

AnimationWrapper

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
AnimationWrapper()		0%		n/a	1	1	3	3	1	1
setOnFinished(EventHandler)		0%		n/a	1	1	2	2	1	1
play()		0%		n/a	1	1	2	2	1	1
getChildren()		0%		n/a	1	1	1	1	1	1
Total	21 of 21	0%	0 of 0	n/a	4	4	8	8	4	4

Created with JaCoCo 0.8.12.202403310830

AnimationWrapper.java

```
1. package com.example.project.controllers.gameScreens.animations;
2.
3. import javafx.animation.Animation;
4. import javafx.animation.SequentialTransition;
5. import javafx.collections.ObservableList;
6. import javafx.event.ActionEvent;
7. import javafx.event.EventHandler;
8.
9. /**
10. * Animation wrapper class for our projects animations that get used.
11. */
12. public abstract class AnimationWrapper
13. {
14.     protected final SequentialTransition sequentialAnimation;
15.
16.     protected AnimationWrapper() {
17.         this.sequentialAnimation = new SequentialTransition();
18.     }
19.
20.     /**
21.      * play.
22.     */
23.     public void play() {
24.         sequentialAnimation.play();
25.     }
26.
27.     /**
28.      * Set on finished.
29.      * @param handler actions to do.
30.     */
31.     public void setOnFinished(EventHandler<ActionEvent> handler) {
32.         sequentialAnimation.setOnFinished(handler);
33.     }
34.
35.     /**
36.      * returns animations children.
37.      * @return list of animations.
38.     */
39.     public ObservableList<Animation> getChildren(){
40.         return this.sequentialAnimation.getChildren();
41.     }
42. }
```

com.example.project.controllers.gameScreens.animations

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
C LevelScoreSequence		0%		0%	3	3	19	19	2	2	1	1
C TextEmphasisAnimation		0%		n/a	3	3	16	16	3	3	1	1
C ScoreTimeline		0%		0%	5	5	17	17	4	4	1	1
C InfiniteFloatingAnimation		0%		n/a	4	4	14	14	4	4	1	1
C AnimationWrapper		0%		n/a	4	4	8	8	4	4	1	1
Total	335 of 335	0%	4 of 4	0%	19	19	74	74	17	17	5	5

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com.example.project.models.tiles

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
C UpgradeEffects	0%	0%	0%	0%	17	17	42	42	8	8	1	1
C ScrabbleTileProvider	100%	100%	100%	100%	0	7	0	45	0	5	0	1
C UpgradeTileModel	100%	100%	n/a	n/a	0	7	0	13	0	7	0	1
C UpgradeTileModel.UpgradeBuilder	100%	100%	n/a	n/a	0	7	0	7	0	7	0	1
C LetterTileModel	100%	100%	n/a	n/a	0	4	0	8	0	4	0	1
C TileModel	100%	100%	n/a	n/a	0	3	0	5	0	3	0	1
C EmptyTileSlotModel	100%	100%	n/a	n/a	0	4	0	6	0	4	0	1
C ScrabbleTileProvider.ScrabbleTileData	100%	100%	n/a	n/a	0	1	0	1	0	1	0	1
Total	204 of 738	72%	18 of 22	18%	17	50	42	127	8	39	1	8

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com.example.project.models.tiles

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
UpgradeEffects.java		0%		0%	17	17	42	42	8	8	1	1
ScrabbleTileProvider.java		100%		100%	0	8	0	46	0	6	0	2
UpgradeTileModel.java		100%		n/a	0	14	0	20	0	14	0	2
LetterTileModel.java		100%		n/a	0	4	0	8	0	4	0	1
TileModel.java		100%		n/a	0	3	0	5	0	3	0	1
EmptyTileSlotModel.java		100%		n/a	0	4	0	6	0	4	0	1
Total	204 of 738	72%	18 of 22	18%	17	50	42	127	8	39	1	8

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User

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
User(String, String, int)	100%		n/a		0	1	0	5	0	1
getHighscore()	100%		n/a		0	1	0	1	0	1
getUsername()	100%		n/a		0	1	0	1	0	1
getPassword()	100%		n/a		0	1	0	1	0	1
Total	0 of 23	100%	0 of 0	n/a	0	4	0	8	0	4

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User.java

```
1. package com.example.project.models;
2.
3. /**
4.  * Represents a user in the application that can log in.
5. */
6. public class User {
7.
8.     private final String username;
9.
10.    private final String password;
11.
12.    private final Integer highscore;
13.
14.    /**
15.     * Constructor.
16.     * @param username username.
17.     * @param password password.
18.     * @param highscore highscore.
19.     */
20.    public User(String username, String password, int highscore)
21.    {
22.        this.hightscore = highscore;
23.        this.username = username;
24.        this.password = password;
25.    }
26.
27.    /**
28.     * get username.
29.     * @return username.
30.     */
31.    public String getUsername(){
32.        return username;
33.    }
34.
35.    /**
36.     * get password.
37.     * @return password.
38.     */
39.    public String getPassword(){
40.        return password;
41.    }
42.
43.    /**
44.     * get highscore.
45.     * @return returns highscore.
46.     */
47.    public int getHighscore(){
48.        return this.hightscore;
49.    }
50.
51. }
```

com.example.project.models

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed Cxty	Missed Lines	Missed Methods	Missed Classes
G User	<div style="width: 100%;">100%</div>	100%	n/a	0	4	0	8	0
Total	0 of 23	100%	0 of 0	n/a	0	4	0	4

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com.example.project.models

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
User.java	<div style="width: 100%;">100%</div>		n/a		0	4	0	8	0	4	0	1
Total	0 of 23	100%	0 of 0	n/a	0	4	0	8	0	4	0	1

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UpgradeTiles

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
static {...}	0%		n/a		1	1	38	38	1	1
getRandomUpgradeTile()	0%		n/a		1	1	2	2	1	1
getTile(int)	0%		n/a		1	1	1	1	1	1
UpgradeTiles()	0%		n/a		1	1	1	1	1	1
Total	130 of 130	0%	0 of 0	n/a	4	4	42	42	4	4

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UpgradeTiles.java

```

1. package com.example.project.services.shopItems;
2.
3. import com.example.project.models.tiles.UpgradeEffects;
4. import com.example.project.models.tiles.UpgradeTileModel;
5.
6. import java.util.Arrays;
7. import java.util.List;
8. import java.util.Random;
9.
10. /**
11. * Static class to store all the possible upgrade tiles available in the game.
12. */
13. public class UpgradeTiles {
14.
15.     private static final List<UpgradeTileModel> upgradeTiles = Arrays.asList(
16.         new UpgradeTileModel.UpgradeBuilder()
17.             .name("Grandma's Glasses")
18.             .description("Add +2 to the score multiplier for every identical pair of letters next to each other.")
19.             .imagePath("/com/example/project/upgradeTileImages/GrandmasGlasses_small.png")
20.             .cost(2)
21.             .upgradeEffect(UpgradeEffects::glassesEffect)
22.             .build(),
23.
24.         new UpgradeTileModel.UpgradeBuilder()
25.             .name("Loaded Dice")
26.             .description("Value is doubled for a random letter in your word.")
27.             .imagePath("/com/example/project/upgradeTileImages/LoadedDice_small.png")
28.             .cost(2)
29.             .upgradeEffect(UpgradeEffects::diceEffect)
30.             .build(),
31.
32.         new UpgradeTileModel.UpgradeBuilder()
33.             .name("Lucky Coin")
34.             .description("20% Chance your total word score is doubled.")
35.             .imagePath("/com/example/project/upgradeTileImages/LuckyCoin_small.png")
36.             .cost(2)
37.             .upgradeEffect(UpgradeEffects::coinEffect)
38.             .build(),
39.
40.         new UpgradeTileModel.UpgradeBuilder()
41.             .name("Compact Mirror")
42.             .description("Whenever a palindrome is played, double the word's base score. (A palindrome is a word that is spelt the same backwards as forwards, e.g. LEVEL.)")
43.             .imagePath("/com/example/project/upgradeTileImages/CompactMirror.png")
44.             .cost(2)
45.             .upgradeEffect(UpgradeEffects::mirrorEffect)
46.             .build(),
47.
48.         new UpgradeTileModel.UpgradeBuilder()
49.             .name("Friendship Bracelet")
50.             .description("Add +1 to the score multiplier for every consecutive letter in alphabetical order.")
51.             .imagePath("/com/example/project/upgradeTileImages/FriendshipBracelet.png")
52.             .cost(2)
53.             .upgradeEffect(UpgradeEffects::braceletEffect)
54.             .build(),
55.
56.         new UpgradeTileModel.UpgradeBuilder()
57.             .name("Lost Button")
58.             .description("Add +5 to the base word score for every X on the tile rack.")
59.             .imagePath("/com/example/project/upgradeTileImages/LostButton.png")
60.             .cost(2)
61.             .upgradeEffect(UpgradeEffects::buttonEffect)
62.             .build(),
63.
64.     );
65.
66.     private static final Random random = new Random();
67.
68.     /**
69.      * Gets random upgrade tile.
70.      * @return returns upgrade tile.
71.      */
72.     public static UpgradeTileModel getRandomUpgradeTile() {
73.         var randomNum = random.nextInt(0, upgradeTiles.size());
74.         return upgradeTiles.get(randomNum);
75.     }
76.
77.     /**
78.      * Gets the upgrade tile at index.
79.      * @param index tile to get.
80.      * @return an upgrade tile model.
81.      */
82.     public static UpgradeTileModel getTile(int index) { return upgradeTiles.get(index); }
83.
84.
85. }

```

com.example.project.services.shopItems

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
UpgradeTiles		0%		n/a	4	4	42	42	4	4	1	1
Total	130 of 130	0%	0 of 0	n/a	4	4	42	42	4	4	1	1

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com.example.project.services.shopItems

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
UpgradeTiles.java	0%		n/a		4	4	42	42	4	4	1	1
Total	130 of 130	0%	0 of 0	n/a	4	4	42	42	4	4	1	1

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com.example.project.controllers.gameScreens.animations

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
LevelScoreSequence.java		0%		0%	3	3	19	19	2	2	1	1
TextEmphasisAnimation.java		0%		n/a	3	3	16	16	3	3	1	1
ScoreTimeline.java		0%		0%	5	5	17	17	4	4	1	1
InfiniteFloatingAnimation.java		0%		n/a	4	4	14	14	4	4	1	1
AnimationWrapper.java		0%		n/a	4	4	8	8	4	4	1	1
Total	335 of 335	0%	4 of 4	0%	19	19	74	74	17	17	5	5

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GameMusicPlayer

Element	Missed Instructions Cov.	Missed Branches Cov.	Missed Cxtys	Missed Lines	Missed Methods
GameMusicPlayer()	100%	n/a	0 1	0 2	0 1
playGameMusicLoop()	100%	n/a	0 1	0 2	0 1
Total	0 of 10	100%	0 of 0	n/a	0 2

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GameMusicPlayer.java

```
1. package com.example.project.services.sound;
2.
3. import javax.sound.sampled.*;
4.
5. /**
6.  * Plays the game music track on repeat.
7. */
8. public class GameMusicPlayer extends GameSoundPlayer
9. {
10.     private static final String clipPath = "/com/example/project/Sounds/puzzleMusic_converted.wav";
11.
12.     /**
13.      * Create new instance of game music player.
14.      */
15.     public GameMusicPlayer()
16.     {
17.         super(clipPath, -3);
18.     }
19.
20.     /**
21.      * play game music loop continuously.
22.      */
23.     public void playGameMusicLoop()
24.     {
25.         clip.loop(Clip.LOOP_CONTINUOUSLY);
26.     }
27. }
```

GameSoundPlayer

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
convertFile(String)		100%		100%	0	2	0	21	0	1
GameSoundPlayer(String, Logger, float)		100%		n/a	0	1	0	8	0	1
GameSoundPlayer(String, Logger)		100%		n/a	0	1	0	6	0	1
GameSoundPlayer(String)		100%		n/a	0	1	0	5	0	1
GameSoundPlayer(String, float)		100%		n/a	0	1	0	4	0	1
changeVolume(float)		100%		n/a	0	1	0	3	0	1
replay()		100%		n/a	0	1	0	3	0	1
unMute()		100%		n/a	0	1	0	2	0	1
mute()		100%		n/a	0	1	0	2	0	1
Total	0 of 174	100%	0 of 2	100%	0	10	0	50	0	9

Created with JaCoCo 0.8.12.202403310830

GameSoundPlayer.java

```
1. package com.example.project.services.sound;
2.
3. import com.example.project.services.Logger;
4.
5. import javax.sound.sampled.*;
6. import java.io.BufferedInputStream;
7. import java.io.IOException;
8. import java.io.InputStream;
9.
10.
11. /**
12.  * plays an audio clip as a sound effect for the game.
13. */
14. public class GameSoundPlayer
15. {
16.     private Logger logger = new Logger();
17.     protected final Clip clip;
18.     private float defaultGain = 0f;
19.
20.     /**
21.      * creates a new instance of GameSoundPlayer
22.      * @param filePath filepath to sound.
23.     */
24.     public GameSoundPlayer(String filePath)
25.     {
26.         clip = convertFile(filePath);
27.     }
28.
29.     protected GameSoundPlayer(String filePath, Logger logger)
30.     {
31.         this.logger = logger;
32.         clip = convertFile(filePath);
33.     }
34.
35.     protected GameSoundPlayer(String filePath, Logger logger, float gainAmount)
36.     {
37.         this.logger = logger;
38.         clip = convertFile(filePath);
39.         defaultGain = gainAmount;
40.         changeVolume(gainAmount);
41.     }
42.
43.     /**
44.      * creates a new instance of GameSoundPlayer
45.      * @param filePath filepath to sound.
46.      * @param gainAmount volume to set the clip at
47.     */
48.     public GameSoundPlayer(String filePath, float gainAmount)
49.     {
50.         this(filePath);
51.         defaultGain = gainAmount;
52.         changeVolume(gainAmount);
53.     }
54.
55.     /**
56.      * Reset clip and then play.
57.     */
58.     public void replay() {
59.         clip.setFramePosition(0);
60.         clip.start();
61.     }
62.
63.     /**
64.      * Change the current clips volume. -80f muted 0f is normal volume.
65.      * @param vol volume.
66.     */
67.     private void changeVolume(float vol)
68.     {
69.         FloatControl volumeControl = (FloatControl) clip.getControl(FloatControl.Type.MASTER_GAIN);
70.         volumeControl.setValue(vol);
71.     }
72.
73.     /**
74.      * set clip volume to mute.
75.     */
76.     public void mute()
77.     {
78.         changeVolume(-80f);
```

```

79. }
80.
81. /**
82. * Set clip to its default volume.
83. */
84. public void unMute(){
85.     changeVolume(defaultGain);
86. }
87.
88. /**
89. * File must be in a specific format for javax.sound.samples library. :(
90. * @param filePath file location.
91. * @return returns clip in correct format.
92. */
93. private Clip convertFile(String filePath) {
94.     Clip convertedClip;
95.
96.     InputStream resourceStream = GameMusicPlayer.class.getResourceAsStream(filePath);
97.     if (resourceStream == null)
98.     {
99.         var errorMessage = String.format("Sound file not found. No sound file at %s", filePath);
100.        this.logger.logError(errorMessage);
101.        throw new IllegalArgumentException(errorMessage);
102.    }
103.
104.    try {
105.        BufferedInputStream bufferedStream = new BufferedInputStream(resourceStream);
106.        AudioInputStream originalStream = AudioSystem.getAudioInputStream(bufferedStream);
107.
108.        AudioFormat targetFormat = new AudioFormat(
109.            AudioFormat.Encoding.PCM_SIGNED,
110.            44100.0f, 16, 2, 4, 44100.0f, false
111.        );
112.
113.        AudioInputStream convertedStream = AudioSystem.getAudioInputStream(targetFormat, originalStream);
114.
115.        convertedClip = AudioSystem.getClip();
116.        convertedClip.open(convertedStream);
117.
118.        convertedStream.close();
119.        originalStream.close();
120.        bufferedStream.close();
121.        resourceStream.close();
122.    }
123.    catch (UnsupportedAudioFileException | IOException | LineUnavailableException e)
124.    {
125.        var message = "Error loading sound file: " + e.getMessage();
126.        this.logger.logError(message);
127.        throw new IllegalArgumentException(message);
128.    }
129.
130.    return convertedClip;
131. }
132. }

```

com.example.project.services.sound

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
C GameSoundPlayer	100%	100%	100%	n/a	0	10	0	50	0	9	0	1
C GameMusicPlayer	100%	100%		n/a	0	2	0	4	0	2	0	1
Total	0 of 184	100%	0 of 2	100%	0	12	0	54	0	11	0	2

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com.example.project.services.sound

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
GameSoundPlayer.java	100%	100%	100%	n/a	0	10	0	50	0	9	0	1
GameMusicPlayer.java	100%	100%	n/a	n/a	0	2	0	4	0	2	0	1
Total	0 of 184	100%	0 of 2	100%	0	12	0	54	0	11	0	2

Created with JaCoCo 0.8.12.202403310830

DictionaryDAO

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
getWordDefinition(String)	100%	100%	100%	100%	0	3	0	20	0	1
isWordInDictionary(String)	100%	100%	n/a	n/a	0	1	0	9	0	1
DictionaryDAO()	100%	100%	n/a	n/a	0	1	0	4	0	1
DictionaryDAO(Connection, Logger)	100%	100%	n/a	n/a	0	1	0	4	0	1
Total	0 of 137	100%	0 of 4	100%	0	6	0	37	0	4

Created with JaCoCo 0.8.12.202403310830

DictionaryDAO.java

```
1. package com.example.project.services.sqlite.dAOs;
2.
3. import com.example.project.services.Logger;
4. import com.example.project.services.SQLiteDictionaryConnection;
5.
6. import java.sql.*;
7. import java.util.ArrayList;
8. import java.util.List;
9.
10. /**
11. * The SQLite Dictionary. The connection returned from SQLiteDictionaryConnection().getInstance() is always the same.
12. */
13. public class DictionaryDAO
14. {
15.     private final Connection connection;
16.     private final Logger logger;
17.
18.     /**
19.      * Constructor for this class SQLLiteDictionary.
20.     */
21.     public DictionaryDAO()
22.     {
23.         this.connection = new SQLiteDictionaryConnection().getInstance();
24.         this.logger = new Logger();
25.     }
26.
27.     /**
28.      * constructor with injection for tests.
29.      * @param connection mock connection.
30.      * @param logger a mock logger.
31.     */
32.     public DictionaryDAO(Connection connection, Logger logger) {
33.         this.connection = connection;
34.         this.logger = logger;
35.     }
36.
37.     /**
38.      * gets the words definition.
39.      * @param wordToFind Word to get definition of.
40.      * @return Returns the definition.
41.     */
42.     public String getWordDefinition(String wordToFind)
43.     {
44.         List<String> definitions = new ArrayList<>();
45.         try
46.         {
47.             wordToFind = wordToFind.trim();
48.             PreparedStatement query = connection.prepareStatement("SELECT wordtype, definition FROM entries WHERE word = ? COLLATE NOCASE");
49.             query.setString(1, wordToFind);
50.             ResultSet result = query.executeQuery();
51.
52.             while (result.next())
53.             {
54.                 definitions.add("Wordtype: " +
55.                     result.getString("wordtype") +
56.                     System.lineSeparator() +
57.                     "Definition: " +
58.                     result.getString("definition"));
59.             }
60.             if (definitions.isEmpty())
61.             {
62.                 this.logger.LogError(String.format("No rows in database for word: %s", wordToFind));
63.                 definitions.add("No Definition");
64.             }
65.         }
66.         catch (SQLException e)
67.         {
68.             this.logger.LogError(String.format("Definition not found for word: %s", wordToFind));
69.             this.logger.LogError("Error message: " + e.getMessage());
70.             definitions.add("No Definition");
71.         }
72.         String doubleLineSeparator = System.lineSeparator() + System.lineSeparator();
73.         return String.join(doubleLineSeparator, definitions);
74.     }
75.
76.     /**
77.      * gets if word is in dictionary.
78.      * @param wordToCheck Word to check.
79.      * @return returns the boolean value indicating whether the word exists in our database.
80.     */
81.     public boolean isWordInDictionary(String wordToCheck)
82.     {
83.         wordToCheck = wordToCheck.toLowerCase();
84.
85.         try
86.         {
87.             PreparedStatement doesWordExistQuery = connection.prepareStatement("SELECT 1 FROM entries WHERE word = ? LIMIT 1");
88.             doesWordExistQuery.setString(1, wordToCheck);
89.             ResultSet doesWordExistResult = doesWordExistQuery.executeQuery();
90.             return doesWordExistResult.next();
91.         }
```

```
91.     }
92.     catch (SQLException e)
93.     {
94.         this.logger.logError("word not found due to exception");
95.         this.logger.logError("Error message:" + e.getMessage());
96.     }
97.
98.     return false;
99. }
100.
```

UsersDAO

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
UsersDAO()		0%		n/a	1	1	5	5	1	1
doesUserExist(String)		87%		50%	1	2	0	1	0	1
addUser(User)		100%		n/a	0	1	0	12	0	1
queryByUsername(String)		100%		100%	0	2	0	13	0	1
UsersDAO(Connection, Logger)		100%		n/a	0	1	0	5	0	1
UsersDAO(PasswordHasher, Connection, Logger)		100%		n/a	0	1	0	3	0	1
getUser(String)		100%		n/a	0	1	0	1	0	1
Total	20 of 185	89%	1 of 4	75%	2	9	4	39	1	7

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UsersDAO.java

```
1. package com.example.project.services.sqlite.dAOs;
2.
3. import com.example.project.services.Logger;
4. import com.example.project.services.PasswordHasher;
5. import com.example.project.models.User;
6. import com.example.project.services.sqlite.SQLiteUsersConnection;
7.
8. import java.sql.Connection;
9. import java.sql.PreparedStatement;
10. import java.sql.ResultSet;
11. import java.sql.SQLException;
12.
13. /**
14. * SQLite Users database. with a table `users` 2 columns. 'username', 'password'. Which are both defined as unique
15. * not null Strings in sqlite.
16. */
17. public class UsersDAO
18. {
19.     private final Logger logger;
20.     private final Connection connection;
21.     PasswordHasher passwordHasher = new PasswordHasher();
22.
23.     /**
24.      * Constructor for this class SQLiteDictionary.
25.      */
26.     public UsersDAO()
27.     {
28.         this.logger = new Logger();
29.         this.connection = new SQLiteUsersConnection().getInstance();
30.     }
31.
32.     protected UsersDAO(PasswordHasher hasher, Connection connection, Logger logger)
33.     {
34.         this(connection, logger);
35.         this.passwordHasher = hasher;
36.     }
37.
38.     /**
39.      * Constructor with injection for unit tests.
40.      * @param connection Connection
41.      * @param logger logger.
42.      */
43.     public UsersDAO(Connection connection, Logger logger)
44.     {
45.         this.logger = logger;
46.         this.connection = connection;
47.     }
48.
49.     /**
50.      * Adds user to the user.db.
51.      * password will be hashed before storing to ensure greater security (no plain text passwords)
52.      * @param user user to add.
53.      */
54.     public void addUser(User user)
55.     {
56.         String sql = "INSERT INTO users (username, password, highscore) VALUES (?, ?, ?)";
57.
58.         try
59.         {
60.             PreparedStatement query = this.connection.prepareStatement(sql);
61.             query.setString(1, user.getUsername());
62.
63.             query.setString(2, this.passwordHasher.hashPassword(user.getPassword())); //hashes password before storing
64.
65.             query.setInt(3, user.getHighscore());
66.             query.executeUpdate();
67.             this.logger.logMessage(String.format("added user: %s to the database", user.getUsername()));
68.         }
69.         catch (SQLException e)
70.         {
71.             this.logger.logError(String.format("Failed to add user: %s to the database", user.getUsername()));
72.             throw new RuntimeException(String.format("Failed to add user to the database. SQL Error details: %s", e.getMessage()));
73.         }
74.     }
75.
76.     /**
77.      * @param username username
78.      * @return returns bool indicating whether user is in database already.
79.      */
80.     public boolean doesUserExist(String username)
81.     {
82.         return queryByUsername(username) != null;
83.     }
84.
```

```
85.     private User queryByUsername(String username)
86.     {
87.         String sql = "SELECT username, password, highscore FROM users WHERE username = ?";
88.         try
89.         {
90.             PreparedStatement statement = connection.prepareStatement(sql);
91.             statement.setString(1, username);
92.             ResultSet result = statement.executeQuery();
93.
94.             if (!result.next()){// if user does not exist in database return null.
95.                 return null;
96.             }
97.
98.             int highscore = result.getInt("highscore");
99.             String usersPassword = result.getString("password");
100.            return new User(username, usersPassword, highscore);
101.        }
102.        catch (SQLException e)
103.        {
104.            this.logger.logError(String.format("SQL Exception. Failed to get user username: %s", username));
105.            this.logger.logError(String.format("%s", e.getMessage()));
106.            throw new RuntimeException("Failed to get user by username", e);
107.        }
108.    }
109.
110.
111.
112.
113. /**
114. * @param username.
115. * @return returns user with matching username.
116. */
117. public User getUser(String username)
118. {
119.     return queryByUsername(username);
120. }
121. }
```

DailyRewardController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
playConfetti()		0%		0%	2	2	14	14	1	1
onSpinButtonClicked()		0%		0%	2	2	11	11	1	1
showReward(DailyRewardType)		0%		0%	3	3	10	10	1	1
onSceneChangedToThis()		0%		0%	2	2	7	7	1	1
DailyRewardController()		0%		n/a	1	1	2	2	1	1
lambda\$onSpinButtonClicked\$0(ActionEvent)		0%		n/a	1	1	4	4	1	1
lambda\$showReward\$2()		0%		n/a	1	1	4	4	1	1
initialize()		0%		n/a	1	1	2	2	1	1
lambda\$showReward\$1()		0%		n/a	1	1	1	1	1	1
Total	208 of 208	0%	9 of 9	0%	14	14	53	53	9	9

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com.example.project.services.sqlite.dAOs

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed Cxty	Missed Lines	Missed Methods	Missed Classes
C UsersDAO		89%		75%	2	9	4	39
C DictionaryDAO		100%		100%	0	6	0	37
Total	20 of 322	93%	1 of 8	87%	2	15	4	76

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com.example.project.services.sqlite.dAOs

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
UsersDAO.java		89%		75%	2	9	4	39	1	7	0	1
DictionaryDAO.java		100%		100%	0	6	0	37	0	4	0	1
Total	20 of 322	93%	1 of 8	87%	2	15	4	76	1	11	0	2

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SQLiteConnection

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
getInstance()		57%		75%	1	3	2	7	0	1
createConnection()		36%		n/a	0	1	3	5	0	1
static {...}		100%		n/a	0	1	0	1	0	1
SQLiteConnection()		100%		n/a	0	1	0	1	0	1
Total	28 of 65	56%	1 of 4	75%	1	6	5	14	0	4

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SQLiteConnection.java

```
1. package com.example.project.services.sqlite;
2.
3. import com.example.project.services.Logger;
4.
5. import java.nio.file.Files;
6. import java.nio.file.Paths;
7. import java.sql.Connection;
8. import java.sql.DriverManager;
9. import java.sql.SQLException;
10.
11. /**
12. * Abstract SQLiteConnection class.
13. */
14. public abstract class SQLiteConnection {
15.     private static final Logger logger = new Logger();
16.
17.     protected abstract Connection getSQLiteInstance();
18.
19.     protected abstract void setSQLiteInstance(Connection newInstance);
20.
21.     /**
22.      * Each subclass provides its database path.
23.      */
24.     protected abstract String getDatabasePath();
25.
26.     /**
27.      * Gets the database connection from an existing readonly resource .db
28.      * @return returns the connection is already made or creates new one.
29.      */
30.     public Connection getInstance()
31.     {
32.         if (getSQLiteInstance() != null){
33.             return getSQLiteInstance();
34.         }
35.
36.         if (!Files.exists(Paths.get(getDatabasePath())))
37.         {
38.             logger.logError(String.format("Database connection failed: Database file not found: %s", getDatabasePath()));
39.             throw new RuntimeException("Cannot initialize connection");
40.         }
41.
42.         setSQLiteInstance(createConnection());
43.         return getSQLiteInstance();
44.     }
45.
46.     private Connection createConnection()
47.     {
48.         String dbUrl = "jdbc:sqlite:" + getDatabasePath();
49.         try
50.         {
51.             return DriverManager.getConnection(dbUrl);
52.         } catch (SQLException sqlEx)
53.         {
54.             logger.logError("Database connection failed: " + sqlEx.getMessage());
55.             throw new RuntimeException("Cannot initialize connection", sqlEx);
56.         }
57.     }
58. }
59. }
```

SQLiteDictionaryConnection

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
SQLiteDictionaryConnection()	100%		n/a		0	1	0	1	0	1
setSQLiteInstance(Connection)	100%		n/a		0	1	0	2	0	1
getSQLiteInstance()	100%		n/a		0	1	0	1	0	1
getDatabasePath()	100%		n/a		0	1	0	1	0	1
Total	0 of 10	100%	0 of 0	n/a	0	4	0	5	0	4

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SQLiteDictionaryConnection.java

```
1. package com.example.project.services.sqlite;
2.
3. import java.sql.Connection;
4.
5. /**
6.  * Connection to the dictionary.db
7. */
8. public class SQLiteDictionaryConnection extends SQLiteConnection
9. {
10.     private static Connection instance;
11.
12.     @Override
13.     protected Connection getSQLiteInstance() {
14.         return instance;
15.     }
16.
17.     @Override
18.     protected void setSQLiteInstance(Connection newInstance) {
19.         instance = newInstance;
20.     }
21.
22.     @Override
23.     protected String getDatabasePath()
24.     {
25.         return "databases/English-Dictionary-Open-Source-main/sqlite3/dictionary.db";
26.     }
27. }
```

SQLiteUsersConnection

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
SQLiteUsersConnection()		0%		n/a	1	1	1	1	1	1
setSQLiteInstance(Connection)		0%		n/a	1	1	2	2	1	1
getSQLiteInstance()		0%		n/a	1	1	1	1	1	1
getDatabasePath()		0%		n/a	1	1	1	1	1	1
Total	10 of 10	0%	0 of 0	n/a	4	4	5	5	4	4

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SQLiteUsersConnection.java

```
1. package com.example.project.services.sqlite;
2.
3. import java.sql.Connection;
4.
5. /**
6. * Connection to the users.db
7. */
8. public class SQLiteUsersConnection extends SQLiteConnection
9. {
10.     private static Connection instance;
11.
12.     @Override
13.     protected Connection getSQLiteInstance() {
14.         return instance;
15.     }
16.
17.     @Override
18.     protected void setSQLiteInstance(Connection newInstance) {
19.         instance = newInstance;
20.     }
21.
22.     @Override
23.     protected String getDatabasePath()
24.     {
25.         return "databases/users.db";
26.     }
27. }
```

com.example.project.services.sqlite

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
C SQLiteConnection	 56%	75%	1	6	5	14	0	4	0	4	0	1
C SQLiteUsersConnection	 0%	n/a	4	4	5	5	4	4	1	4	1	1
C SQLiteDictionaryConnection	 100%	n/a	0	4	0	5	0	4	0	4	0	1
Total	38 of 85	55%	1 of 4	75%	5	14	10	24	4	12	1	3

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com.example.project.services.sqlite

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
SQLiteConnection.java	56%	75%	1	6	5	14	0	4	0	4	0	1
SQLiteUsersConnection.java	0%	n/a	4	4	5	5	4	4	1	4	1	1
SQLiteDictionaryConnection.java	100%	n/a	0	4	0	5	0	4	0	4	0	1
Total	38 of 85	55%	1 of 4	75%	5	14	10	24	4	12	1	3

