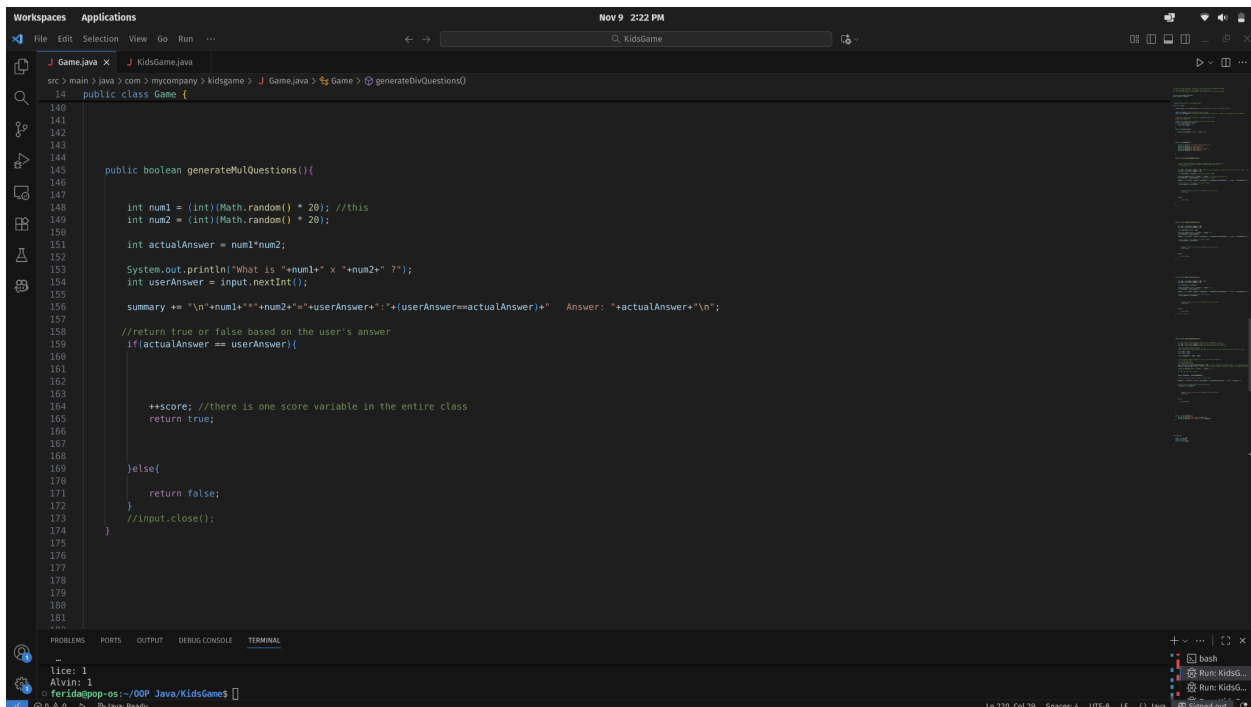
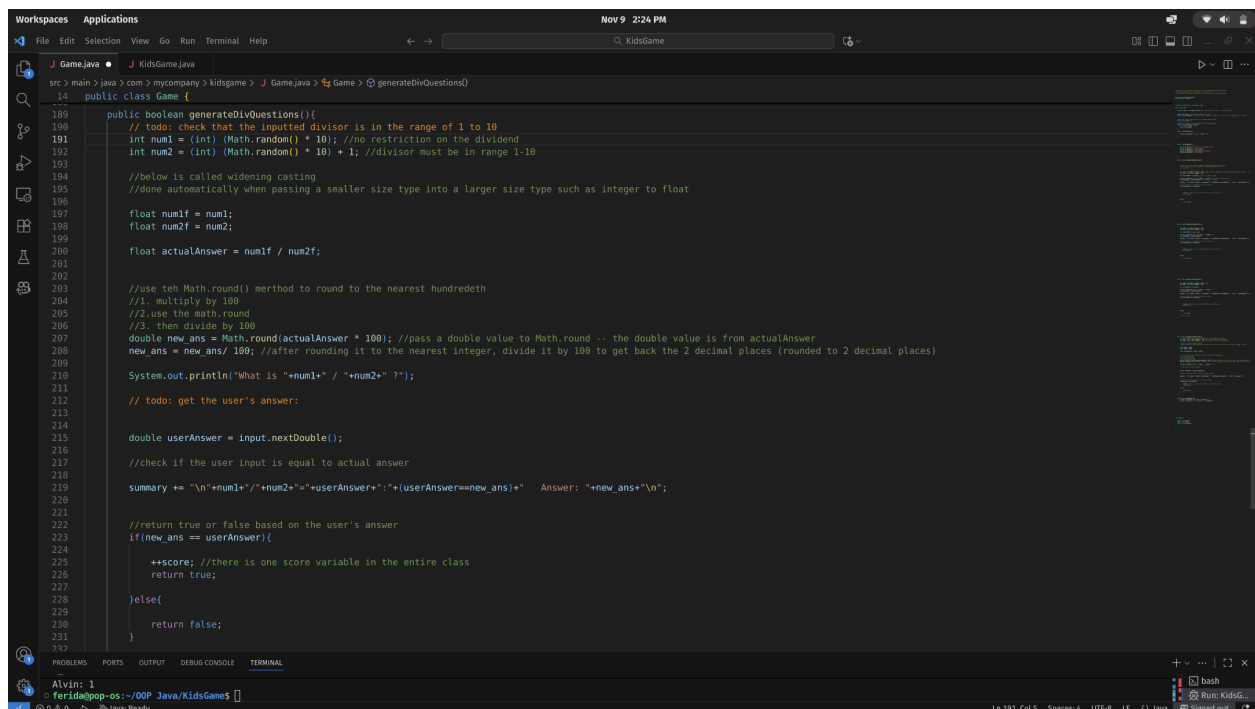


