

A1:

Above is the method generateMulQuestions() method. To implement it, I first created two random numbers using the Math.random() method. Math.random() generates a random number between 0.0 and 0.1, then I multiplied it by 20 to make it between 0-19 (the 0.1 is not inclusive). I used the scanner object in the Game class file to get the user's answer.

Then within the summary, I showed the results of the user, and I used `userAnswer == actualAnswer` to get a boolean True or False to add to the summary string.

This method returns a boolean value, because it provides the exit condition for some of the while loops in KidsGame file. (Look at cases where I set the variable 'result' = EachArithmeticMethod())

The screenshot shows a Java IDE interface with the following details:

- File Bar:** Workspaces, Applications, File, Edit, Selection, View, Go, Run, Terminal, Help.
- Title Bar:** Nov 9 2:24 PM, J Game.java, KidsGame.java
- Code Editor:**

```

1 public class Game {
2     ...
3     public boolean generateDivQuestions(){
4         // todo: check that the inputed divisor is in the range of 1 to 10
5         int num1 = (int) (Math.random() * 10); //no restriction on the dividend
6         int num2 = (int) (Math.random() * 10) + 1; //divisor must be in range 1-10
7         ...
8         float num1f = num1;
9         float num2f = num2;
10        ...
11        float actualAnswer = num1f / num2f;
12        ...
13        System.out.println("What is "+num1+" / "+num2+" ?");
14        ...
15        double userAnswer = input.nextDouble();
16        ...
17        if(userAnswer == actualAnswer){
18            score++; //there is one score variable in the entire class
19        }
20        ...
21    }
22    ...
23    return score;
24 }

```
- Terminal:** Alvin: 1 feride@pop-os:~/OOP Java/KidsGame\$
- Status Bar:** In 193, Col 5, Spaces: 4, UTF-8, LF, (Java), Signed out

Above is the generateDivQuestion() method. I generated random numbers the same way I did for the generateMulQuestions() method. However, for the divisor, the number had to be between 1-10 to avoid dividing by zero. To fix this, I did (Math.random() * 10) + 1 so that the range would become 1-10 instead of 0-9 (0.0 - 0.1(non inclusive), is what Math.random() usually returns). The reason I type casted it to int is so that when I print the question to the user, it's easy to read. Then I got the actualAnswer by dividing the two floats num1f and num2f. (They're the double equivalents to the random ints I got).

Within Math.round(), I passed the actualAnswer (a float) times 100 to keep the two decimal place numbers for my final answer.

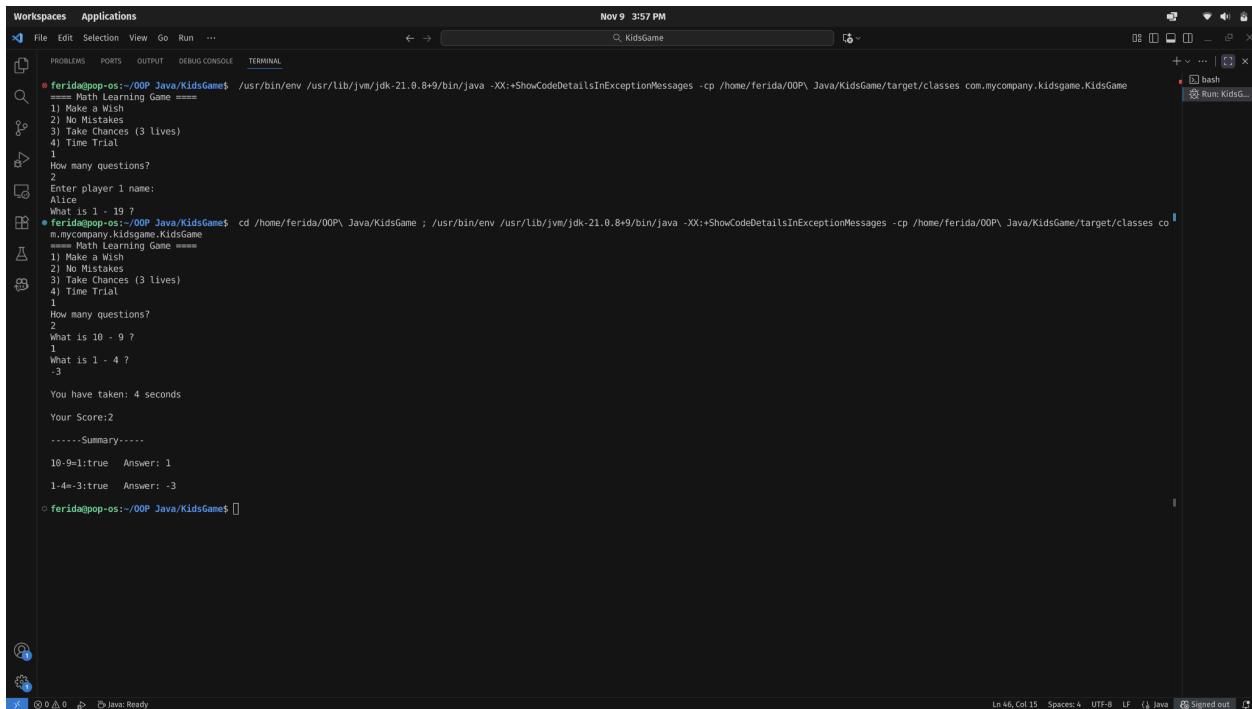
Passing this to Math.round() would round it to the nearest integer.

