Questions 1 and 2: ACT scores, part 1

The ACT is a standardized college admissions test used in the United States. The four multi-part questions in this assessment all involve simulating some ACT test scores and answering probability questions about them.

For the three year period 2016-2018, ACT standardized test scores were approximately normally distributed with a mean of 20.9 and standard deviation of 5.7. (Real ACT scores are integers between 1 and 36, but we will ignore this detail and use continuous values instead.)

First we'll simulate an ACT test score dataset and answer some questions about it.

Set the seed to 16, then use `rnorm()` to generate a normal distribution of 10000 tests with a mean of 20.9 and standard deviation of 5.7. Save these values as `act_scores`. You'll be using this dataset throughout these four multi-part questions.

(IMPORTANT NOTE! If you use R 3.6 or later, you will need to use the command format `set.seed(x, sample.kind = "Rounding")` instead of `set.seed(x)`. Your R version will be printed at the top of the Console window when you start RStudio.)

Question 1a

1/1 point (graded)

What is the mean of `act_scores`?

20.84012 ✔ **Answer:** 20.8

20.84012

Explanation

The mean can be found using the following code:

```
set.seed(16, sample.kind = "Rounding")
act_scores <- rnorm(10000, 20.9, 5.7)
mean(act_scores)
```

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Answers are displayed within the problem

Question 1b

1/1 point (graded)

What is the standard deviation of `act_scores`?

5.675237 ✔ **Answer:** 5.68

5.675237

Explanation

The standard deviation can be found using the following code:

```
sd(act_scores)
```

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Question 1c

1/1 point (graded)

A perfect score is 36 or greater (the maximum reported score is 36).

In `act_scores`, how many perfect scores are there out of 10,000 simulated tests?

41 ✔ **Answer:** 41

41

Explanation

The number of perfect scores can be found using the following code:

```
sum(act_scores >= 36)
```

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Question 1d

1/1 point (graded)

In `act_scores`, what is the probability of an ACT score greater than 30?

0.0527 ✔ **Answer:** 0.0527

0.0527

Explanation

The probability can be found using the following code:

```
mean(act_scores > 30)
```

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Answers are displayed within the problem

Question 1e

1/1 point (graded)

In `act_scores`, what is the probability of an ACT score less than or equal to 10?

0.0282 ✔ **Answer:** 0.0282

0.0282

Explanation

The probability can be found using the following code:

```
mean(act_scores <= 10)
```

You have used 1 of 10 attempts

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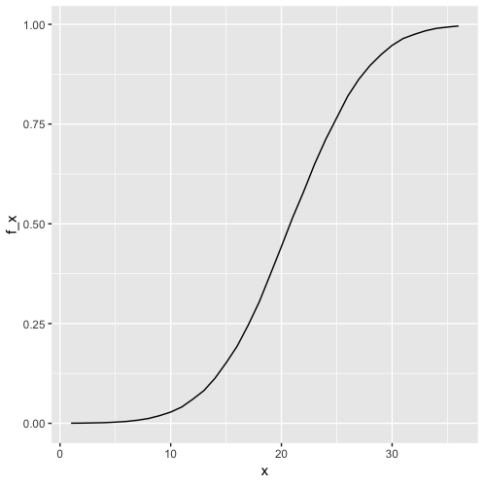
Answers are displayed within the problem

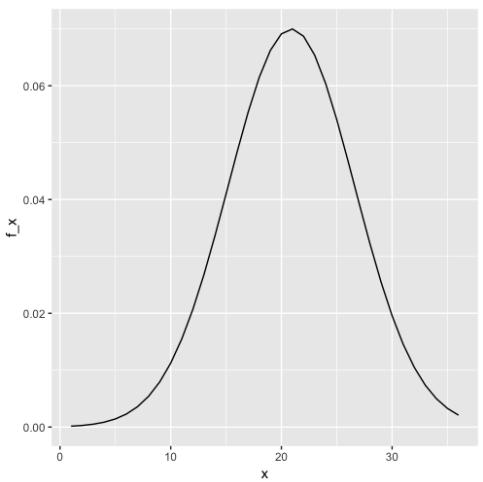
Question 2

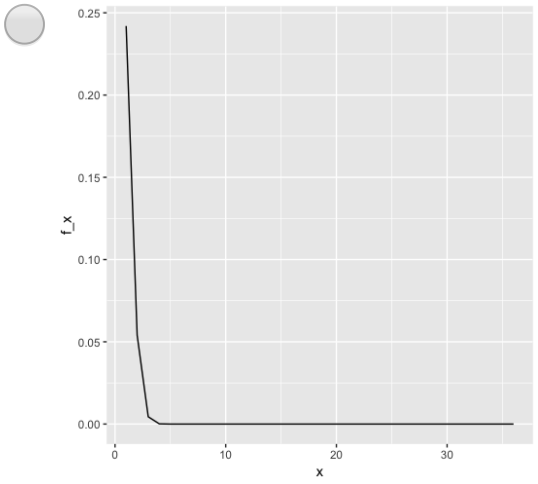
1/1 point (graded)

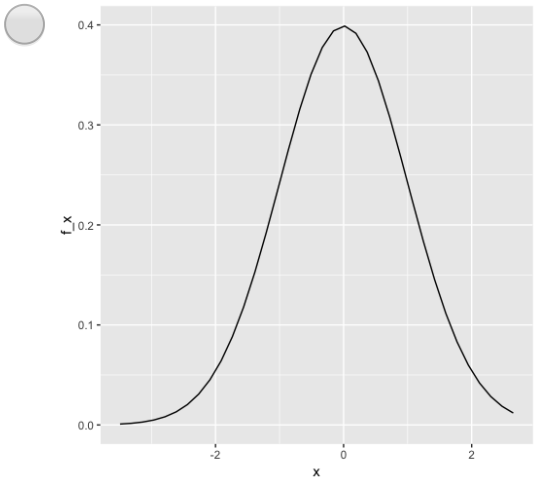
Set `x` equal to the sequence of integers 1 to 36. Use `dnorm` to determine the value of the probability density function over `x` given a mean of 20.9 and standard deviation of 5.7; save the result as `f_x`. Plot `x` against `f_x`.

Which of the following plots is correct?









✔

Explanation

The second plot, generated using the following code, is correct:

```
x <- 1:36
f_x <- dnorm(x, 20.9, 5.7)
data.frame(x, f_x) %>%
  ggplot(aes(x, f_x)) +
  geom_line()
```

The first plot is the distribution function rather than the density function. The third plot fails to include the mean and standard deviation in the `dnorm` call. The fourth plot is of Z-score values.

Submit You have used 1 of 2 attempts

Answers are displayed within the problem