A1:



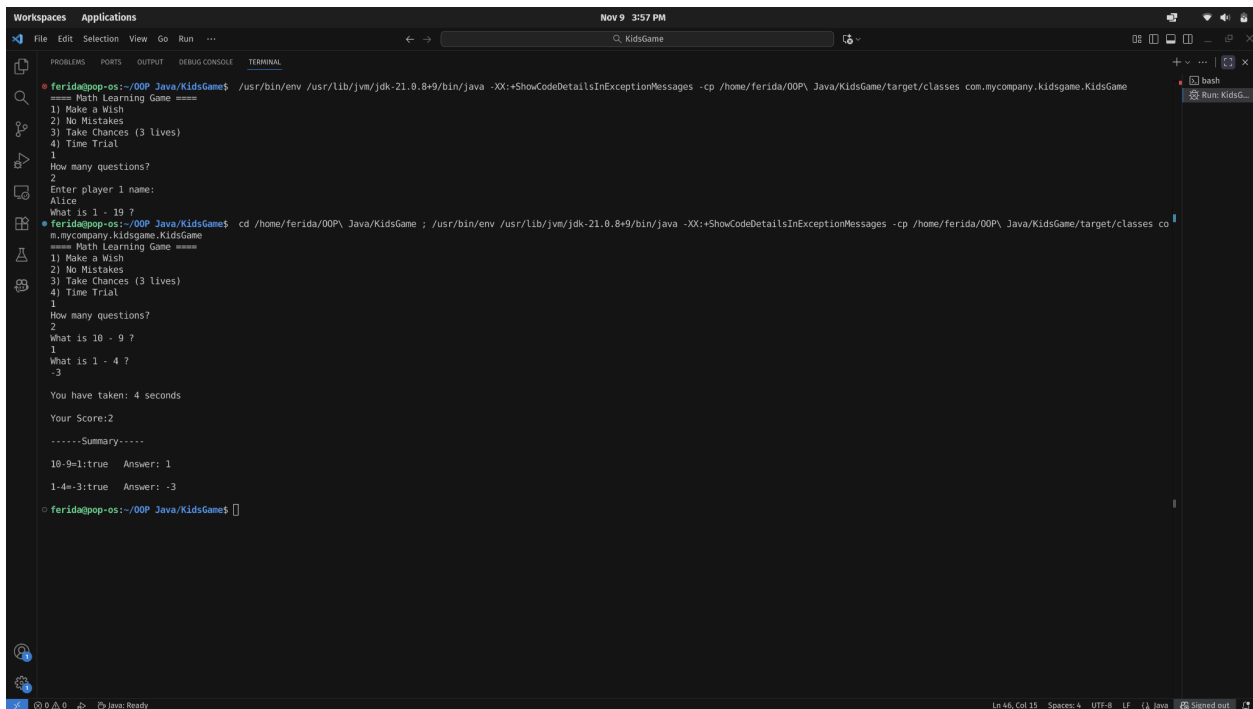
```
src > main > java > com > mycompany > kidsgame > J Game.java > Game > generateMulQuestions()
14 public class Game {
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147
148     int num1 = (int)(Math.random() * 20); //this
149     int num2 = (int)(Math.random() * 20);
150
151     int actualAnswer = num1*num2;
152
153     System.out.println("What is "+num1+" x "+num2+" ?");
154     int userAnswer = input.nextInt();
155
156     summary += "\n"+num1+"*"+num2+"="+userAnswer+" "+(userAnswer==actualAnswer)+" Answer: "+actualAnswer+"\n";
157
158     //return true or false based on the user's answer
159     if(actualAnswer == userAnswer){
160
161
162
163
164
165         ++score; //there is one score variable in the entire class
166         return true;
167
168     }else{
169
170         return false;
171     }
172     //input.close();
173 }
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```