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DailyRewardController.java

```
1. package com.example.project.controllers.gameScreens;
2.
3. import com.example.project.models.gameScreens.DailyRewardModel;
4. import com.example.project.models.gameScreens.DailyRewardType;
5. import com.example.project.services.GameScenes;
6. import com.example.project.services.SceneManager;
7. import com.example.project.services.Session;
8. import javafx.animation.RotateTransition;
9. import javafx.application.Platform;
10. import javafx.fxml.FXML;
11. import javafx.scene.control.Button;
12. import javafx.scene.control.Label;
13. import javafx.scene.image.ImageView;
14. import javafx.scene.layout.Pane;
15. import javafx.scene.layout.StackPane;
16. import javafx.scene.paint.Color;
17. import javafx.scene.shape.Rectangle;
18. import javafx.util.Duration;
19.
20. import java.time.LocalDate;
21. import java.util.Random;
22.
23. /**
24. * Controller for the daily reward popup screen.
25. */
26. public class DailyRewardController extends GameScreenController
27. {
28.     @FXML private StackPane root;
29.     @FXML private ImageView wheelImage;
30.     @FXML private ImageView stickImage;
31.     @FXML private Button spinButton;
32.     @FXML private Label rewardResultLabel;
33.     @FXML private Pane confettiLayer;
34.
35.     private final Random random = new Random();
36.
37.     /**
38.      * Initialises the daily reward view by resetting the reward label.
39.      */
40.     @FXML
41.     public void initialize() {
42.         rewardResultLabel.setText("");
43.     }
44.
45.     @Override
46.     public void onSceneChangedToThis() {
47.         rewardResultLabel.setText("");
48.         confettiLayer.getChildren().clear();
49.
50.         if (Session.getInstance().hasClaimedRewardToday()) {
51.             spinButton.setDisable(true);
52.             rewardResultLabel.setText("You've already claimed today's reward.");
53.         } else {
54.             spinButton.setDisable(false);
55.         }
56.     }
57.
58.     @FXML
59.     private void onSpinButtonClicked() {
60.         // Block spin if already claimed
61.         if (Session.getInstance().hasClaimedRewardToday()) {
62.             rewardResultLabel.setText("Already claimed.");
63.             spinButton.setDisable(true);
64.             return;
65.         }
66.
67.         spinButton.setDisable(true);
68.
69.         int spinDegrees = 720 + random.nextInt(360); // random stop angle
70.         RotateTransition rotate = new RotateTransition(Duration.seconds(2), stickImage);
71.         rotate.setByAngle(spinDegrees);
72.         rotate.setOnFinished(event -> {
73.             DailyRewardType reward = DailyRewardModel.rollReward();
74.             DailyRewardModel.applyReward(reward);
75.             showReward(reward);
76.         });
77.         rotate.play();
78.     }
}
```

```

79.
80.     private void showReward(DailyRewardType reward) {
81.         Platform.runLater(this::playConfetti);
82.
83.         String message = switch (reward) {
84.             case Daily_Reward_Won_1Dollar -> "You won $1!";
85.             case Daily_Reward_Won_5Dollars -> "You won $5!";
86.             case Daily_Reward_Won_NOTHING -> "You won... nothing! Try again tomorrow for a better Prize!";
87.         };
88.
89.         rewardResultLabel.setText(message);
90.         Session.getInstance().setLastRewardDate(LocalDate.now()); // mark claimed
91.
92.         new Thread(() -> {
93.             try {
94.                 Thread.sleep(3000);
95.             } catch (InterruptedException ignored) {}
96.             Platform.runLater(() -> SceneManager.getInstance().switchScene(GameScenes.MAINMENU));
97.         }).start();
98.     }
99.
100.    private void playConfetti() {
101.        confettiLayer.getChildren().clear();
102.        Random rand = new Random();
103.        for (int i = 0; i < 75; i++) {
104.            Rectangle confetti = new Rectangle(6, 12);
105.            confetti.setFill(Color.hsb(rand.nextInt(360), 1.0, 1.0));
106.            confetti.setLayoutX(confettiLayer.getWidth() / 2);
107.            confetti.setLayoutY(confettiLayer.getHeight() / 2);
108.
109.            var drop = new javafx.animation.TranslateTransition(Duration.seconds(1 + rand.nextDouble()), confetti);
110.            drop.setByX(rand.nextDouble() * 400 - 200);
111.            drop.setByY(rand.nextDouble() * 400 - 100);
112.            drop.setCycleCount(1);
113.            confettiLayer.getChildren().add(confetti);
114.            drop.play();
115.        }
116.    }
117. }

```

FXMLPageLoader

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
load(String)	100%		n/a		0	1	0	2	0	1
FXMLPageLoader()	100%		n/a		0	1	0	3	0	1
getController()	100%		n/a		0	1	0	1	0	1
Total	0 of 26	100%	0 of 0	n/a	0	3	0	6	0	3

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FXMLPageLoader.java

```
1. package com.example.project.services;
2.
3. import javafx.fxml.FXMLLoader;
4. import javafx.scene.Parent;
5.
6. import java.io.IOException;
7.
8. /**
9. * FXML Loader wrapper class for the project to load the game screen FXML pages.
10.*/
11. public class FXMLPageLoader implements PageLoader
12. {
13.     private FXMLLoader loader;
14.
15.     /**
16.      * constructor.
17.     */
18.     public FXMLPageLoader() {
19.         this.loader = new FXMLLoader();
20.     }
21.
22.     @Override
23.     public Parent load(String fxmlPath) throws IOException
24.     {
25.         this.loader = new FXMLLoader(this.getClass().getResource(fxmlPath));
26.         return loader.load();
27.     }
28.
29.     @Override
30.     public <T> T getController() {
31.         return loader.getController();
32.     }
33. }
```

GameScenes

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
static {...}	100%		n/a		0	1	0	6	0	1
Total	0 of 33	100%	0 of 0	n/a	0	1	0	6	0	1

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GameScenes.java

```
1. package com.example.project.services;
2.
3. /**
4.  * Game Scenes enum.
5. */
6. public enum GameScenes {
7.     /**
8.      * Login Screen.
9.     */
10.    LOGIN,
11.
12.    /**
13.     * Main Menu Screen.
14.     */
15.    MAINMENU,
16.
17.    /**
18.     * Daily Reward Spinner Screen.
19.     */
20.    DAILY_REWARD,
21.
22.    /**
23.     * Level Screen
24.     */
25.    LEVEL,
26.
27.    /**
28.     * Shop screen.
29.     */
30.    SHOP,
31.
32. }
```

Logger

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
Logger(ByteArrayOutputStream, ByteArrayOutputStream)		100%	n/a	0	1	0	12	0	1	
Logger()		100%	n/a	0	1	0	9	0	1	
logWithCapture(String, PrintStream, PrintStream)		100%		100%	0	2	0	4	0	1
Logger(ByteArrayOutputStream, ByteArrayOutputStream, PrintStream, PrintStream)		100%	n/a	0	1	0	4	0	1	
logError(String)		100%	n/a	0	1	0	2	0	1	
logMessage(String)		100%	n/a	0	1	0	2	0	1	
setPrintToConsole(boolean)		100%	n/a	0	1	0	2	0	1	
getErrorLogs()		100%	n/a	0	1	0	1	0	1	
getLogs()		100%	n/a	0	1	0	1	0	1	
clearLogs()		100%	n/a	0	1	0	2	0	1	
Total	0 of 142	100%	0 of 2	100%	0	11	0	36	0	10

Created with JaCoCo 0.8.12.202403310830

Logger.java

```
1. package com.example.project.services;
2.
3. import org.apache.commons.logging.Log;
4.
5. import java.io.ByteArrayOutputStream;
6. import java.io.PrintStream;
7.
8. /**
9. * com.example.project.services.Logger for Application and to show up in test and build CI workflow.
10. */
11. public class Logger
12. {
13.     private PrintStream consoleErrorStream;
14.     private final PrintStream captureErrorStream;
15.     private ByteArrayOutputStream capturedErrorLogs = new ByteArrayOutputStream();
16.
17.     private PrintStream consoleStdOutStream;
18.     private final PrintStream captureStdOutStream;
19.     private ByteArrayOutputStream capturedStdOutLogs = new ByteArrayOutputStream();
20.
21.     private boolean printToConsole = true;
22.
23.     /**
24.      * Default constructor writes to console does not capture. For the project files. Use below for unit tests.
25.      */
26.     public Logger()
27.     {
28.         this.consoleErrorStream = System.err;
29.         this.captureErrorStream = new PrintStream(capturedErrorLogs);
30.
31.         this.consoleStdOutStream = System.out;
32.         this.captureStdOutStream = new PrintStream(capturedStdOutLogs);
33.     }
34.
35.     /**
36.      * Constructor for unit tests. Logger with constructor to input the byte array output stream to write to. (for mocking a log to check get methods.)
37.      * @param capturedErrStream byte array to store error logs.
38.      * @param capturedOutStream byte array to store standard output logs.
39.      */
40.     public Logger(ByteArrayOutputStream capturedErrStream, ByteArrayOutputStream capturedOutStream) {
41.         this.setPrintToConsole(false);
42.         this.consoleErrorStream = System.err;
43.         this.capturedErrorLogs = capturedErrStream;
44.         this.captureErrorStream = new PrintStream(this.capturedErrorLogs);
45.
46.         this.consoleStdOutStream = System.out;
47.         this.capturedStdOutLogs = capturedOutStream;
48.         this.captureStdOutStream = new PrintStream(this.capturedStdOutLogs);
49.     }
50.
51.     protected Logger(ByteArrayOutputStream capturedErrStream, ByteArrayOutputStream capturedOutStream, PrintStream mockRealErrOutput, PrintStream mockRealStdOutput)
52.     {
53.         this(capturedErrStream, capturedOutStream);
54.         this.consoleErrorStream = mockRealErrOutput;
55.         this.consoleStdOutStream = mockRealStdOutput;
56.     }
57.
58.     /**
59.      * @param value if this logger will also print to the console.
60.      */
61.     public void setPrintToConsole(boolean value){
62.         this.printToConsole = value;
63.     }
64.
65.     /**
66.      * @return Gets the error log messages.
67.      */
68.     public String getErrorLogs()
69.     {
70.         return this.capturedErrorLogs.toString();
71.     }
72.
73.
74.     /**
75.      * @return returns the standard log messages.
76.      */
77.     public String getLogs(){ return this.capturedStdOutLogs.toString(); }
78.
79.     /**
80.      * Logs an error message to standard error. And adds a newline.
81.      * <p>
82.      * The message can include format specifiers like in {@link String#format(String, Object...)}.
83.      *
84.      * @param message the error message format string (e.g., "Failed to connect to %s")
85.      */
86.     public void logError(String message)
87.     {
88.         this.logWithCapture(message, captureErrorStream, consoleErrorStream);
89.     }
90.
91.     /**
92.      * Clears captured logs use in tests teardown.
93.      */
94.     public void clearLogs() {
95.         capturedErrorLogs.reset();
96.     }
97.
98.     /**
99.      * Log message to System.out.
100.     * @param formattedMessage message.
101.     */
102.    public void logMessage(String formattedMessage)
103.    {
104.        this.logWithCapture(formattedMessage, captureStdOutStream, consoleStdOutStream);
105.    }
106.
```

```
107.     private synchronized void logWithCapture(String formattedMessage, PrintStream captureStream, PrintStream consoleStream)
108.     {
109.         captureStream.printf(formattedMessage + "%n"); // capture in memory for tests to look at.
110.         ◆◆ if (printToConsole)
111.             {
112.                 consoleStream.printf(formattedMessage + "%n"); // console output
113.             }
114.         }
115.     }
```

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PasswordHasher

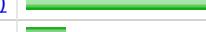
Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
doesPasswordMatch(String, String)	100%		n/a		0	1	0	5	0	1
PasswordHasher()	100%		n/a		0	1	0	3	0	1
PasswordHasher(Logger)	100%		n/a		0	1	0	3	0	1
hashPassword(String)	100%		n/a		0	1	0	1	0	1
Total	0 of 49	100%	0 of 0	n/a	0	4	0	12	0	4

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PasswordHasher.java

```
1. package com.example.project.services;
2. import org.mindrot.jbcrypt.BCrypt;
3.
4.
5. /**
6.  * Hashes passwords.
7. */
8. public class PasswordHasher
9. {
10.     private final Logger logger;
11.
12.     /**
13.      * public constructor.
14.     */
15.     public PasswordHasher(){
16.         this.logger = new Logger();
17.     }
18.
19.     protected PasswordHasher(Logger logger)
20.     {
21.         this.logger = logger;
22.     }
23.
24.     /**
25.      * Hashes a raw password using BCrypt.
26.      *
27.      * @param rawPassword the plain text password
28.      * @return the hashed password string
29.      */
30.     public String hashPassword(String rawPassword) {
31.         return BCrypt.hashpw(rawPassword, BCrypt.gensalt());
32.     }
33.
34.     /**
35.      * Verifies a candidate password against a hashed password.
36.      * @param candidate the plain text password entered by the user
37.      * @param hashed    the hashed password stored in the database
38.      * @return true if the password matches, false otherwise
39.      */
40.     public boolean doesPasswordMatch(String candidate, String hashed)
41.     {
42.         try {
43.             return BCrypt.checkpw(candidate, hashed);
44.         }
45.         catch (IllegalArgumentException e)
46.         {
47.             this.logger.logMessage(String.format("Password check failed, caught exception: %s", e.getMessage()));
48.             this.logger.logMessage(String.format("Cause: %s", e.getCause()));
49.             return false;
50.         }
51.     }
52. }
```

PopupLoader

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
PopupLoader()		0%		n/a	1	1	3	3	1	1
createPopupController(PopupModel)		100%		n/a	0	1	0	7	0	1
PopupLoader(FXMLLoaderPageLoader)		100%		n/a	0	1	0	3	0	1
Total	8 of 41	80%	0 of 0	n/a	1	3	3	13	1	3

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PopupLoader.java

```
1. package com.example.project.services;
2.
3. import com.example.project.controllers.popupControllers.PopupController;
4. import com.example.project.models.popups.PopupModel;
5. import javafx.scene.Parent;
6.
7. import java.io.IOException;
8.
9. /**
10. * class to load the popup and initialize it with a controller
11. */
12. public class PopupLoader
13. {
14.     private final FXMLPageLoader loader;
15.
16.     protected PopupLoader(FXMLPageLoader loader)
17.     {
18.         this.loader = loader;
19.     }
20.
21.     /**
22.      * Constructor.
23.     */
24.     public PopupLoader()
25.     {
26.         this.loader = new FXMLPageLoader();
27.     }
28.
29.     /**
30.      * create popup controller.
31.      * @param popupModel popup object.
32.      * @param <C> class of popup controller.
33.      * @param <P> class of popup.
34.      * @return returns controller of the tile.
35.     */
36.     public <C extends PopupController<P>, P extends PopupModel> C createPopupController(P popupModel)
37.     {
38.         try
39.         {
40.             // In this case not using javafx Popup because of its limitations.
41.             // Might refactor in case we use actual Popups.
42.             String fxmlPath = popupModel.getFXMLPath();
43.             Parent root = this.loader.load(fxmlPath);
44.             C controller = loader.getController();
45.             controller.initialize(popupModel);
46.             return controller;
47.         } catch (IOException e) {
48.             throw new RuntimeException("Failed to create popup controller: " + popupModel.getFXMLPath(), e);
49.         }
50.     }
51. }
```

GameScreenController SidebarLoaded

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
GameScreenController SidebarLoaded(Parent, SidebarController)		0%	n/a	1	1	1	1	1	1	1
Total	9 of 9	0%	0 of 0	n/a	1	1	1	1	1	1

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SVGIcons

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
getCogIcon()	0%		n/a		1	1	4	4	1	1
SVGIcons()	0%		n/a		1	1	1	1	1	1
Total	15 of 15	0%	0 of 0	n/a	2	2	5	5	2	2

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SVGIcons.java

```
1. package com.example.project.services;
2.
3. import javafx.scene.paint.Color;
4. import javafx.scene.shape.SVGPath;
5.
6. /**
7. * a static class to hold some icons for the application.
8. */
9. public class SVGIcons
10. {
11.     private static final String cogIcon = "M19.43 12.98c.04-.32.07-.66.07-1s-.03-.68-.07-1l2.11-1.65c.19-.15.24-.42.12-.64l-2-3.46c-.12-.21-.37-.3-.6-.22l-2.49 1a7.027 7.027 0 00-1.73-1l-.38-2.65A.4";
12.
13.     /**
14.      * gets a cog icon.
15.      * @return icon SVG.
16.     */
17.     public static SVGPath getCogIcon()
18.     {
19.         SVGPath cog = new SVGPath();
20.         cog.setContent(cogIcon);
21.         cog.setFill(Color.GRAY);
22.         return cog;
23.     }
24. }
```

SceneManager

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
preloadPage(GameScenes, String, PageLoader)		29%		50%	2	3	6	14	0	1
initialise(RootLayoutController, PageLoader)		100%		100%	0	2	0	9	0	1
switchScene(GameScenes)		100%		n/a	0	1	0	5	0	1
SceneManager(SceneManager, RootLayoutController, Map, Map)		100%		n/a	0	1	0	6	0	1
static {...}		100%		n/a	0	1	0	2	0	1
getInstance()		100%		100%	0	2	0	3	0	1
SceneManager(SceneManager)		100%		n/a	0	1	0	3	0	1
Total	58 of 166	65%	2 of 8	75%	2	11	6	42	0	7

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SceneManager.java

```

1. package com.example.project.services;
2.
3. import com.example.project.controllers.RootLayoutController;
4. import javafx.scene.Parent;
5.
6. import java.io.IOException;
7. import java.util.HashMap;
8. import java.util.Map;
9. import com.example.project.controllers.gameScreens.GameScreenController;
10.
11. /**
12. * Represents the scene manager class.
13. */
14. public class SceneManager
15. {
16.     private static RootLayoutController rootController;
17.     private static Map<GameScenes, Parent> pages = new HashMap<>();
18.     private static Map<GameScenes, GameScreenController> controllers = new HashMap<>();
19.     private static SceneManager instance;
20.
21. /**
22. * @return Gets the programs Scene Manager instance.
23. */
24. public static SceneManager getInstance()
25. {
26.     if (instance == null) {
27.         instance = new SceneManager();
28.     }
29.
30.     return instance;
31. }
32.
33. private SceneManager() {}
34.
35. /**
36. * Constructor to inject an instance.
37. * @param newInstance new instance.
38. */
39. public SceneManager(SceneManager newInstance)
40. {
41.     instance = newInstance;
42. }
43.
44. /**
45. * Constructor with injection for tests
46. * @param newInstance instance
47. * @param newRootController root controller
48. * @param controllersToUse controllers
49. * @param pagesToUse pages
50. */
51. protected SceneManager(SceneManager newInstance, RootLayoutController newRootController, Map<GameScenes,
52.                         GameScreenController> controllersToUse, Map<GameScenes, Parent> pagesToUse)
53. {
54.     instance = newInstance;
55.     rootController = newRootController;
56.     controllers = controllersToUse;
57.     pages = pagesToUse;
58. }
59.
60. /**
61. * loads the fxml of all the scenes on launch to switch to via scene manager.
62. * @param theRootController the root Controller for the rootLayout scene.
63. * @param loader FXMLLoader
64. */
65. public void initialise(RootLayoutController theRootController, PageLoader loader)
66. {
67.     if (rootController != null)
68.     {
69.         throw new RuntimeException("Scene Manager already initialised in Application.start()");
70.     }
71.
72.     rootController = theRootController;
73.     preloadPage(GameScenes.LOGIN, "/com/example/project/gameScreens/login-view.fxml", loader);
74.     preloadPage(GameScenes.MAINMENU, "/com/example/project/gameScreens/main-menu-view.fxml", loader);
75.     preloadPage(GameScenes.DAILY_REWARD, "/com/example/project/gameScreens/dailyReward-view.fxml", loader);
76.     preloadPage(GameScenes.LEVEL, "/com/example/project/gameScreens/level-view.fxml", loader);
77.     preloadPage(GameScenes.SHOP, "/com/example/project/gameScreens/shop-view.fxml", loader);
78. }
79.
80. private void preloadPage(GameScenes type, String fxmlPath, PageLoader loader)
81. {
82.     Parent page;
83.     try{
84.         page = loader.load(fxmlPath);
85.     }
86.     catch (IOException e){
87.         throw new RuntimeException(String.format("Exception when loading page: %s. Message: %s, cause: %s", fxmlPath, e.getMessage(), e.getCause()));
88.     }
89.     catch (IllegalStateException e){
90.         throw new RuntimeException(String.format("game scene fxml path for %s not correct: %s, cause: %s", fxmlPath, e.getMessage(), e.getCause()));
91.     }
92.
93.     if (page == null)
94.     {
95.         throw new IllegalArgumentException("Page not loaded: " + type);
96.     }
97.
98.     GameScreenController controller = loader.getController();
99.     if (controller == null){

```

```
100.         throw new RuntimeException("must have a controller on the game screen that is a gameScreenController");
101.     }
102.
103.     controllers.put(type, controller);
104.     pages.put(type, page);
105. }
106.
107. /**
108. * Switch between scenes specify scene type of type from {@link GameScenes}.
109. * @param type scene.
110. */
111. public void switchScene(GameScenes type)
112. {
113.     Parent page = pages.get(type);
114.     GameScreenController controller = controllers.get(type);
115.     rootController.setContent(page);
116.     controller.onSceneChangedToThis();
117. }
118. }
```

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Session

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
spendMoney(int)		0%		0%	3	3	6	6	1	1
addMoney(int)		0%	n/a		1	1	2	2	1	1
addUpgrade(UpgradeTileModel)		0%	n/a		1	1	2	2	1	1
hasClaimedRewardToday()		0%	n/a		1	1	1	1	1	1
resetMoney()		0%	n/a		1	1	2	2	1	1
setLevelModel(LevelModel)		0%	n/a		1	1	2	2	1	1
setUser(User)		0%	n/a		1	1	2	2	1	1
getHandSize()		0%	n/a		1	1	1	1	1	1
getWordWindowSize()		0%	n/a		1	1	1	1	1	1
setLastRewardDate(LocalDate)		0%	n/a		1	1	2	2	1	1
getLastRewardDate()		0%	n/a		1	1	1	1	1	1
getLevelModel()		0%	n/a		1	1	1	1	1	1
getRedrawWindowSize()		0%	n/a		1	1	1	1	1	1
Session(int, int, int, ObservableList, User, int, int, int, int, int)		100%	n/a		0	1	0	22	0	1
Session()		100%	n/a		0	1	0	16	0	1
updateLevelInfo()		100%	n/a		0	1	0	4	0	1
resetGame()		100%	n/a		0	1	0	6	0	1
resetPlaysRedraws()		100%	n/a		0	1	0	3	0	1
getInstance()		100%		50%	1	2	0	3	0	1
getUpgradeTilesProperty()		100%	n/a		0	1	0	1	0	1
getLevelRequirement()		100%	n/a		0	1	0	1	0	1
getLevelsBeaten()		100%	n/a		0	1	0	1	0	1
getMoneyProperty()		100%	n/a		0	1	0	1	0	1
getCurrentPlays()		100%	n/a		0	1	0	1	0	1
getCurrentRedraws()		100%	n/a		0	1	0	1	0	1
Total	78 of 303	74%	5 of 6	16%	16	28	24	74	13	25

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Session.java

```
1. package com.example.project.services;
2.
3. import com.example.project.models.User;
4. import com.example.project.models.gameScreens.LevelModel;
5. import com.example.project.models.tiles.UpgradeTileModel;
6. import javafx.beans.property.*;
7. import javafx.collections.FXCollections;
8. import javafx.collections.ObservableList;
9.
10. import java.time.LocalDate;
11.
12.
13. /**
14. * Game Session. holds info of the current session.
15. */
16. public class Session
17. {
18.     private Integer handSize = 9;
19.
20.     private Integer wordWindowSize = 9;
21.
22.     private Integer redrawWindowSize = 9;
23.
24.     private final ObservableList<UpgradeTileModel> upgrades = FXCollections.observableArrayList();
25.
26.     private final IntegerProperty money;
27.
28.     private final int initialMoney;
29.
30.     private User loggedInUser;
31.
32.     private LevelModel levelModel;
33.
34.     private int levelsBeaten = 0;
35.
36.     private final int initialLevelRequirement;
37.
38.     private final int initialRedraws = 4;
39.     private final ReadOnlyIntegerWrapper currentRedraws = new ReadOnlyIntegerWrapper(initialRedraws);
40.     private final int initialPlays = 4;
41.     private final ReadOnlyIntegerWrapper currentPlays = new ReadOnlyIntegerWrapper(initialPlays);
42.
43.     private static Session instance;
44.
45.     /**
46.      * Gets the last date the player claimed their daily reward.
47.      *
48.      * @return the date the reward was last claimed, or null if never claimed
49.      */
50.     public LocalDate getLastRewardDate() {
51.         return lastRewardDate;
52.     }
53.
54.     /**
55.      * Gets session.
56.      * @return session instance.
57.      */
58.     public static Session getInstance()
59.     {
60.         if (instance == null){
61.             instance = new Session();
62.         }
63.
64.         return instance;
65.     }
66.
67.     /**
68.      * points required for the player to score at least to beat the current level.
69.      */
70.     private final ReadOnlyIntegerWrapper levelRequirement;
71.
72.     /**
73.      * @return points required for the play to score at least to beat the level.
74.      */
75.     public ReadOnlyIntegerWrapper getLevelRequirement() {
76.         return levelRequirement;
77.     }
78.
```

```

79. /**
80.  * Constructor for injecting values in for unit test.
81.  * @param newHandSize hand size.
82.  * @param newWordViewSize word length allowed.
83.  * @param newRedrawWindowSize redraw window size.
84.  * @param newUpgrades upgrade tiles.
85.  * @param newUser user.
86.  * @param newMoney money.
87.  * @param newLevelsBeaten levels beaten.
88.  * @param currentLevelRequirement current level requirement.
89.  * @param newFirstLevelsRequirement first level requirement.
90. */
91. protected Session(int newHandSize, int newWordViewSize, int newRedrawWindowSize,
92.                 ObservableList<UpgradeTileModel> newUpgrades, User newUser,
93.                 int newMoney, int newLevelsBeaten,
94.                 int currentLevelRequirement, int newFirstLevelsRequirement, int newInitialMoney)
95. {
96.     initialMoney = newInitialMoney;
97.     money = new ReadOnlyIntegerWrapper(newMoney);
98.     initialLevelRequirement = newFirstLevelsRequirement;
99.     handSize = newHandSize;
100.    wordWindowSize = newWordViewSize;
101.    redrawWindowSize = newRedrawWindowSize;
102.    loggedInUser = newUser;
103.    upgrades.setAll(newUpgrades);
104.    levelsBeaten = newLevelsBeaten;
105.    levelRequirement = new ReadOnlyIntegerWrapper(initialLevelRequirement);
106. }
107.
108. protected int getLevelsBeaten(){
109.     return levelsBeaten;
110. }
111.
112. /**
113.  * sets the session's level model
114.  * @param levelModel the current level model
115. */
116. public void setLevelModel(LevelModel levelModel) {
117.     this.levelModel = levelModel;
118. }
119.
120. /**
121.  * @return the current level model
122. */
123. public LevelModel getLevelModel() {
124.     return levelModel;
125. }
126.
127. /**
128.  * Default constructor.
129. */
130. public Session()
131. {
132.     initialLevelRequirement = 4;
133.     levelRequirement = new ReadOnlyIntegerWrapper(initialLevelRequirement);
134.     initialMoney = 0;
135.     money = new ReadOnlyIntegerWrapper(initialMoney);
136. }
137.
138. /**
139.  * Returns the read-only money property for binding to UI components.
140.  * This allows UI elements to automatically update when the players money changes.
141.  * @return ReadOnlyIntegerProperty representing the player's current money amount
142. */
143. public IntegerProperty getMoneyProperty()
144. {
145.     return money;
146. }
147.
148. /**
149.  * Adds an upgrade tile to the player's collection.
150.  * This will automatically update all UI displays bound to the upgrades property.
151.  *
152.  * @param upgrade this upgrades the tile to add it to the players collection
153. */
154. public void addUpgrade(UpgradeTileModel upgrade)
155. {
156.     upgrades.add(upgrade);
157. }
158.
159. /**
160.  * This attempts to spend the specified amount of money from the player's account.
161.  * This operation should only succeed if the player has enough money.

```

```

162.
163. *
164. * @param amount the amount of money to spend (cannot be negative)
165. * @return true if the transaction was successful (player had enough money),
166. *         false if the player is a brokey
167. * @throws IllegalArgumentException if the amount is negative
168. */
169. public boolean spendMoney(int amount)
170. {
171.     if (amount < 0)
172.     {
173.         throw new IllegalArgumentException("You do not have enough funds");
174.     }
175.     if (money.get() >= amount)
176.     {
177.         money.set(money.get() - amount);
178.         return true;
179.     }
180.     return false;
181.
182.
183. /**
184. * set new user.
185. * @param newUser user that logged in.
186. */
187. public void setUser(User newUser) {
188.     loggedInUser = newUser;
189. }
190.
191. /**
192. * gets hand size.
193. * @return returns number of tiles allowed in hand.
194. */
195. public int getHandSize() {
196.     return handSize;
197. }
198.
199. /**
200. * gets word size.
201. * @return return int word size.
202. */
203. public int getWordWindowSize() {
204.     return wordWindowSize;
205. }
206.
207. /**
208. * gets upgrade tile property
209. * @return upgrade tiles model list
210. */
211. public ReadOnlyListProperty<UpgradeTileModel> getUpgradeTilesProperty() {
212.     return new ReadOnlyListWrapper<>(upgrades);
213. }
214.
215. /**
216. * Increments how many points are required to beat the level.
217. */
218. public void updateLevelInfo() {
219.     this.levelsBeaten++;
220.     var current = this.levelRequirement.get();
221.     this.levelRequirement.set(current + (int) Math.pow(2, this.levelsBeaten));
222. }
223.
224. /**
225. * Resets the current session when you lose
226. */
227. public void resetGame() {
228.     money.set(initialMoney); // resets the players account to their starting amount
229.     levelsBeaten = 0;
230.     levelRequirement.set(initialLevelRequirement);
231.     upgrades.clear();
232.     resetPlaysRedraws();
233. }
234.
235. /**
236. * gets redraw window size (number of slots)
237. * @return return int redraw window size.
238. */
239. public Integer getRedrawWindowSize() {
240.     return redrawWindowSize;
241. }
242.
243. /**
244. * gets the current plays.