Then the result I got from this, (new_ans) was divided by 100, so that the two decimal places return to being decimals (after the *100).

Since we used round(), the two decimal places are rounded to the *nearest hundredth*.

Take the nextDouble() from the user

A2



The screenshot shows a Java IDE interface with a terminal window open. The terminal window displays the output of a Java application named 'KidsGame'. The application starts by listing four modes: 'Math Learning Game', 'Make a Wish', 'No Mistakes', and 'Take Chances (3 lives)'. It then asks for player 1's name, which is entered as 'Alice'. The game then presents a series of arithmetic questions. The user answers '1' for 'What is 1 - 10 ?', '-3' for 'What is 1 - 4 ?', and '2' for 'What is 10 - 9 ?'. The application also asks 'How many questions?' and receives the answer '2'. After the second question, it prints 'Your Score: 2'. The terminal window also shows a summary of the user's answers: '10-9=1:true Answer: 1' and '1-4=-3:true Answer: -3'. The terminal window has tabs for PROBLEMS, PORTS, OUTPUT, DEBUG CONSOLE, and TERMINAL. The title bar shows 'Nov 9 3:57 PM' and the file 'KidsGame'. The bottom status bar indicates 'Ln 46, Col 15 Spaces: 4 UTF-8 C:\Java Signed out /A4'.

The above screenshot displays a single user's game with Mode 1. Please ignore the first run of my program in the screenshot; look at the second one.

In this Mode, I had a switch case, where each arithmetic function is employed based on a random number generator from 1-4. If the number is 4, it employs the fourth arithmetic method in the fourth case.

To keep track of scores, I increase the game class variable 'score' by one, in each arithmetic method of the game class (only if the user got the answer right).

That is why I have an if block in each arithmetic method to check whether userAnswer == actualAnswer or not.

The screenshot shows a Java IDE interface with a terminal window open. The terminal window displays the output of a Java application named 'KidsGame'. The application starts with a welcome message and four mode options: 'Make a Wish', 'No Mistakes', 'Take Chances (3 lives)', and 'Time Trial'. It then asks for a multiplication problem (18 x 17) and a division problem (7 / 3). The user's answers are 306 and 2.33 respectively. The application prints the user's score (1), summary statistics, and the results of the arithmetic operations. The terminal window has tabs for 'Game.java' and 'KidsGame.java', and the status bar at the bottom indicates 'Java Ready'.

```
Workspaces Applications Nov 9 3:58 PM
File Edit Selection View Go Run Terminal Help ← → KidsGame
PROBLEMS PORTS OUTPUT DEBUG CONSOLE TERMINAL
ferida@pop-os:~/OOP Java/KidsGame$ cd /home/ferida/OOP/ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/OOP/ Java/KidsGame/target/classes co m.mycompany.kidsgame.KidsGame
==== Math Learning Game ====
1) Make a Wish
2) No Mistakes
3) Take Chances (3 lives)
4) Time Trial
2
What is 18 x 17 ?
306
What is 7 / 3 ?
0.3
The user took 32 seconds
Your Score:1
-----Summary-----
18*17=306:true Answer: 306
7/3=0.3:false Answer: 2.33
ferida@pop-os:~/OOP Java/KidsGame$
```

In mode 2 above, to implement the ‘No Mistakes’ feature, I use a switch case to check the return value of each arithmetic function.

Each arithmetic function returns a boolean value, and within the switch case that employs each method (in main, based on a random number generator), I store the return value of the method in a variable called ‘result’. Result is obtained from each method based on the if-else block for (actualAnswer == userAnswer).

