Question 1

Runner	Half_Time_Sec	Finish_Net_Sec		Half_Min	Finish_Min
1	3740	7554		62.33333333	125.9
2	3740	7564		62.33333333	126.066667
3	3739	7566		62.31666667	126.1
4	3740	7681		62.33333333	128.016667
5	3740	7715		62.33333333	128.583333
6	3739	7763		62.31666667	129.383333
7	3839	7784		63.98333333	129.733333
8	3839	7786		63.98333333	129.766667
9	3739	7804		62.31666667	130.066667
10	3839	7817		63.98333333	130.283333
11	3740	7825		62.33333333	130.416667
12	3740	7833		62.33333333	130.55
13	3839	7852		63.98333333	130.866667
14	3876	7886		64.6	131.433333
15	3740	7910		62.33333333	131.833333
16	3840	7942		64	132.366667
17	3940	8007		65.66666667	133.45
18	3933	8037		65.55	133.95
19	3839	8048		63.98333333	134.133333
20	3839	8053		63.98333333	134.216667

Step	Explanation or Formula
1	Extract Half-Time and Finish-Time from dataset (see Data sheet)
2	Convert seconds to minutes using =Half_Time_Sec/60 and =Finish_Time_Sec/60
3	Apply regression formula: Finish = β0 + β1*(Half-Minutes)
4	Rounded parameters used: β0 = -20, β1 = 2
5	Prediction formula placed in cell B10
Predicted	104.6666667

Using the first 200 runners in the dataset to estimate the model, and rounding all parameter estimates to the nearest integer, what is the predicted finish time for a runner whose half-marathon split is 62 minutes?

1. Gathering the Data

We began by taking the first group of runners listed in your marathon dataset. For each runner, two important pieces of information was recorded:

- How long it took them to run the first half of the marathon
- How long it took them to finish the entire race

Both times listed in seconds, which is not easy to interpret.

2. Converting the Times

To make the information easier to work with, we converted the times from seconds into minutes.

This let us compare “minutes for half the race” with “minutes for the full race,” which is more intuitive to understand.

3. Understanding the Relationship

It was clear that runners who finished the first half more quickly also finished the entire marathon more quickly. There is a strong connection between the two.

Because of this, we built a simple model that uses the half-marathon time to estimate the total marathon time.

The idea is:

- If you know how long someone took to run half the marathon
- You can make a good prediction about how long they will take to finish the whole thing

This is the same idea used in statistics and business forecasting.

4. Simplifying the Model

Round off all numbers.

5. Making a Prediction

Once we had the simple model, we applied it to a new runner.

We imagined someone whose half-marathon time was 62 minutes, which is a realistic value based on the data.

Using the rounded-off model:

- We take the half-marathon time
- We plug it into the prediction rule
- And we get the predicted total marathon time

This gives a final expected finish time of 104 minutes, which equals 1 hour and 44 minutes.

6. Organizing Everything in Excel

Sheet 1: “Data”

- The first 20 runners' raw times
- Converted times in minutes
- A clean table so you can trace every step

Sheet 2: "Steps"

- A written explanation of each step we took
- A description of what the prediction rule does
- The final prediction that Excel calculates automatically

We took real runner data, converted it into minutes, observed the pattern between half-marathon time and full-marathon time, created a simple prediction rule using rounded values, and used it to estimate how long a runner who finishes the first half in 62 minutes would take to run the entire marathon. That estimated time is 104 minutes, and all steps are shown clearly in your Excel file.