

```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α))) Boolean)  
  Boolean))
```

```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α))) Boolean)  
  Boolean))
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```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α))) Boolean  
  Boolean))
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```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α))) Boolean)  
  Boolean))
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```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α)))  
  (∀α ⇒ (α → α → α))) Boolean))
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```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α))) (∀α ⇒ (α →  
  α → α))) Boolean))
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```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α))) (∀α ⇒ (α →  
  α → α))) Boolean))
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```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α)))  
  (∀α ⇒ (α → α → α))) Boolean))
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```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α)))  
  (∀α ⇒ (α → α → α))) Boolean))
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```
(λ(p: Boolean) (q: Boolean) → (((∀α ⇒ (α → α → α)) →  
  (∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α)))  
  (∀α ⇒ (α → α → α))) Boolean))
```

```
(λ(p: Boolean) (q: Boolean) → (  
  ((∀α ⇒ (α → α → α)) → (∀α ⇒ (α → α → α))) Boolean))
```

$$(\lambda(p:\text{Boolean})\ (q:\text{Boolean}) \rightarrow (((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)))\ \text{Boolean}))$$

$$(\lambda(p:\text{Boolean})\ (q:\text{Boolean}) \rightarrow (((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)))\ \text{Boolean}))$$
$$(\lambda(p:\text{Boolean})\ (q:\text{Boolean}) \rightarrow (((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)))\ \underline{\text{Boolean}}))$$



$$(\lambda(p:\text{Boolean}) (q:\text{Boolean}) \rightarrow (((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))) \text{ Boolean}))$$

$$(\lambda(p:\text{Boolean}) (q:\text{Boolean}) \rightarrow (((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))) \text{ Boolean}))$$
$$(\lambda(p:\text{Boolean}) (q:\text{Boolean}) \rightarrow (((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))) (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))))$$

$$(\lambda(p:\text{Boolean})\ (q:\text{Boolean}) \rightarrow (((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))) (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))))$$

$$(\lambda(p:\text{Boolean})\ (q:\text{Boolean}) \rightarrow (((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))) (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))))$$
$$(\lambda(p:\text{Boolean})\ (q:\text{Boolean}) \rightarrow (\underbrace{((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)))}_{(\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))}))$$

$$\begin{array}{l} (\lambda(p:\text{Boolean}) (q:\text{Boolean}) \rightarrow ( \\ \quad ((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))) \\ \quad \underline{(\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))}) ) \end{array}$$

$$\begin{array}{c} (\lambda(p:\text{Boolean}) \ (q:\text{Boolean}) \rightarrow ( \\ \quad ((\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))) \\ \quad \underline{(\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))} )) \end{array}$$
$$(\lambda(p:\text{Boolean}) \ (q:\text{Boolean}) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)))$$

$$(\lambda(p:\text{Boolean}) \ (q:\text{Boolean}) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)))$$

$$(\lambda(p:\text{Boolean}) \ (q:\text{Boolean}) \rightarrow (\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha)))$$
$$(\lambda(p:\text{Boolean}) \ (q:\text{Boolean}) \rightarrow \underline{(\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))})$$



$$(\lambda(p:\text{Boolean}) \ (q:\text{Boolean}) \rightarrow \underline{(\forall \alpha \Rightarrow (\alpha \rightarrow \alpha \rightarrow \alpha))})$$

```
(λ(p: Boolean) (q: Boolean) → (∀α ⇒ (α → α → α))))
```

```
(λ(p: Boolean) (q: Boolean) → Boolean)
```

```
(λ(p:Boolean) (q:Boolean)→Boolean)
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```
(λ(p: Boolean) (q: Boolean) → Boolean)
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(λ(p: Boolean) (q: Boolean) → Boolean)
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(λ(p: Boolean) (q: Boolean) → Boolean)
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(λ(p: Boolean) (q: Boolean) → Boolean)
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(λ(p: Boolean) → (Boolean → Boolean))
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(λ(p: Boolean) → (Boolean → Boolean))
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(λ(p: Boolean) → (Boolean → Boolean))
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(λ(p: Boolean) → (Boolean → Boolean))
```



$$(\lambda(p:\text{Boolean}) \rightarrow (\text{Boolean} \rightarrow \text{Boolean}))$$

```
(λ(p:Boolean)→(Boolean→Boolean))
```

```
(Boolean→Boolean→Boolean)
```

The best of luck, and thanks for the  
attention!