Then I use boolean ‘result’ to determine the condition of the while loop that this mode 2 is in. If result == False, mode_is_on = False. This exits the while loop, and then prints the results.

```

Workspaces Applications Nov 9 3:58 PM
File Edit Selection View Go Run Terminal Help
src > main > java > com > mycompany > kidsgame > J KidsGame.java > main(String[])
PROBLEMS PORTS OUTPUT DEBUG CONSOLE TERMINAL
ferida@oep-os:~/OOP Java/KidsGame$ cd /home/ferida/OOP\ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/OOP\ Java/KidsGame/target/classes co m.mycompany.kidsgame.KidsGame
==== Math Learning Game ====
1) Make a Wish
2) Take 3 Stakes
3) Take Challenges (3 lives)
4) Time Trial
3
[ Lives = 3 ]
What is 12 - 10 ?
2
[ Lives = 3 ]
What is 19 - 5 ?
14
[ Lives = 3 ]
What is 9 * 8 ?
3
[ Lives = 2 ]
What is 12 x 4 ?
2
[ Lives = 1 ]
What is 2 + 17 ?
3

The user took 7 seconds
Your Score:2
-----Summary-----
12-10=2:true Answer: 2
19-5=14:true Answer: 14
9*8=3:false Answer: 72
12*4=2:false Answer: 48
2+17=3:false Answer: 19
ferida@oep-os:~/OOP Java/KidsGame$
```

For mode 3 above (single user), I used the concept of encapsulation. Within my game class, I have a private variable called `lives` which is set to 3. Then I have defined a setter class called `set_lives(userInput)`, and a getter called `get_lives`.

In my main code, I have declared a variable called `lives_left`, which is passed into the `set_lives` method, each time the user gets the wrong answer. (Wrong answer is determined by the switch cases of each arithmetic function explained above).

I use `get_lives` to print the [Lives = #] that is shown in the screenshot, in each iteration.

Then at the bottom of the `while(mode_is_on)` loop, I use an if block to determine how many lives are left (using the local variable I have declared in my main program).

`if(lives == 0), then mode_is_on == false`

```

Workspaces Applications Nov 9 4:01 PM
File Edit Selection View Go Run Terminal Help PROBLEMS PORTS OUTPUT DEBUG CONSOLE TERMINAL
src > main > java > com > mycompany > kidsgame > J KidsGame.java > mainString()
m.mycompany.kidsgame.KidsGame
===== Math Learning Game =====
1) Make a Wish
2) Make Mistakes
3) Take Chances (3 lives)
4) Time Trial
4
Enter a time limit (seconds):
5
What is 7 / 1 ?
7
What is 4 * 12 ?
48
What is 6 - 0 ?
6
What is 6 - 6 ?
0
What is 6 / 7 ?
0.8571428571428572
What is 13 - 18 ?
-5
Time's Up!
Your Score:1
-----Summary-----
7/1=7:0:true Answer: 7.0
4*12=48:false Answer: 48
6-0=6:false Answer: 6
6-6=0:false Answer: 0
6/7=5.0:false Answer: 0.86
13-18=-5:false Answer: -5

```

In mode 4 above, I had to implement the time limit feature.

To do this, I asked the user for a time limit in seconds, and I read it using the `input.nextInt()`. Then I used the `currentTimeMillis()` method to get the current time of the system (which gets it in milliseconds). This was to be the `startTime` of the while loop.

The condition of the while loop was (the current time) < (`startTime + timeLimit`)

The current time was different from the `startTime` of the while loop, because it was calculated at the beginning of each iteration.

If the `startTime + timeLimit` was still greater than the current time, that means that the user still gets to be asked a question.

If the limit was reached (current system time was greater than or equal to the `startTime + limit`), then the while loop would be exited, and the results would be displayed.

*NOTE: The scoring is all the same for all the modes; I have one class instance variable called 'score', which is incremented depending on the user's correct answer within each arithmetic method in the game class.

B1

```
src : main > java > com > mycompany > kidsgame > J Game.java > 4 Game > generateDivQuestions()
14 public class Game {
189     public boolean generateDivQuestions(){
228         if(score < 100)
229             return false;
230         else{
231             return true;
232         }
233     }
234
235     public void printSummary(){
237         System.out.println("Your Score:"+score+"\n");
238         System.out.println("-----\n"+summary);
239     }
240
241 }
242
243
244
245
246
247
248
249
250
251     class Player{
252
253         public String name;
254         public int score;
255         public String summary;
256
257     }
258
259
260
261
262
263
```

PROBLEMS PORTS OUTPUT DEBUG CONSOLE TERMINAL

feiride@pop-os:~/00P Java/KidsGame\$

In the player class, I added attributes for each player's name, score, and summary of their results. I did not use the summary of results anywhere for printing to screen, because it was only a requirement to have it included in the class itself.