```

```

245.     * @return current plays remaining.
246.     */
247.    public ReadOnlyIntegerWrapper getCurrentPlays() {
248.        return currentPlays;
249.    }
250.
251.    /**
252.     * gets the redraws property.
253.     * @return the current redraws.
254.     */
255.    public ReadOnlyIntegerWrapper getCurrentRedraws(){
256.        return currentRedraws;
257.    }
258.
259.    /**
260.     * Reset the plays and redraws.
261.     */
262.    public void resetPlaysRedraws()
263.    {
264.        getCurrentRedraws().set(initialRedraws);
265.        getCurrentPlays().set(initialPlays);
266.    }
267.
268.
269.
270.    private LocalDate lastRewardDate = null;
271.
272.    /**
273.     * Adds money to the player's balance.
274.     * @param amount amount to add
275.     */
276.    public void addMoney(int amount) {
277.        this.money.set(this.money.get() + amount);
278.    }
279.
280.    /**
281.     * Sets the date the daily reward was last claimed.
282.     * @param date LocalDate of the reward claim
283.     */
284.    public void setLastRewardDate(LocalDate date) {
285.        this.lastRewardDate = date;
286.    }
287.
288.    /**
289.     * Checks if the player already claimed today's reward.
290.     * @return true if already claimed today
291.     */
292.    public boolean hasClaimedRewardToday() {
293.        return LocalDate.now().equals(lastRewardDate);
294.    }
295.
296.    /**
297.     * Resets the player's money to the initial state (e.g. 0).
298.     */
299.    public void resetMoney() {
300.        this.money.set(0);
301.    }
302.}

```

com.example.project.services

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
Session		74%		16%	16	28	24	74	13	25	0	1
SceneManager		65%		75%	2	11	6	42	0	7	0	1
SVGIcons		0%		n/a	2	2	5	5	2	2	1	1
PopupLoader		80%		n/a	1	3	3	13	1	3	0	1
Logger		100%		100%	0	11	0	36	0	10	0	1
PasswordHasher		100%		n/a	0	4	0	12	0	4	0	1
GameScenes		100%		n/a	0	1	0	6	0	1	0	1
FXMLPageLoader		100%		n/a	0	3	0	6	0	3	0	1
Total	159 of 775	79%	7 of 16	56%	21	63	38	194	16	55	1	8

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com.example.project.services

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
Session.java		74%		16%	16	28	24	74	13	25	0	1
SceneManager.java		65%		75%	2	11	6	42	0	7	0	1
SVGIcons.java		0%		n/a	2	2	5	5	2	2	1	1
PopupLoader.java		80%		n/a	1	3	3	13	1	3	0	1
Logger.java		100%		100%	0	11	0	36	0	10	0	1
PasswordHasher.java		100%		n/a	0	4	0	12	0	4	0	1
GameScenes.java		100%		n/a	0	1	0	6	0	1	0	1
FXMLPageLoader.java		100%		n/a	0	3	0	6	0	3	0	1
Total	159 of 775	79%	7 of 16	56%	21	63	38	194	16	55	1	8

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Application

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
start(Stage)		0%		n/a	1	1	13	13	1	1
main(String[])		0%		n/a	1	1	2	2	1	1
Application()		0%		n/a	1	1	1	1	1	1
Total	56 of 56	0%	0 of 0	n/a	3	3	16	16	3	3

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Application.java

```
1. package com.example.project;
2.
3. import com.example.project.services.GameScenes;
4. import javafx.fxml.FXMLLoader;
5. import javafx.scene.Parent;
6. import javafx.scene.Scene;
7. import javafx.stage.Stage;
8. import com.example.project.services.FXMLPageLoader;
9. import com.example.project.services.SceneManager;
10.
11. import java.io.IOException;
12.
13. /**
14. * The entry point of the application.
15. */
16. public class Application extends javafx.application.Application
17. {
18.     /// Constants defining the window title and size
19.     public static final String TITLE = "WordPlay";
20.
21.     /// defining the window width.
22.     public static final int WIDTH = 1300;
23.
24.     /// Defining the window height.
25.     public static final int HEIGHT = 700;
26.
27.     @Override
28.     public void start(Stage stage) throws IOException
29.     {
30.         String rootScenePath = "/com/example/project/rootLayout-view.fxml";
31.         FXMLLoader rootLoader = new FXMLLoader(this.getClass().getResource(rootScenePath));
32.         Parent root = rootLoader.load();
33.         Scene scene = new Scene(root, WIDTH, HEIGHT);
34.         stage.setTitle(TITLE);
35.         stage.setScene(scene);
36.         stage.show();
37.         stage.setResizable(true);
38.         stage.setFullScreen(true);
39.
40.         var sceneManager = SceneManager.getInstance();
41.         sceneManager.initialise(rootLoader.getController(), new FXMLPageLoader());
42.         sceneManager.switchScene(GameScenes.LOGIN);
43.     }
44.
45.     /**
46.      * @param args the command-line arguments passed to your program when it starts.
47.      */
48.     public static void main(String[] args) {
49.         launch();
50.     }
51. }
```

GameScreenController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
loadSidebar()		0%		n/a	1	1	9	9	1	1
GameScreenController()		100%		n/a	0	1	0	2	0	1
Total	32 of 40	20%	0 of 0	n/a	1	2	9	11	1	2

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com.example.project

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
G Application	<div style="width: 0%; background-color: red;"></div>	0%		n/a	3	3	16	16	3	3	1	1
Total	56 of 56	0%	0 of 0	n/a	3	3	16	16	3	3	1	1

Created with JaCoCo 0.8.12.202403310830

com.example.project

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
Application.java	<div style="width: 0%; background-color: red;"></div>	0%	n/a		3	3	16	16	3	3	1	1
Total	56 of 56	0%	0 of 0	n/a	3	3	16	16	3	3	1	1

Created with JaCoCo 0.8.12.202403310830

Project

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
com.example.project.controllers.gameScreens		5%		4%	126	136	401	432	84	93	7	10
com.example.project.controllers.gameScreens.animations		0%		0%	19	19	74	74	17	17	5	5
com.example.project.models.gameScreens		72%		64%	41	104	68	242	23	65	2	8
com.example.project.models.tiles		72%		18%	17	50	42	127	8	39	1	8
com.example.project.services		79%		56%	21	63	38	194	16	55	1	8
com.example.project.controllers.popupControllers		0%		0%	12	12	27	27	10	10	2	2
com.example.project.controllers.tiles		62%		78%	9	36	34	93	7	28	1	5
com.example.project.services.shopItems		0%		n/a	4	4	42	42	4	4	1	1
com.example.project		0%		n/a	3	3	16	16	3	3	1	1
com.example.project.controllers		15%		0%	6	7	14	16	4	5	0	1
com.example.project.services.sqlite		55%		75%	5	14	10	24	4	12	1	3
com.example.project.services.sqlite.dAOs		93%		87%	2	15	4	76	1	11	0	2
com.example.project.models.tileGroups		95%		76%	8	33	3	84	2	20	0	3
com.example.project.models.popups		96%		75%	1	12	1	23	0	10	0	2
com.example.project.services.sound		100%		100%	0	12	0	54	0	11	0	2
com.example.project.models		100%		n/a	0	4	0	8	0	4	0	1
Total	3,474 of 6,774	48%	153 of 266	42%	274	524	774	1,532	183	387	22	62

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Sessions

This coverage report is based on execution data from the following sessions:

Session	Start Time	Dump Time
runnervmwhb2z-562ee488	Oct 23, 2025, 4:44:45 AM	Oct 23, 2025, 4:44:51 AM

Execution data for the following classes is considered in this report:

Class	Id
C IntegrationTests.SQLite.DAOs.DictionaryDAOTests	cbc478615c608970
C IntegrationTests.SQLite.SQLiteDictionaryConnectionTests	48cceaa90217d0662
C com.example.project.controllers.RootLayoutController	9ae56790d5e30800
C com.example.project.controllers.gameScreens.GameScreenController	ee4d827410c39b14
C com.example.project.controllers.gameScreens.GameScreenController.MockitoMock.JaDMW7XL	6cf6b7df39dc6bd
C com.example.project.controllers.gameScreens.LevelController	01d63db2fde4e184
C com.example.project.controllers.gameScreens.LevelControllerTests	7387170a47ed87ee
C com.example.project.controllers.gameScreens.ShopController	a192ac01ad4f201a
C com.example.project.controllers.gameScreens.ShopControllerTests	25b259513d633ff9
C com.example.project.controllers.popupControllers.DefinitionController	a27e9fd845b67d9e
C com.example.project.controllers.tiles.EmptyTileControllerTests	6497475060dddb55
C com.example.project.controllers.tiles.EmptyTileSlotController	18b6e94a91e2870d
C com.example.project.controllers.tiles.LetterTileController	3155123f322d1e95
C com.example.project.controllers.tiles.TileController	472170f1175ccb7a
C com.example.project.controllers.tiles.TileControllerFactory	c8eecc2f00b38344
C com.example.project.controllers.tiles.TileControllerFactoryTests	f42d29fec32812f
C com.example.project.controllers.tiles.TileControllerFactoryTests.UnsupportedTileModel	f68f61f240dc72ed
C com.example.project.controllers.tiles.UpgradeTileController	e82b0a2b77e89c80
C com.example.project.controllers.tiles.UpgradeTileControllerTests	6dc5393ffc2a3798
C com.example.models.User	73f2d93c7dc8d563
C com.example.project.models.gameScreens.GameScreenModel	6a43d6c00726008a
C com.example.project.models.gameScreens.LevelModel	c5ede2a760c1c2c6
C com.example.project.models.gameScreens.LevelModelTests	20982a55b8728ed2
C com.example.project.models.gameScreens.LoginModel	072cedfbca9d34f5
C com.example.project.models.gameScreens.LoginModelTest	b3d0d2127edb5564
C com.example.project.models.gameScreens.MainMenuModel	90d13fb9b0d17ebd
C com.example.project.models.gameScreens.MainMenuModelTest	d8c1d3147e16af2f
C com.example.project.models.gameScreens.ScoreChimePlayer	305eeeebb1be24dfe
C com.example.project.models.gameScreens.ShopModel	04297a2d42d78998
C com.example.project.models.gameScreens.ShopModelTests	edbae39c00ed37dd
C com.example.project.models.popups.DefinitionPopup	c8f10388524de747
C com.example.project.models.popups.DefinitionPopupTest	8cbcfc00e98e10091
C com.example.project.models.popups.PopupModel	d7d747ca54f3b887
C com.example.project.models.popups.PopupModelTest	04d5e36a76a2f67f
C com.example.project.models.popups.PopupModelTest.TestPopup	3c2eea42713b0843
C com.example.project.models.tileGroups.LetterTileGroup	772523f0066a5e5e
C com.example.project.models.tileGroups.LetterTileGroupTests	ff80914c3c043aca
C com.example.project.models.tileGroups.TileGroup	7e19ae733332145c
C com.example.project.models.tileGroups.UpgradeTileGroup	929e544f2e2e1545
C com.example.project.models.tileGroups.UpgradeTileGroupTests	416d5d8f386fb9eb
C com.example.project.models.tiles.EmptyTileSlotModel	560309348fcda5aa7
C com.example.project.models.tiles.EmptyTileSlotTests	eea0f1d61a927270
C com.example.project.models.tiles.LetterTileModel	9fd302f38c1f8cd1
C com.example.project.models.tiles.LetterTileTest	c23418cec948c9d6
C com.example.project.models.tiles.ScrabbleTileProvider	27315692a76d665a
C com.example.project.models.tiles.ScrabbleTileProvider.ScrabbleTileData	a8fe0d118608ac4b
C com.example.project.models.tiles.ScrabbleTileProviderTests	55e168852cf7ab64
C com.example.project.models.tiles.TileModel	7f89317b74b781f4
C com.example.project.models.tiles.TileTests	f139067565a01480
C com.example.project.models.tiles.TileTests.TestTile	1ca92c587282a891
C com.example.project.models.tiles.UpgradeTileModel	d8e5bd4de3a48904
C com.example.project.models.tiles.UpgradeTileModel.UpgradeBuilder	e43d95b879b5cfb0
C com.example.project.models.tiles.UpgradeTileModelTests	f1b88d4fa30ff85f
C com.example.project.services.FXMLPageLoader	fc465941ce8499fa
C com.example.project.services.GameScenes	bb6365da561e625c
C com.example.project.services.Logger	35873a42f21af8ed
C com.example.project.services.LoggerTests	c1ae23810f932124
C com.example.project.services.PageLoader.MockitoMock.69oMQcfR	d3218ef152542418
C com.example.project.services.PasswordHasher	21259083042798f8
C com.example.project.services.PasswordHasherTests	ab9b14223d126452
C com.example.project.services.PopupLoader	81a0bc8fbeb958e2
C com.example.project.services.PopupLoaderTests	4a1e5fed2011cccc
C com.example.project.services.SceneManager	fa906701896b7ad3
C com.example.project.services.SceneManagerTests	b7213257f589722d

com.example.project.services.Session	7429939e85409605
com.example.project.services.SessionTests	2bfd6120c5723b24
com.example.project.services.sound.GameMusicPlayer	aa5a7a44e9cf5149
com.example.project.services.sound.GameMusicPlayerTests	3ef4c70490b0845c
com.example.project.services.sound.GameSoundPlayer	d9fd4a247737058d
com.example.project.services.sound.GameSoundPlayerTests	5ed8bc9023ccee40
com.example.project.services.sqlite.ConnectionComparer	3788cb41159b3e33
com.example.project.services.sqlite.SQLiteConnection	99d0f75cd42ab9bc
com.example.project.services.sqlite.SQLiteDictionaryConnection	dd0780a3988434c0
com.example.project.services.sqlite.dAOs.DictionaryDAO	2e2be8bd42950ccb
com.example.project.services.sqlite.dAOs.DictionaryDAOTests	59928558d04cdf1
com.example.project.services.sqlite.dAOs.SQLiteDBCreator	8d3f0f1224c95ccf
com.example.project.services.sqlite.dAOs.UsersDAO	bb0370a34c4a4a27
com.example.project.services.sqlite.dAOs.UsersDAOTests	a414ca3d9e49520d
com.example.project.testHelpers.MockAudioSystemExtension	ecc3043b791fc9ac
com.sun.glass.ui.Application	d2c633053efff922
com.sun.glass.ui.View.Capability	137b2444912a7638
com.sun.glass.utils.NativeLibLoader	2756c6e87ea3573a
com.sun.javafx.PlatformUtil	180f2410faf7cd2c
com.sun.javafx.application.PlatformImpl	91660b3e95e248d3
com.sun.javafx.application.PlatformImpl_2	b971d51ebea10887
com.sun.javafx.application.PlatformImpl.HighContrastScheme	d2d4a159e49aa741
com.sun.javafx.beans.event.AbstractNotifyListener	2a527122b153d8f7
com.sun.javafx.binding.ExpressionHelper	f926dda9605240bf
com.sun.javafx.binding.ExpressionHelperBase	9465a503879a5bb7
com.sun.javafx.binding.ListExpressionHelper	6be51d95359214b6
com.sun.javafx.binding.ListExpressionHelper.Generic	ecc179e6031e116e
com.sun.javafx.binding.ListExpressionHelper.SingleChange	a0e45bc5db7b1d8f
com.sun.javafx.collections.ListListenerHelper	77e86a2f08f0d7be
com.sun.javafx.collections.ListListenerHelper.Generic	6ba162bb98d6936f
com.sun.javafx.collections.ListListenerHelper.SingleChange	a74f7e03718465a8
com.sun.javafx.collections.MapListenerHelper	83a6071d9d8e996c
com.sun.javafx.collections.ObservableListWrapper	43e38702734066b8
com.sun.javafx.collections.ObservableMapWrapper	9beb57dce3694f06
com.sun.javafx.collections.ObservableMapWrapper.SimpleChange	6d2a9cb0f6001132
com.sun.javafx.collections.SourceAdapterChange	22fe67ed36a975b9
com.sun.javafx.collections.TrackableObservableList	d30f4d2fe4b29e79
com.sun.javafx.collections.VetoableListDecorator	347d1dd01557fc01
com.sun.javafx.css.BitSet	ab2966ccf18a1d6f
com.sun.javafx.css.PseudoClassImpl	3f1829ba7270d233
com.sun.javafx.css.PseudoClassState	6f7e579d2277afb4
com.sun.javafx.event.BasicEventDispatcher	aa45d7a164f70eb3
com.sun.javafx.event.CompositeEventDispatcher	1d685633a1724ba3
com.sun.javafx.event.CompositeEventHandler	1e76a577da3cf8c4
com.sun.javafx.event.EventHandlerManager	fd757caa74231309
com.sun.javafx.fxml.BeanAdapter	2f491e945420e949
com.sun.javafx.fxml.BeanAdapter_1	54763299be740b64
com.sun.javafx.fxml.BeanAdapter.MethodCache	7ca3780f0a0405b6
com.sun.javafx.fxml.FXMLLoaderHelper	ef6e8fbe52a02992
com.sun.javafx.fxml.MethodHelper	c772402c943b6f9f
com.sun.javafx.fxml.ModuleHelper	9001ae8bc94c3759
com.sun.javafx.geom.BaseBounds	ed0a354be28d924a
com.sun.javafx.geom.RectBounds	8919b9f96338309c
com.sun.javafx.geom.RectangularShape	7fd95f3413eb8787
com.sun.javafx.geom.RoundRectangle2D	c717cc2e84756909
com.sun.javafx.geom.Shape	c8bc730560d51518
com.sun.javafx.geom.Vec2d	d828757c2463f252
com.sun.javafx.geom.transform.BaseTransform	1eb9022f26ea24ef
com.sun.javafx.geom.transform.Identity	797e8fc16bcdcbdf
com.sun.javafx.perf.PerformanceTracker	c0073c4114dae170
com.sun.javafx.reflect.ConstructorUtil	61fe60a532acbe26
com.sun.javafx.reflect.MethodUtil	2dfe70e9f3f59b0d
com.sun.javafx.reflect.MethodUtil_1	411edf81fa5fe806
com.sun.javafx.reflect.ReflectUtil	955b6e20e3cf3988
com.sun.javafx.runtime.VersionInfo	097d2593b109124b
com.sun.javafx.scene.CssFlags	7074f98c6728098c
com.sun.javafx.scene.DirtyBits	6d9772ee39dddcc4c
com.sun.javafx.scene.EnteredExitedHandler	b8c2963c3fde263f
com.sun.javafx.scene.EventHandlerProperties	648a60aa74c8d9a6
com.sun.javafx.scene.EventHandlerProperties.EventHandlerProperty	666b1b8358e54996
com.sun.javafx.scene.ImageViewHelper	c083c8f185c5da1d
com.sun.javafx.scene.LayoutFlags	0df59ec15bbc4d05
com.sun.javafx.scene.NodeEventDispatcher	3b549faa95a5d88b
com.sun.javafx.scene.NodeHelper	a4b93b169753f510
com.sun.javafx.scene.ParentHelper	c23f48847b5f5a46

com.sun.javafx.scene.layout.PaneHelper	a289606e8fb303fb
com.sun.javafx.scene.layout.RegionHelper	97ad39fc0e16ade1
com.sun.javafx.scene.shape.RectangleHelper	912449853f782479
com.sun.javafx.scene.shape.ShapeHelper	9d6790c3d4b6e077
com.sun.javafx.scene.transform.TransformHelper	1f659cc46e4280c5
com.sun.javafx.sg.prism.NGShape.Mode	92ac86dee521cb6d
com.sun.javafx.tk.Toolkit	aa53129eb4a5d031
com.sun.javafx.tk.quantum.GlassSystemMenu	de866cf40dbbee0eb
com.sun.javafx.tk.quantum.PaintCollector	44df43dc614d8fbe
com.sun.javafx.tk.quantum.PerformanceTrackerHelper	2f870f9613045e15
com.sun.javafx.tk.quantum.PerformanceTrackerHelper.1	d6105bcb01c52025
com.sun.javafx.tk.quantum.PerformanceTrackerHelper.PerformanceTrackerDummyImpl	cd4b8f71678a2253
com.sun.javafx.tk.quantum.PerformanceTrackerImpl	5a12f07b8477f48e
com.sun.javafx.tk.quantum.QuantumRenderer	d35e94179b5d12af
com.sun.javafx.tk.quantum.QuantumRenderer.PipelineRunnable	9245b3aa82fba9b1
com.sun.javafx.tk.quantum.QuantumRenderer.QuantumThreadFactory	5247389d1c9eb181
com.sun.javafx.tk.quantum.QuantumToolkit	0ac1bcd0138cfbee
com.sun.javafx.tk.quantum.QuantumToolkit.1	c1f65e7a1298638d
com.sun.javafx.tk.quantum.QuantumToolkit.3	1b3c034cb8122f46
com.sun.javafx.tk.quantum.QuantumToolkit.PulseTask	986af6e7eae3b82f
com.sun.javafx.util.Utils	d2f9b00a9a3e4b69
com.sun.prism.BasicStroke	3417623692b8498e
com.sun.prism.GraphicsPipeline	1ea8581ec0cac4c2
com.sun.prism.es2.ES2Pipeline	12c69b05002c53d2
com.sun.prism.es2.GLFactory	de00ec3076b6872
com.sun.prism.es2.GLFactory.FactoryLoader	71b6eea996e4d096
com.sun.prism.es2.GLPGPUInfo	23a63eb0b2f3c8a4
com.sun.prism.es2.GLPixelFormat	5ca3832be6da3d2d
com.sun.prism.es2.GLPixelFormat.Attributes	f0a08c0d5bbfe95d
com.sun.prism.es2.X11GLFactory	97cd118484915fa9
com.sun.prism.impl.PrismSettings	832493b2febdafc7
com.sun.prism.impl.PrismSettings.RasterizerType	7fe513df0e240ce3
com.sun.prism.sw.SWPipeline	fc33f4f522d468ce
java.sql.DriverInfo	ea91df4c5e4e8e22
java.sql.DriverManager	fe9c6ae8f9ed72e9
java.sql.DriverManager.1	2ea175afe4482980
java.sql.DriverManager.2	60e8a2c0231a1a2e
java.sql.SQLException	c2a7742cda8a83ff
java.sql.SQLPermission	545a7e448515d9f6
javafx.application.ConditionalFeature	4de75e8169bbb408
javafx.application.Platform	7704090522af6319
javafx.beans.WeakInvalidationListener	fc4d99766f197be1
javafx.beans.binding.BooleanExpression	b1becc7549966757
javafx.beans.binding.DoubleExpression	10bb2e36be67250e
javafx.beans.binding.IntegerExpression	ac1a3e7f2ec46b03
javafx.beans.binding.ListExpression	525dc5226e624658
javafx.beans.binding.NumberExpressionBase	70a4960fb7c7a0ad
javafx.beans.binding.ObjectExpression	71fce2987e1e3a7
javafx.beans.binding.StringExpression	fad2310c05aa584d
javafx.beans.property.BooleanProperty	1f157f7ffe1d66b2
javafx.beans.property.BooleanPropertyBase	18da3c04ea61d9a7
javafx.beans.property.DoubleProperty	22c72527e41c548a
javafx.beans.property.DoublePropertyBase	c8058b74ae1b4aec
javafx.beans.property.IntegerProperty	860f9829eea70f98
javafx.beans.property.IntegerPropertyBase	3dd9f4069b6bdd90
javafx.beans.property.ListProperty	29a1ec9e1248f4fe
javafx.beans.property.ListPropertyBase	7e21b5955a903554
javafx.beans.property.ObjectProperty	50a7a1c50070f772
javafx.beans.property.ObjectPropertyBase	1b77caf6ee06f0c5
javafx.beans.property.ReadOnlyBooleanProperty	66c2d9017baabc55
javafx.beans.property.ReadOnlyBooleanPropertyBase	0554ba38d8176bfe
javafx.beans.property.ReadOnlyBooleanWrapper	05943b8893bc32ea
javafx.beans.property.ReadOnlyBooleanWrapper	dfa0cd2532c362c7
javafx.beans.property.ReadOnlyBooleanWrapper.ReadOnlyPropertyImpl	81793df4b3a47322
javafx.beans.property.ReadOnlyDoubleProperty	b13c35e24e34c27e
javafx.beans.property.ReadOnlyIntegerProperty	b3a87bcf2e9fa979
javafx.beans.property.ReadOnlyIntegerPropertyBase	d147b7f5307c06bc
javafx.beans.property.ReadOnlyIntegerWrapper	9625fc21b7fbff3
javafx.beans.property.ReadOnlyIntegerWrapper.ReadOnlyPropertyImpl	326c5d21b5e41bbe
javafx.beans.property.ReadOnlyListProperty	0402abd0036925b8
javafx.beans.property.ReadOnlyListPropertyBase	62924df6ddbfb859
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javafx.beans.property.ReadOnlyObjectProperty	f87507710d6dbf30
javafx.beans.property.ReadOnlyObjectPropertyBase	7ef6a5d83ad3373c
javafx.beans.property.ReadOnlyObjectWrapper	

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javafx.beans.property.ReadOnlyStringPropertyBase	8bca588b79328b72
javafx.beans.property.ReadOnlyStringWrapper	635d11120cae20f8
javafx.beans.property.ReadOnlyStringWrapper.ReadOnlyPropertyImpl	b7aab847e1dc97
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javafx.beans.property.StringPropertyBase	60fce33df74167c0
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javafx.collections.FXCollections.EmptyObservableSet	35a313fd7cc99877
javafx.collections.FXCollections.EmptyObservableSet.1	4394fa5b7c103428
javafx.collections.FXCollections.UnmodifiableObservableListImpl	81254e56283c2213
javafx.collections.FXCollections.UnmodifiableObservableSet	7d47d4a75de603fe
javafx.collections.ListChangeBuilder	8958dfad8635242e
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javafx.collections.ListChangeBuilder.SubChange	473eb48dab5e3f55
javafx.collections.ListChangeListener.Change	ff56149b808c32b3
javafx.collections.MapChangeListener.Change	8f5e1c5decb27258
javafx.collections.ModifiableObservableListBase	d4f104fd3a700623
javafx.collections.ObservableList.MockitoMock.bBHac041	2f5614f15e5d7825
javafx.collections.ObservableListBase	36500a719201d2f4
javafx.collections.WeakListChangeListener	2e10b4d0553c7631
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javafx.css.StyleableObjectProperty	02667de3152973b3
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javafx.fxml.FXMLLoader.2	e143ce550df057b1
javafx.fxml.FXMLLoader.3	03a848685f1dd34e
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javafx.fxml.FXMLLoader.SupportedType.2	68e64353d2b59749
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javafx.fxml.FXMLLoader.SupportedType.6	842aed37912d33b0
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javafx.scene.Node.NodeTransformation.6	cf8e6e2840547a35
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javafx.scene.Node.TreeVisibleProperty	8971fc2890fab06
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javafx.scene.Parent.3	19244e4c5182952e
javafx.scene.Parent.4	960c69df124b8173
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javafx.scene.image.ImageView.1	c67458f4f6e78c6e
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net.bytebuddy.description.field.FieldDescription.ForLoadedField	123156fd14617ba2
net.bytebuddy.description.field.FieldDescription.InDefinedShape.AbstractBase	0d8b55a89d1f5d33
net.bytebuddy.description.field.FieldDescription.Latent	3988698b9a06a78b
net.bytebuddy.description.field.FieldDescription.SignatureToken	56fee817a36ae13e
net.bytebuddy.description.field.FieldDescription.Token	cb32bbcddd28b15f
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net.bytebuddy.description.field.FieldList.ForTokens	212571f44e74f5ee

net.bytebuddy.description.method.MethodDescription	29fc82bada408f50
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net.bytebuddy.description.method.MethodDescription.ForLoadedMethod	1c3e6a782b133159
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net.bytebuddy.description.method.MethodDescription.InDefinedShape.AbstractBase.ForLoadedExecutable	1009e43f35e34cbd
net.bytebuddy.description.method.MethodDescription.Latent	906c68aeeaaf7c2c
net.bytebuddy.description.method.MethodDescription.Latent.TypeInitializer	d2d992bea0797b42
net.bytebuddy.description.method.MethodDescription.SignatureToken	5451f2ff109b0d00
net.bytebuddy.description.method.MethodDescription.Token	a2181b4586337ee7
net.bytebuddy.description.method.MethodDescription.TypeSubstituting	0993d75a33526eb0
net.bytebuddy.description.method.MethodDescription.TypeToken	5e47ae2a4768bc1c
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net.bytebuddy.description.method.MethodList.ForTokens	42b106ad57e53b91
net.bytebuddy.description.method.MethodList.TypeSubstituting	e3ff3658a2c85bc8
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net.bytebuddy.description.method.ParameterDescription.ForLoadedParameter	1f8303d30bd71a08
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net.bytebuddy.description.method.ParameterDescription.Token	8b04ac8d91e9a55d
net.bytebuddy.description.method.ParameterDescription.Token.TypeList	c866bbd9b65b2971
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net.bytebuddy.description.modifier.Visibility.1	b8d629c2c45ceb7b
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net.bytebuddy.description.type.TypeDescription.Generic.Visitor.Validator.2	499de672436311ce
net.bytebuddy.description.type.TypeDescription.Generic.Visitor.Validator.3	7923429fa88ea5cf
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net.bytebuddy.dynamic.scaffold.subclass.SubclassImplementationTarget.OriginTypeResolver.1	307c2f6381acad86
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org.junit.jupiter.api.IsFalse	dea6dc33450c92f0
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org.junit.jupiter.api.DisplayNameGenerator.ReplaceUnderscores	45af1f815eb3bfc6
org.junit.jupiter.api.DisplayNameGenerator.Simple	3587fc3bd5ac68a7
org.junit.jupiter.api.DisplayNameGenerator.Standard	232bffaafaa51a0c4e
org.junit.jupiter.api.TestInstanceLifecycle	235138c6ffffd45f1
org.junit.jupiter.api.extension.ConditionEvaluationResult	fc311dfabd3a0e23
org.junit.jupiter.api.extension.ExtensionContext	dacb7330135ba8f9
org.junit.jupiter.api.extension.ExtensionContext.Namespace	eb8d03782ab35d64
org.junit.jupiter.api.extension.ExtensionContext.Store	288780f400093c7c
org.junit.jupiter.api.extension.InvocationInterceptor	695ac2a6b4b9c7e4
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org.junit.jupiter.engine.config.DefaultJupiterConfiguration	bbee9c72790c271d
org.junit.jupiter.engine.config.EnumConfigurationParameterConverter	433eec982a6fabbc
org.junit.jupiter.engine.config.InstantiatingConfigurationParameterConverter	d2270f0957971443
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org.junit.jupiter.engine.descriptor.ClassExtensionContext	e804dacaeaef4a6a
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org.junit.jupiter.engine.discovery.ClassOrderingVisitor	1f09fc1c6b9779bb
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org.junit.jupiter.engine.discovery.predicates.IsTestableMethod	4be487dee199f633
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org.junit.jupiter.engine.execution.InvocationInterceptorChain.InterceptedInvocation	199eef1acbe0b316
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org.junit.jupiter.engine.support.JupiterThrowableCollectorFactory	46546a446de4c9c0
org.junit.jupiter.engine.support.OpenTest4JAndJUnit4AwareThrowableCollector	e9ee7d4e1adeedd1
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org.junit.platform.commons.util.ReflectionUtils.HierarchyTraversalMode	349d54e51f2ffb44
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org.junit.platform.commons.util.UnrecoverableExceptions	e906a774e770e7d4
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org.mockito.internal.debugging.LocationFactory.DefaultLocationFactory	962892aa849afdfc
org.mockito.internal.debugging.LocationImpl	530a4709e6947f60
org.mockito.internal.debugging.LocationImpl.MetadataShim	e0e02617575176a4
org.mockito.internal.exceptions.stacktrace.ConditionalStackTraceFilter	3ae9774773f8cc1
org.mockito.internal.exceptions.stacktrace.DefaultStackTraceCleaner	ccefda75b25508d
org.mockito.internal.exceptions.stacktrace.DefaultStackTraceCleanerProvider	b96ca03f68c6b0bc
org.mockito.internal.exceptions.stacktrace.StackTraceFilter	f1e5dd123e555b09
org.mockito.internal.handler.InvocationNotifierHandler	81a88d2a9823ca2e
org.mockito.internal.handler.MockHandlerFactory	60aaf611c9f037ba
org.mockito.internal.handler.MockHandlerImpl	40af730c41726d19
org.mockito.internal.handler.NullResultGuardian	887855f598dc7f26
org.mockito.internal.invocation.ArgumentsProcessor	48a63d334fbe1568
org.mockito.internal.invocation.DefaultInvocationFactory	fd7a2f1ca0abf244
org.mockito.internal.invocation.InterceptedInvocation	2bc1759562590122
org.mockito.internal.invocation.InterceptedInvocation.1	a808ee7e12b0c370
org.mockito.internal.invocation.InvocationMarker	f36ccd569efd70f7
org.mockito.internal.invocation.InvocationMatcher	a60a277cd788c00
org.mockito.internal.invocation.InvocationMatcher.1	d5c4b96c4388ebd1
org.mockito.internal.invocation.InvocationsFinder	d125e72698a81c75
org.mockito.internal.invocation.MatcherApplicationStrategy	e8e6c5931cd35a1f
org.mockito.internal.invocation.MatchersBinder	7855054a8c7718ee
org.mockito.internal.invocation.RealMethod.isIllegal	64f3caff97edef01
org.mockito.internal.invocation.StubInfoImpl	9766984c92e9959b
org.mockito.internal.invocation.TypeSafeMatching	db8fac8befb40512
org.mockito.internal.invocation.mockref.MockWeakReference	1fbf38ee01ef223b
org.mockito.internal.listeners.StubbingLookupNotifier	6f87fdb14780b091
org.mockito.internal.listeners.VerificationStartedNotifier	bc97b666d47bf342
org.mockito.internal.matchers.Any	ddca80baaf883a0c
org.mockito.internal.matchers.ArrayEquals	27688bbfffae1861
org.mockito.internal.matchers.Equality	341b019eaeb85d40
org.mockito.internal.matchers.Equals	84c89c09d537ae1d
org.mockito.internal.matchers.InstanceOf	5c0eab070e987a7e
org.mockito.internal.matchers.LocalizedMatcher	f3da081806496e9c
org.mockito.internal.progress.ArgumentParserStorageImpl	d9b8becac423331b
org.mockito.internal.progress.MockingProgressImpl	b4b478523e99786f
org.mockito.internal.progress.MockingProgressImpl.1	9f7db825fdcdf194
org.mockito.internal.progress.SequenceNumber	a68ee1dd45f51b97
org.mockito.internal.progress.ThreadSafeMockingProgress	452aa6e38ddf43e
org.mockito.internal.progress.ThreadSafeMockingProgress.1	79ae9726492f0c4f
org.mockito.internal.stubbing.BaseStubbing	7fb9abb0c3eadb7f
org.mockito.internal.stubbing.ConsecutiveStubbing	557234368bf5ca41
org.mockito.internal.stubbing.DoAnswerStyleStubbing	6e7ca0308caa0784
org.mockito.internal.stubbing.InvocationContainerImpl	6fc98009157aaa61
org.mockito.internal.stubbing.OngoingStubbingImpl	747b28f7f0499aba
org.mockito.internal.stubbing.StubbedInvocationMatcher	73693c29bdb5f1d4
org.mockito.internal.stubbing.StubberImpl	0598892699f1408c
org.mockito.internal.stubbing.answers.AbstractThrowsException	4d8774faf570ee8b
org.mockito.internal.stubbing.answers.CallsRealMethods	e57edbc68b0e39e6
org.mockito.internal.stubbing.answers.DefaultAnswerValidator	bc157688cbf26d9c
org.mockito.internal.stubbing.answers.DoesNothing	fe0bc81f8af9ad94
org.mockito.internal.stubbing.answers.InvocationInfo	35c4a7d4431e2604
org.mockito.internal.stubbing.answers.Returns	419d0de7c8cd9ec2
org.mockito.internal.stubbing.answers.ThrowsException	d5453a6546fff054
org.mockito.internal.stubbing.answers.ThrowsExceptionForClassType	c40bbb544982fb63
org.mockito.internal.stubbing.defaultanswers.GloballyConfiguredAnswer	b4af5d0cc4127c43
org.mockito.internal.stubbing.defaultanswers.ReturnsDeepStubs	9290a19f5dbdf1b2
org.mockito.internal.stubbing.defaultanswers.ReturnsEmptyValues	dbc025659648ed02
org.mockito.internal.stubbing.defaultanswers.ReturnsMocks	99d9220ab6ee9e86
org.mockito.internal.stubbing.defaultanswers.ReturnsMoreEmptyValues	708bd411a28382b5
org.mockito.internal.stubbing.defaultanswers.ReturnsSmartNulls	f434f2f732e6e80e
org.mockito.internal.stubbing.defaultanswers.TriesToReturnSelf	13e6f22c3923267d
org.mockito.internal.util.Checks	693b7ec3dc9db88a
org.mockito.internal.util.ConsoleMockitoLogger	f6ec54a756328702

