Problem of the Week
Problem A and Solution
Chasing the Great One

Problem

Auston McCrosby (a professional hockey player) has earned 1000 points (goals and assists) in his career so far. Wayne Gretzky, the highest point getter of all time in the National Hockey League, scored 2875 points in his career. If Auston averages 2 points per game in an 82 game season, approximately how many more seasons will he need to complete in order to reach Wayne Gretzky's record?

Solution

If Auston averages 2 points per game and there are 82 games in a season then he is expected to earn $2 \times 82 = 164$ points in each season. With this information we can make a table that estimates how many points he has accumulated after each season.

Year	Points in Season	Accumulated Points
Start		1000
1	164	1164
2	164	1328
3	164	1492
4	164	1656
5	164	1820
6	164	1984
7	164	2148
8	164	2312
9	164	2476
10	164	2640
11	164	2804
12	164	2968

So after 12 more seasons we expect that Auston will have accumulated more points than Wayne Gretzky.

Alternatively, we can calculate the number of points that Auston needs to earn to match Wayne Gretzky as $2875 - 1000 = 1875$. Then we can divide by 164 to determine how many years we expect it will take to accumulate 1875 more points. So we calculate $1875 \div 164 = 11$ remainder 71. Since there is a remainder with this division, we expect that it will take 12 seasons for Auston to surpass Wayne Gretzky's record.

It is also possible to use estimation to predict how many more seasons it will take Auston to reach Gretzky's record. We expect that Auston will score approximately 160 points per season. After 10 seasons, we expect him to score approximately 1600 points, so he would have accumulated approximately 2600 points. Since he needs to accumulate approximately 2900 points, he will need at least two more years where he would be expected to accumulate approximately 320 points. This means we expect it would take a total of 12 years for Auston to surpass the record.

Teacher's Notes

Another way to solve this problem would be to use a spreadsheet or to write a program to calculate how many goals Auston is predicted to have scored at the end of each year. Here is a program written in Python that would compute the prediction:

```python
CURRENT_GOALS = 1000
GOALS_PER_GAME = 2
GAMES_PER_SEASON = 82
GOALS_PER_SEASON = GOALS_PER_GAME * GAMES_PER_SEASON
RECORD_GOALS = 2875

year = 0
accumulated_goals = CURRENT_GOALS
while accumulated_goals <= RECORD_GOALS:
    year = year + 1
    accumulated_goals = accumulated_goals + GOALS_PER_SEASON

print(year)
```

The values at the beginning of the program such as CURRENT_GOALS and GOALS_PER_GAME are called constants. These are values that can be easily changed to do the same calculation for other players with other numbers. It would also be easy to make the program interactive so you can ask someone to enter the starting number of goals and goals per game for a particular player and then calculate how many seasons it would take to surpass the record.

The main calculations happen starting at the line year = 0. The program initializes the values of two variables that are keeping track of the **year** and the **accumulated_goals**.

The line:

$$\textbf{while } accumulated\_goals <= RECORD\_GOALS:$$

tells the computer to repeat the next two instructions as long as the number of accumulated goals is less than the record number of goals. The repeated instructions are to increase the year by 1, and to increase the accumulated goals by the number of goals expected to be scored in a season. When the number of accumulated goals is greater than the record, the repetition will stop. At that point the program will continue to the last line which is and instruction to print the year.

Since the year has been increasing by 1 as long as the number of accumulated goals is less than the record, the value printed at the end will be the year in which the total number of goals surpasses the record.