Example problem for the normal distribution

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Question

The distribution of passenger vehicle speeds traveling on an interstate highway is nearly normal with a mean of 72.6 miles per hour and a standard deviation of 4.78 miles per hour.

Question 1

A single car on the interstate highway was measured to be traveling at a speed of 76.5 miles per hour. What percentile is the car in?

```
pnorm(q = 76.5, mean = 72.6, sd = 4.78)
```

```
## [1] 0.7927212
```

Question 2

Calculate what percentage of passenger vehicles travel slower than 80 miles per hour on the interstate.

```
pnorm(q = 80, mean = 72.6, sd = 4.78)
```

```
## [1] 0.939203
```

Question 3

Calculate what percentage of passenger vehicles travel slower than 60 miles per hour on the interstate.
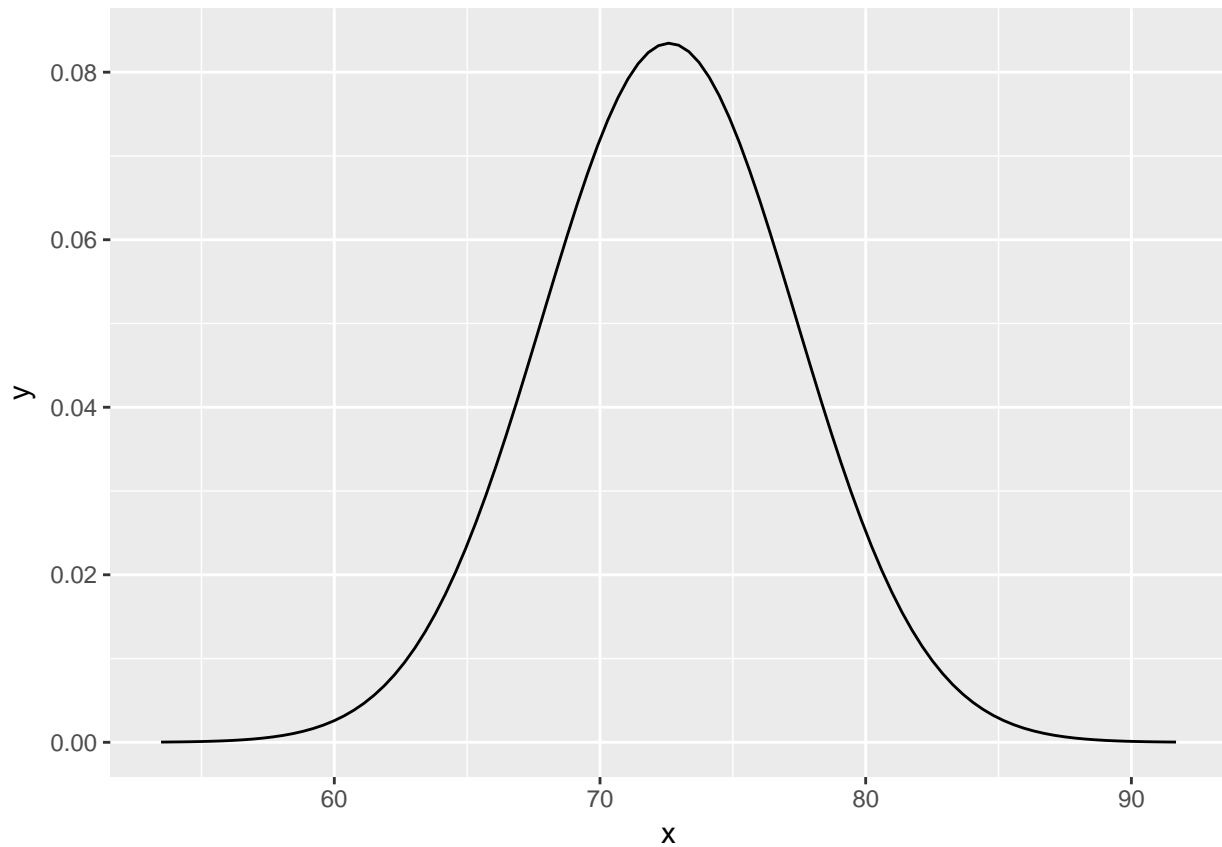
```
pnorm(q = 60, mean = 72.6, sd = 4.78)
```

```
## [1] 0.004194693
```

Question 4

Generate and plot the probability distribution function (PDF) for the passenger vehicle speeds.

```
normal_range <- tibble(x = seq(72.6 - 4 * 4.78, 72.6 + 4 * 4.78, 0.1))
ggplot(normal_range) +
  stat_function(mapping = aes(x = x), fun = dnorm, args = c(mean = 72.6, sd = 4.78))
```

Question 5

How fast do the fastest 5% of passenger vehicles travel on the interstate?

```
qnorm(p = 0.95, mean = 72.6, sd = 4.78)
```

```
## [1] 80.4624
```

```
72.6 + 3 * 4.78
```

```
## [1] 86.94
```

```
qnorm(p = 0.975, mean = 72.6, sd = 4.78)
```

```
## [1] 81.96863
```

```
qnorm(p = 0.025, mean = 72.6, sd = 4.78)
```

```
## [1] 63.23137
```

```
pnorm(q = 80, mean = 72.6, sd = 4.78)
```

```
## [1] 0.939203
```