org.mockito.internal.util.DefaultMockingDetails	445b7a7104a677ce
org.mockito.internal.util.KotlinInlineClassUtil	8f2e65801baf9ad5
org.mockito.internal.util.MockCreationValidator	83a10f2760252cf3
org.mockito.internal.util.MockNameImpl	009cd5fc276ed0dd
org.mockito.internal.util.MockUtil	8cedd1d6aa623c6c
org.mockito.internal.util.ObjectMethodsGuru	e958146f93547352
org.mockito.internal.util.Platform	6c061a17b8fd556f
org.mockito.internal.util.Primitives	6b6a08aaaf147839f
org.mockito.internal.util.collections.Iterables	f7eb3a38de601237
org.mockito.internal.util.concurrent.DetachedThreadLocal	24c845c0cee0c23b
org.mockito.internal.util.concurrent.DetachedThreadLocal.1	defaf890898faa64
org.mockito.internal.util.concurrent.DetachedThreadLocal.Cleaner	fe82f09eda153c82
org.mockito.internal.util.concurrent.WeakConcurrentMap	317df0cbc9bf65e4
org.mockito.internal.util.concurrent.WeakConcurrentMap.LatentKey	49d0008ff01c2270
org.mockito.internal.util.concurrent.WeakConcurrentMap.WeakKey	c9b8ab481aee9c32
org.mockito.internal.util.concurrent.WeakConcurrentMap.WithInlinedExpunction	2900bb8f66594337
org.mockito.internal.util.concurrent.WeakConcurrentSet	01665a2956990716
org.mockito.internal.util.concurrent.WeakConcurrentSet.Cleaner	8e47207f365780a7
org.mockito.internal.util.reflection.GenericMetadataSupport	9acdfdf63f655b49
org.mockito.internal.util.reflection.GenericMetadataSupport.FromClassGenericMetadataSupport	99c88b2ac93b8f3f
org.mockito.internal.util.reflection.GenericMetadataSupport.NotGenericReturnTypeSupport	8c611ef213f94120
org.mockito.internal.util.reflection.GenericMetadataSupport.ParameterizedReturnType	25e3bc9dabf2fa9d
org.mockito.internal.util.reflection.GenericMetadataSupport.TypeVarBoundedType	b7f4d58732c20401
org.mockito.internal.util.reflection.GenericMetadataSupport.TypeVariableReturnType	6d8641bfb4e9554b
org.mockito.internal.util.reflection.InstrumentationMemberAccessor	00b247ec3e952710
org.mockito.internal.util.reflection.ModuleMemberAccessor	df6459cdb157634f
org.mockito.internalverification.AtLeast	742247f606a7d3c4
org.mockito.internalverification.DefaultRegisteredInvocations	48184ff2108397ec
org.mockito.internalverification.MockAwareVerificationMode	140035dc62d048aa
org.mockito.internalverification.Times	ce9c3ea7bcd93e4
org.mockito.internalverification.VerificationDataImpl	960bc0e7bc4cb209
org.mockito.internalverification.VerificationEventImpl	c5d4f54b84a790e3
org.mockito.internalverification.VerificationModeFactory	9d00ab6e5382924b
org.mockito.internalverification.checkers.AtLeastXNumberOflnvolutionsChecker	129db1498c6df606
org.mockito.internalverification.checkers.MissingInvocationChecker	bc21ba1054e605b2
org.mockito.internalverification.checkers.NumberOflnvolutionsChecker	bd3469583e9e6716
org.mockito.mock.MockType	0b5105452bbd0790
org.mockito.mock.SerializableMode	d8db118920e53367
org.mockito.plugins.DoNotMockEnforcer	d84a80636a3b2091
org.mockito.plugins.DoNotMockEnforcer.Cache	7ad724250d9a8fd2
org.objenesis.ObjenesisBase	0c1d2fd83029257f
org.objenesis.ObjenesisStd	f35c83a75caeae811
org.objenesis.instantiator.sun.SunReflectionFactoryHelper	d17e7b3403696605
org.objenesis.instantiator.sun.SunReflectionFactoryInstantiator	6156947e7d7c507c
org.objenesis.strategy.BaseInstantiatorStrategy	b0aaa6460452f5ce
org.objenesis.strategy.PlatformDescription	c6456f671febfd7c
org.objenesis.strategy.StdInstantiatorStrategy	abae05ba56ea35a6
org.slf4j.LoggerFactory	d4f8bf028cb667a7
org.slf4j.helpers.AbstractLogger	0927772f80afa51d
org.slf4j.helpers.BasicMDCAdapter	354fafb117483fdb
org.slf4j.helpers.BasicMDCAdapter.1	8f0671fb507009fb
org.slf4j.helpers.BasicMarkerFactory	d8e0b7e9d11b515c
org.slf4j.helpers.LegacyAbstractLogger	9c0bab469712e43b
org.slf4j.helpers.NOPLoggerFactory	eaf704972ef7000c
org.slf4j.helpers.NOPMDCAdept	d816a97d0b663014
org.slf4j.helpers.NOP_FallbackServiceProvider	44c4aa253bad3620
org.slf4j.helpers.Reporter	c9b912a7116daa87
org.slf4j.helpers.Reporter.Level	07530b930aa1c996
org.slf4j.helpers.Reporter.TargetChoice	0aa347cd82827a6b
org.slf4j.helpers.SubstituteLoggerFactory	2c5fb1b0f92b644d
org.slf4j.helpers.SubstituteServiceProvider	1caf06178d203dfd
org.slf4j.helpers.ThreadLocalMapOfStacks	2b24a935616f8730
org.slf4j.helpers.Util	859d67cf0632e467
org.slf4j.simple.OutputChoice	1210473ae6c23a02
org.slf4j.simple.OutputChoice.OutputChoiceType	b1a3560a9741f5b4
org.slf4j.simple.SimpleLogger	1d2d4d9ea2830f3d
org.slf4j.simple.SimpleLoggerConfiguration	1f2875dbbf5941d4
org.slf4j.simple.SimpleLoggerFactory	e94c2f64e0e452e9
org.slf4j.simple.SimpleServiceProvider	99b66f9433a7c345
org.sqlite.ExtendedCommand	c50b1f7fa92b5727
org.sqlite.JDBC	8e6db90d48c26646
org.sqlite.SQLiteConfig	e5bc293c5fc5a401
org.sqlite.SQLiteConfig.DateClass	d291e525fe22bbab
org.sqlite.SQLiteConfig.DatePrecision	48b2cfcf8b6cbc9f

org.sqlite.SQLiteConfig.Encoding	3da2a60c689ecb45
org.sqlite.SQLiteConfig.HexKeyMode	b96f57e39f13322c
org.sqlite.SQLiteConfig.JournalMode	35850632da3b340e
org.sqlite.SQLiteConfig.LockingMode	e9325b088d34aed6
org.sqlite.SQLiteConfig.Pragma	87df8fb81c84ddba
org.sqlite.SQLiteConfig.SynchronousMode	a29bf5ffa16c164c
org.sqlite.SQLiteConfig.TempStore	b1b405b6ad7dee3c
org.sqlite.SQLiteConfig.TransactionMode	2f404b6104bcee7c
org.sqlite.SQLiteConnection	ed855927d8eeb04b
org.sqlite.SQLiteConnectionConfig	bcd564a9722e9f02
org.sqlite.SQLiteErrorCode	5abe51ede2cd0696
org.sqlite.SQLiteException	55db16725b912d5c
org.sqlite.SQLiteJDBCLoader	a6594526880a50cc
org.sqlite.SQLiteJDBCLoader.VersionHolder	9280009235d99717
org.sqlite.SQLiteLimits	5de2416ef4a27971
org.sqlite.SQLiteOpenMode	8359ea3e35c0f022
org.sqlite.core.CoreDatabaseMetaData	7051aebb4552574e
org.sqlite.core.CorePreparedStatement	750078529300087e
org.sqlite.core.CoreResultSet	1acb626cccfd5d5
org.sqlite.core.CoreStatement	a1ceabd06ac323b0
org.sqlite.core.DB	b6fc4681448d547c
org.sqlite.core.NativeDB	500d057ceb6ec321
org.sqlite.core.SafeStmtPtr	e50aa62317dfce9c
org.sqlite.date.FastDateFormat	452c95a00328b9cc
org.sqlite.date.FastDateFormat.1	46fbf48faf2148ae
org.sqlite.date.FastDateParser	fae281e33d96261d
org.sqlite.date.FastDateParser.1	ae45c588680f9086
org.sqlite.date.FastDateParser.2	13d88cc5c2eb8734
org.sqlite.date.FastDateParser.3	4cc4a0b1ba9c0895
org.sqlite.date.FastDateParser.4	e0ed4ea7b45392ea
org.sqlite.date.FastDateParser.CopyQuotedStrategy	edf865cc9ad02d15
org.sqlite.date.FastDateParser.ISO8601TimeZoneStrategy	80f87e347be6d3f2
org.sqlite.date.FastDateParser.NumberStrategy	c35d8b87ff103836
org.sqlite.date.FastDateParser.Strategy	3aff03d37d59cc72
org.sqlite.date.FastDatePrinter	aadc011f46d3de8a
org.sqlite.date.FastDatePrinter.CharacterLiteral	84f3f16ae96b7cb8
org.sqlite.date.FastDatePrinter.PaddedNumberField	81a67ba8156f5efa
org.sqlite.date.FastDatePrinter.TwoDigitMonthField	86f24deb0f79ff8e
org.sqlite.date.FastDatePrinter.TwoDigitNumberField	a85da15723b8b680
org.sqlite.date.FormatCache	9860c57b5c859df9
org.sqlite.date.FormatCache.MultipartKey	469164d2c8315f67
org.sqlite.jdbc3.JDBC3Connection	5e27d2f7139a637b
org.sqlite.jdbc3.JDBC3DatabaseMetaData	5bf62e00b2309290
org.sqlite.jdbc3.JDBC3PreparedStatement	612ff277d1eb1a39
org.sqlite.jdbc3.JDBC3ResultSet	904eb93adc35ae17
org.sqlite.jdbc3.JDBC3Statement	74fa6af2dbcfc659
org.sqlite.jdbc4.JDBC4Connection	a06b30cae027651
org.sqlite.jdbc4.JDBC4DatabaseMetaData	f7bac5219bb5b0af
org.sqlite.jdbc4.JDBC4PreparedStatement	2e47f390feb2663e
org.sqlite.jdbc4.JDBC4ResultSet	bade386a08cd541c
org.sqlite.jdbc4.JDBC4Statement	5abde92f58724875
org.sqlite.util.LibraryLoaderUtil	4df105564098d269
org.sqlite.util.OSInfo	50a8b6f7f0e697a7
org.sqlite.util.ProcessRunner	eab1d4463e729110
sun.util.resources.cldr.provider.CLDRLocaleDataMetaInfo	cea799461486d92b

GameScreenController.java

```
1. package com.example.project.controllers.gameScreens;
2.
3. import com.example.project.services.Logger;
4. import javafx.fxml.FXMLLoader;
5. import javafx.scene.Parent;
6.
7. import java.io.IOException;
8.
9. /**
10. * Game screen controller that has some startup on screen thing todo. Level, shop controllers.
11. */
12. public abstract class GameScreenController
13. {
14.     protected Logger logger = new Logger();
15.
16.     protected GameScreenController() {}
17.
18.     /**
19.      * Called when the game scene is changed to one of the GameScenes Login, Level, Shop etc.
20.      */
21.     public abstract void onSceneChangedToThis();
22.
23.     protected record SidebarLoaded(Parent node, SidebarController controller){}
24.
25.     protected SidebarLoaded loadSidebar(){
26.         // TODO: put in parent return a sidebar node return a sidebarController. OR put static load method into controller?. or make it a singleton.
27.         var sidebarPath = "/com/example/project/gameScreens/sidebar.fxml";
28.         FXMLLoader loader = new FXMLLoader(getClass().getResource(sidebarPath));
29.         Parent sidebarNode = null;
30.         try{
31.             sidebarNode = loader.load();
32.         }
33.         catch (IOException exception){
34.             this.logger.LogError("failed to load sidebar fxml file.");
35.         }
36.
37.         SidebarLoaded side = new SidebarLoaded(sidebarNode, loader.getController());
38.         return side;
39.     }
40. }
```

LevelController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
λ lambda\$onPlayButton\$9(int, ActionEvent)		0%		0%	8	8	25	25	1	1
initialize()		0%	n/a	n/a	1	1	24	24	1	1
onSceneChangedToThis()		0%	n/a	n/a	1	1	12	12	1	1
syncLevelWonText()		0%	n/a	n/a	3	3	16	16	1	1
setupDefinitionPopup()		0%	n/a	n/a	1	1	11	11	1	1
onPlayButton()		0%	n/a	n/a	1	1	9	9	1	1
syncRedrawWindow()		0%	n/a	n/a	3	3	9	9	1	1
syncDefinitionWindow(boolean)		0%	n/a	n/a	3	3	9	9	1	1
LevelController()		0%	n/a	n/a	1	1	8	8	1	1
lambda\$runTotalScoreAnimation\$10(Label, Paint, int, ActionEvent)		0%	n/a	n/a	1	1	10	10	1	1
syncPlayButton()		0%		0%	5	5	4	4	1	1
runTotalScoreAnimation(int, int)		0%	n/a	n/a	1	1	7	7	1	1
syncRedrawButton()		0%		0%	3	3	4	4	1	1
lambda\$setupDefinitionPopup\$6(ObservableValue, Boolean, Boolean)		0%		0%	2	2	5	5	1	1
onLetterTileClicked(LetterTileController)		0%		0%	2	2	3	3	1	1
lambda\$setupDefinitionPopup\$5(MouseEvent)		0%		0%	2	2	4	4	1	1
lambda\$onSceneChangedToThis\$4()		0%		0%	2	2	1	1	1	1
lambda\$onPlayButton\$8(int, int, ActionEvent)		0%	n/a	n/a	1	1	3	3	1	1
syncConfirmRedrawButton()		0%	n/a	n/a	1	1	2	2	1	1
lambda"syncDefinitionWindow\$7(boolean, ActionEvent)		0%		0%	2	2	3	3	1	1
lambda\$initialize\$3(ObservableValue, Boolean, Boolean)		0%	n/a	n/a	1	1	1	1	1	1
lambda"syncLevelWonText\$12(ActionEvent)		0%	n/a	n/a	1	1	1	1	1	1
lambda"syncLevelWonText\$11(ActionEvent)		0%	n/a	n/a	1	1	1	1	1	1
lambda\$initialize\$2(ObservableValue, Boolean, Boolean)		0%	n/a	n/a	1	1	1	1	1	1
lambda\$initialize\$1(ObservableValue, Number, Number)		0%	n/a	n/a	1	1	1	1	1	1
lambda\$initialize\$0(ObservableValue, Number, Number)		0%	n/a	n/a	1	1	1	1	1	1
onRedrawButton()		91%		50%	1	2	0	3	0	1
onConfirmRedrawButton()		91%		50%	1	2	0	3	0	1
LevelController(LevelModel)		100%	n/a	n/a	0	1	0	5	0	1
onSkipButton()		100%	n/a	n/a	0	1	0	1	0	1
Total	737 of 791	6%	50 of 52	3%	52	56	164	176	26	30

LevelController.java

```

1. package com.example.project.controllers.gameScreens;
2.
3. import com.example.project.models.tileGroups.LetterTileGroup;
4. import com.example.project.models.tileGroups.UpgradeTileGroup;
5. import com.example.project.controllers.gameScreens.animations.LevelScoreSequence;
6. import com.example.project.controllers.gameScreens.animations.ScoreTimeline;
7. import com.example.project.controllers.gameScreens.animations.TextEmphasisAnimation;
8. import com.example.project.controllers.popupControllers.DefinitionController;
9. import com.example.project.controllers.tiles.LetterTileController;
10. import com.example.project.models.gameScreens.LevelModel;
11. import com.example.project.models.popups.DefinitionPopup;
12. import com.example.project.services.GameScenes;
13. import com.example.project.services.PopupLoader;
14. import com.example.project.services.SceneManager;
15. import com.example.project.services.Session;
16. import com.example.project.services.sound.GameSoundPlayer;
17. import javafx.animation.*;
18. import javafx.beans.binding.Bindings;
19. import javafx.fxml.FXML;
20. import javafx.scene.Cursor;
21. import javafx.scene.control.Button;
22. import javafx.scene.control.Label;
23. import javafx.scene.layout.HBox;
24. import javafx.scene.layout.StackPane;
25. import javafx.scene.paint.Color;
26. import javafx.util.Duration;
27. import javafx.scene.layout.VBox;
28. import java.util.*;
29.
30.
31. /**
32. * Controller for the level screen.
33. */
34. public class LevelController extends GameScreenController
35. {
36.     @FXML Label levelWonLostText;
37.     @FXML private StackPane sidebar;
38.     @FXML HBox tileRackContainer;
39.     @FXML HBox wordWindowContainer;
40.     @FXML HBox upgradeTilesContainer;
41.     @FXML Button playButton;
42.     @FXML Button redrawButton;
43.     @FXML VBox redrawContainer;
44.     @FXML Button confirmRedrawButton;
45.     @FXML private StackPane root;
46.     @FXML private StackPane definitionContainer;
47.
48.     private static LevelModel levelModel;
49.     private final DefinitionPopup definitionPopup = new DefinitionPopup();
50.     private UpgradeTileGroup upgradeGroup;
51.     private LetterTileGroup tileRack;
52.     private LetterTileGroup wordTilesRow;
53.     private LetterTileGroup redrawTilesColumn;
54.     private SidebarController sidebarController;
55.
56.     private final GameSoundPlayer spillSound = new GameSoundPlayer("/com/example/project/Sounds/spill2.wav");
57.     private final GameSoundPlayer shakeSound = new GameSoundPlayer("/com/example/project/Sounds/shake2.wav");
58.     private final GameSoundPlayer wonSound = new GameSoundPlayer("/com/example/project/Sounds/win.wav");
59.
60. /**
61. * Constructor only called once each time application opened.
62. */
63. public LevelController()
64. {
65.     super();
66.     levelModel = new LevelModel(Session.getInstance());
67.     Session.getInstance().setLevelModel(levelModel);
68. }
69.
70. protected LevelController(LevelModel model) { levelModel = model; }
71.
72. /**
73. * @see Session#getMoneyProperty() for the money binding
74. */
75. @FXML
76. public void initialize()
77. {
78.     // Setup Listeners. (automatically updates each property when they're changed)
79.     Session.getInstance().getCurrentRedraws().addListener((obs, oldValue, newValue) -> syncRedrawButton());
80.     Session.getInstance().getCurrentPlays().addListener((obs, oldValue, newValue) -> syncPlayButton());
81.
82.     levelModel.getIsRedrawActive().addListener((obs, oldValue, newValue) -> syncRedrawWindow());
83.     definitionPopup.getIsDefinitionActive().addListener((obs, oldValue, newValue) -> syncDefinitionWindow(newValue));
84.
85.     tileRack = new LetterTileGroup(Session.getInstance().getHandSize(), tileRackContainer,
86.         levelModel.getTileRackTilesProperty(), this::onLetterTileClicked);
87.
88.     wordTilesRow = new LetterTileGroup(Session.getInstance().getWordWindowSize(), wordWindowContainer,
89.         levelModel.getWordWindowTilesProperty(), this::onLetterTileClicked,
90.         List.of(this::syncPlayButton));
91.
92.     redrawTilesColumn = new LetterTileGroup(Session.getInstance().getWordWindowSize(), redrawContainer,
93.         levelModel.getRedrawWindowTilesProperty(), this::onLetterTileClicked,
94.         List.of(this::syncRedrawButton, this::syncConfirmRedrawButton));
95.
96.     upgradeGroup = new UpgradeTileGroup(upgradeTilesContainer, Session.getInstance().getUpgradeTilesProperty());
97.
98.     setupDefinitionPopup();
99.
100.    var loadedSidebar = this.loadSidebar();
101.    var sidebarNode = ((StackPane) loadedSidebar.node());
102.    this.sidebar.getChildren().add(sidebarNode);
103.    this.sidebarController = loadedSidebar.controller();
104.    sidebarController.setupProperties(levelModel);
105.
106.    // initial sync.
107.    syncPlayButton();
108.    syncRedrawButton();
109.    syncConfirmRedrawButton();
110.    syncRedrawWindow();
111. }
112.

```

```

113. @Override
114. public void onSceneChangedToThis()
115. {
116.     levelModel.setupNewLevel();
117.     this.logger.logMessage("level page loaded.");
118.     levelWonLostText.setText("");
119.
120.     tileRack.syncTiles();
121.     wordTilesRow.syncTiles();
122.     redrawTilesColumn.syncTiles();
123.     upgradeGroup.syncTiles();
124.
125.     // level outcome text banner will only be visible when there is text
126.     levelWonLostText.visibleProperty().bind(Bindings.createBooleanBinding(
127.         () -> !levelWonLostText.getText().isEmpty(), levelWonLostText.textProperty()));
128.     levelWonLostText.managedProperty().bind(levelWonLostText.visibleProperty());
129.     levelWonLostText.prefWidthProperty().bind(levelWonLostText.widthProperty().add(500));
130.
131. }
132.
133. private void setupDefinitionPopup()
134. {
135.     PopupLoader popupLoader = new PopupLoader();
136.     DefinitionController definitionController = popupLoader.createPopupController(definitionPopup);
137.     definitionContainer.setMouseTransparent(true);
138.     definitionContainer.setVisible(false);
139.
140.     var popupRoot = definitionController.getStack();
141.     definitionContainer.getChildren().add(popupRoot);
142.
143.     popupRoot.managedProperty().bind(definitionPopup.getIsDefinitionActive());
144.     definitionPopup.setIsDefinitionActive(false);
145.
146.     // Listener for auto hiding the popup when clicking the container area outside the popup's content
147.     definitionContainer.setOnMouseClicked(event -> {
148.         if (event.getTarget() == definitionContainer) {
149.             definitionPopup.setIsDefinitionActive(false);
150.         }
151.         event.consume();
152.     });
153.
154.     // Listener for changing cursor appearance anywhere on screen
155.     definitionPopup.getIsDefinitionActive().addListener((activeObs, wasActive, isActive) -> {
156.         if (isActive) {
157.             definitionContainer.setCursor(Cursor.HAND);
158.         } else {
159.             definitionContainer.setCursor(Cursor.DEFAULT);
160.             this.syncLevelWonText();
161.         }
162.     });
163. }
164.
165. private void syncRedrawWindow()
166. {
167.     var isRedrawActive = levelModel.getIsRedrawActive().get();
168.     var distance = isRedrawActive ? -50 : 300; // slide on if inactive. slide out if active.
169.     TranslateTransition redrawWindowSlide = new TranslateTransition(Duration.millis(500), redrawContainer);
170.     redrawWindowSlide.setToX(distance);
171.     redrawWindowSlide.play();
172.     syncRedrawButton();
173.     var soundToPlay = isRedrawActive ? shakeSound : spillSound;
174.     soundToPlay.replay();
175. }
176.
177. private void syncDefinitionWindow(boolean isDefinitionActive){
178.     if (isDefinitionActive) {
179.         definitionContainer.setVisible(true);
180.         definitionContainer.setMouseTransparent(false);
181.     }
182.     var distance = isDefinitionActive ? 300 : 1000; // slide on if inactive. slide out if active.
183.     TranslateTransition definitionWindowSlide = new TranslateTransition(Duration.millis(500), definitionContainer);
184.     definitionWindowSlide.setToX(distance);
185.     definitionWindowSlide.setOnFinished(e -> {
186.         if (!isDefinitionActive) {
187.             definitionContainer.setVisible(false);
188.         }
189.     });
190.     definitionWindowSlide.play();
191. }
192.
193.
194. private void syncRedrawButton()
195. {
196.     var redraws = Session.getInstance().getCurrentRedraws().get();
197.     redrawButton.setDisable(redraws == 0);
198.     redrawButton.setText(levelModel.getIsRedrawActive().get() ? "Cancel" : "Redraw Letters");
199. }
200.
201. private void syncPlayButton()
202. {
203.     var plays = Session.getInstance().getCurrentPlays().get();
204.     playButton.setDisable((plays == 0) || !levelModel.isCurrentWordValid() || levelModel.getWordWindowTilesProperty().isEmpty() || levelModel.getIsRedrawActive().get());
205.     playButton.setText("Play Word");
206. }
207.
208.
209. private void syncConfirmRedrawButton(){
210.     confirmRedrawButton.setDisable(levelModel.getRedrawWindowTilesProperty().isEmpty());
211. }
212.
213. /**
214. * Handle tile clicks.
215. */
216. private void onLetterTileClicked(LetterTileController tileController)
217. {
218.     boolean moved = levelModel.tryMoveTile(tileController.getModel());
219.     if (!moved) { this.logger.logMessage("Cannot move tile - no space available or tile not found."); }
220.
221.
222. /**
223. * Handle play button
224. */
225. @FXML
226. protected void onPlayButton()
227. {
228.     definitionPopup.setPopup(levelModel.getCurrentWord());
229.     playButton.setDisable(true);
230.     var rawPoints = sidebarController.getRawPointsLabel();

```

```

231.     var multiplier = sidebarController.getMultiplierLabel();
232.
233.     int startScore = levelModel.getPlayersTotalPoints().get();
234.     var tileScoringSequence = new LevelScoreSequence(wordTilesRow.getControllers(), levelModel, rawPoints, multiplier);
235.     tileScoringSequence.setOnFinished(e ->
236.     {
237.         // Capturing scores before upgrades run
238.         int preUpgradePoints = levelModel.wordPointsProperty().get();
239.         int preUpgradeMulti = levelModel.wordMultiProperty().get();
240.
241.         int endScore = startScore + levelModel.calcTotalWordScore(); // Upgrades run here
242.
243.         // Capturing scores after upgrades run
244.         int postUpgradePoints = levelModel.wordPointsProperty().get();
245.         int postUpgradeMulti = levelModel.wordMultiProperty().get();
246.
247.         // Check if any upgrade changed the points or multiplier
248.         boolean pointsChanged = preUpgradePoints != postUpgradePoints;
249.         boolean multiChanged = preUpgradeMulti != postUpgradeMulti;
250.         boolean upgradesApplied = pointsChanged || multiChanged;
251.
252.         SequentialTransition upgradeSequence = new SequentialTransition();
253.
254.         if (upgradesApplied) {
255.             if (pointsChanged) {
256.                 var pointsLabel = sidebarController.getRawPointsLabel();
257.                 var scoreInitialColour = pointsLabel.getTextFill();
258.                 TextEmphasisAnimation pointsEmphasis = new TextEmphasisAnimation(pointsLabel, scoreInitialColour, scoreInitialColour, Duration.seconds(0));
259.                 upgradeSequence.getChildren().addAll(pointsEmphasis.getChildren());
260.                 upgradeSequence.getChildren().add(new javafx.animation.PauseTransition(Duration.millis(1)));
261.             }
262.             if (multiChanged) {
263.                 var comboMultiplierLabel = sidebarController.getComboLabel();
264.                 var multiColour = comboMultiplierLabel.getTextFill();
265.                 TextEmphasisAnimation multiEmphasis = new TextEmphasisAnimation(comboMultiplierLabel, multiColour, multiColour, Duration.seconds(0));
266.                 upgradeSequence.getChildren().addAll(multiEmphasis.getChildren());
267.             }
268.
269.             upgradeSequence.setOnFinished(g -> {
270.                 levelModel.getTileScoreSoundPlayer().playNextNote();
271.                 runTotalScoreAnimation(startScore, endScore);
272.             });
273.
274.             upgradeSequence.play();
275.         } else {
276.             // If no upgrades changed the score, skip the upgrade animation and run total score immediately
277.             runTotalScoreAnimation(startScore, endScore);
278.         }
279.     });
280.
281.     tileScoringSequence.play();
282. }
283.
284. private void runTotalScoreAnimation(int startScore, int endScore) {
285.     ScoreTimeline totalScoreTimeline = new ScoreTimeline();
286.     var currentScoreLabel = sidebarController.getCurrentScoreLabel();
287.     var scoreInitialColour = currentScoreLabel.getTextFill();
288.     Timeline timeline = totalScoreTimeline.animateTotalScore(startScore, endScore, currentScoreLabel, 1000);
289.     timeline.setOnFinished(f ->
290.     {
291.         TextEmphasisAnimation scoreEmphasis = new TextEmphasisAnimation(currentScoreLabel, scoreInitialColour, scoreInitialColour, Duration.seconds(0));
292.         scoreEmphasis.play();
293.         levelModel.getTileScoreSoundPlayer().playNextNote();
294.         playButton.setDisable(false);
295.         levelModel.playTiles();
296.         levelModel.resetCombo();
297.         levelModel.setTotalScore(endScore);
298.         levelModel.getTileScoreSoundPlayer().reset();
299.         definitionPopup.setIsDefinitionActive(true);
300.     });
301.     timeline.play();
302. }
303.
304. private void syncLevelWonText()
305. {
306.     if (levelModel.hasWon()){
307.         levelWonLostText.setText("VICTORY ACHIEVED");
308.         TextEmphasisAnimation youWonSequence = new TextEmphasisAnimation(levelWonLostText, Color.YELLOW, Color.BLACK, Duration.seconds(1));
309.         wonSound.replay();
310.         youWonSequence.setOnFinished(e -> levelModel.onWonLevel());
311.         youWonSequence.play();
312.     }
313.     else if (levelModel.hasLost()){
314.         levelWonLostText.setText("YOU DIED");
315.         TextEmphasisAnimation animSequence =
316.             new TextEmphasisAnimation(levelWonLostText, Color.RED, Color.BLACK, Duration.seconds(1));
317.         animSequence.setOnFinished(e -> levelModel.onLostLevel());
318.         animSequence.play();
319.     }
320.     else{
321.         levelWonLostText.setText("");
322.     }
323. }
324.
325. @FXML
326. protected void onSkipButton() { SceneManager.getInstance().switchScene(GameScenes.SHOP); }
327.
328. /**
329. * redraw button opens or cancels the redraw.
330. */
331. @FXML
332. protected void onRedrawButton()
333. {
334.     levelModel.setIsRedrawActive(!levelModel.getIsRedrawActive().get());
335.     levelModel.returnRedrawTilesToTheRack();
336. }
337.
338. /**
339. * Handle redraw confirm button.
340. */
341. @FXML
342. protected void onConfirmRedrawButton() {
343.     levelModel.setIsRedrawActive(!levelModel.getIsRedrawActive().get());
344.     levelModel.redrawTiles();
345. }
346. }

```


LoginController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
initialize()		0%		0%	3	3	16	16	1	1
LoginController()		0%	n/a		1	1	4	4	1	1
onSceneChangedToThis()		0%	n/a		1	1	3	3	1	1
onLoginButtonClick()		0%	n/a		1	1	2	2	1	1
onSignupButtonClick()		0%	n/a		1	1	2	2	1	1
lambda\$onSceneChangedToThis\$0(observableValue, String, String)		0%	n/a		1	1	1	1	1	1
Total	160 of 160	0%	4 of 4	0%	8	8	28	28	6	6

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InfiniteFloatingAnimation

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
moveToRandom(Node, double, double)		0%	n/a	1	1	10	10	1	1	
InfiniteFloatingAnimation()		0%	n/a	1	1	2	2	1	1	
apply(Node, double)		0%	n/a	1	1	2	2	1	1	
lambda\$moveToRandom\$0(Node, double, double, ActionEvent)		0%	n/a	1	1	1	1	1	1	
Total	68 of 68	0%	0 of 0	n/a	4	4	14	14	4	4