```
189 public boolean generateDivQuestions(){
190     // todo: check that the inputted divisor is in the range of 1 to 10
191     int num1 = (int) (Math.random() * 10); //no restriction on the dividend
192     int num2 = (int) (Math.random() * 10) + 1; //divisor must be in range 1-10
193
194     //below is called widening casting
195     //done automatically when passing a smaller size type into a larger size type such as integer to float
196
197     float num1f = num1;
198     float num2f = num2;
199
200     float actualAnswer = num1f / num2f;
201
202
203     //use the Math.round() method to round to the nearest hundredth
204     //1. multiply by 100
205     //2. use the math.round
206     //3. then divide by 100
207     double new_ans = Math.round(actualAnswer * 100); //pass a double value to Math.round -- the double value is from actualAnswer
208     new_ans = new_ans / 100; //after rounding it to the nearest integer, divide it by 100 to get back the 2 decimal places (rounded to 2 decimal places)
209
210     System.out.println("What is "+num1+" / "+num2+" ?");
211
212     // todo: get the user's answer:
213
214
215     double userAnswer = input.nextDouble();
216
217     //check if the user input is equal to actual answer
218
219     summary += "\n"+num1+"/"+num2+"="+userAnswer+"; "+(userAnswer==new_ans)+"    Answer: "+new_ans+"\n";
220
221
222     //return true or false based on the user's answer
223     if(new_ans == userAnswer){
224
225         ++score; //there is one score variable in the entire class
226         return true;
227     }else{
228
229         return false;
230     }
231
232 }
```

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



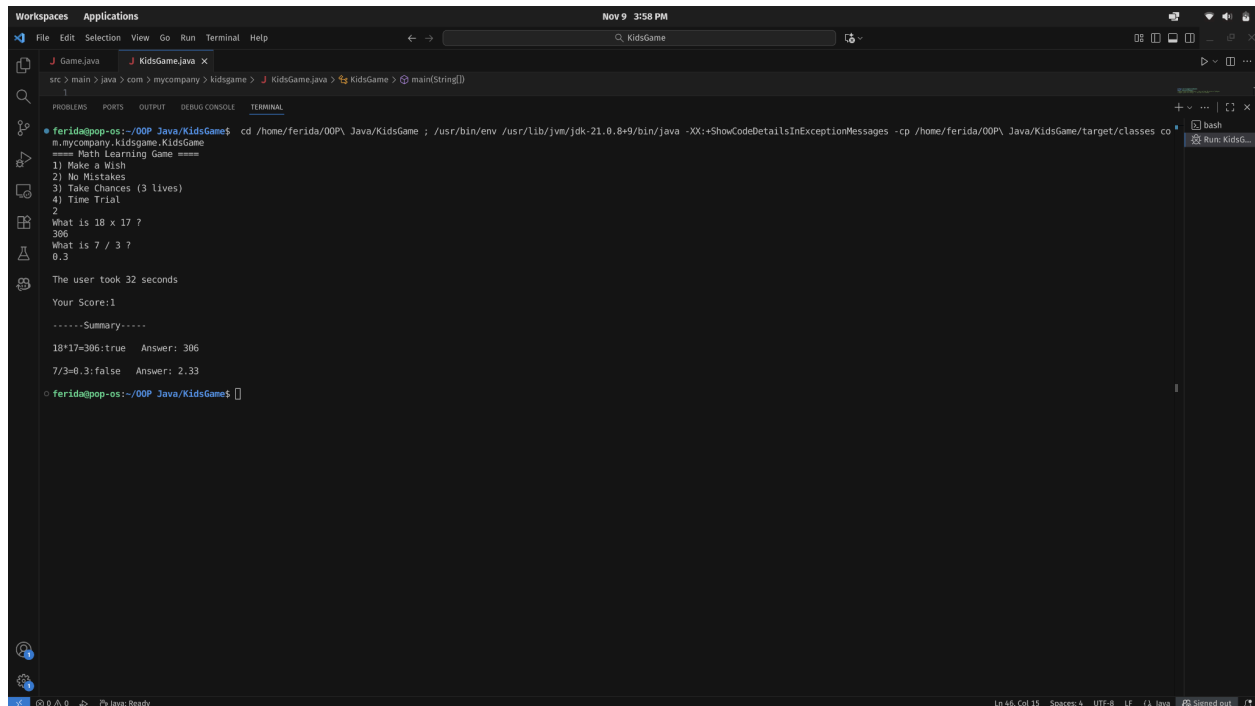
```
Workspaces Applications Nov 9 3:57 PM
File Edit Selection View Go Run ...
PROBLEMS PORTS OUTPUT DEBUG CONSOLE TERMINAL
ferida@pop-os:~/OOP Java/KidsGame$ /usr/bin/env /usr/lib/jvm/jdk-21.0.8-9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/OOP Java/KidsGame/target/classes com.mycompany.kidsgame.KidsGame
===== Math Learning Game =====
1) Make a Wish
2) No Mistakes
3) Take Chances (3 lives)
4) Time Trial
1
How many questions?
2
Enter player 1 name:
Alice
What is 1 - 19 ?
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 questions?
2
What is 10 - 9 ?
1
What is 1 - 4 ?
-3
You have taken: 4 seconds
Your Score:2
-----Summary-----
10-9=1:true Answer: 1
1-4=-3:true Answer: -3
ferida@pop-os:~/OOP Java/KidsGame$
```

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.