I did not explicitly create a constructor, instead, each time I got an answer from the user regarding the player's name, I used: ([player.name](#) = input.nextLine())

For the score, I would append it to the respective player object using the same format described above. The same idea for the summary.

The sequence of code for competition loop:

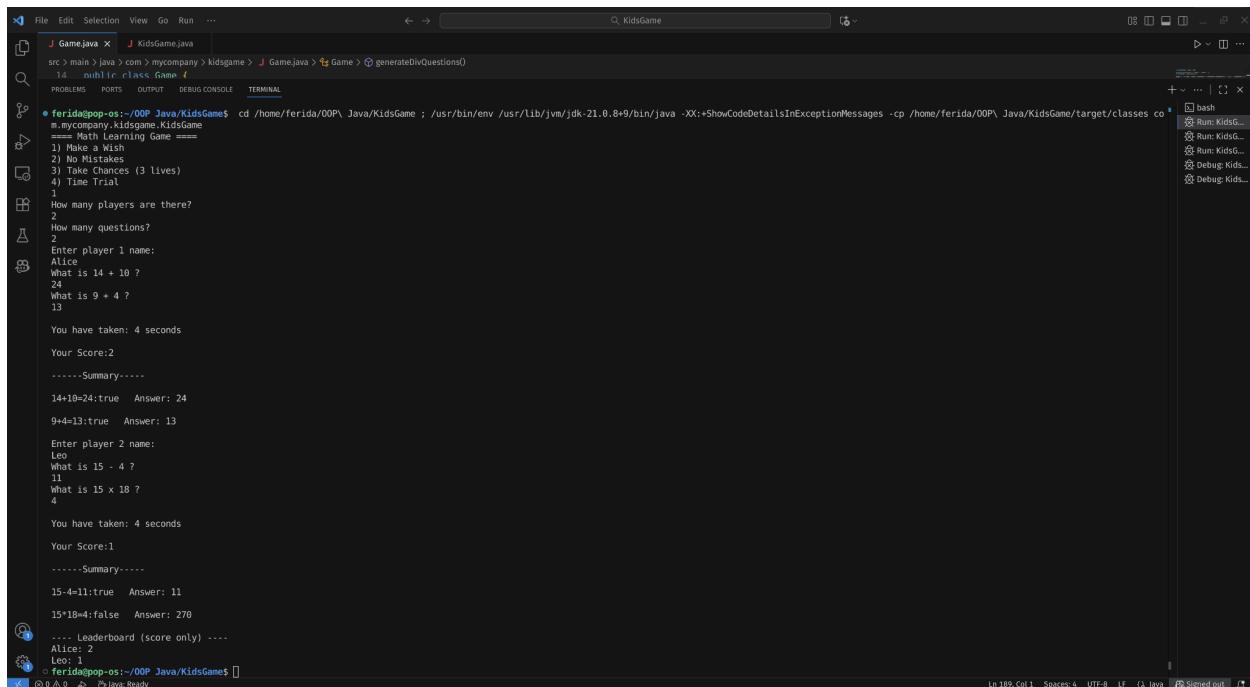
1. I would ask the user for how many players, and store it in a variable called 'players'. Before this, I asked them what mode they wanted to play, stored in 'mode'.
2. Then I had one large if-else-else block to check whether user chose mode = 1, 2,3,or 4.
3. In mode 1, I ask user for how many questions, stored in 'nQuestions'
4. Using the 'players' variable, I used a while ($i \leq players$) → int $i = 1$. Within the while loop, I had a for loop to iterate through nQuestions to ask user.
5. Before the for loop, I would create a new player object, and ask for their name, and reset the game object's summary, and score class variables (so that each user starts from 0).
6. I had created an array of player objects before entering the if-else-else block, using the 'players' variable to determine its size

7. So at the end of each while ($i \leq players$) iteration, I would append `arr_players[i - 1] = player`. (the current iteration player object, with $i-1$ for indexing)
8. For the leaderboard, I used the `Arrays.list(Comparator.comparingInt()).reversed()`, to sort through the scores of each player object. Then I used `reversed()` to order the array from highest to lowest score. These methods were present in the Professor's Arrays in 2D slides.
9. To print the leaderboard, I went through this array in a for loop, to access each score, and print it along with the player's name. This step was done at the very end of the program.