Created with JaCoCo 0.8.12.202403310830

LoginController.java

```
1. package com.example.project.controllers.gameScreens;
2.
3. import com.example.project.controllers.gameScreens.animations.InfiniteFloatingAnimation;
4. import com.example.project.models.gameScreens.LoginModel;
5. import com.example.project.models.tiles.LetterTileModel;
6. import com.example.project.services.PasswordHasher;
7. import com.example.project.controllers.tiles.TileControllerFactory;
8. import com.example.project.services.sqlite.dAOs.UsersDAO;
9. import com.example.project.services.Session;
10. import javafx.fxml.FXML;
11. import javafx.scene.control.Label;
12. import javafx.scene.control.TextField;
13. import javafx.scene.image.Image;
14. import javafx.scene.image.ImageView;
15. import javafx.scene.layout.Pane;
16.
17. import java.util.ArrayList;
18. import java.util.List;
19. import java.util.Objects;
20.
21. /**
22. * Controller for the login scene.
23. */
24. public class LoginController extends GameScreenController
25. {
26.     @FXML
27.     Pane root;
28.
29.     @FXML
30.     Pane titleRow;
31.
32.     @FXML
33.     ImageView imageBG;
34.
35.     @FXML
36.     Pane backgroundContainer;
37.
38.     @FXML
39.     private Label infoText;
40.
41.     @FXML
42.     private TextField usernameTextField;
43.
44.     @FXML
45.     private TextField passwordTextField;
46.
47.     private final LoginModel loginModel;
48.     private final TileControllerFactory tileControllerFactory = new TileControllerFactory();
49.
50. /**
51. * No arg constructor.
52. */
53. public LoginController()
54. {
55.     super();
56.     this.loginModel = new LoginModel(Session.getInstance(), new UsersDAO(), new PasswordHasher());
57. }
58.
59. @Override
60. public void onSceneChangedToThis()
61. {
62.     this.logger.logMessage("Login page loaded.");
63.
64.     loginModel.getWelcomeTextProperty().addListener((obs, oldVal, newVal) ->
65.         this.infoText.setText(newVal));
66. }
67.
68. /**
69. * FXML initialise function called once when the .fxml is loaded on application launch.
70. */
71. @FXML
72. public void initialize()
73. {
74.     var newIm = new Image(Objects.requireNonNull(getClass().getResource("/com/example/project/gameScreens/loginBgImage.jpg")).toExternalForm());
75.     imageBG.setImage(newIm);
76.     imageBG.fitWidthProperty().bind(backgroundContainer.widthProperty());
77.     imageBG.fitHeightProperty().bind(backgroundContainer.heightProperty());
78.
79.     List<LetterTileModel> lettersInWordPlayWord = new ArrayList<>();
80.     var letters = List.of('w', 'o', 'r', 'd', 'p', 'l', 'a','y');
81.     for (char letter : letters){
82.         lettersInWordPlayWord.add(new LetterTileModel(letter));
83.     }
84.
85.     for (var t : lettersInWordPlayWord){
86.         var ltController = tileControllerFactory.createLetterTileController(t);
87.         titleRow.getChildren().add(ltController.getRoot());
88.         InfiniteFloatingAnimation fa = new InfiniteFloatingAnimation();
89.         fa.apply(ltController.getRoot(), 4);
90.     }
91. }
92.
93. @FXML
94. protected void onLoginButtonClick()
95. {
```

```
96.     loginModel.onLoginClicked(usernameTextField.getText(), passwordTextField.getText());
97. }
98.
99. @FXML
100. protected void onSignupButtonClick()
101. {
102.     this.loginModel.onSignUpClicked(usernameTextField.getText(), passwordTextField.getText());
103. }
104. }
```

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MainMenuController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
● initialize()		0%		0%	3	3	18	18	1	1
● onFastForwardClick()		0%		n/a	1	1	6	6	1	1
● MainMenuController()		0%		n/a	1	1	4	4	1	1
● updateDailyRewardUI()		0%		0%	2	2	3	3	1	1
● onSceneChangedToThis()		0%		n/a	1	1	3	3	1	1
● onStartButtonClick()		0%		n/a	1	1	2	2	1	1
● onLogoutButtonClick()		0%		n/a	1	1	2	2	1	1
● onDailyRewardClicked()		0%		n/a	1	1	2	2	1	1
Total	176 of 176	0%	6 of 6	0%	11	11	40	40	8	8

Created with JaCoCo 0.8.12.202403310830

MainMenuController.java

```

1. package com.example.project.controllers.gameScreens;
2.
3. import com.example.project.controllers.gameScreens.animations.InfiniteFloatingAnimation;
4. import com.example.project.controllers.tiles.TileControllerFactory;
5. import com.example.project.models.gameScreens.MainMenuModel;
6. import com.example.project.models.tiles.LetterTileModel;
7. import com.example.project.services.SceneManager;
8. import com.example.project.services.Session;
9. import javafx.fxml.FXML;
10. import javafx.scene.image.Image;
11. import javafx.scene.image.ImageView;
12. import javafx.scene.layout.Pane;
13. import java.util.ArrayList;
14. import java.util.List;
15. import java.util.Objects;
16.
17. import com.example.project.services.GameScenes;
18.
19.
20. import javafx.scene.control.Button;
21. import javafx.scene.control.Label;
22.
23. import java.time.LocalDate;
24.
25. /**
26. * controller for the main menu.
27. */
28. public class MainMenuController extends GameScreenController
29. {
30.
31.     @FXML
32.     Pane root;
33.
34.     @FXML
35.     Pane titleRow;
36.
37.     @FXML
38.     ImageView imageBG;
39.
40.     @FXML
41.     Pane backgroundContainer;
42.
43.     @FXML private Button dailyRewardButton;
44.     @FXML private Label dailyRewardStatusLabel;
45.
46.     private final MainMenuModel mainMenuModel;
47.     private final TileControllerFactory tileControllerFactory = new TileControllerFactory();
48.
49.     /**
50.      * No arg constructor.
51.     */
52.     public MainMenuController()
53.     {
54.         super();
55.         this.mainMenuModel = new MainMenuModel(Session.getInstance());
56.     }
57.
58.     @Override
59.     public void onSceneChangedToThis()
60.     {
61.
62.         this.logger.logMessage("Main menu page loaded.");
63.         updateDailyRewardUI();
64.     }
65.
66.     /**
67.      * FXML initialise function called once when the .fxml is loaded.
68.     */
69.     @FXML
70.     public void initialize()
71.     {
72.         var newIm = new Image(Objects.requireNonNull(getClass().getResource("/com/example/project/gameScreens/loginBgImage.jpg")).toExternalForm());
73.         imageBG.setImage(newIm);
74.         imageBG.fitWidthProperty().bind(backgroundContainer.widthProperty());
75.         imageBG.fitHeightProperty().bind(backgroundContainer.heightProperty());
76.
77.         List<LetterTileModel> lettersInWordPlayWord = new ArrayList<>();
78.         var letters = List.of('w', 'o', 'r', 'd', 'p', 'l', 'a', 'y');
79.         for (char letter : letters){
80.             lettersInWordPlayWord.add(new LetterTileModel(letter));
81.         }
82.
83.         for (var t : lettersInWordPlayWord){
84.             var ltController = tileControllerFactory.createLetterTileController(t);
85.             titleRow.getChildren().add(ltController.getRoot());
86.             InfiniteFloatingAnimation fa = new InfiniteFloatingAnimation();
87.             fa.apply(ltController.getRoot(), 4);
88.         }
89.
90.         TooltipSetup tooltip = new TooltipSetup();
91.         tooltip.setupTooltip(dailyRewardButton, TooltipSetup.Element.DAILY, mainMenuModel);
92.     }
93.
94.     @FXML
95.     protected void onStartButtonClick()

```

```
96.     {
97.         mainMenuModel.onStartClicked();
98.     }
99.
100.    @FXML
101.    protected void onLogoutButtonClick()
102.    {
103.        mainMenuModel.onLogoutClicked();
104.    }
105.
106.
107.    @FXML
108.    protected void onDailyRewardClicked() {
109.        SceneManager.getInstance().switchScene(GameScenes.DAILY_REWARD);
110.    }
111.
112.    @FXML
113.    protected void onFastForwardClick() {
114.        // Fast-forward by clearing reward state and resetting money for testing
115.        Session session = Session.getInstance();
116.
117.        session.setLastRewardDate(LocalDate.now().minusDays(1));
118.        session.resetMoney();
119.        updateDailyRewardUI();
120.
121.        logger.logMessage("Fast forwarded to the next day, to next reward date and reset money.");
122.    }
123.
124.    /**
125.     * Updates the UI for the daily reward button and label.
126.     * Hides the button if already claimed today.
127.     */
128.    private void updateDailyRewardUI() {
129.        boolean claimed = Session.getInstance().hasClaimedRewardToday();
130.        dailyRewardButton.setVisible(!claimed);
131.    }
132.
133.
134. }
```

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ShopController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
initialize()		0%	n/a	1	1	9	9	1	1	
ShopController()		0%	n/a	1	1	3	3	1	1	
ShopController(ShopModel, UpgradeTileGroup, UpgradeTileGroup, Logger)		100%	n/a	0	1	0	6	0	1	
onUpgradeClicked(UpgradeTileController)		100%		100%	0	2	0	4	0	1
onSceneChangedToThis()		100%	n/a	0	1	0	5	0	1	
onNextLevelPressed()		100%	n/a	0	1	0	2	0	1	
Total	52 of 98	46%	0 of 2	100%	2	7	12	29	2	6

Created with JaCoCo 0.8.12.202403310830

ShopController.java

```

1. package com.example.project.controllers.gameScreens;
2.
3. import com.example.project.models.tileGroups.UpgradeTileGroup;
4. import com.example.project.controllers.tiles.UpgradeTileController;
5. import com.example.project.models.gameScreens.ShopModel;
6. import com.example.project.services.*;
7. import javafx.fxml.FXML;
8. import javafx.scene.layout.HBox;
9. import javafx.scene.layout.Pane;
10. import javafx.scene.layout.StackPane;
11.
12. /**
13.  * Shop view controller.
14. */
15. public class ShopController extends GameScreenController
16. {
17.     @FXML private Pane root;
18.     @FXML private HBox shopItemsContainer;
19.     @FXML private HBox playersUpgradesContainer;
20.     @FXML private StackPane sidebar;
21.
22.     private final ShopModel shopModel;
23.     private UpgradeTileGroup playersUpgrades;
24.     private UpgradeTileGroup shopItemsGroup;
25.
26.     /**
27.      * no arg constructor.
28.     */
29.     public ShopController()
30.     {
31.         super();
32.         this.shopModel = new ShopModel(Session.getInstance());
33.     }
34.
35.     /**
36.      * protected constructor for unit testing with mock model injection.
37.     */
38.     protected ShopController(ShopModel model, UpgradeTileGroup players, UpgradeTileGroup shopItems, Logger logger) {
39.         super();
40.         this.logger = logger;
41.         this.shopModel = model;
42.         this.playersUpgrades = players;
43.         this.shopItemsGroup = shopItems;
44.     }
45.
46.     /**
47.      * FXML initialise function called once when the .fxml is loaded on application launch.
48.     */
49.     @FXML
50.     public void initialize()
51.     {
52.         playersUpgrades = new UpgradeTileGroup(playersUpgradesContainer, shopModel.playersUpgradesProperty());
53.         shopItemsGroup = new UpgradeTileGroup(shopItemsContainer, shopModel.currentShopItemsProperty(),
54.             this::onUpgradeClicked);
55.
56.         var loadedSidebar = this.loadSidebar();
57.         var sidebarNode = ((StackPane) loadedSidebar.node());
58.         this.sidebar.getChildren().add(sidebarNode);
59.         SidebarController sidebarController = loadedSidebar.controller();
60.         sidebarController.bindPersistentInfo();
61.         sidebarController.onlyShopShopInfo();
62.     }
63.
64.     @Override
65.     public void onSceneChangedToThis()
66.     {
67.         this.logger.logMessage("Scene changed to shop");
68.         shopModel.regenerateShopItems();
69.         playersUpgrades.syncTiles();
70.         Session.getInstance().resetPlaysRedraws();
71.     }
72.
73.     /**
74.      *
75.      * @param controller upgrade tile ui element clicked on.
76.     */
77.     protected void onUpgradeClicked(UpgradeTileController controller)
78.     {

```

```
79.     var model = controller.getModel();
80.     if (shopModel.canPurchase(model))
81.     {
82.         shopModel.purchase(model);
83.     }
84. }
85.
86. @FXML
87. protected void onNextLevelPressed()
88. {
89.     this.shopModel.onNextLevelPressed();
90. }
91. }
```

Created with JaCoCo 0.8.12.202403310830

SidebarController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
setupProperties(LevelModel)		0%		n/a	1	1	10	10	1	1
bindPersistentInfo()		0%		n/a	1	1	9	9	1	1
onlyShopShopInfo()		0%		n/a	1	1	4	4	1	1
syncScoreToBeat()		0%		n/a	1	1	2	2	1	1
syncMoney()		0%		n/a	1	1	2	2	1	1
syncwordMultiProperty(Number)		0%		n/a	1	1	2	2	1	1
syncwordPointsProperty(Number)		0%		n/a	1	1	2	2	1	1
syncTotalScoreProperty(Number)		0%		n/a	1	1	2	2	1	1
syncPlaysCount()		0%		n/a	1	1	2	2	1	1
syncRedrawsCount()		0%		n/a	1	1	2	2	1	1
lambda\$setupProperties\$6(ObservableValue, Number, Number)		0%		n/a	1	1	1	1	1	1
lambda\$setupProperties\$5(ObservableValue, Number, Number)		0%		n/a	1	1	1	1	1	1
lambda\$setupProperties\$4(ObservableValue, Number, Number)		0%		n/a	1	1	1	1	1	1
SidebarController()		0%		n/a	1	1	1	1	1	1
getComboLabel()		0%		n/a	1	1	1	1	1	1
getRawPointsLabel()		0%		n/a	1	1	1	1	1	1
getCurrentScoreLabel()		0%		n/a	1	1	1	1	1	1
getmultiplierLabel()		0%		n/a	1	1	1	1	1	1
lambda\$setupProperties\$7(ObservableValue, Number, Number)		0%		n/a	1	1	1	1	1	1
lambda\$bindPersistentInfo\$3(ObservableValue, Number, Number)		0%		n/a	1	1	1	1	1	1
lambda\$bindPersistentInfo\$2(ObservableValue, Number, Number)		0%		n/a	1	1	1	1	1	1
lambda\$bindPersistentInfo\$1(ObservableValue, Number, Number)		0%		n/a	1	1	1	1	1	1
lambda\$bindPersistentInfo\$0(ObservableValue, Number, Number)		0%		n/a	1	1	1	1	1	1
Total	211 of 211	0%	0 of 0	n/a	23	23	42	42	23	23

SidebarController.java

```
1. package com.example.project.controllers.gameScreens;
2.
3. import com.example.project.models.gameScreens.LevelModel;
4. import com.example.project.services.Session;
5. import javafx.fxml.FXML;
6. import javafx.scene.control.Label;
7. import javafx.scene.layout.Pane;
8.
9. /**
10. * The sidebar on shop and level with the current round info.
11. */
12. public class SidebarController
13. {
14.     @FXML
15.     Pane root;
16.
17.     /**
18.      * This runs after the constructor and after all @FXML fields are initialized once each time application opened.
19.      */
20.     @FXML
21.     private Label moneyLabel;
22.
23.     @FXML private Label playsLeftLabel;
24.
25.     @FXML private Label redrawsLeftLabel;
26.
27.     @FXML Label scoreToBeatLabel;
28.     @FXML Label currentScoreLabel;
29.     @FXML Label rawPoints;
30.     @FXML Label multiplier;
31.
32.     /**
33.      * Binds things used in multiple screens, money, redraws plays.
34.      */
35.     public void bindPersistentInfo()
36.     {
37.         Session.getInstance().getMoneyProperty().addListener((obs, oldVal, newVal) -> syncMoney());
38.         Session.getInstance().getCurrentPlays().addListener((obs, oldVal, newVal) -> syncPlaysCount());
39.         Session.getInstance().getCurrentRedraws().addListener((obs, oldVal, newVal) -> syncRedrawsCount());
40.         Session.getInstance().getLevelRequirement().addListener((obs, oldVal, newVal) -> syncScoreToBeat());
41.
42.         // TODO get tooltip setup to work with sidebar containers
43.
44.         syncPlaysCount();
45.         syncRedrawsCount();
46.         syncMoney();
47.         syncScoreToBeat();
48.     }
49.
50.     @FXML private Label ScoreAtLeastText;
51.     @FXML private Pane playersScoreContainer;
52.     @FXML private Pane wordScoreContainer;
53.
54.     /**
55.      * Only show things relevant to upgrades or the shop. Money, redraws, plays.
56.      */
57.     public void onlyShopShopInfo()
58.     {
59.         playersScoreContainer.visibleProperty().set(false);
60.         wordScoreContainer.visibleProperty().set(false);
61.         ScoreAtLeastText.setText("Next level");
62.     }
63.
64.     /**
65.      * Returns combo label.
66.      * @return combo label.
67.      */
68.     public Label getComboLabel(){
69.         return this.multiplier;
70.     }
71.
72.     /**
73.      * Setup sync able properties.
74.      * @param levelModel level model.
75.      */
76.     public void setupProperties(LevelModel levelModel)
77.     {
78.         // Binds the money display to Session money property for automatic updates
```

```

79.     bindPersistentInfo();
80.     levelModel.wordPointsProperty().addListener((obs, oldVal, newVal) -> syncwordPointsProperty(newVal));
81.     levelModel.wordMultiProperty().addListener((obs, oldVal, newVal) -> syncwordMultiProperty(newVal));
82.     levelModel.getPlayersTotalPoints().addListener((obs, oldVal, newVal) -> syncTotalScoreProperty(newVal));
83.     Session.getInstance().getLevelRequirement().addListener((obs, oldVal, newVal) -> syncScoreToBeat());
84.
85.     syncwordPointsProperty(levelModel.wordPointsProperty().get());
86.     syncwordMultiProperty(levelModel.wordMultiProperty().get());
87.     syncTotalScoreProperty(levelModel.getPlayersTotalPoints().get());
88.     syncScoreToBeat();
89. }
90.
91. private void syncScoreToBeat(){
92.     scoreToBeatLabel.setText(String.format("%s", Session.getInstance().getLevelRequirement().get()));
93. }
94.
95. private void syncMoney(){
96.     moneyLabel.setText(String.format("Funds: $%d", Session.getInstance().getMoneyProperty().get()));
97. }
98.
99. private void syncPlaysCount(){
100.    playsLeftLabel.setText(String.valueOf(Session.getInstance().getCurrentPlays().get()));
101. }
102.
103. private void syncRedrawsCount(){
104.    redrawsLeftLabel.setText(String.valueOf(Session.getInstance().getCurrentRedraws().get()));
105. }
106.
107. /**
108. * raw points label to be multiplied by multiplier.
109. * @return label.
110. */
111. public Label getRawPointsLabel(){
112.     return this.rawPoints;
113. }
114.
115. /**
116. * current score label.
117. * @return label.
118. */
119. public Label getCurrentScoreLabel(){
120.     return this.currentScoreLabel;
121. }
122.
123. /**
124. * word score multiplier label.
125. * @return label.
126. */
127. public Label getmultiplierLabel(){
128.     return this.multiplier;
129. }
130.
131. private void syncwordMultiProperty(Number newVal)
132. {
133.     this.multiplier.setText(String.format("%s", newVal));
134. }
135.
136. private void syncwordPointsProperty(Number newVal)
137. {
138.     this.rawPoints.setText(String.format("%s", newVal));
139. }
140.
141. private void syncTotalScoreProperty(Number newVal)
142. {
143.     this.currentScoreLabel.setText(String.format("%s", newVal));
144. }
145. }

```

TooltipSetup.Element

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
static {...}	0%		n/a		1	1	6	6	1	1
Total	33 of 33	0%	0 of 0	n/a	1	1	6	6	1	1

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TooltipSetup

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
createTooltipContainer()		0%		n/a	1	1	9	9	1	1
createUpgradeGraphic(VBox, Object)		0%		0%	2	2	8	8	1	1
createStyledLabel(String, Color, Color)		0%		n/a	1	1	6	6	1	1
setTooltipContent(TooltipSetup.Element, Object)		0%		0%	6	6	9	9	1	1
setupTooltip(Node, TooltipSetup.Element, Object)		0%		n/a	1	1	8	8	1	1
createTooltipGraphic(VBox, String)		0%		n/a	1	1	5	5	1	1
TooltipSetup()		0%		n/a	1	1	1	1	1	1
Total	259 of 259	0%	8 of 8	0%	13	13	46	46	7	7

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TooltipSetup.java

```

1. package com.example.project.controllers.gameScreens;
2.
3. import com.example.project.models.tiles.UpgradeTileModel;
4. import javafx.geometry.Insets;
5. import javafx.geometry.Pos;
6. import javafx.scene.Node;
7. import javafx.scene.control.Tooltip;
8. import javafx.scene.control.Label;
9. import javafx.scene.layout.*;
10. import javafx.scene.paint.Color;
11. import javafx.util.Duration;
12.
13. /**
14. * sets a tooltip for desired element
15. */
16. public class TooltipSetup {
17.
18.     /**
19.      * different types of elements that require a tooltip
20.      */
21.     public enum Element {
22.         /**
23.          * tooltip for upgrade tiles
24.          */
25.         UPGRADE,
26.         /**
27.          * tooltip for daily rewards
28.          */
29.         DAILY,
30.         /**
31.          * tooltip for target score label
32.          */
33.         SCORETOBEAT,
34.         /**
35.          * tooltip for round score label
36.          */
37.         ROUNDSCORE,
38.         /**
39.          * tooltip for game funds label
40.          */
41.         FUNDS,
42.
43.     }
44.
45.     /**
46.      * @param node Node to attach tooltip to
47.      * @param element Element type
48.      * @param model Model associated with element
49.     */
50.     public void setupTooltip(Node node, Element element, Object model) {
51.         Node content = setTooltipContent(element, model);
52.
53.         // default constructor with empty string
54.         Tooltip tooltip = new Tooltip("");
55.
56.         // Set the custom graphic content
57.         tooltip.setGraphic(content);
58.
59.         tooltip.setPrefWidth(200);
60.         tooltip.setStyle("-fx-padding: 0;");
61.         tooltip.setShowDelay(Duration.seconds(0));
62.
63.         Tooltip.install(node, tooltip);
64.
65.     }
66.
67.     private Node setTooltipContent(Element element, Object model) {
68.
69.         VBox container = createTooltipContainer();
70.
71.         ◆ return switch (element) {
72.             case UPGRADE -> createUpgradeGraphic(container, model);
73.             case DAILY -> createTooltipGraphic(container, "Spin the wheel for your daily reward!");
74.             case SCORETOBEAT -> createTooltipGraphic(container, "The score you must reach before the number of plays run out! Be sure not to spend all of your redraws if you want some $$!");
75.             case ROUNDSCORE -> createTooltipGraphic(container, "The score you get after you play a word.");
76.             case FUNDS -> createTooltipGraphic(container, "How much $$$ you have. You earn more based on how many redraws you have left after winning!");
77.             default -> {
78.                 String description = "no description";
79.                 yield createTooltipGraphic(container, description);
80.             }
81.         };
82.     }
83.
84.     private VBox createTooltipContainer() {
85.         VBox container = new VBox(3); // 5 is the spacing between labels
86.         container.setPadding(new Insets(5));
87.
88.         container.setAlignment(Pos.TOP_CENTER);
89.
90.         container.setMaxSize(VBox.USE_PREF_SIZE, VBox.USE_PREF_SIZE);
91.
92.         Color bgColor = Color.color(1.0, 1.0, 1.0, 0.1);
93.         Color borderColor = Color.WHITE;
94.
95.         container.setBackground(new Background(new BackgroundFill(bgColor, new CornerRadii(6), Insets.EMPTY)));
96.         container.setBorder(new Border(new BorderStroke(
97.             borderColor,
98.             BorderStrokeStyle.SOLID,
99.             new CornerRadii(6),
100.            new BorderWidths(2) // 2px white border
101.        )));
102.         return container;
103.     }
104.
105.     private Node createTooltipGraphic(VBox container, String description) {
106.
107.         Label descriptionLabel = createStyledLabel(description, Color.web("#d9d8c7"), Color.BLACK);
108.
109.         descriptionLabel.setWrapText(true);
110.
111.         descriptionLabel.setPrefWidth(200);
112.
113.         container.getChildren().addAll(descriptionLabel);
114.         return container;
115.     }
116.
117.     private Node createUpgradeGraphic(VBox container, Object model) {
118.         if (!(model instanceof UpgradeTileModel upgradeModel)) {
119.             return new Label("Error: Invalid model type or missing data.");
120.         }
121.
122.         Label nameLabel = createStyledLabel(upgradeModel.getName(), Color.web("#9f1124"), Color.WHITE);
123.
```

```
124.         container.getChildren().add(nameLabel);
125.
126.         createTooltipGraphic(container, upgradeModel.getDescription());
127.
128.         Label costLabel = createStyledLabel(String.format("Cost: %.2f", upgradeModel.getCost()), Color.web("#f98c3f"), Color.WHITE);
129.
130.         container.getChildren().add(costLabel);
131.
132.         return container;
133.     }
134.
135.     private Label createStyledLabel(String text, Color bgColor, Color txtColor) {
136.         Label label = new Label(text);
137.         label.setTextFill(txtColor);
138.
139.         label.setBackground(new Background(new BackgroundFill(bgColor, new CornerRadii(4), Insets.EMPTY)));
140.         label.setPadding(new Insets(2, 8, 2, 8));
141.
142.         label.setStyle("-fx-font-family: 'Inter'; -fx-font-weight: bold; -fx-font-size: 14px;");
143.
144.         return label;
145.     }
146. }
```

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InfiniteFloatingAnimation.java

```
1. package com.example.project.controllers.gameScreens.animations;
2.
3. import javafx.animation.TranslateTransition;
4. import javafx.scene.Node;
5. import javafx.util.Duration;
6.
7. import java.util.Random;
8.
9. /**
10. * Balatro style floating tile animation.
11. */
12. public class InfiniteFloatingAnimation
13. {
14.     private final Random random = new Random();
15.
16.     /**
17.      * apply to node.
18.      * @param node node.
19.      * @param intervalSeconds time between changing directions.
20.      */
21.     public void apply(Node node, double intervalSeconds)
22.     {
23.         moveToRandom(node, intervalSeconds, intervalSeconds);
24.     }
25.
26.     private void moveToRandom(Node node, double minD, double maxD)
27.     {
28.         // pick random target position
29.         double x = random.nextDouble(0, 10);
30.         double y = random.nextDouble(0, 10);
31.
32.         double duration = minD + random.nextDouble() * (maxD - minD);
33.
34.         TranslateTransition tt = new TranslateTransition(Duration.seconds(duration), node);
35.         tt.setToX(x);
36.         tt.setToY(y);
37.         tt.setInterpolator(javafx.animation.Interpolator.LINEAR); // constant speed
38.
39.         // when done, pick a new target
40.         tt.setOnFinished(e -> moveToRandom(node, minD, maxD));
41.         tt.play();
42.     }
43. }
```

com.example.project.controllers.gameScreens

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
C LevelController		6%		3%	52	56	164	176	26	30	0	1
C TooltipSetup		0%		0%	13	13	46	46	7	7	1	1
C SidebarController		0%		n/a	23	23	42	42	23	23	1	1
C DailyRewardController		0%		0%	14	14	53	53	9	9	1	1
C MainMenuController		0%		0%	11	11	40	40	8	8	1	1
C LoginController		0%		0%	8	8	28	28	6	6	1	1
C ShopController		46%		100%	2	7	12	29	2	6	0	1
C TooltipSetup.Element		0%		n/a	1	1	6	6	1	1	1	1
C GameScreenController		20%		n/a	1	2	9	11	1	2	0	1
C GameScreenController-sidebarLoaded		0%		n/a	1	1	1	1	1	1	1	1
Total	1,877 of 1,985	5%	77 of 81	4%	126	136	401	432	84	93	7	10

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com.example.project.controllers.gameScreens

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
LevelController.java		6%		3%	52	56	164	176	26	30	0	1
TooltipSetup.java		0%		0%	14	14	52	52	8	8	2	2
SidebarController.java		0%		n/a	23	23	42	42	23	23	1	1
DailyRewardController.java		0%		0%	14	14	53	53	9	9	1	1
MainMenuController.java		0%		0%	11	11	40	40	8	8	1	1
LoginController.java		0%		0%	8	8	28	28	6	6	1	1
ShopController.java		46%		100%	2	7	12	29	2	6	0	1
GameScreenController.java		16%		n/a	2	3	10	12	2	3	1	2
Total	1,877 of 1,985	5%	77 of 81	4%	126	136	401	432	84	93	7	10

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DefinitionController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
syncwordProperty(String)		0%		0%	3	3	14	14	1	1
initialize(DefinitionPopup)		0%		n/a	1	1	5	5	1	1
syncDefinitionProperty(String)		0%		n/a	1	1	2	2	1	1
DefinitionController()		0%		n/a	1	1	2	2	1	1
getModel()		0%		n/a	1	1	1	1	1	1
lambda\$initialize\$1(ObservableValue, String, String)		0%		n/a	1	1	1	1	1	1
lambda\$initialize\$0(ObservableValue, String, String)		0%		n/a	1	1	1	1	1	1
getStack()		0%		n/a	1	1	1	1	1	1
Total	139 of 139	0%	4 of 4	0%	10	10	25	25	8	8

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DefinitionController.java

```
1. package com.example.project.controllers.popupControllers;
2.
3. import com.example.project.controllers.gameScreens.animations.InfiniteFloatingAnimation;
4. import com.example.project.controllers.tiles.TileControllerFactory;
5. import com.example.project.models.tiles.LetterTileModel;
6. import javafx.fxml.FXML;
7. import javafx.scene.image.ImageView;
8. import javafx.scene.control.Label;
9. import javafx.scene.layout.Pane;
10. import javafx.scene.Node;
11. import javafx.scene.layout.StackPane;
12. import com.example.project.models.popups.DefinitionPopup;
13. import java.util.ArrayList;
14. import java.util.List;
15.
16.
17. /**
18. * Controller for definition popup
19. */
20. public class DefinitionController extends PopupController<DefinitionPopup>
21. {
22.     @FXML
23.     private StackPane defStack;
24.
25.     @FXML
26.     Pane wordRow;
27.
28.     @FXML
29.     Label definitionLabel;
30.
31.     @FXML
32.     ImageView definitionImage;
33.
34.     /**
35.      * @return returns Node
36.     */
37.     public Node getStack() { return defStack; }
38.
39.     public DefinitionPopup getModel(){
40.         return model;
41.     }
42.
43.     private final TileControllerFactory tileControllerFactory = new TileControllerFactory();
44.
45.     @Override
46.     public void initialize(DefinitionPopup model)
47.     {
48.         this.model = model;
49.         wordRow.setMouseTransparent(true);
50.         model.definitionProperty().addListener((obs, oldStr, newStr) -> syncDefinitionProperty(newStr));
51.         model.wordProperty().addListener((obs, oldStr, newStr) -> syncwordProperty(newStr));
52.     }
53.
54.     private void syncDefinitionProperty(String newStr){
55.         this.definitionLabel.setText(String.format("%s", newStr));
56.     }
57.
58.     private void syncwordProperty(String newStr){
59.         // TODO: turn this into a reusable external function (same used in LoginController)
60.         wordRow.getChildren().clear();
61.         List<LetterTileModel> lettersInWordPlayed = new ArrayList<>();
62.         char[] charArray = newStr.toCharArray();
63.
64.         for (char letter : charArray){
65.             lettersInWordPlayed.add(new LetterTileModel(letter));
66.         }
67.
68.         for (var t : lettersInWordPlayed){
69.             var ltController = tileControllerFactory.createLetterTileController(t);
70.             ltController.getRoot().setScaleX(-(wordRow.getMaxWidth()/1.5));
71.             ltController.getRoot().setScaleY(-(wordRow.getMaxWidth()/1.5));
72.             wordRow.getChildren().add(ltController.getRoot());
73.             InfiniteFloatingAnimation fa = new InfiniteFloatingAnimation();
74.             fa.apply(ltController.getRoot(), 4);
75.         }
76.     }
77.
78. }
```


PopupController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
PopupController()	0%		n/a		1	1	1	1	1	1
getModel()	0%		n/a		1	1	1	1	1	1
Total	6 of 6	0%	0 of 0	n/a	2	2	2	2	2	2