```
src > main > java > com > mycompany > kidsgame > KidsGame.java > KidsGame > main(String[])
1

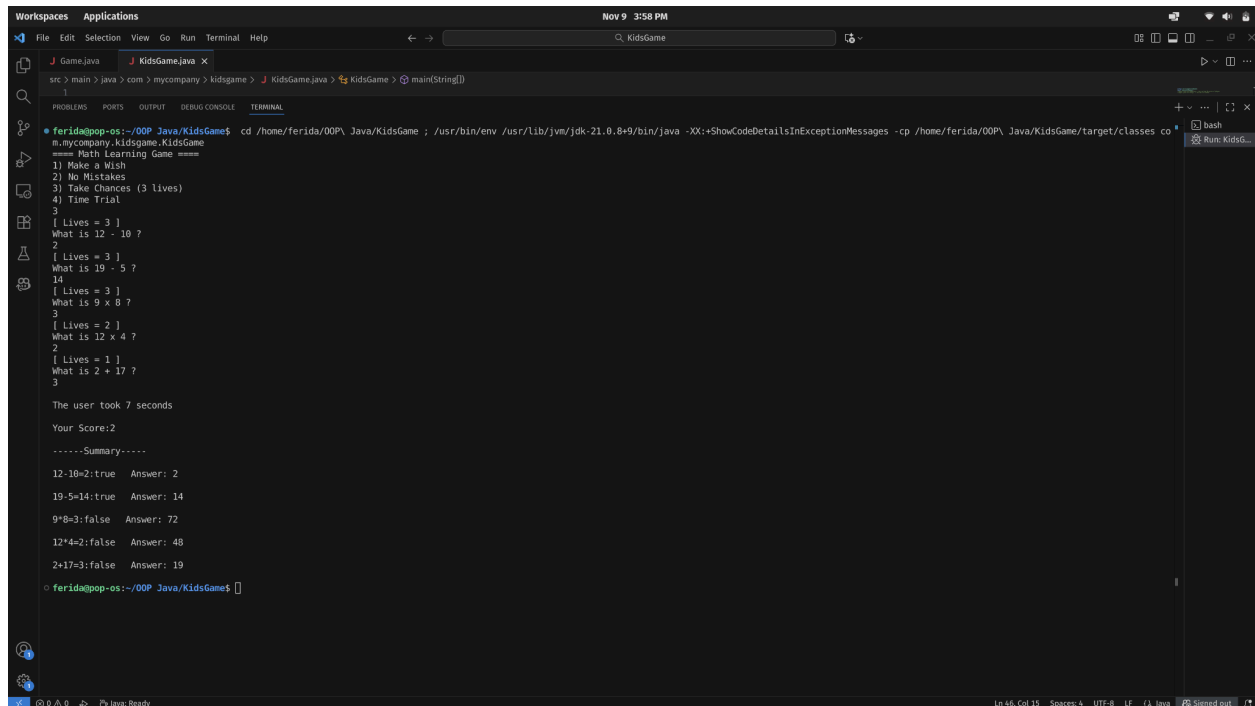
PROBLEMS  PORTS  OUTPUT  DEBUG CONSOLE  TERMINAL

ferida@pop-os:~/00P Java/KidsGame$ cd /home/ferida/00P\ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/00P\ Java/KidsGame/target/classes co
n.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:~/00P 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.



```
src > main > java > com > mycompany > kidsgame > KidsGame > main(String[])
1

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
n.mycompany.kidsgame.KidsGame
===== Math Learning Game =====
1) Make a Wish
2) No Mistakes
3) Take Chances (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 x 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@pop-os:~/OOP Java/KidsGame$
```

