Question 1: Olympic running

In the 200m dash finals in the Olympics, 8 runners compete for 3 medals (order matters). In the 2012 Olympics, 3 of the 8 runners were from Jamaica and the other 5 were from different countries. The three medals were all won by Jamaica (Usain Bolt, Yohan Blake, and Warren Weir).

Use the information above to help you answer the following four questions.

Question 1a

1.0/1.0 point (graded)

How many different ways can the 3 medals be distributed across 8 runners?

336 ✔ **Answer:** 336

336

Explanation

The following code can be used to determine the number of permutations:

```
library(gtools)
medals <- permutations(8,3)
nrow(medals)
```

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Answers are displayed within the problem

Question 1b

1.0/1.0 point (graded)

How many different ways can the three medals be distributed among the 3 runners from Jamaica?

6 ✔ **Answer:** 6

6

Explanation
The following code can be used to determine the number of permutations:

```
jamaica < permutations(3,3)
nrow(jamaica)
```

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Question 1c

1.0/1.0 point (graded)
What is the probability that all 3 medals are won by Jamaica?

0.0179 ✔ **Answer:** 0.0179

0.0179

Explanation
The following code can be used to determine the probability:

```
nrow(jamaica)/nrow(medals)
```

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Question 1d

1.0/1.0 point (graded)
Run a Monte Carlo simulation on this vector representing the countries of the 8 runners in this race:

```
runners <- c("Jamaica", "Jamaica", "Jamaica", "USA", "Ecuador", "Netherlands", "France", "South Afr
```

For each iteration of the Monte Carlo simulation, within a `replicate` loop, select 3 runners representing the 3 medalists and check whether they are all from Jamaica. Repeat this simulation 10,000 times. Set the seed to 1 before running the loop.

Calculate the probability that all the runners are from Jamaica.

0.0179 ✔ **Answer:** 0.0165

0.0179

Explanation

Note that your answer will differ depending on whether you are using R 3.5 or earlier (0.0165) or R 3.6 or later (0.0174) because of the way `set.seed` works in different versions of R.

The following code can be used to determine the probability:

```
set.seed(1)
runners <- c("Jamaica", "Jamaica", "Jamaica", "USA", "Ecuador", "Netherlands", "France", "South Afr
B <- 10000
all_jamaica <- replicate(B, {
  results <- sample(runners, 3)
  all(results == "Jamaica")
})
mean(all_jamaica)
```

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Answers are displayed within the problem