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PopupController.java

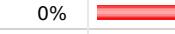
```
1. package com.example.project.controllers.popupControllers;
2.
3. import com.example.project.models.popups.PopupModel;
4. import javafx.fxml.FXML;
5. import javafx.scene.Node;
6.
7. /**
8. * Parent class for PopupControllers
9. * @param <P> Popup model type
10.*/
11. public abstract class PopupController<P extends PopupModel>
12. {
13.     /**
14.      * root ui node.
15.      * @return root ui Node
16.      */
17.     public abstract Node getStack();
18.
19.     /**
20.      * sets elements of the ui
21.      * @param popup popup to initialize
22.      */
23.     @FXML
24.     public abstract void initialize(P popup);
25.
26.     protected P model;
27.
28.     /**
29.      * gets the popup model.
30.      * @return model.
31.      */
32.     public P getModel()
33.     {
34.         return this.model;
35.     }
36. }
```

com.example.project.controllers.popupControllers

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
DefinitionController	 0%	0%	 0%	n/a	10	10	25	25	8	8	1	1
PopupController	 0%	n/a	 0%	2	2	2	2	2	2	2	1	1
Total	145 of 145	0%	4 of 4	0%	12	12	27	27	10	10	2	2

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com.example.project.controllers.popupControllers

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
DefinitionController.java	 0%	 0%	10	10	25	25	8	8	1	1	1	1
PopupController.java	 0%	n/a	2	2	2	2	2	2	1	1	1	1
Total	145 of 145	0%	4 of 4	0%	12	12	27	27	10	10	2	2

Created with JaCoCo 0.8.12.202403310830

EmptyTileSlotController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
setLetter(LetterTileController)	100%	100%	100%	100%	0	3	0	6	0	1
updateView()	100%	100%	100%	100%	0	2	0	4	0	1
bind(EmptyTileSlotModel)	100%	100%		n/a	0	1	0	2	0	1
EmptyTileSlotController()	100%	100%		n/a	0	1	0	1	0	1
getRoot()	100%	100%		n/a	0	1	0	1	0	1
Total	0 of 50	100%	0 of 6	100%	0	8	0	14	0	5

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EmptyTileSlotController.java

```
1. package com.example.project.controllers.tiles;
2.
3. import com.example.project.models.tiles.EmptyTileSlotModel;
4. import javafx.fxml.FXML;
5. import javafx.scene.Node;
6. import javafx.scene.layout.StackPane;
7.
8. /**
9. * Empty Tile controller for EmptyTile view.
10.*/
11. public class EmptyTileSlotController extends TileController<EmptyTileSlotModel>
12. {
13.     @FXML
14.     protected StackPane root;
15.
16.     @FXML
17.     protected StackPane slotForLetterTile;
18.
19.     public void bind(EmptyTileSlotModel modelToUse)
20.     {
21.         this.model = modelToUse;
22.     }
23.
24.     private LetterTileController letterTileController;
25.
26.     public Node getRoot()
27.     {
28.         return root;
29.     }
30.
31.     /**
32.      * updates the tile slot with a new letter tile controller.
33.      * @param letterController the letter tiles controller.
34.      */
35.     public void setLetter(LetterTileController letterController)
36.     {
37.         if (this.model == null){
38.             throw new RuntimeException("model was null. call bind first.");
39.         }
40.
41.         this.model.setTile(letterController == null ? null : letterController.getModel());
42.         letterTileController = letterController;
43.         updateView();
44.     }
45.
46.     private void updateView()
47.     {
48.         slotForLetterTile.getChildren().clear();
49.
50.         if (this.letterTileController != null){
51.             slotForLetterTile.getChildren().add(this.letterTileController.getRoot());
52.         }
53.     }
54. }
```

LevelScoreSequence

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
• LevelScoreSequence(List, LevelModel, Label, Label)		0%		0%	2	2	16	16	1	1
• lambda\$new\$0(LevelModel, LetterTileController, ActionEvent)		0%		n/a	1	1	3	3	1	1
Total	94 of 94	0%	2 of 2	0%	3	3	19	19	2	2

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LetterTileController

Element	Missed Instructions Cov.	Missed Branches Cov.	Missed Cxts	Missed Lines	Missed Methods
bind(LetterTileModel)	0%	n/a	1 1	10 10	1 1
getModel()	0%	n/a	1 1	1 1	1 1
LetterTileController()	0%	n/a	1 1	1 1	1 1
getRoot()	0%	n/a	1 1	1 1	1 1
Total	54 of 54	0% 0 of 0	n/a	4 4	13 13

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LetterTileController.java

```
1. package com.example.project.controllers.tiles;
2.
3. import com.example.project.models.tiles.LetterTileModel;
4. import javafx.fxml.FXML;
5. import javafx.scene.CacheHint;
6. import javafx.scene.Node;
7. import javafx.scene.control.Label;
8. import javafx.scene.image.ImageView;
9. import javafx.scene.layout.StackPane;
10.
11. /**
12. * Controls the layout of the letterUIModel. Which is a letter tile.
13. */
14. public class LetterTileController extends TileController<LetterTileModel>
15. {
16.     @FXML
17.     private StackPane root;
18.
19.     @FXML
20.     ImageView tileImage;
21.
22.     @FXML
23.     Label letterLabel;
24.
25.     @FXML
26.     Label valueLabel;
27.
28.     public Node getRoot()
29.     {
30.         return root;
31.     }
32.
33.     public LetterTileModel getModel(){
34.         return model;
35.     }
36.
37.     @Override
38.     public void bind(LetterTileModel tile)
39.     {
40.         this.model = tile;
41.         letterLabel.setText(String.valueOf(model.getLetter()));
42.         valueLabel.setText(String.valueOf(model.getValue()));
43.
44.         letterLabel.setCache(true);
45.         letterLabel.setCacheHint(CacheHint.QUALITY);
46.
47.         valueLabel.setCache(true);
48.         valueLabel.setCacheHint(CacheHint.QUALITY);
49.
50.         tileImage.setCache(true);
51.         tileImage.setCacheHint(CacheHint.QUALITY);
52.     }
53. }
```

TileController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
setModel(TileModel)	100%		n/a		0	1	0	2	0	1
TileController()	100%		n/a		0	1	0	1	0	1
getModel()	100%		n/a		0	1	0	1	0	1
Total	0 of 10	100%	0 of 0	n/a	0	3	0	4	0	3

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TileController.java

```
1. package com.example.project.controllers.tiles;
2.
3. import com.example.project.models.tiles.TileModel;
4. import javafx.scene.Node;
5.
6. /**
7.  * Parent class of TileControllers.
8.  * @param <T> tile model type.
9. */
10. public abstract class TileController<T extends TileModel>
11. {
12.     /**
13.      * root ui node.
14.      * @return root ui Node
15.      */
16.     public abstract Node getRoot();
17.
18.     /**
19.      * Binds tile to the controller as its model.
20.      * @param tile tile to bind.
21.      */
22.     public abstract void bind(T tile);
23.
24.     /**
25.      * Set the model this controller will observe.
26.      * @param tile tile model class.
27.      */
28.     public void setModel(T tile){
29.         model = tile;
30.     }
31.
32.     protected T model;
33.
34.     /**
35.      * gets the tile model.
36.      * @return model.
37.      */
38.     public T getModel()
39.     {
40.         return this.model;
41.     }
42. }
```

TileControllerFactory

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
λ lambda\$createLetterTileController\$3(LetterTileController)		0%	n/a	1	1	1	1	1	1	1
createTileController(TileModel, Class)		100%		100%	0	4	0	6	0	1
createGenericTileController(TileModel)		100%	n/a	0	1	0	8	0	0	1
createUpgradeTileController(UpgradeTileModel)		100%	n/a	0	1	0	4	0	0	1
createLetterTileController(LetterTileModel)		100%	n/a	0	1	0	4	0	0	1
TileControllerFactory(FXMLLoaderPageLoader)		100%	n/a	0	1	0	4	0	0	1
addHoverEffects(Node, Runnable)		100%	n/a	0	1	0	3	0	0	1
λ lambda\$addHoverEffects\$0(Node, Runnable, MouseEvent)		100%	n/a	0	1	0	4	0	0	1
TileControllerFactory()		100%	n/a	0	1	0	2	0	0	1
λ lambda\$addHoverEffects\$1(Node, MouseEvent)		100%	n/a	0	1	0	3	0	0	1
λ lambda\$createUpgradeTileController\$2(UpgradeTileController)		100%	n/a	0	1	0	1	0	0	1
createEmptyTileController(EmptyTileSlotModel)		100%	n/a	0	1	0	1	0	0	1
Total	5 of 167	97%	0 of 4	100%	1	15	0	38	1	12

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TileControllerFactory.java

```
1. package com.example.project.controllers.tiles;
2.
3. import com.example.project.models.tiles.EmptyTileSlotModel;
4. import com.example.project.models.tiles.LetterTileModel;
5. import com.example.project.models.tiles.TileModel;
6. import com.example.project.models.tiles.UpgradeTileModel;
7. import com.example.project.services.FXMLPageLoader;
8. import javafx.scene.Node;
9.
10. import java.io.IOException;
11.
12. /**
13.  * class to load the tile model controller for that tile model type.
14. */
15. public class TileControllerFactory
16. {
17.     private FXMLPageLoader loader = new FXMLPageLoader();
18.
19.     /**
20.      * Creates instance of {@link TileControllerFactory}.
21.     */
22.     public TileControllerFactory() {}
23.
24.     protected TileControllerFactory(FXMLPageLoader loader)
25.     {
26.         this.loader = loader;
27.     }
28.
29.     /**
30.      * create tile controller.
31.      * @param tileObject tile object.
32.      * @param <C> class of tile controller.
33.      * @param <T> class of tile.
34.      * @return returns controller of the tile.
35.     */
36.     private <C extends TileController<T>, T extends TileModel> C createGenericTileController(T tileObject)
37.     {
38.         try
39.         {
40.             String fxmlPath = tileObject.getFXMLPath();
41.             loader.load(fxmlPath);
42.             C controller = loader.getController();
43.             controller.setModel(tileObject);
44.             controller.bind(tileObject);
45.             return controller;
46.         } catch (IOException e) {
47.             throw new RuntimeException("Failed to create tile controller: " + tileObject.getFXMLPath(), e);
48.         }
49.     }
50.
51.     private void addHoverEffects(Node pane, Runnable onEnter)
52.     {
53.         pane.setOnMouseEntered(e -> {
54.             pane.setScaleX(1.1);
55.             pane.setScaleY(1.1);
56.             onEnter.run();
57.         });
58.         pane.setOnMouseExited(e -> {
59.             pane.setScaleX(1.0);
60.             pane.setScaleY(1.0);
61.         });
62.     }
63.
64.     /**
65.      * @param upgradeTile upgrade tile model.
66.      * @return new upgrade tile controller.
67.     */
68.     private UpgradeTileController createUpgradeTileController(UpgradeTileModel upgradeTile)
69.     {
70.         UpgradeTileController upgradeTileController = createGenericTileController(upgradeTile);
71.         var pane = upgradeTileController.getRoot();
72.         addHoverEffects(pane, () -> upgradeTileController.getModel().getHoverSoundPlayer().replay());
73.         return upgradeTileController;
74.     }
75.
76.     /**
77.      * Returns controller of type.
78.      * @param tile tile model.
```

```
79.     * @param controllerType controller type.
80.     * @return return controller.
81.     * @param <C> controller type.
82.     * @param <T> tile type.
83.     */
84.     public <C extends TileController<T>, T extends TileModel> C createTileController(T tile, Class<C> controllerType)
85.     {
86.         var controller = switch (tile)
87.         {
88.             case UpgradeTileModel upgradeTileModel -> createUpgradeTileController(upgradeTileModel);
89.             case LetterTileModel letterTile -> createLetterTileController(letterTile);
90.             case EmptyTileSlotModel emptyTileSlotModel -> createEmptyTileController(emptyTileSlotModel);
91.             default -> throw new IllegalArgumentException("Unsupported tile type: " + tile.getClass());
92.         };
93.
94.         return controllerType.cast(controller);
95.     }
96.
97.     /**
98.      * @param lt letter tile model.
99.      * @return returns letter tile controller.
100.     */
101.    public LetterTileController createLetterTileController(LetterTileModel lt)
102.    {
103.        LetterTileController controller = createGenericTileController(lt);
104.        var pane = controller.getRoot();
105.        addHoverEffects(pane, () -> controller.getModel().getHoverSoundPlayer().replay());
106.        return controller;
107.    }
108.
109.    /**
110.     * @param emptyTile empty tile model.
111.     * @return returns empty tile controller.
112.     */
113.    private EmptyTileSlotController createEmptyTileController(EmptyTileSlotModel emptyTile){
114.        return createGenericTileController(emptyTile);
115.    }
116. }
```

UpgradeTileController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
bind(UpgradeTileModel)		18%		50%	1	2	14	16	0	1
updateCount(int)		0%		0%	2	2	6	6	1	1
getRoot()		0%	n/a	n/a	1	1	1	1	1	1
UpgradeTileController()		100%	n/a	n/a	0	1	0	1	0	1
Total	83 of 99	16%	3 of 4	25%	4	6	21	24	2	4

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UpgradeTileController.java

```
1. package com.example.project.controllers.tiles;
2.
3. import com.example.project.models.tiles.TileModel;
4. import com.example.project.models.tiles.UpgradeTileModel;
5. import com.example.project.controllers.gameScreens.TooltipSetup;
6. import javafx.fxml.FXML;
7. import javafx.scene.Node;
8. import javafx.scene.control.Label;
9. import javafx.scene.image.Image;
10. import javafx.scene.image.ImageView;
11. import javafx.scene.layout.StackPane;
12.
13. import javafx.scene.shape.Rectangle;
14.
15. /**
16. * Controls the upgrade tile view fxml file.
17. */
18. public class UpgradeTileController extends TileController<UpgradeTileModel>
19. {
20.     @FXML
21.     protected StackPane root;
22.
23.     @FXML
24.     protected ImageView imageView;
25.
26.     @FXML
27.     protected Label countText;
28.
29.     public Node getRoot()
30.     {
31.         return root;
32.     }
33.
34.     public void bind(UpgradeTileModel tileModel)
35.     {
36.         var path = getClass().getResource(tileModel.getAbilityImagePath());
37.         if (path == null) { throw new RuntimeException("path null"); }
38.         var url = path.toExternalForm();
39.         var image = new Image(url);
40.         this.imageView.setImage(image);
41.
42.         Rectangle clip = new Rectangle();
43.         // set corner radii
44.         clip.setArcWidth(TileModel.CORNER_RADIUS);
45.         clip.setArcHeight(TileModel.CORNER_RADIUS);
46.
47.         clip.widthProperty().bind(imageView.fitWidthProperty());
48.         clip.heightProperty().bind(imageView.fitHeightProperty());
49.
50.         imageView.setClip(clip);
51.
52.         TooltipSetup tooltip = new TooltipSetup();
53.         tooltip.setupTooltip(this.root, TooltipSetup.Element.UPGRADE, model);
54.
55.         this.countText.setText("");
56.         this.countText.setVisible(false);
57.     }
58.
59.     /**
60.      * updates upgrade # subscript
61.      * @param count the number of duplicate upgrades
62.      */
63.     public void updateCount(int count)
64.     {
65.         if (count > 1)
66.         {
67.             this.countText.setText(String.valueOf(count));
68.             this.countText.setVisible(true);
69.         }
70.         else
71.         {
72.             this.countText.setText("");
73.             this.countText.setVisible(false);
74.         }
75.     }
76. }
```

com.example.project.controllers.tiles

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
C UpgradeTileController		16%		25%	4	6	21	24	2	4	0	1
C LetterTileController		0%		n/a	4	4	13	13	4	4	1	1
C TileControllerFactory		97%		100%	1	15	0	38	1	12	0	1
C EmptyTileSlotController		100%		100%	0	8	0	14	0	5	0	1
C TileController		100%		n/a	0	3	0	4	0	3	0	1
Total	142 of 380	62%	3 of 14	78%	9	36	34	93	7	28	1	5

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com.example.project.controllers.tiles

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxt	Missed	Lines	Missed	Methods	Missed	Classes	
UpgradeTileController.java		16%		25%	4	6	21	24	2	4	0	1	
LetterTileController.java		0%		n/a	4	4	13	13	4	4	1	1	
TileControllerFactory.java		97%		100%	1	15	0	38	1	12	0	1	
EmptyTileSlotController.java		100%		100%	0	8	0	14	0	5	0	1	
TileController.java		100%		n/a	0	3	0	4	0	3	0	1	
Total	142 of 380	62%	3 of 14		78%	9	36	34	93	7	28	1	5

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LevelScoreSequence.java

```
1. package com.example.project.controllers.gameScreens.animations;
2.
3. import com.example.project.controllers.tiles.LetterTileController;
4. import com.example.project.models.gameScreens.LevelModel;
5. import javafx.animation.*;
6. import javafx.scene.control.Label;
7. import javafx.scene.paint.Color;
8. import javafx.util.Duration;
9.
10. import java.util.List;
11.
12. /**
13. * Animates each level tile popping up and the score text increasing for every tile in the word row.
14. */
15. public class LevelScoreSequence extends AnimationWrapper
16. {
17.     /**
18.      * Constructor.
19.      * @param wordTileControllers tiles to animate.
20.      * @param levelModel level model.
21.      * @param comboCountLabel the text label to add the sum to.
22.      * @param multiplierLabel the text label to add the multi to.
23.      */
24.     public LevelScoreSequence(List<LetterTileController> wordTileControllers, LevelModel levelModel, Label comboCountLabel, Label multiplierLabel)
25.     {
26.         super();
27.
28.         for (LetterTileController control : wordTileControllers)
29.         {
30.             var translateUp = new TranslateTransition(Duration.seconds(0.1), control.getRoot());
31.             translateUp.setByY(-10);
32.             translateUp.setOnFinished(e ->
33.             {
34.                 levelModel.addToCombo(control.getModel());
35.                 levelModel.getTileScoreSoundPlayer().playNextNote();
36.             });
37.
38.             this.sequentialAnimation.getChildren().add(translateUp);
39.             var pointsTextColour = multiplierLabel.getTextFill();
40.             var multiplierTextColour = comboCountLabel.getTextFill();
41.             TextEmphasisAnimation sumComboSequence = new TextEmphasisAnimation(comboCountLabel, Color.GREEN, pointsTextColour, Duration.seconds(0));
42.             TextEmphasisAnimation multiComboSequence = new TextEmphasisAnimation(multiplierLabel, Color.GREEN, multiplierTextColour, Duration.seconds(0));
43.             this.sequentialAnimation.getChildren().addAll(sumComboSequence.getChildren());
44.             this.sequentialAnimation.getChildren().addAll(multiComboSequence.getChildren());
45.         }
46.
47.         // After all tiles
48.         var timeDelay = new PauseTransition(Duration.seconds(1));
49.         this.sequentialAnimation.getChildren().add(timeDelay);
50.     }
51. }
```

RootLayoutController

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
● toggleSound()		0%		0%	3	3	5	5	1	1
● setContent(Parent)		0%		n/a	1	1	3	3	1	1
● initialize()		0%		n/a	1	1	4	4	1	1
● skipLogin()		0%		n/a	1	1	2	2	1	1
● RootLayoutController()		100%		n/a	0	1	0	2	0	1
Total	45 of 53	15%	4 of 4	0%	6	7	14	16	4	5

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RootLayoutController.java

```
1. package com.example.project.controllers;
2.
3. import com.example.project.services.GameScenes;
4. import com.example.project.services.SceneManager;
5. import com.example.project.services.sound.GameMusicPlayer;
6. import com.example.project.services.SVGIcons;
7. import javafx.fxml.FXML;
8. import javafx.scene.Parent;
9. import javafx.scene.control.Button;
10. import javafx.scene.layout.BorderPane;
11. import javafx.scene.layout.StackPane;
12.
13.
14. /**
15. * Root layout that remains the root scene of the application to switch scenes within.
16. */
17. public class RootLayoutController
18. {
19.     @FXML
20.     private BorderPane rootPane;
21.
22.     @FXML
23.     private StackPane contentPane;
24.
25.     @FXML
26.     private StackPane headerPane;
27.
28.     @FXML
29.     Button soundToggle;
30.
31.     private final GameMusicPlayer musicPlayer = new GameMusicPlayer();
32.
33.     private boolean isPlaying;
34.
35.     /**
36.      * @param page Set page content to a game scene.
37.      */
38.     public void setContent(Parent page) {
39.         contentPane.getChildren().clear();
40.         contentPane.getChildren().add(page);
41.     }
42.
43.     @FXML
44.     void initialize()
45.     {
46.         soundToggle.setGraphic(SVGIcons.getCogIcon());
47.         musicPlayer.playGameMusicLoop();
48.         this.isPlaying = true;
49.     }
50.
51.     @FXML
52.     private void toggleSound()
53.     {
54.         if (isPlaying){
55.             musicPlayer.mute();
56.         }
57.         else{
58.             musicPlayer.unMute();
59.         }
60.
61.         isPlaying = !isPlaying;
62.     }
63.
64.     // TODO: remove later
65.     @FXML
66.     private void skipLogin()
67.     {
68.         SceneManager.getInstance().switchScene(GameScenes.LEVEL);
69.     }
70.
71. }
```

com.example.project.controllers

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
 RootLayoutController	 15%	 0%	6	7	14	16	4	5	0	1		
Total	45 of 53	15%	4 of 4	0%	6	7	14	16	4	5	0	1

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com.example.project.controllers

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
RootLayoutController.java	 15%	0%	 0%	0%	6	7	14	16	4	5	0	1
Total	45 of 53	15%	4 of 4	0%	6	7	14	16	4	5	0	1

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DailyRewardModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
applyReward(DailyRewardType)		0%		0%	3	3	6	6	1	1
static {...}		0%	n/a		1	1	2	2	1	1
rollReward()		0%	n/a		1	1	1	1	1	1
DailyRewardModel()		0%	n/a		1	1	1	1	1	1
Total	40 of 40	0%	3 of 3	0%	6	6	10	10	4	4

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DailyRewardModel.java

```
1. package com.example.project.models.gameScreens;
2.
3. import com.example.project.services.Session;
4.
5. import java.time.LocalDate;
6. import java.util.List;
7. import java.util.Random;
8.
9. /**
10. * Model for handling daily reward logic and state.
11. */
12. public class DailyRewardModel {
13.
14.     private static final List<DailyRewardType> possibleRewards = List.of(
15.         DailyRewardType.Daily_Reward_Won_1Dollar,
16.         DailyRewardType.Daily_Reward_Won_5Dollars,
17.         DailyRewardType.Daily_Reward_Won_NOTHING
18.     );
19.
20.     private static final Random random = new Random();
21.
22.     /**
23.      * Randomly selects a daily reward.
24.      * @return a randomly selected reward
25.     */
26.     public static DailyRewardType rollReward() {
27.         return possibleRewards.get(random.nextInt(possibleRewards.size()));
28.     }
29.
30.     /**
31.      * Applies the effect of the given reward to the session and marks it as claimed.
32.      * @param reward the reward to apply
33.     */
34.     public static void applyReward(DailyRewardType reward) {
35.         Session session = Session.getInstance();
36.
37.         switch (reward) {
38.             case Daily_Reward_Won_1Dollar -> session.addMoney(1);
39.             case Daily_Reward_Won_5Dollars -> session.addMoney(5);
40.             case Daily_Reward_Won_NOTHING -> {
41.                 // no-op
42.             }
43.         }
44.
45.         session.setLastRewardDate(LocalDate.now());
46.     }
47. }
```

DailyRewardType

Element	Missed Instructions Cov.	Missed Branches Cov.	Missed Cxty	Missed Lines	Missed Methods
 static {...}	0%	n/a	1 1	4 4	1 1
Total	21 of 21	0% 0 of 0	n/a	1 1	4 4

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DailyRewardType.java

```
1. package com.example.project.models.gameScreens;
2.
3. /**
4.  * Enum representing the possible daily reward outcomes.
5. */
6. public enum DailyRewardType {
7.     /**
8.      * Player wins $1
9.     */
10.    Daily_Reward_Won_1Dollar,
11.
12.    /**
13.     * Player wins $5
14.     */
15.    Daily_Reward_Won_5Dollars,
16.
17.    /**
18.     * Player wins nothing
19.     */
20.    Daily_Reward_Won_NOTHING
21. }
```

GameScreenModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
 GameScreenModel(Session)		100%		n/a	0	1	0	4	0	1
Total	0 of 11	100%	0 of 0	n/a	0	1	0	4	0	1

Created with JaCoCo 0.8.12.202403310830

GameScreenModel.java

```
1. package com.example.project.models.gameScreens;
2.
3. import com.example.project.services.Logger;
4. import com.example.project.services.Session;
5.
6. /**
7. * Game Screen Model. extended by loginModel, shopModel, levelModel.
8. */
9. public abstract class GameScreenModel
10. {
11.     protected Logger logger = new Logger();
12.
13.     protected final Session session;
14.
15.     protected GameScreenModel (Session session)
16.     {
17.         this.session = session;
18.     }
19. }
```

ScoreTimeline

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
animateTotalScore(int, int, Label, long)		0%	n/a		1	1	10	10	1	1
lambda\$animateTotalScore\$0(IntegerProperty, int, Label, ActionEvent)		0%		0%	2	2	4	4	1	1
lambda\$animateTotalScore\$1(Label, int, ActionEvent)		0%	n/a		1	1	2	2	1	1
ScoreTimeline()		0%	n/a		1	1	1	1	1	1
Total	70 of 70	0%	2 of 2	0%	5	5	17	17	4	4

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LevelModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
calcTotalWordScore()		0%		0%	2	2	4	4	1	1
addToCombo(LetterTileModel)		0%		n/a	1	1	3	3	1	1
refillTileTack()		66%		50%	1	2	1	5	0	1
resetCombo()		0%		n/a	1	1	3	3	1	1
setWordPoints(int)		0%		n/a	1	1	2	2	1	1
setWordMulti(int)		0%		n/a	1	1	2	2	1	1
setTotalScore(int)		0%		n/a	1	1	2	2	1	1
getPlayersTotalPoints()		0%		n/a	1	1	1	1	1	1
wordPointsProperty()		0%		n/a	1	1	1	1	1	1
wordMultiProperty()		0%		n/a	1	1	1	1	1	1
getIsRedrawActive()		0%		n/a	1	1	1	1	1	1
getTileScoreSoundPlayer()		0%		n/a	1	1	1	1	1	1
LevelModel(Session, Logger)		100%		n/a	0	1	0	13	0	1
LevelModel(Session)		100%		n/a	0	1	0	13	0	1
tryMoveTile(LetterTileModel)		100%		100%	0	6	0	11	0	1
onWonLevel()		100%		50%	1	2	0	9	0	1
tryMoveTileToRedrawArea(LetterTileModel)		100%		66%	2	4	0	5	0	1
tryMoveToTileRack(LetterTileModel)		100%		75%	1	3	0	7	0	1
tryMoveTileToWordArea(LetterTileModel)		100%		50%	2	3	0	4	0	1
getCurrentWord()		100%		100%	0	2	0	5	0	1
generateLetters()		100%		100%	0	2	0	4	0	1
returnRedrawTilesToTheRack()		100%		100%	0	2	0	3	0	1
redrawTiles()		100%		n/a	0	1	0	4	0	1
playTiles()		100%		n/a	0	1	0	4	0	1
setupNewLevel()		100%		n/a	0	1	0	5	0	1
hasWon()		100%		100%	0	2	0	1	0	1
onLostLevel()		100%		n/a	0	1	0	4	0	1
hasLost()		100%		100%	0	2	0	1	0	1
resetLevelVariables()		100%		n/a	0	1	0	3	0	1
getWordWindowTilesProperty()		100%		n/a	0	1	0	1	0	1
getTileRackTilesProperty()		100%		n/a	0	1	0	1	0	1
getRedrawWindowTilesProperty()		100%		n/a	0	1	0	1	0	1
addTileToWordWindow(LetterTileModel)		100%		n/a	0	1	0	2	0	1
addTileToRack(LetterTileModel)		100%		n/a	0	1	0	2	0	1
addTileToRedrawWindow(LetterTileModel)		100%		n/a	0	1	0	2	0	1
isCurrentWordValid()		100%		n/a	0	1	0	1	0	1
setIsRedrawActive(boolean)		100%		n/a	0	1	0	2	0	1
setPlayersScore(int)		100%		n/a	0	1	0	2	0	1
getPlayersCurrentPoints()		100%		n/a	0	1	0	1	0	1
Total	98 of 627	84%	9 of 40	77%	19	59	22	127	11	39

LevelModel.java

```
1. package com.example.project.models.gameScreens;
2.
3. import com.example.project.models.tiles.LetterTileModel;
4. import com.example.project.models.tiles.UpgradeTileModel;
5. import com.example.project.services.GameScenes;
6. import com.example.project.services.Logger;
7. import com.example.project.services.SceneManager;
8. import com.example.project.services.Session;
9. import com.example.project.models.tiles.ScrabbleTileProvider;
10. import com.example.project.services.sqlite.DAOs.DictionaryDAO;
11. import javafx.beans.property.*;
12. import javafx.collections.FXCollections;
13. import javafx.collections.ObservableList;
14.
15.
16. /**
17. * Represents the level model.
18. */
19. public class LevelModel extends GameScreenModel
20. {
21.     private final ObservableList<LetterTileModel> wordWindowTiles = FXCollections.observableArrayList();
22.     private final ObservableList<LetterTileModel> tileRackTiles = FXCollections.observableArrayList();
23.     private final ObservableList<LetterTileModel> redrawWindowTiles = FXCollections.observableArrayList();
24.     private final ReadOnlyBooleanWrapper isRedrawActive = new ReadOnlyBooleanWrapper(false);
25.     private final ReadOnlyIntegerWrapper wordPoints = new ReadOnlyIntegerWrapper(0);
26.     private final ReadOnlyIntegerWrapper wordMulti = new ReadOnlyIntegerWrapper(0);
27.     private final ReadOnlyIntegerWrapper playersTotalPoints = new ReadOnlyIntegerWrapper(0);
28.     private final DictionaryDAO dictionary = new DictionaryDAO();
29.
30.     private final ScoreChimePlayer tileScoreSoundPlayer = new ScoreChimePlayer();
31.     private final ScrabbleTileProvider scrabbleLettersBalancer = new ScrabbleTileProvider();
32.
33.     protected LevelModel(Session session, Logger logger)
34.     {
35.         super(session);
36.         this.logger = logger;
37.     }
38.
39.     /**
40.      * Default constructor.
41.      * @param session session
42.      */
43.     public LevelModel(Session session)
44.     {
45.         super(session);
46.         generateLetters();
47.     }
48.
49.     /**
50.      * Gets the tile score sound effect player.
51.      * @return LevelTileScoreSoundPlayer.
52.      */
53.     public ScoreChimePlayer getTileScoreSoundPlayer() { return this.tileScoreSoundPlayer; }
54.
55.     /**
56.      * @return Read-only list of tiles currently in the word area
57.      */
58.     public ReadOnlyListProperty<LetterTileModel> getWordWindowTilesProperty() {
59.         return new ReadOnlyListWrapper<>(wordWindowTiles).getReadOnlyProperty();
60.     }
61.
62.     /**
63.      * @return Read-only list of tiles currently in the rack
64.      */
65.     public ReadOnlyListProperty<LetterTileModel> getTileRackTilesProperty() {
66.         return new ReadOnlyListWrapper<>(tileRackTiles).getReadOnlyProperty();
67.     }
68.
69.     /**
70.      * @return Read-only list of tiles currently in the redraw window.
71.      */
72.     public ReadOnlyListProperty<LetterTileModel> getRedrawWindowTilesProperty() {
73.         return new ReadOnlyListWrapper<>(redrawWindowTiles).getReadOnlyProperty();
74.     }
75.     /**
76.      * @return the total points property to observe.
77.      */
78.     public ReadOnlyIntegerProperty getPlayersTotalPoints() {
```

```

79.     return playersTotalPoints.getReadOnlyProperty();
80. }
81.
82. /**
83. * @return the sum combo points property to observe.
84. */
85. public ReadOnlyIntegerProperty wordPointsProperty() {
86.     return wordPoints.getReadOnlyProperty();
87. }
88.
89. /**
90. * @return the players current level points property to observe.
91. */
92. public ReadOnlyIntegerProperty getPlayersCurrentPoints() { return playersTotalPoints.getReadOnlyProperty(); }
93.
94. /**
95. * word multiplier.
96. * @return multiplier.
97. */
98. public ReadOnlyIntegerProperty wordMultiProperty() {
99.     return wordMulti.getReadOnlyProperty();
100. }
101.
102. /**
103. * gets the redraw property.
104. * @return returns indication if redraw active.
105. */
106. public ReadOnlyBooleanProperty getIsRedrawActive()
107. {
108.     return isRedrawActive.getReadOnlyProperty();
109. }
110.
111. /**
112. * set redraw active.
113. * @param newValue get if redraw window is on screen.
114. */
115. public void setIsRedrawActive(boolean newValue)
116. {
117.     this.isRedrawActive.set(newValue);
118. }
119.
120. protected void setPlayersScore(int newValue)
121. {
122.     this.playersTotalPoints.set(newValue);
123. }
124.
125. protected void addTileToWordWindow(LetterTileModel tile)
126. {
127.     this.wordWindowTiles.add(tile);
128. }
129.
130. protected void addTileToRack(LetterTileModel tile)
131. {
132.     this.tileRackTiles.add(tile);
133. }
134.
135. protected void addTileToRedrawWindow(LetterTileModel tile)
136. {
137.     this.redrawWindowTiles.add(tile);
138. }
139.
140. /**
141. * Called when the level has been lost.
142. * resets the players session info and logs back out to the login screen.
143. */
144. public void onLostLevel()
145. {
146.     this.resetLevelVariables();
147.     this.session.resetGame();
148.     SceneManager.getInstance().switchScene(GameScenes.MAINMENU);
149. }
150.
151. /**
152. * Called when level has been won.
153. * reset the per level info: redraws plays. Goes to shop window.
154. */
155. public void onWonLevel()
156. {
157.     //award money equal to remaining plays
158.     int remainingPlays = this.session.getCurrentPlays().get();
159.     if (remainingPlays > 0)
160.     {
161.         session.getMoneyProperty().set(session.getMoneyProperty().get() + remainingPlays);

```

```

162.         this.logger.logMessage(String.format("You Won! Awarded $%d for %d remaining plays",
163.             remainingPlays, remainingPlays));
164.     }
165.
166.     this.resetLevelVariables();
167.     this.session.updateLevelInfo();
168.     SceneManager.getInstance().switchScene(GameScenes.SHOP);
169. }
170.
171. /**
172. * returns true if player has won.
173. * @return value indicating if player has won.
174. */
175. public boolean hasWon()
176. {
177.     return (this.session.getLevelRequirement().get() <= this.playersTotalPoints.get());
178. }
179.
180. /**
181. * true if player has lost
182. * @return value indicating if player has lost.
183. */
184. public boolean hasLost()
185. {
186.     return this.session.getCurrentPlays().get() == 0;
187. }
188.
189. /**
190. * Attempts to move a tile from rack to word area
191. * @param tile The tile to move
192. * @return true if move was successful, false otherwise
193. */
194. private boolean tryMoveTileToWordArea(LetterTileModel tile) {
195.     if (tileRackTiles.contains(tile) && wordWindowTiles.size() < session.getWordWindowSize()) {
196.         tileRackTiles.remove(tile);
197.         wordWindowTiles.add(tile);
198.     }
199.     return wordWindowTiles.contains(tile);
200. }
201.
202. /**
203. * Attempts to move a tile from rack to redraw area
204. * @param tile The tile to move
205. * @return true if move was successful, false otherwise
206. */
207. private boolean tryMoveTileToRedrawArea(LetterTileModel tile)
208. {
209.     if (redrawWindowTiles.size() < session.getRedrawWindowSize() && !redrawWindowTiles.contains(tile))
210.     {
211.         var rowItsIn = tileRackTiles.contains(tile) ? tileRackTiles : wordWindowTiles;
212.         rowItsIn.remove(tile);
213.         redrawWindowTiles.add(tile);
214.     }
215.
216.     return redrawWindowTiles.contains(tile);
217. }
218.
219. /**
220. * Attempts to move a tile from word area or redraw area to rack
221. * @param tile The tile to move
222. * @return true if move was successful, false otherwise
223. */
224. private boolean tryMoveToTileRack(LetterTileModel tile) {
225.     if (wordWindowTiles.contains(tile)) {
226.         wordWindowTiles.remove(tile);
227.         tileRackTiles.add(tile);
228.     } else if (redrawWindowTiles.contains(tile)) {
229.         redrawWindowTiles.remove(tile);
230.         tileRackTiles.add(tile);
231.     }
232.
233.     return tileRackTiles.contains(tile);
234. }
235.
236. /**
237. * determines where tile should go and moves it
238. * @param tile The tile to move
239. * @return true if move was successful, false otherwise
240. */
241. public boolean tryMoveTile(LetterTileModel tile) {
242.     boolean moved = false;
243.
244.     // When no redraw window is open.