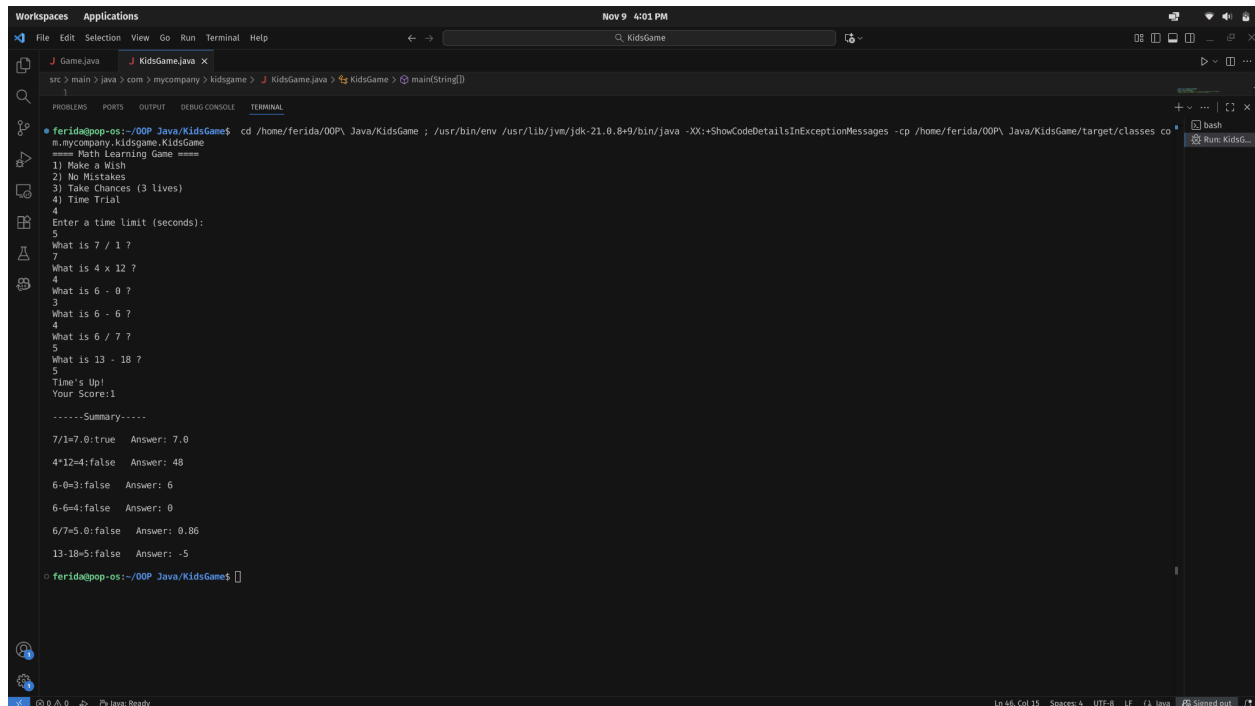
For mode 3 above (single user), I used the concept of encapsulation. Within my game class, I have a private variable called lives which is set to 3. Then I have defined a setter class called set_lives(userInput), and a getter called get_lives.

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



```
src > main > java > com > mycompany > kidsgame > KidsGame.java > KidsGame > main(String[])
1
PROBLEMS PORTS OUTPUT DEBUG CONSOLE TERMINAL
ferida@pop-os:~/00P Java/KidsGame$ cd /home/ferida/00P\ Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/00P\ 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
4
Enter a time limit (seconds):
5
What is 7 / 1 ?
7
What is 4 x 12 ?
4
What is 6 - 0 ?
3
What is 6 - 6 ?
4
What is 6 / 7 ?
5
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=3:false Answer: 6
6-6=0:false Answer: 0
6/7=5.0:false Answer: 0.86
13-18=-5:false Answer: -5
ferida@pop-os:~/00P Java/KidsGame$
```

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 $(\text{the current time}) < (\text{startTime} + \text{timeLimit})$