→ These steps are repeated for the rest of the modes. The other modes are in else blocks, with their respective functions/features. However the resetting score, and summary, and while loop condition are the same for all modes for the multiplayer version.

B2

Mode 1:



The screenshot shows a Java IDE interface with a terminal window open. The terminal displays a Java application named 'Game' which is a math learning game. The game asks for player names (Alice and Leo), performs arithmetic operations (14+10=24, 9+4=13, 15-4=11, 15*18=270), and calculates scores (24, 13, 11, 270). It also prints a summary and a leaderboard entry for Alice: 2.

```
src > main > java > com > mycompany > kidsgame > J Game.java > J Game > generateDivQuestions()
14 public class Game {
    ...
    ferida@pop-os:~/OOP Java/KidsGame$ cd /home/ferida/OOP\ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/OOP\ Java/KidsGame/target/classes co...
    m.mycompany.kidsgame.KidsGame
    === Math Learning Game ===
    1) Make a Wish
    2) No Mistakes
    3) Take Chances (3 lives)
    4) Time Trial
    1
    How many players are there?
    2
    How many questions?
    2
    Enter player 1 name:
    Alice
    What is 14 + 10 ?
    24
    What is 9 + 4 ?
    13
    You have taken: 4 seconds
    Your Score:2
    .....Summary.....
    14+10=24:true Answer: 24
    9+4=13:true Answer: 13
    Enter player 2 name:
    Leo
    What is 15 - 4 ?
    11
    What is 15 x 18 ?
    270
    You have taken: 4 seconds
    Your Score:1
    .....Summary.....
    15-4=11:true Answer: 11
    15*18=270:false Answer: 270
    .... Leaderboard (score only) ....
    Alice: 2
    ferida@pop-os:~/OOP Java/KidsGame$
```

Mode 2:

```

feride@op-os:~/0OP Java/KidsGame$ cd /home/ferida/0OP\ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/0OP\ Java/KidsGame/target/classes co...
m.myCompany.KidsGame.KidsGame
2) No Mistakes
3) Take Chances (3 lives)
4) Time Trial
2
How many players are there?
2
Enter player 1 name:
Alice
What is 13 + 3 ?
16
What is 18 + 1 ?
0
The user took 6 seconds
Your Score:1
-----Summary-----
13+3=16:true Answer: 16
18+1=0:false Answer: 19
Enter player 2 name:
Leo
What is 2 + 4 ?
6
What is 2 * 15 ?
17
What is 9 * 10 ?
90
What is 15 * 18 ?
0
The user took 9 seconds
Your Score:3
-----Summary-----
2+4=6:true Answer: 6
2+15=17:true Answer: 17
9*10=90:true Answer: 90
15*18=0:false Answer: 270
.... Leaderboard (score only) ....
Leo: 3
Alice: 1
feride@op-os:~/0OP Java/KidsGame$ 

```

Mode 3-P1 (Leaderboard couldn't fit in screenshot):

```

feride@op-os:~/0OP Java/KidsGame$ cd /home/ferida/0OP\ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/0OP\ Java/KidsGame/target/classes co...
m.myCompany.KidsGame.KidsGame
==== Math Learning Game ====
1) No Mistakes
2) No Mistakes
3) Take Chances (3 lives)
4) Time Trial
3
How many players are there?
2
Enter player 1 name:
Janice
[ Lives = 3 ]
What is 5 / 4 ?
0
[ Lives = 2 ]
What is 13 * 19 ?
0
[ Lives = 1 ]
What is 7 * 19 ?
0
The user took 3 seconds
Your Score:0
-----Summary-----
5/4=0.0:false Answer: 1.25
13*19=0:false Answer: 247
7*19=0:false Answer: 26
Enter player 2 name:
Jerry
[ Lives = 3 ]
What is 9 / 4 ?
4
[ Lives = 2 ]
What is 9 / 10 ?
4
[ Lives = 1 ]
What is 1 - 0 ?
4
The user took 2 seconds
Your Score:0
-----Summary-----
9/4=4.0:false Answer: 2.25
feride@op-os:~/0OP Java/KidsGame$ 