```

```

245.     if (!isRedrawActive.get()) {
246.         if (tileRackTiles.contains((tile))) {
247.             moved = tryMoveTileToWordArea(tile);
248.         }
249.         else if (wordWindowTiles.contains(tile)) {
250.             moved = tryMoveToTileRack(tile);
251.         }
252.     }
253.     // when redraw window is open.
254.     else
255.     {
256.         if (!redrawWindowTiles.contains((tile))) {
257.             moved = tryMoveTileToRedrawArea(tile);
258.         }
259.         else {
260.             moved = tryMoveToTileRack(tile);
261.         }
262.     }
263. }
264. if (moved) { tile.getClackSoundPlayer().replay(); }
265. return moved;
266. }
267.
268. /**
269. * Gets the current word formed by tiles in the word area
270. * @return returns current word string.
271. */
272. public String getCurrentWord() {
273.     StringBuilder word = new StringBuilder();
274.     for (LetterTileModel tile : wordWindowTiles) {
275.         word.append(tile.getLetter());
276.     }
277.     return word.toString();
278. }
279.
280. /**
281. * returns true if word is in dictionary.
282. * @return value indicating if word is valid.
283. */
284. public boolean isCurrentWordValid(){
285.     return dictionary.isWordInDictionary(this.getCurrentWord());
286. }
287.
288. /**
289. * redraws tiles into the tile rack and removes from redraw window.
290. */
291. public void redrawTiles()
292. {
293.     this.session.getCurrentRedraws().set(this.session.getCurrentRedraws().get() - 1);
294.     this.redrawWindowTiles.clear();
295.     refillTileTack();
296. }
297.
298. /**
299. * add combo sum and multiCombo
300. * @param tile tile.
301. */
302. public void addToCombo(LetterTileModel tile) {
303.     this.wordPoints.set(this.wordPoints.get() + tile.getValue());
304.     this.wordMulti.set(this.wordMulti.get() + 1);
305. }
306.
307. /**
308. * @return total score int
309. */
310. public int calcTotalWordScore() {
311.     for (UpgradeTileModel upgrade : session.getUpgradeTilesProperty()) {
312.         upgrade.getUpgradeEffect().run();
313.     }
314.     return this.wordPoints.get() * this.wordMulti.get();
315. }
316.
317. /**
318. * sets the current word points before multipliers
319. * @param newWordPoints the new word points value
320. */
321. public void setWordPoints(int newWordPoints) {
322.     this.wordPoints.set(newWordPoints);
323. }
324.
325. /**
326. * sets the current word multiplier
327. * @param newMulti the new multiplier value

```

```

328.     */
329.     public void setWordMulti(int newMulti) {
330.         this.wordMulti.set(newMulti);
331.     }
332.
333.     /**
334.      * @param totalScore from calcTotalScore
335.      * sets Total Score
336.      */
337.     public void setTotalScore(int totalScore){
338.         this.playersTotalPoints.set(totalScore);
339.     }
340.
341.     /**
342.      * clears the word row tiles. and refills the tile rack. and decreases the plays left.
343.      */
344.     public void playTiles()
345.     {
346.         this.wordWindowTiles.clear();
347.         this.refillTileTack();
348.         this.session.getCurrentPlays().set(this.session.getCurrentPlays().get() - 1);
349.     }
350.
351.     /**
352.      * sends the selected redraw tiles back to the rack
353.      */
354.     public void returnRedrawTilesToTheRack() {
355.         for (int i = 0; i < redrawWindowTiles.size(); i++) {
356.             tryMoveToTileRack(redrawWindowTiles.get(i));
357.         }
358.     }
359.
360.     /**
361.      * Initialise new level. Clears word row, redraw rack. draws new tiles for the player's tile rack.
362.      */
363.     public void setupNewLevel()
364.     {
365.         this.wordWindowTiles.clear();
366.         this.returnRedrawTilesToTheRack();
367.         isRedrawActive.set(false);
368.         this.session.resetPlaysRedraws();
369.     }
370.
371.     /**
372.      * resets counts for sum and multi in combo
373.      */
374.     public void resetCombo()
375.     {
376.         this.wordPoints.set(0);
377.         this.wordMulti.set(0);
378.     }
379.
380.     private void resetLevelVariables()
381.     {
382.         this.playersTotalPoints.set(0);
383.         this.session.resetPlaysRedraws();
384.     }
385.
386.     private void generateLetters() {
387.         for (int i = 0; i < session.getHandSize(); i++) {
388.             var newLetter = new LetterTileModel(this.scrabbleLettersBalancer.drawRandomTile());
389.             this.tileRackTiles.add(newLetter); // Start all tiles in rack
390.         }
391.     }
392.
393.     /**
394.      * Refills tile rack. Only up to the hand size allowed this level.
395.      */
396.     private void refillTileTack()
397.     {
398.         var tilesPlayerHas = tileRackTiles.size() + wordWindowTiles.size() + redrawWindowTiles.size();
399.         var tilesToReplace = (this.session.getHandSize() - tilesPlayerHas);
400.         for (int i = 0; i < tilesToReplace; i++){
401.             tileRackTiles.add(new LetterTileModel(this.scrabbleLettersBalancer.drawRandomTile()));
402.         }
403.     }
404. }

```

LoginModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
• isInputLegal(String, String)	100%	100%	91%	91%	1	7	0	13	0	1
• onLoginClicked(String, String)	100%	100%	100%	100%	0	3	0	10	0	1
• onSignUpClicked(String, String)	100%	100%	100%	100%	0	3	0	8	0	1
• LoginModel(Session, UsersDAO, PasswordHasher)	100%	100%		n/a	0	1	0	5	0	1
• doesPasswordMatch(String, String)	100%	100%		n/a	0	1	0	2	0	1
• getWelcomeTextProperty()	100%	100%		n/a	0	1	0	1	0	1
Total	0 of 142	100%	1 of 20	95%	1	16	0	39	0	6

Created with JaCoCo 0.8.12.202403310830

LoginModel.java

```
1. package com.example.project.models.gameScreens;
2.
3. import com.example.project.models.User;
4. import com.example.project.services.PasswordHasher;
5. import com.example.project.services.Session;
6. import com.example.project.services.sqlite.dAOs.UsersDAO;
7. import com.example.project.services.GameScenes;
8. import com.example.project.services.SceneManager;
9. import javafx.beans.property.ReadOnlyStringProperty;
10. import javafx.beans.property.ReadOnlyStringWrapper;
11.
12. /**
13.  * Login model class.
14. */
15. public class LoginModel extends GameScreenModel
16. {
17.     private final UsersDAO usersDAO;
18.     private final PasswordHasher passwordHasher;
19.
20.     private final ReadOnlyStringWrapper infoText = new ReadOnlyStringWrapper("");
21.
22.     /**
23.      * Gets the info text property.
24.      * @return ReadonlyStringProperty.
25.     */
26.     public ReadOnlyStringProperty getWelcomeTextProperty(){
27.         return this.infoText;
28.     }
29.
30.     /**
31.      * constructor.
32.      * @param session session to use for the game.
33.      * @param dao users database implementation.
34.      * @param passwordHasher password hasher for this login
35.     */
36.     public LoginModel(Session session, UsersDAO dao, PasswordHasher passwordHasher)
37.     {
38.         super(session);
39.         this.usersDAO = dao;
40.         this.passwordHasher = passwordHasher;
41.     }
42.
43.     /**
44.      * @param username username
45.      * @param password password
46.      * @return returns value indicating if login is valid.
47.     */
48.     private boolean doesPasswordMatch(String username, String password)
49.     {
50.         var user = this.usersDAO.getUser(username);
51.         return this.passwordHasher.doesPasswordMatch(password, user.getPassword());
52.     }
53.
54.     /**
55.      * @param username username.
56.      * @param password password.
57.     */
58.     public void onLoginClicked(String username, String password)
59.     {
60.         if (!this.usersDAO.doesUserExist(username)) {
61.             this.infoText.set("No account found. Sign up first.");
62.             return;
63.         }
64.
65.         if (!this.doesPasswordMatch(username, password)) {
66.             this.infoText.set("Incorrect password.");
67.             return;
68.         }
69.
70.         var user = this.usersDAO.getUser(username);
71.         this.session.setUser(user);
72.
73.         SceneManager.getInstance().switchScene(GameScenes.MAINMENU);
74.     }
75.
76.     /**
77.      * returns value indicating if the input is legal. Illegal if blank.
78.      * @param username username.
```

```

79.     * @param password password.
80.     * @return value indicating if the input is legal.
81.     */
82.     private boolean isInputLegal(String username, String password)
83.     {
84.         if (username.isBlank() || password.isBlank()) {
85.             this.infoText.set("Fields cannot be empty.");
86.             return false;
87.         }
88.
89.         if (username.length() < 3 || username.length() > 30) {
90.             this.infoText.set("Username must be between 3-30 characters long.");
91.             return false;
92.         }
93.
94.         if (password.length() < 8) {
95.             this.infoText.set("Password must be at least 8 characters.");
96.             return false;
97.         }
98.
99.         if (password.equals(username)) {
100.             this.infoText.set("Password must not match username.");
101.             return false;
102.         }
103.
104.         return true;
105.     }
106.
107. /**
108. * Adds user to database.
109. * @param username username
110. * @param password password
111. */
112. public void onSignUpClicked(String username, String password)
113. {
114.     if (!isInputLegal(username, password)){
115.         return;
116.     }
117.
118.     if (this.usersDAO.doesUserExist(username))
119.     {
120.         this.infoText.set("Already signed up. Click login.");
121.         return;
122.     }
123.
124.     this.usersDAO.addUser(new User(username, password, 0));
125.     this.infoText.set("User added successfully.");
126. }
127. }

```

MainMenuModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
MainMenuModel(Session)	100%		n/a		0	1	0	2	0	1
onStartClicked()	100%		n/a		0	1	0	2	0	1
onLogoutClicked()	100%		n/a		0	1	0	2	0	1
Total	0 of 12	100%	0 of 0	n/a	0	3	0	6	0	3

Created with JaCoCo 0.8.12.202403310830

MainMenuModel.java

```
1. package com.example.project.models.gameScreens;
2.
3. import com.example.project.services.GameScenes;
4. import com.example.project.services.SceneManager;
5. import com.example.project.services.Session;
6.
7. /**
8. * main menu model class
9. */
10. public class MainMenuModel extends GameScreenModel
11. {
12.
13.     /**
14.      * constructor.
15.      * @param session session to use for the game.
16.      */
17.     public MainMenuModel(Session session)
18.     {
19.         super(session);
20.     }
21.
22.     /**
23.      * switches to the level screen
24.      */
25.     public void onStartClicked()
26.     {
27.         SceneManager.getInstance().switchScene(GameScenes.LEVEL);
28.     }
29.
30.     /**
31.      * switches to the login screen
32.      */
33.     public void onLogoutClicked()
34.     {
35.         SceneManager.getInstance().switchScene(GameScenes.LOGIN);
36.     }
37.
38. }
```

ScoreChimePlayer

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
● playNextNote()		0%		0%	2	2	5	5	1	1
● reset()		0%	n/a	n/a	1	1	2	2	1	1
● ScoreChimePlayer()		100%	n/a	n/a	0	1	0	12	0	1
Total	26 of 107	75%	2 of 2	0%	3	4	7	19	2	3

Created with JaCoCo 0.8.12.202403310830

ScoreChimePlayer.java

```
1. package com.example.project.models.gameScreens;
2.
3.
4. import com.example.project.services.sound.GameSoundPlayer;
5.
6. import java.util.List;
7.
8. /**
9. * plays a note from the F major scale ascending in pitch each time for a nice score combo sound.
10.*/
11. public class ScoreChimePlayer
12. {
13.     private final GameSoundPlayer F_4 = new GameSoundPlayer("/com/example/project/Sounds/scoreSounds/F_4.wav");
14.     private final GameSoundPlayer G_4 = new GameSoundPlayer("/com/example/project/Sounds/scoreSounds/G_4.wav");
15.     private final GameSoundPlayer A_4 = new GameSoundPlayer("/com/example/project/Sounds/scoreSounds/A_4.wav");
16.     private final GameSoundPlayer Bb_4 = new GameSoundPlayer("/com/example/project/Sounds/scoreSounds/Bb_4.wav");
17.     private final GameSoundPlayer C_4 = new GameSoundPlayer("/com/example/project/Sounds/scoreSounds/C_4.wav");
18.     private final GameSoundPlayer D_4 = new GameSoundPlayer("/com/example/project/Sounds/scoreSounds/D_5.wav");
19.     private final GameSoundPlayer E_4 = new GameSoundPlayer("/com/example/project/Sounds/scoreSounds/E_5.wav");
20.     private final GameSoundPlayer F_5 = new GameSoundPlayer("/com/example/project/Sounds/scoreSounds/F_5.wav");
21.     private final GameSoundPlayer G_5 = new GameSoundPlayer("/com/example/project/Sounds/scoreSounds/G_5.wav");
22.
23.     private final List<GameSoundPlayer> theCMajorScale = List.of(F_4, G_4, A_4, Bb_4, C_4, D_4, E_4, F_5, G_5);
24.
25.     private int currentNote = 0;
26.
27.     /**
28.      * resets back to 0.
29.     */
30.     public void reset(){
31.         currentNote = 0;
32.     }
33.
34.     /**
35.      * plays the note then increments the int index.
36.     */
37.     public void playNextNote()
38.     {
39.         if (theCMajorScale.size() == currentNote){
40.             reset();
41.         }
42.
43.         theCMajorScale.get(currentNote).replay();
44.         currentNote++;
45.     }
46. }
```

ShopModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
purchase(UpgradeTileModel)		0%		0%	4	4	16	16	1	1
canPurchase(UpgradeTileModel)		0%		0%	3	3	3	3	1	1
regenerateShopItems()		0%		0%	2	2	4	4	1	1
playersUpgradesProperty()		0%		n/a	1	1	1	1	1	1
currentShopItemsProperty()		0%		n/a	1	1	1	1	1	1
ShopModel(Session)		100%		n/a	0	1	0	3	0	1
ShopModel(Session, Logger)		100%		n/a	0	1	0	3	0	1
onNextLevelPressed()		100%		n/a	0	1	0	2	0	1
Total	119 of 140	15%	12 of 12	0%	11	14	25	33	5	8

Created with JaCoCo 0.8.12.202403310830

ShopModel.java

```
1. package com.example.project.models.gameScreens;
2.
3. import com.example.project.models.tiles.UpgradeTileModel;
4. import com.example.project.services.GameScenes;
5. import com.example.project.services.Logger;
6. import com.example.project.services.SceneManager;
7. import com.example.project.services.Session;
8. import com.example.project.services.shopItems.UpgradeTiles;
9. import javafx.beans.property.ListProperty;
10. import javafx.beans.property.ReadOnlyListProperty;
11. import javafx.beans.property.SimpleListProperty;
12. import javafx.collections.FXCollections;
13. import org.apache.commons.logging.Log;
14.
15. /**
16. * Shop Model.
17. */
18. public class ShopModel extends GameScreenModel
19. {
20.     private final ListProperty<UpgradeTileModel> currentInShop = new SimpleListProperty<>(FXCollections.observableArrayList());
21.
22.     /**
23.      * Current items in the shop row that you can buy.
24.      * @return shop items.
25.     */
26.     public ListProperty<UpgradeTileModel> currentShopItemsProperty(){
27.         return currentInShop;
28.     }
29.
30.     /**
31.      * Constructor for tests.
32.      * @param session session.
33.      * @param logger logger to use.
34.     */
35.     protected ShopModel(Session session, Logger logger)
36.     {
37.         this(session);
38.         this.logger = logger;
39.     }
40.
41.     /**
42.      * Constructor
43.      * @param session game session.
44.     */
45.     public ShopModel(Session session)
46.     {
47.         super(session);
48.     }
49.
50.     /**
51.      * create new shop items.
52.     */
53.     public void regenerateShopItems()
54.     {
55.         currentInShop.clear();
56.         for (int i = 0; i < 3; i++)
57.         {
58.             currentInShop.add(UpgradeTiles.getRandomUpgradeTile());
59.         }
60.     }
61.
62.     /**
63.      * get what upgrades the player currently has.
64.      * @return returns the list of upgrades.
65.     */
66.     public ReadOnlyListProperty<UpgradeTileModel> playersUpgradesProperty()
67.     {
68.         return this.session.getUpgradeTilesProperty();
69.     }
70.
71.     /**
72.      * This should attempt to purchase an upgrade tile from the shop.
73.      * Verifies the player has sufficient funds, deducts the cost, removes the item
74.      * from the shop, and logs the transaction.
75.      *
76.      * @param tileClickedOn the upgrade tile the player is trying to purchase
77.      * @throws IllegalArgumentException if tileClickedOn is empty (null)
78.      * @see #canPurchase(UpgradeTileModel) to check affordability before calling this method
79.      * @see Session#spendMoney(int) for the payment mechanism
80.      * @see Session#addUpgrade(UpgradeTileModel) for adding to player's collection
81.      */
82.
```

```

83.     public void purchase(UpgradeTileModel tileClickedOn)
84.     {
85.         ◆◆ if (tileClickedOn == null) {
86.             throw new IllegalArgumentException("Cannot purchase null tile");
87.         }
88.
89.         ◆◆ if (canPurchase(tileClickedOn)) {
90.             boolean success = session.spendMoney((int) tileClickedOn.getCost());
91.             ◆◆ if (success) {
92.                 currentInShop.remove(tileClickedOn);
93.                 session.addUpgrade(tileClickedOn);
94.                 this.logger.logMessage(String.format("Purchased %s for $%d",
95.                     tileClickedOn.getName(),
96.                     (int) tileClickedOn.getCost()));
97.             }
98.         } else {
99.             this.logger.logMessage(String.format("Cannot afford %s (costs $%.2f, have $%d)",
100.                 tileClickedOn.getName(),
101.                 tileClickedOn.getCost(),
102.                 session.getMoneyProperty().get()));
103.         }
104.     }
105.
106. /**
107. * Determines whether the player can afford to purchase the specified upgrade tile.
108. * Compares the player's current money against the tile's cost.
109. *
110. * @param tile the upgrade tile the player wants to buy thus check affordability for
111. * @return true if the player has enough money to purchase the tile, false if the player is broke and can't
112. * @throws IllegalArgumentException if tile is empty
113. * @see UpgradeTileModel#getCost() for tile pricing
114. */
115. public boolean canPurchase(UpgradeTileModel tile)
116. {
117.     ◆◆ if (tile == null)
118.     {
119.         throw new IllegalArgumentException("Cannot check affordability of an empty tile");
120.     }
121.     ◆◆ return session.getMoneyProperty().get() >= tile.getCost();
122. }
123.
124. /**
125. * exists shop and increments level requirement for the next level.
126. */
127. public void onNextLevelPressed()
128. {
129.     SceneManager.getInstance().switchScene(GameScenes.LEVEL);
130. }
131. }

```

ScoreTimeline.java

```
1. package com.example.project.controllers.gameScreens.animations;
2. import javafx.animation.KeyFrame;
3. import javafx.animation.Timeline;
4. import javafx.beans.property.IntegerProperty;
5. import javafx.beans.property.SimpleIntegerProperty;
6. import javafx.scene.control.Label;
7. import javafx.util.Duration;
8.
9. /**
10. * Class for total score counter animation
11. */
12. public class ScoreTimeline {
13.     /**
14.      * @param totalDurationMillis total duration
15.      * @param startScore int from current total score
16.      * @param endScore int from calculated current score
17.      * @param currentScoreLabel Label for total score
18.      * @return timeline of total score counter
19.     */
20.     public Timeline animateTotalScore(int startScore, int endScore, Label currentScoreLabel, long totalDurationMillis) {
21.         // Total scoring timeline
22.         Timeline scoreTimeline = new Timeline();
23.         IntegerProperty currentScore = new SimpleIntegerProperty(startScore);
24.
25.         int scoreDifference = endScore - startScore;
26.
27.         int steps = scoreDifference;
28.
29.         double durationPerStepMillis = (double) totalDurationMillis / steps;
30.
31.         scoreTimeline.getKeyFrames().add(
32.             new KeyFrame(Duration.millis(durationPerStepMillis), event -> {
33.                 if (currentScore.get() < endScore) {
34.                     currentScore.set(currentScore.get() + 1);
35.                     currentScoreLabel.setText(String.valueOf(currentScore.get()));
36.                 }
37.             })
38.         );
39.         scoreTimeline.setCycleCount(steps);
40.
41.         scoreTimeline.setOnFinished(event -> {
42.             currentScoreLabel.setText(String.valueOf(endScore));
43.         });
44.
45.         return scoreTimeline;
46.     }
47. }
```

com.example.project.models.gameScreens

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
ShopModel		15%		0%	11	14	25	33	5	8	0	1
LevelModel		84%		77%	19	59	22	127	11	39	0	1
DailyRewardModel		0%		0%	6	6	10	10	4	4	1	1
ScoreChimePlayer		75%		0%	3	4	7	19	2	3	0	1
DailyRewardType		0%		n/a	1	1	4	4	1	1	1	1
LoginModel		100%		95%	1	16	0	39	0	6	0	1
MainMenuModel		100%		n/a	0	3	0	6	0	3	0	1
GameScreenModel		100%		n/a	0	1	0	4	0	1	0	1
Total	304 of 1,100	72%	27 of 77	64%	41	104	68	242	23	65	2	8

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com.example.project.models.gameScreens

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
ShopModel.java		15%		0%	11	14	25	33	5	8	0	1
LevelModel.java		84%		77%	19	59	22	127	11	39	0	1
DailyRewardModel.java		0%		0%	6	6	10	10	4	4	1	1
ScoreChimePlayer.java		75%		0%	3	4	7	19	2	3	0	1
DailyRewardType.java		0%		n/a	1	1	4	4	1	1	1	1
LoginModel.java		100%		95%	1	16	0	39	0	6	0	1
MainMenuModel.java		100%		n/a	0	3	0	6	0	3	0	1
GameScreenModel.java		100%		n/a	0	1	0	4	0	1	0	1
Total	304 of 1,100	72%	27 of 77	64%	41	104	68	242	23	65	2	8

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DefinitionPopup

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
setIsDefinitionActive(boolean)		85%		75%	1	3	1	5	0	1
DefinitionPopup()		100%		n/a	0	1	0	4	0	1
setPopup(String)		100%		n/a	0	1	0	5	0	1
definitionProperty()		100%		n/a	0	1	0	1	0	1
wordProperty()		100%		n/a	0	1	0	1	0	1
getIsDefinitionActive()		100%		n/a	0	1	0	1	0	1
getFXMLPath()		100%		n/a	0	1	0	1	0	1
Total	3 of 73	95%	1 of 4	75%	1	9	1	18	0	7

Created with JaCoCo 0.8.12.202403310830

DefinitionPopup.java

```

1. package com.example.project.models.popups;
2. import com.example.project.services.sqlite.dAOs.DictionaryDAO;
3. import javafx.beans.property.*;
4.
5. /**
6. * Represents Definition window called when a word is played
7. */
8. public class DefinitionPopup extends PopupModel {
9.
10.    private final ReadOnlyStringWrapper definition = new ReadOnlyStringWrapper("lorem ipsum");
11.
12.    private final ReadOnlyStringWrapper word = new ReadOnlyStringWrapper("lorem");
13.
14.    private final ReadOnlyBooleanWrapper isDefinitionActive = new ReadOnlyBooleanWrapper(false);
15.
16.    /**
17.     * @return returns property of definition
18.     */
19.    public ReadOnlyStringProperty definitionProperty(){
20.        return definition.getReadOnlyProperty();
21.    }
22.
23.    /**
24.     * @return returns property of word
25.     */
26.    public ReadOnlyStringProperty wordProperty(){
27.        return word.getReadOnlyProperty();
28.    }
29.
30.    /**
31.     * @return returns boolean
32.     */
33.    public ReadOnlyBooleanProperty getIsDefinitionActive(){
34.    {
35.        return isDefinitionActive.getReadOnlyProperty();
36.    }
37.
38.    /**
39.     * toggle isDefinitionActive
40.     * @param newState current state of definition window
41.     */
42.    public void setIsDefinitionActive(boolean newState)
43.    {
44.        if(this.isDefinitionActive.get() == newState) { return; }
45.        if (newState){getPaperSoundPlayer().replay();}
46.        else {getReversePaperSoundPlayer().replay();}
47.        this.isDefinitionActive.set(newState);
48.    }
49.
50.    /**
51.     * @param currentWord Word, when OnPlayButton is passed
52.     */
53.    public void setPopup(String currentWord){
54.        word.set(currentWord);
55.        DictionaryDAO dictionary = new DictionaryDAO();
56.        currentWord = currentWord.toLowerCase();
57.        definition.set(dictionary.getWordDefinition(currentWord));
58.    }
59.
60.    // TODO this is only used here are there other classes with popups? Otherwise can remove parent Popup class and just have a single concrete DefinitionPopup model and controller.
61.    @Override
62.    public String getFXMLPath() {
63.        return "/com/example/project/PopUps/DefinitionView.fxml";
64.    }
65. }
```

PopupModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cqty	Missed	Lines	Missed	Methods
PopupModel()	100%		n/a		0	1	0	3	0	1
getPaperSoundPlayer()	100%		n/a		0	1	0	1	0	1
getReversePaperSoundPlayer()	100%		n/a		0	1	0	1	0	1
Total	0 of 21	100%	0 of 0	n/a	0	3	0	5	0	3

Created with JaCoCo 0.8.12.202403310830

PopupModel.java

```
1. package com.example.project.models.popups;
2.
3. import com.example.project.services.sound.GameSoundPlayer;
4.
5. /**
6.  * Parent class for popup windows
7. */
8. public abstract class PopupModel {
9.
10.    /**
11.     * gets FXML path
12.     * @return string path
13.    */
14.    public abstract String getFXMLPath();
15.
16.    protected final GameSoundPlayer paperSoundPlayer = new GameSoundPlayer("/com/example/project/Sounds/PaperFlip.wav");
17.
18.    protected final GameSoundPlayer reversePaperSoundPlayer = new GameSoundPlayer("/com/example/project/Sounds/PaperFlipReversed.wav");
19.    /**
20.     * gets paper sound player
21.     * @return sound player
22.    */
23.    public GameSoundPlayer getPaperSoundPlayer() {return paperSoundPlayer;}
24.
25.    /**
26.     * gets reversed paper sound player
27.     * @return sound player
28.    */
29.    public GameSoundPlayer getReversePaperSoundPlayer() {return reversePaperSoundPlayer;}
30. }
```

com.example.project.models.popups

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
C DefinitionPopup		95%		75%	1	9	1	18	0	7	0	1
C PopupModel		100%		n/a	0	3	0	5	0	3	0	1
Total	3 of 94	96%	1 of 4	75%	1	12	1	23	0	10	0	2

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com.example.project.models.popups

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
DefinitionPopup.java		95%		75%	1	9	1	18	0	7	0	1
PopupModel.java		100%		n/a	0	3	0	5	0	3	0	1
Total	3 of 94	96%	1 of 4	75%	1	12	1	23	0	10	0	2

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LetterTileGroup

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
updateVisuals()		100%		100%	0	3	0	6	0	1
LetterTileGroup(int, Pane, ReadOnlyListProperty, Consumer, List, TileControllerFactory)		100%		n/a	0	1	0	7	0	1
createEmptySlots()		100%		100%	0	2	0	5	0	1
loadEmptySlotIntoContainer()		100%		n/a	0	1	0	4	0	1
LetterTileGroup(int, Pane, ReadOnlyListProperty, Consumer)		100%		n/a	0	1	0	5	0	1
LetterTileGroup(int, Pane, ReadOnlyListProperty, Consumer, List)		100%		n/a	0	1	0	3	0	1
lambda\$new\$1(List, ObservableValue, ObservableList, ObservableList)		100%		n/a	0	1	0	1	0	1
lambda\$new\$0(List, ObservableValue, ObservableList, ObservableList)		100%		n/a	0	1	0	1	0	1
Total	0 of 136	100%	0 of 6	100%	0	11	0	29	0	8