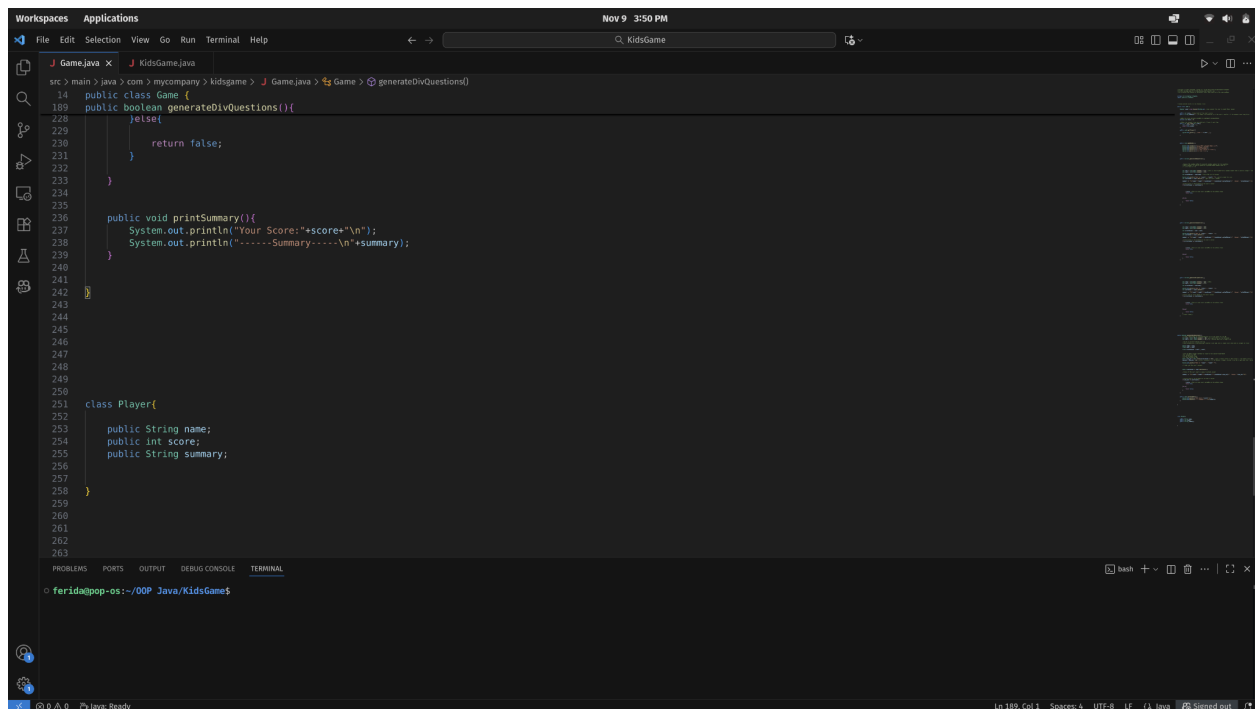
The current time was different from the `startTime` of the while loop, because it was calculated at the beginning of each iteration.

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 > generateDivQuestions()
14 public class Game {
109 public boolean generateDivQuestions(){
228     ifelse{
229         return false;
230     }
231 }
232
233 }
234
235 public void printSummary(){
236     System.out.println("Your Score:"+score+"\n");
237     System.out.println("-----Summary-----\n"+summary);
238 }
239
240
241
242 }
243
244
245
246
247
248
249
250
251 class Player{
252     public String name;
253     public int score;
254     public String summary;
255 }
256
257
258
259
260
261
262
263
```