```

Mode 3-P2 (With leaderboard)

```

File Edit Selection View Go Run Terminal Help
PROBLEMS PORTS OUTPUT DEBUG CONSOLE TERMINAL
ferida@pop-os:~/OOP Java/KidsGame$ cd /home/ferida/OOP\ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/OOP\ Java/KidsGame/target/classes co...
m.mycompany.kidsgame.KidsGame
Enter player 1 name:
Janice
[ Lives = 3 ]
What is 5 / 4 ?
0
[ Lives = 2 ]
What is 13 * 19 ?
0
[ Lives = 1 ]
What is 7 + 19 ?
8

The user took 3 seconds
Your Score:0
-----Summary-----
5/4=0.0:false Answer: 1.25
13*19=0.0:false Answer: 247
7+19=0.0:false Answer: 26

Enter player 2 name:
Jerry
[ Lives = 3 ]
What is 9 / 4 ?
4
[ Lives = 2 ]
What is 9 / 10 ?
4
[ Lives = 1 ]
What is 1 - 0 ?
4

The user took 2 seconds
Your Score:0
-----Summary-----
9/4=4.0:false Answer: 2.25
9/10=0.0:false Answer: 0.9
1-0=4.0:false Answer: 1
----- Leaderboard (score only) -----
Janice: 0
Jerry: 0
ferida@pop-os:~/OOP Java/KidsGame$ 

```

Ln 250, Col 35 Spaces: 4 UTF-8 LF { } Java Signed out

Mode 4-P1:

```

File Edit Selection View Go Run Terminal Help
PROBLEMS PORTS OUTPUT DEBUG CONSOLE TERMINAL
ferida@pop-os:~/OOP Java/KidsGame$ cd /home/ferida/OOP\ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/OOP\ Java/KidsGame/target/classes co...
m.mycompany.kidsgame.KidsGame
==== Math Learning Game ====
1) Make A Wish
2) Make Mistakes
3) Take Chances (3 lives)
4) Time Trial
4
How many players are there?
2
Enter player 1 name:
Nia
Enter a time limit (seconds):
3
What is 1 x 2 ?
2
What is 1 - 12 ?
3
What is 8 / 7 ?
1
Time's Up!
Your Score:1
-----Summary-----
1*2=2:true Answer: 2
1-12=3:false Answer: -11
8/7=3.0:false Answer: 1.14

Enter player 2 name:
Leo
Enter a time limit (seconds):
4
What is 4 - 18 ?
4
What is 17 - 18 ?
3
What is 4 - 19 ?
2
What is 17 x 0 ?
0
Time's Up!
Your Score:1
-----Summary-----
4-18=4.0:false Answer: -14
17-18=3.0:false Answer: -1
4-19=2.0:false Answer: -15
ferida@pop-os:~/OOP Java/KidsGame$ 

```

Ln 250, Col 35 Spaces: 4 UTF-8 LF { } Java Signed out

Mode 4-P2:

A screenshot of a terminal window titled "KidsGame". The window shows a Java application running. The application asks for player names (Nia and Leo), sets a time limit (1 minute), and asks several math questions (e.g., 1x2=2?, 1-12=3?, 8/7=?). It provides answers and scores (-2, -11, 1.14 for Nia; -14, -1, -15, 0 for Leo). A summary section shows results for 4-18=4, 17-18=3, 4-19=2, and 17*0=0. Finally, it displays a leaderboard with Nia at 1 and Leo at 1.

```
feride@pop-os:~/OOP Java/KidsGame$ cd /home/ferida/OOP\ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/OOP\ Java/KidsGame/target/classes co...  
m.myCompany.Kidsgame.KidsGame  
How many players are there?  
2  
Enter player 1 name:  
Nia  
Enter a time limit (seconds):  
3  
What is 1 x 2 ?  
2  
What is 1 - 12 ?  
3  
What is 8 / 7 ?  
3  
Time's Up!  
Your Score:1  
.....Summary.....  
1x2=2:true Answer: 2  
1-12=3:false Answer: -11  
8/7=3.0:false Answer: 1.14  
Enter player 2 name:  
Leo  
Enter a time limit (seconds):  
4  
What is 4 - 18 ?  
4  
What is 17 - 18 ?  
3  
What is 4 - 19 ?  
2  
What is 17 x 0 ?  
0  
Time's Up!  
Your Score:1  
.....Summary.....  
4-18=4:false Answer: -14  
17-18=3:false Answer: -1  
4-19=2:false Answer: -15  
17*0=0:true Answer: 0  
..... Leaderboard (score only) ....  
Nia: 1  
Leo: 1  
feride@pop-os:~/OOP Java/KidsGame$
```