Created with JaCoCo 0.8.12.202403310830

LetterTileGroup.java

```
1. package com.example.project.models.tileGroups;
2.
3. import com.example.project.controllers.tiles.EmptyTileSlotController;
4. import com.example.project.controllers.tiles.LetterTileController;
5. import com.example.project.models.tiles.EmptyTileSlotModel;
6. import com.example.project.models.tiles.LetterTileModel;
7. import com.example.project.controllers.tiles.TileControllerFactory;
8. import javafx.beans.property.ReadOnlyListProperty;
9. import javafx.scene.layout.Pane;
10. import java.util.ArrayList;
11. import java.util.List;
12. import java.util.function.Consumer;
13.
14. /**
15. * tile group that observes an observable list and updates the ui Tile Controller's nodes into their EmptyTileSlotController nodes.
16. */
17. public class LetterTileGroup extends TileGroup<LetterTileModel, LetterTileController>
18. {
19.     private final List<EmptyTileSlotController> tileSlots = new ArrayList<>();
20.     private final int numberofEmptyTileSlots;
21.
22.     protected LetterTileGroup(int numberofEmptyTileSlots, Pane container,
23.                               ReadOnlyListProperty<LetterTileModel> observedList,
24.                               Consumer<LetterTileController> onClickHandler,
25.                               List<Runnable> afterSyncActions,
26.                               TileControllerFactory factory)
27.     {
28.         super(container, onClickHandler, LetterTileController.class, observedList);
29.         this.tileControllerFactory = factory;
30.         observedList.addListener((obs, oldVal, newVal) -> afterSyncActions.forEach(Runnable::run));
31.         this.numberofEmptyTileSlots = numberofEmptyTileSlots;
32.         createEmptySlots();
33.     }
34.
35.     /**
36.      * Constructor
37.      * @param numberofEmptyTileSlots number of max tiles in group (empty slots)
38.      * @param container container to place all in.
39.      * @param observedList the observed list.
40.      * @param onClickHandler On tile click action.
41.      * @param afterSyncActions additional synchronisation actions that need to happen when this observed list changes.
42.      */
43.     public LetterTileGroup(int numberofEmptyTileSlots, Pane container,
44.                           ReadOnlyListProperty<LetterTileModel> observedList,
45.                           Consumer<LetterTileController> onClickHandler,
46.                           List<Runnable> afterSyncActions)
47.     {
48.         this(numberofEmptyTileSlots, container, observedList, onClickHandler);
49.         observedList.addListener((obs, oldVal, newVal) -> afterSyncActions.forEach(Runnable::run));
50.     }
51.
52.     /**
53.      * Constructor
54.      * @param numberofEmptyTileSlots number of max tiles in group (empty slots)
55.      * @param container container to place all in.
56.      * @param observedList the observed list.
57.      * @param onClickAction On tile click action.
58.      */
59.     public LetterTileGroup(int numberofEmptyTileSlots, Pane container,
60.                           ReadOnlyListProperty<LetterTileModel> observedList,
61.                           Consumer<LetterTileController> onClickAction)
62.     {
63.         super(container, onClickAction, LetterTileController.class, observedList);
64.         this.numberofEmptyTileSlots = numberofEmptyTileSlots;
65.         createEmptySlots();
66.     }
67.
68.     /**
69.      * Create empty slots for both word area and tile rack
70.      */
71.     private void createEmptySlots()
72.     {
73.         tileSlots.clear();
74.
75.         for (var i = 0; i < numberofEmptyTileSlots; i++)
76.         {
77.             var emptyTileController = loadEmptySlotIntoContainer();
78.             tileSlots.add(emptyTileController);
79.         }
80.     }
81.
82.     /**
83.      * Load a new empty slot into a container
84.      */
```

```
85.     private EmptyTileSlotController loadEmptySlotIntoContainer()
86.     {
87.         // TODO: this model should store empty tiles and the controller of this should observe those.
88.         var emptyTile = new EmptyTileSlotModel();
89.         EmptyTileSlotController controller = tileControllerFactory.createTileController(emptyTile, EmptyTileSlotController.class);
90.         container.getChildren().add(controller.getRoot());
91.         return controller;
92.     }
93.
94.     @Override
95.     protected void updateVisuals()
96.     {
97.         // update visuals
98.         for (EmptyTileSlotController rowsEmptyTile : tileSlots) {
99.             rowsEmptyTile.setLetter(null);
100.        }
101.
102.         for (int i = 0; i < tileControllers.size(); i++){
103.             tileSlots.get(i).setLetter(tileControllers.get(i));
104.         }
105.     }
106. }
```

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TextEmphasisAnimation

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
TextEmphasisAnimation(Label, Paint, Paint, Duration)		0%	n/a	1	1	16	16	1	1	1
lambda\$new\$1(Label, Paint, ActionEvent)		0%	n/a	1	1	1	1	1	1	1
lambda\$new\$0(Label, Paint, ActionEvent)		0%	n/a	1	1	1	1	1	1	1
Total	82 of 82	0%	0 of 0	n/a	3	3	16	16	3	3

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TileGroup

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
● lambda\$recreateControllers\$1(TileController, MouseEvent)		0%	n/a		1	1	1	1	1	1
● recreateControllers()		100%		75%	1	3	0	8	0	1
● TileGroup(Pane, Class, ReadOnlyListProperty)		100%	n/a		0	1	0	9	0	1
● TileGroup(Pane, Consumer, Class, ReadOnlyListProperty)		100%	n/a		0	1	0	3	0	1
● syncTiles()		100%	n/a		0	1	0	3	0	1
● getControllers()		100%	n/a		0	1	0	1	0	1
● lambda\$new\$0(ObservableValue, ObservableList, ObservableList)		100%	n/a		0	1	0	1	0	1
Total	5 of 92	94%	1 of 4	75%	2	9	0	24	1	7

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TileGroup.java

```
1. package com.example.project.models.tileGroups;
2.
3. import com.example.project.controllers.tiles.TileController;
4. import com.example.project.models.tiles.TileModel;
5. import com.example.project.controllers.tiles.TileControllerFactory;
6. import javafx.beans.property.ReadOnlyListProperty;
7. import javafx.scene.layout.Pane;
8.
9. import java.util.ArrayList;
10. import java.util.List;
11. import java.util.function.Consumer;
12.
13. /**
14. * Tile Group abstract class holds a row or column of tiles.
15. * @param <modelType> tile model type.
16. * @param <controllerType> controller type.
17. */
18. public abstract class TileGroup<modelType extends TileModel, controllerType extends TileController<modelType>>
19. {
20.     protected final Pane container;
21.     protected final List<controllerType> tileControllers = new ArrayList<>();
22.     protected TileControllerFactory tileControllerFactory = new TileControllerFactory();
23.     protected Consumer<controllerType> onClickAction = null;
24.     private final Class<controllerType> controllerClass;
25.     private final ReadOnlyListProperty<modelType> observedModels;
26.
27.     TileGroup(Pane container, Consumer<controllerType> onClickAction, Class<controllerType> tileControllerClass, ReadOnlyListProperty<modelType> observedList)
28.     {
29.         this(container, tileControllerClass, observedList);
30.         this.onClickAction = onClickAction;
31.     }
32.
33.     TileGroup(Pane container, Class<controllerType> tileControllerClass, ReadOnlyListProperty<modelType> observedList)
34.     {
35.         this.container = container;
36.         this.controllerClass = tileControllerClass;
37.         this.observedModels = observedList;
38.         this.observedModels.addListener((obs, oldVal, newVal) -> syncTiles());
39.     }
40.
41.     private void recreateControllers()
42.     {
43.         tileControllers.clear();
44.         for (modelType tile : this.observedModels)
45.         {
46.             controllerType controller = tileControllerFactory.createTileController(tile, controllerClass);
47.             tileControllers.add(controller);
48.
49.             if (onClickAction != null){
50.                 controller.getRoot().setOnMouseClicked(e -> onClickAction.accept(controller));
51.             }
52.         }
53.     }
54.
55.     protected abstract void updateVisuals();
56.
57. /**
58. * Sync tiles in this tile groups controller.
59. */
60. public void syncTiles()
61. {
62.     recreateControllers();
63.     updateVisuals();
64. }
65.
66. /**
67. * Gets the groups tile controllers.
68. * @return the letter tile groups controllers
69. */
70. public List<controllerType> getControllers(){
71.     return tileControllers;
72. }
```

UpgradeTileGroup

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
UpgradeTileGroup(Pane, ReadOnlyListProperty)		0%	n/a	1	1	2	2	1	1	
lambda\$trackDuplicates\$0(Object, Integer)		60%		50%	1	2	0	1	0	1
updateVisuals()		98%		66%	4	7	1	22	0	1
trackDuplicates(List)		100%		100%	0	2	0	5	0	1
UpgradeTileGroup(Pane, ReadOnlyListProperty, Consumer)		100%	n/a	0	1	0	2	0	0	1
Total	11 of 141	92%	5 of 16	68%	6	13	3	31	1	5

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UpgradeTileGroup.java

```

1. package com.example.project.models.tileGroups;
2.
3. import com.example.project.controllers.tiles.UpgradeTileController;
4. import com.example.project.models.tiles.UpgradeTileModel;
5. import javafx.beans.property.ReadOnlyListProperty;
6. import javafx.scene.layout.Pane;
7.
8. import java.util.*;
9. import java.util.function.Consumer;
10.
11. /**
12. * tile group that observes an observable list and updates the ui nodes for some game tiles.
13. */
14. public class UpgradeTileGroup extends TileGroup<UpgradeTileModel, UpgradeTileController>
15. {
16.     /**
17.      * Constructor.
18.      * @param container container all tiles are in.
19.      * @param observedList the observed list that when changes this tile group will sync.
20.      * @param onClickAction additional synchronisation actions that need to be called.
21.      */
22.     public UpgradeTileGroup(Pane container, ReadOnlyListProperty<UpgradeTileModel> observedList, Consumer<UpgradeTileController> onClickAction)
23.     {
24.         super(container, onClickAction, UpgradeTileController.class, observedList);
25.     }
26.
27.     /**
28.      * Constructor with no additional sync action parameter.
29.      * @param container container tiles are in.
30.      * @param observedList the observed list that when changes this tile group will sync.
31.      */
32.     public UpgradeTileGroup(Pane container, ReadOnlyListProperty<UpgradeTileModel> observedList)
33.     {
34.         super(container, UpgradeTileController.class, observedList);
35.     }
36.
37.     /**
38.      * Makes hashmap that tracks the count of each element in list
39.      * @param list the input list of elements
40.      * @param <T> the type of elements in the list
41.      * @return a map for # of dupes for each unique element
42.      */
43.     public static <T> Map<T, Integer> trackDuplicates(List<T> list){
44.         Map<T, Integer> countMap = new HashMap<>();
45.
46.         for (T element : list) {
47.             countMap.compute(element, (key, count) -> (count == null) ? 1 : count + 1);
48.         }
49.
50.         return countMap;
51.     }
52.
53.     @Override
54.     protected void updateVisuals()
55.     {
56.         List<UpgradeTileModel> allModels = new ArrayList<>();
57.         for (var controller : tileControllers) {
58.             allModels.add(controller.getModel());
59.         }
60.
61.         Map<UpgradeTileModel, Integer> countMap = trackDuplicates(allModels);
62.
63.         Set<UpgradeTileModel> uniqueModels = countMap.keySet();
64.
65.         Set<UpgradeTileController> usedControllers = new HashSet<>();
66.
67.
68.
69.         container.getChildren().clear();
70.
71.         for (var uniqueModel : uniqueModels)
72.         {
73.             UpgradeTileController controllerToUse = null;
74.             for (var controller : tileControllers) {
75.                 if (controller.getModel().equals(uniqueModel) && !usedControllers.contains(controller)) {
76.                     controllerToUse = controller;
77.                     usedControllers.add(controller); // Mark as used
78.                     break;
79.                 }
80.             }
81.
82.             if (controllerToUse != null) {
83.                 int count = countMap.get(uniqueModel);
84.                 controllerToUse.updateCount(count);
85.                 container.getChildren().add(controllerToUse.getRoot());
86.             }
87.         }
88.     }
89. }
```

com.example.project.models.tileGroups

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
C UpgradeTileGroup		92%		68%	6	13	3	31	1	5	0	1
C TileGroup		94%		75%	2	9	0	24	1	7	0	1
C LetterTileGroup		100%		100%	0	11	0	29	0	8	0	1
Total	16 of 369	95%	6 of 26	76%	8	33	3	84	2	20	0	3

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com.example.project.models.tileGroups

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods	Missed	Classes
UpgradeTileGroup.java		92%		68%	6	13	3	31	1	5	0	1
TileGroup.java		94%		75%	2	9	0	24	1	7	0	1
LetterTileGroup.java		100%		100%	0	11	0	29	0	8	0	1
Total	16 of 369	95%	6 of 26	76%	8	33	3	84	2	20	0	3

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EmptyTileSlotModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
EmptyTileSlotModel()	100%		n/a		0	1	0	2	0	1
getTile()	100%		n/a		0	1	0	1	0	1
setTile(LetterTileModel)	100%		n/a		0	1	0	2	0	1
getFXMLPath()	100%		n/a		0	1	0	1	0	1
Total	0 of 21	100%	0 of 0	n/a	0	4	0	6	0	4

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EmptyTileSlotModel.java

```
1. package com.example.project.models.tiles;
2.
3.
4. import javafx.beans.property.SimpleObjectProperty;
5.
6. /**
7. * An empty tile slot model. Empty tile slots store a letter tile.
8. */
9. public class EmptyTileSlotModel extends TileModel
10.
11.     private SimpleObjectProperty<LetterTileModel> currentTile = new SimpleObjectProperty<>(null);
12.
13.     /**
14.     * get letter tile in slot.
15.     * @return letter tile.
16.     */
17.     public LetterTileModel getTile(){
18.         return this.currentTile.get();
19.     }
20.
21.     /**
22.     * Set a new tile.
23.     * @param tile letter tile.
24.     */
25.     public void setTile(LetterTileModel tile)
26.     {
27.         this.currentTile.set(tile);
28.     }
29.
30.     @Override
31.     public String getFXMLPath() {
32.         return "/com/example/project/SingleTiles/emptyTileSlot.fxml";
33.     }
34. }
```

LetterTileModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
• LetterTileModel(Character)	100%		n/a		0	1	0	5	0	1
• getLetter()	100%		n/a		0	1	0	1	0	1
• getValue()	100%		n/a		0	1	0	1	0	1
• getFXMLPath()	100%		n/a		0	1	0	1	0	1
Total	0 of 28	100%	0 of 0	n/a	0	4	0	8	0	4

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LetterTileModel.java

```
1. package com.example.project.models.tiles;
2.
3.
4. /**
5.  * Represents the letter tiles the player plays holds, redraws.
6. */
7. public class LetterTileModel extends TileModel
8. {
9.     private final Character letter;
10.
11.    private final Integer value;
12.
13.    /**
14.     * @param newLetter letter
15.     */
16.    public LetterTileModel(Character newLetter)
17.    {
18.        this.letter = Character.toUpperCase(newLetter);
19.        ScrabbleTileProvider provider = new ScrabbleTileProvider();
20.        this.value = provider.getValue(letter);
21.    }
22.
23.    /**
24.     * @return returns the tiles character.
25.     */
26.    public Character getLetter() {
27.        return letter;
28.    }
29.
30.    /**
31.     * @return base value of scrabble letter score.
32.     */
33.    public Integer getValue(){
34.        return this.value;
35.    }
36.
37.    @Override
38.    public String getFXMLPath() {
39.        return "/com/example/project/SingleTiles/letterTileView.fxml";
40.    }
41.}
```

TextEmphasisAnimation.java

```
1. package com.example.project.controllers.gameScreens.animations;
2.
3. import javafx.animation.PauseTransition;
4. import javafx.animation.ScaleTransition;
5. import javafx.scene.control.Label;
6. import javafx.scene.paint.Paint;
7. import javafx.util.Duration;
8.
9. /**
10. * An animation to quickly enlarge text and then return it to its original scale.
11. */
12. public class TextEmphasisAnimation extends AnimationWrapper
13. {
14.     /**
15.      * create the animations for text growing then shrinking
16.      * @param textToAnimate Label.
17.      * @param colorAtStart initial colour change.
18.      * @param changeColourAtEnd colour change after finished.
19.      * @param timePauseAfterAnim time delay after animation until animation finished.
20.      */
21.     public TextEmphasisAnimation(Label textToAnimate, Paint colorAtStart, Paint changeColourAtEnd, Duration timePauseAfterAnim)
22.     {
23.         super();
24.
25.         var colourTextAtStart = new PauseTransition(Duration.seconds(0));
26.         colourTextAtStart.setOnFinished(e -> textToAnimate.setTextFill(colorAtStart));
27.         this.sequentialAnimation.getChildren().add(colourTextAtStart);
28.
29.         var revertSizeTransition = new ScaleTransition(Duration.seconds(0.2), textToAnimate);
30.         revertSizeTransition.setToY(1);
31.         revertSizeTransition.setToX(1);
32.
33.         var doubleSizeTransition = new ScaleTransition(Duration.seconds(0.2), textToAnimate);
34.         doubleSizeTransition.setToY(2);
35.         doubleSizeTransition.setToX(2);
36.
37.         var pauseAfter = new PauseTransition(timePauseAfterAnim);
38.         pauseAfter.setOnFinished(e -> textToAnimate.setTextFill(changeColourAtEnd));
39.
40.         this.sequentialAnimation.getChildren().add(doubleSizeTransition);
41.         this.sequentialAnimation.getChildren().add(revertSizeTransition);
42.         this.sequentialAnimation.getChildren().add(pauseAfter);
43.     }
44. }
```

ScrabbleTileProvider.ScrabbleTileData

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
ScrabbleTileProvider.ScrabbleTileData(int, int)	100%		n/a		0	1	0	1	0	1
Total	0 of 9	100%	0 of 0	n/a	0	1	0	1	0	1

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ScrabbleTileProvider

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
ScrabbleTileProvider()	100%	100%	100%	100%	0	2	0	38	0	1
getValue(Character)	100%	100%	100%	100%	0	2	0	2	0	1
drawRandomTile()	100%	100%	n/a	n/a	0	1	0	2	0	1
static {...}	100%	100%	n/a	n/a	0	1	0	1	0	1
seedRandomNumberGenerator(long)	100%	100%	n/a	n/a	0	1	0	2	0	1
Total	0 of 380	100%	0 of 4	100%	0	7	0	45	0	5

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ScrabbleTileProvider.java

```
1. package com.example.project.models.tiles;
2.
3. import java.util.Map;
4. import java.util.TreeMap;
5. import java.util.Random;
6.
7. /**
8. * Static class to store the scrabble base letter value.
9. */
10. public class ScrabbleTileProvider {
11.     /**
12.      * Constructor.
13.      */
14.     public ScrabbleTileProvider() {
15.         /**
16.          // Calculate total number of tiles by summing frequencies
17.          double totalTiles = this.baseLetterData.values().stream()
18.              .mapToInt(ScrabbleTileData::frequency)
19.              .sum();
20.
21.          double cumulativeFrequency = 0.0;
22.
23.          // Populate the cdfMap
24.          for (Map.Entry<Character, ScrabbleTileData> entry : baseLetterData.entrySet()) {
25.              cumulativeFrequency += entry.getValue().frequency();
26.              cdfMap.put(cumulativeFrequency / totalTiles, entry.getKey());
27.          }
28.      }
29. }
30.
31. /**
32. * @param value value of scrabble letter
33. * @param frequency population of tile
34. */
35. public record ScrabbleTileData(int value, int frequency)
36. {
37.
38.     private final TreeMap<Double, Character> cdfMap = new TreeMap<>();
39.     private static final Random random = new Random();
40.
41.     protected static void seedRandomNumberGenerator(long newSeed){
42.         random.setSeed(newSeed);
43.     }
44.
45.     private final Map<Character, ScrabbleTileData> baseLetterData = Map.ofEntries(
46.         Map.entry('a', new ScrabbleTileData(1, 9)),
47.         Map.entry('b', new ScrabbleTileData(3, 2)),
48.         Map.entry('c', new ScrabbleTileData(3, 2)),
49.         Map.entry('d', new ScrabbleTileData(2, 4)),
50.         Map.entry('e', new ScrabbleTileData(1, 12)),
51.         Map.entry('f', new ScrabbleTileData(4, 2)),
52.         Map.entry('g', new ScrabbleTileData(2, 3)),
53.         Map.entry('h', new ScrabbleTileData(4, 2)),
54.         Map.entry('i', new ScrabbleTileData(1, 9)),
55.         Map.entry('j', new ScrabbleTileData(8, 1)),
56.         Map.entry('k', new ScrabbleTileData(5, 1)),
57.         Map.entry('l', new ScrabbleTileData(1, 4)),
58.         Map.entry('m', new ScrabbleTileData(3, 2)),
59.         Map.entry('n', new ScrabbleTileData(1, 6)),
60.         Map.entry('o', new ScrabbleTileData(1, 8)),
61.         Map.entry('p', new ScrabbleTileData(3, 2)),
62.         Map.entry('q', new ScrabbleTileData(10, 1)),
63.         Map.entry('r', new ScrabbleTileData(1, 6)),
64.         Map.entry('s', new ScrabbleTileData(1, 4)),
65.         Map.entry('t', new ScrabbleTileData(1, 6)),
66.         Map.entry('u', new ScrabbleTileData(1, 4)),
67.         Map.entry('v', new ScrabbleTileData(4, 2)),
68.         Map.entry('w', new ScrabbleTileData(4, 2)),
69.         Map.entry('x', new ScrabbleTileData(8, 1)),
70.         Map.entry('y', new ScrabbleTileData(4, 2)),
71.         Map.entry('z', new ScrabbleTileData(10, 1))
72. );
73.
74. /**
75. * Returns Integer of the letter according to scrabble
76. * @param letter letter to get value of
77. * @return Integer value of the letter, or 0 if not found
78. */
```

```
79.     public int getValue(Character letter)
80.     {
81.         ScrabbleTileData data = baseLetterData.get(Character.toLowerCase(letter));
82.         return (data != null) ? data.value() : 0;
83.     }
84.
85.    /**
86.     * @return randomly selected tile based on CDF
87.     */
88.    public Character drawRandomTile() {
89.        // Generate a random float between 0.0 (inclusive) and 1.0 (exclusive)
90.        double randomFloat = random.nextDouble();
91.
92.        // Find the first entry in the CDF map whose key is greater than or equal to the random float.
93.        return cdfMap.tailMap(randomFloat, true).firstEntry().getValue();
94.    }
95.
96. }
```

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TileModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
TileModel()	100%		n/a		0	1	0	3	0	1
getHoverSoundPlayer()	100%		n/a		0	1	0	1	0	1
getClackSoundPlayer()	100%		n/a		0	1	0	1	0	1
Total	0 of 23	100%	0 of 0	n/a	0	3	0	5	0	3

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TileModel.java

```
1. package com.example.project.models.tiles;
2.
3. import com.example.project.services.sound.GameSoundPlayer;
4.
5. /**
6. * Parent tile class for objects in the scene that are tiles.
7. */
8. public abstract class TileModel
9.
10. {
11.     /**
12.      * gets the fxml path.
13.      * @return string path.
14.      */
15.     public abstract String getFXMLPath();
16.
17.     protected final GameSoundPlayer hoverSoundPlayer = new GameSoundPlayer("/com/example/project/Sounds/hover.wav", -80f);
18.     protected final GameSoundPlayer ClackSoundPlayer = new GameSoundPlayer("/com/example/project/Sounds/clack3.wav", 6f);
19.
20.     /**
21.      * gets the hover sound player
22.      * @return sound player
23.      */
24.     public GameSoundPlayer getHoverSoundPlayer() { return hoverSoundPlayer; }
25.
26.     /**
27.      * gets the sound player that plays the click sound.
28.      * @return sound player.
29.      */
30.     public GameSoundPlayer getClackSoundPlayer() {return ClackSoundPlayer;}
31.
32.     /**
33.      * corner radius (rounded corners).
34.      */
35.     public static final int CORNER_RADIUS = 20;
}
```

UpgradeEffects

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
braceletEffect()		0%		0%	4	4	10	10	1	1
glassesEffect()		0%		0%	3	3	7	7	1	1
buttonEffect()		0%		0%	3	3	6	6	1	1
diceEffect()		0%		n/a	1	1	5	5	1	1
mirrorEffect()		0%		0%	2	2	6	6	1	1
coinEffect()		0%		0%	2	2	6	6	1	1
static {...}		0%		n/a	1	1	1	1	1	1
UpgradeEffects()		0%		n/a	1	1	1	1	1	1
Total	204 of 204	0%	18 of 18	0%	17	17	42	42	8	8

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UpgradeEffects.java

```
1. package com.example.project.models.tiles;
2.
3. import com.example.project.models.gameScreens.LevelModel;
4. import com.example.project.services.Session;
5.
6. import java.util.Random;
7.
8. /**
9. * upgrade effect methods
10.*/
11. public class UpgradeEffects
12. {
13.     private static final LevelModel levelModel = Session.getInstance().getLevelModel();
14.
15.     /**
16.      * Adds +2 to the score multiplier for every identical pair of letters next to each other
17.      */
18.     public static void glassesEffect() {
19.         // for each letter in word, if the current letter matches the previous letter add 2 to the modifier
20.         for (int i = 1; i < levelModel.getWordWindowTilesProperty().size(); i++) {
21.             Character previousLetter = levelModel.getWordWindowTilesProperty().get(i-1).getLetter();
22.             Character currentLetter = levelModel.getWordWindowTilesProperty().get(i).getLetter();
23.             if (previousLetter.equals(currentLetter)) {
24.                 int newMulti = levelModel.wordMultiProperty().get() + 2;
25.                 levelModel.setWordMulti(newMulti);
26.             }
27.         }
28.     }
29.
30.     /**
31.      * Value is doubled for a random letter in the played word
32.      */
33.     public static void diceEffect() {
34.         Random random = new Random();
35.         int randomNum = random.nextInt(levelModel.getWordWindowTilesProperty().size());
36.         int newScore = levelModel.wordPointsProperty().get() + levelModel.getWordWindowTilesProperty().get(randomNum).getValue();
37.         levelModel.setWordPoints(newScore);
38.     }
39.
40.     /**
41.      * 20% Chance the total word score is doubled
42.      */
43.     public static void coinEffect() {
44.         Random random = new Random();
45.         double chance = 0.2;
46.         if (random.nextDouble() < chance) {
47.             int newScore = levelModel.wordPointsProperty().get() * 2;
48.             levelModel.setWordPoints(newScore);
49.         }
50.     }
51.
52.     /**
53.      * If played word is a palindrome, doubles word score.
54.      */
55.     public static void mirrorEffect() {
56.         String word = levelModel.getCurrentWord();
57.         String reversedWord = new StringBuilder(word).reverse().toString();
58.
59.         if (word.equals(reversedWord)) {
60.             int newScore = levelModel.wordPointsProperty().get() * 2;
61.             levelModel.setWordPoints(newScore);
62.         }
63.     }
64.
65.     /**
66.      * Add +1 to score multiplier for every consecutive letter alphabetical order.
67.      */
68.     public static void braceletEffect() {
69.
70.         String alphabet = "ABCDEFGHIJKLMNPQRSTUVWXYZ";
71.
72.         // for each letter in the word, if the next letter matches the next letter in the alphabet, add 1 to modifier
73.         for (int i = 0; i < levelModel.getWordWindowTilesProperty().size()-1; i++) {
74.
75.             Character currentLetter = levelModel.getWordWindowTilesProperty().get(i).getLetter();
76.             Character nextLetter = levelModel.getWordWindowTilesProperty().get(i+1).getLetter();
77.
78.             if (currentLetter.equals('Z')) { continue; }
79.
80.             Character nextAlphabeticalLetter = alphabet.charAt(alphabet.indexOf(currentLetter)+1);
81.
82.             if (nextLetter.equals(nextAlphabeticalLetter)) {
83.                 int newMulti = levelModel.wordMultiProperty().get() + 1;
```

```
84.             levelModel.setWordMulti(newMulti);
85.         }
86.     }
87. }
88.
89. /**
90. * adds 5 to the word score for every x in the tile rack.
91. */
92. public static void buttonEffect() {
93.     for (LetterTileModel tile : levelModel.getTileRackTilesProperty()) {
94.         if (tile.getLetter().equals('X')) {
95.             int newScore = levelModel.wordPointsProperty().get() + 5;
96.             levelModel.setWordPoints(newScore);
97.         }
98.     }
99. }
100.
101.
102. }
```

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UpgradeTileModel.UpgradeBuilder

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
description(String)	100%		n/a		0	1	0	1	0	1
name(String)	100%		n/a		0	1	0	1	0	1
imagePath(String)	100%		n/a		0	1	0	1	0	1
cost(double)	100%		n/a		0	1	0	1	0	1
upgradeEffect(Runnable)	100%		n/a		0	1	0	1	0	1
build()	100%		n/a		0	1	0	1	0	1
UpgradeTileModel.UpgradeBuilder()	100%		n/a		0	1	0	1	0	1
Total	0 of 33	100%	0 of 0	n/a	0	7	0	7	0	7

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UpgradeTileModel

Element	Missed Instructions	Cov.	Missed Branches	Cov.	Missed	Cxty	Missed	Lines	Missed	Methods
UpgradeTileModel(UpgradeTileModel.UpgradeBuilder)	100%	n/a	0	1	0	7	0	1	0	1
getName()	100%	n/a	0	1	0	1	0	1	0	1
getDescription()	100%	n/a	0	1	0	1	0	1	0	1
getCost()	100%	n/a	0	1	0	1	0	1	0	1
getAbilityImagePath()	100%	n/a	0	1	0	1	0	1	0	1
getUpgradeEffect()	100%	n/a	0	1	0	1	0	1	0	1
getFXMLPath()	100%	n/a	0	1	0	1	0	1	0	1
Total	0 of 40	100%	0 of 0	n/a	0	7	0	13	0	7

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UpgradeTileModel.java

```
1. package com.example.project.models.tiles;
2.
3. /**
4.  * Represents the upgrade tiles sold at the shop.
5. */
6. public class UpgradeTileModel extends TileModel
7. {
8.     private final String description;
9.     private final String name;
10.    private final String imagePath;
11.    private final double cost;
12.    private final Runnable upgradeEffect;
13.
14.    /**
15.     * public upgrade constructor.
16.     * @param builder upgrade builder
17.     */
18.    public UpgradeTileModel(UpgradeBuilder builder)
19.    {
20.        this.description = builder.description;
21.        this.name = builder.name;
22.        this.imagePath = builder.imagePath;
23.        this.cost = builder.cost;
24.        this.upgradeEffect = builder.upgradeEffect;
25.    }
26.
27.
28.    /**
29.     * builder class for the upgrades
30.     */
31.    public static class UpgradeBuilder {
32.        private String description;
33.        private String name;
34.        private String imagePath;
35.        private double cost;
36.        private Runnable upgradeEffect;
37.
38.        /**
39.         * upgrade description builder
40.         * @param description new upgrade description
41.         * @return description
42.         */
43.        public UpgradeBuilder description(String description) {this.description = description; return this; }
44.
45.        /**
46.         * upgrade name builder
47.         * @param name new upgrade name
48.         * @return name
49.         */
50.        public UpgradeBuilder name(String name) {this.name = name; return this; }
51.
52.        /**
53.         * upgrade image path builder
54.         * @param imagePath new upgrade image path
55.         * @return image path
56.         */
57.        public UpgradeBuilder imagePath(String imagePath) {this.imagePath = imagePath; return this; }
58.
59.        /**
60.         * upgrade cost builder
61.         * @param cost new upgrade cost
62.         * @return cost
63.         */
64.        public UpgradeBuilder cost(double cost) {this.cost = cost; return this; }
65.
66.        /**
67.         * upgrade effect builder
68.         * @param upgradeEffect new upgrade effect
69.         * @return upgrade effect
70.         */
71.        public UpgradeBuilder upgradeEffect(Runnable upgradeEffect) {this.upgradeEffect = upgradeEffect; return this; }
72.
73.        /**
74.         * build upgrade
75.         * @return new upgrade
76.         */
77.        public UpgradeTileModel build() { return new UpgradeTileModel(this); }
78.    }
```

```
79.  
80.  
81.  
82.    /**  
83.     * gets the name.  
84.     * @return return name.  
85.     */  
86.    public String getName(){  
87.        return this.name;  
88.    }  
89.  
90.    /**  
91.     * gets the description.  
92.     * @return description.  
93.     */  
94.    public String getDescription(){  
95.        return this.description;  
96.    }  
97.  
98.    /**  
99.     * gets the cost  
100.    * @return return cost.  
101.    */  
102.   public double getCost()  
103.   {  
104.       return this.cost;  
105.   }  
106.  
107.   /**  
108.    * gets upgrade tile image path.  
109.    * @return returns loaded Image for this tile.  
110.    */  
111.   public String getAbilityImagePath() { return imagePath; }  
112.  
113.   /**  
114.    * gets the effect for this tile.  
115.    * @return returns the runnable effect for this tile.  
116.    */  
117.   public Runnable getUpgradeEffect() { return upgradeEffect; }  
118.  
119.   @Override  
120.   public String getFXMLPath() {  
121.       return "/com/example/project/SingleTiles/upgradeTileView.fxml";  
122.   }  
123.  
124. }
```