PROBLEMS PORTS OUTPUT DEBUG CONSOLE TERMINAL

ferida@pop-os:~/OOP 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:

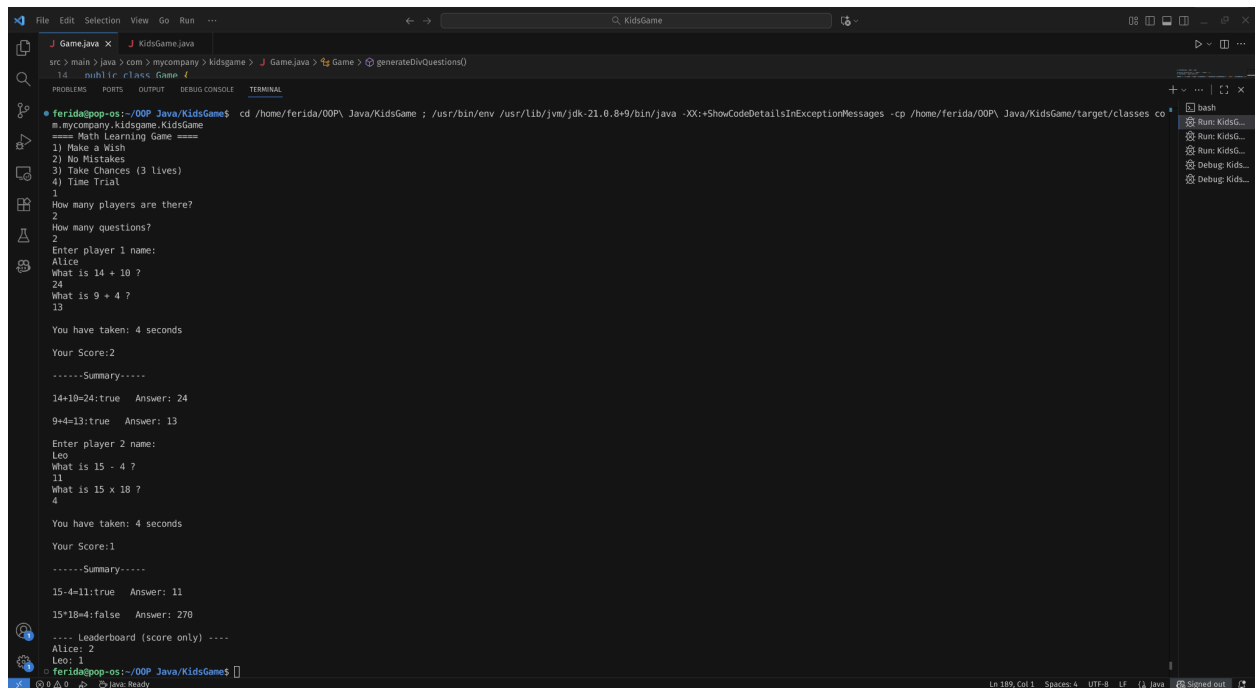
1. I would ask the user for how many players, and store it in a variable called 'players'. Before this, I asked them what mode they wanted to play, stored in 'mode'.
2. Then I had one large if-else-else-else block to check whether user chose mode = 1, 2,3,or 4.
3. In mode 1, I ask user for how many questions, stored in 'nQuestions'
4. Using the 'players' variable, I used a while (i<=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-else block, using the 'players' variable to determine its size

7. So at the end of each while ($i \leq \text{players}$) 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:



```
src > main > java > com > mycompany > kidsgame > J Game.java > 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
w.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 ?
4
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
Leo: 1
ferida@pop-os:~/OOP Java/KidsGame$
```

Mode 2:

```
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
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 ?
19
The user took 6 seconds
Your Score:1
-----Summary-----
13+3=16:true  Answer: 16
18+1=19:false Answer: 19
Enter player 2 name:
Leo
What is 2 + 4 ?
6
What is 2 + 15 ?
17
What is 9 x 10 ?
90
What is 15 x 18 ?
270
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=270:false Answer: 270
---- Leaderboard (score only) ----
Leo: 3
Alice: 1
ferida@pop-os:~/OOP Java/KidsGame$
```

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

```
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
3
How many players are there?
3
Enter player 1 name:
Janice
[ Lives = 3 ]
What is 5 / 4 ?
0
[ Lives = 2 ]
What is 13 x 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=247:false Answer: 247
7+19=26: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
```

Mode 3-P2 (With leaderboard)

```
File Edit Selection View Go Run Terminal Help
KidsGame

ferida@pop-os:~/OOOP/Java/KidsGame$ cd /home/ferida/OOOP/Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/OOOP/Java/KidsGame/target/classes co
a.mycompany.kidsgame.KidsGame
Enter player 1 name:
Janice
[ Lives = 3 ]
What is 5 / 4 ?
0
[ Lives = 2 ]
What is 13 x 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
9/10=4.0:false Answer: 0.9
1-0=4:false Answer: 1
---- Leaderboard (score only) ----
Janice: 0
Jerry: 0
ferida@pop-os:~/OOOP/Java/KidsGame$
```

Mode 4-P1:

```
File Edit Selection View Go Run Terminal Help
KidsGame

ferida@pop-os:~/OOOP/Java/KidsGame$ cd /home/ferida/OOOP/Java/KidsGame ; /usr/bin/env /usr/lib/jvm/jdk-21.0.8+9/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /home/ferida/OOOP/Java/KidsGame/target/classes co
a.mycompany.kidsgame.KidsGame
===== Math Learning Game =====
1) Make a Wish
2) No Mistakes
3) Take Chances (3 lives)
4) Time Trial
4
How many players are there?
2
Enter player 1 name:
Mia
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-----
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:false Answer: -14
17-18=3:false Answer: -1
4-19=2:false Answer: -15
```

Mode 4-P2:

```
File Edit Selection View Go Run Terminal Help
K: 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
a.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-----
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: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
ferida@pop-os:~/OOP Java/KidsGame$
```