Project Documentation

**EspioQuest **

Contents

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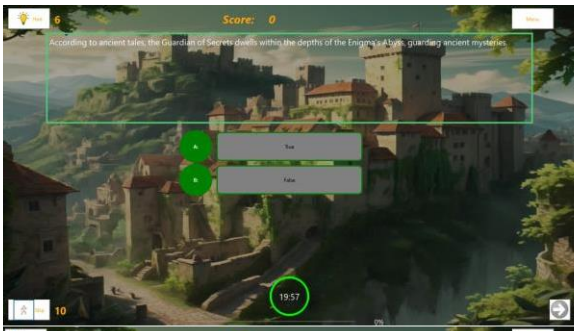
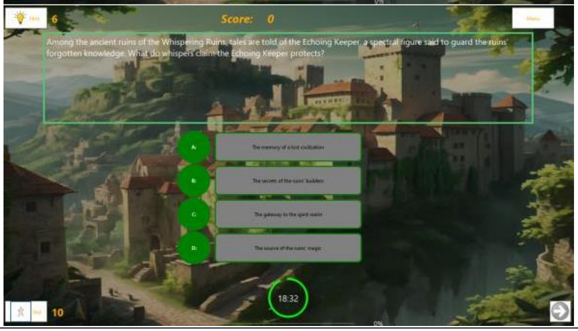
Introduction

Welcome to 'Espioquest,' an immersive quiz adventure set in the mysterious village of Glenhaven nestled within the Scottish Highlands. In this game, players embark on a thrilling journey to unravel the centuries-old mysteries shrouding Dunhaven Castle and uncover the secrets of the legendary Emerald Cipher. Prepare to test your wits as you solve cryptic puzzles, decrypt mysterious messages, and untangle ancient riddles, all while racing against the clock to unlock the hidden truths of Glenhaven. With each challenge, players delve deeper into the enigmatic history of the village, piecing together clues passed down through generations to unveil the ultimate secrets buried within the castle's ancient walls. Developed with intricate storytelling and immersive gameplay, 'Espioquest' offers players an unforgettable experience of espionage, intrigue, and discovery.

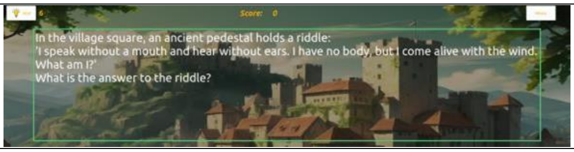
Question Structure

1. True/False questions, Multiple-Choice Questions

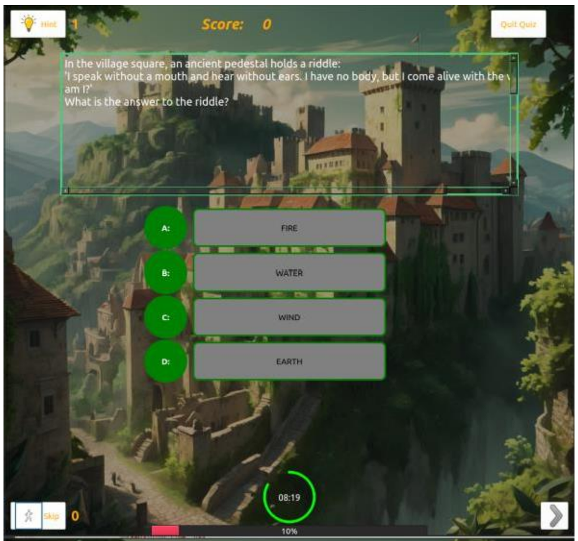
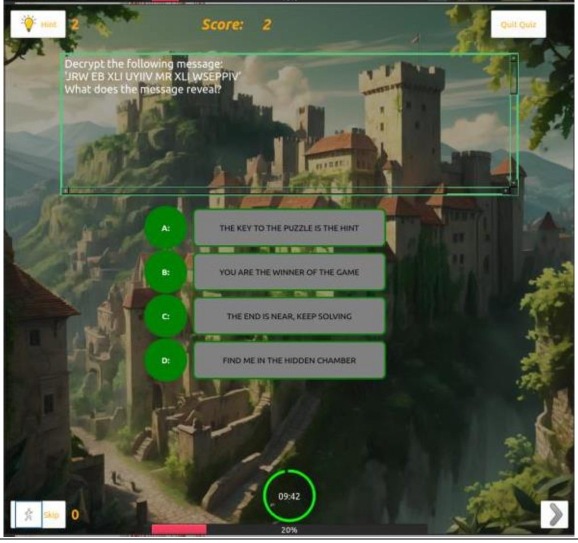
Screenshot	Explanation
 Score: 0 According to ancient tales, the Guardian of Secrets dwells within the depths of the Enigma's Abyss, guarding ancient mysteries. A: True B: False 19:57  Score: 0 Among the ancient ruins of the Whispering Ruins, tales are told of the Echoing Keeper, a spectral figure said to guard the ruins' forgotten knowledge. What do whispers claim the Echoing Keeper protects? A: The memory of a lost civilization B: The secrets of the ruins' builders C: The gateway to the spirit realm D: The source of the ruins' magic 18:32	

	The screenshot shows the True/False question with two answer buttons for the user to select from.
	The screenshot shows the MCQ question with four answer buttons for the user to select from.

2. Questions appear individually

Screenshot	Explanation
 In the village square, an ancient pedestal holds a riddle: 'I speak without a mouth and hear without ears. I have no body, but I come alive with the wind. What am I?' What is the answer to the riddle?	One question is displayed at a time.

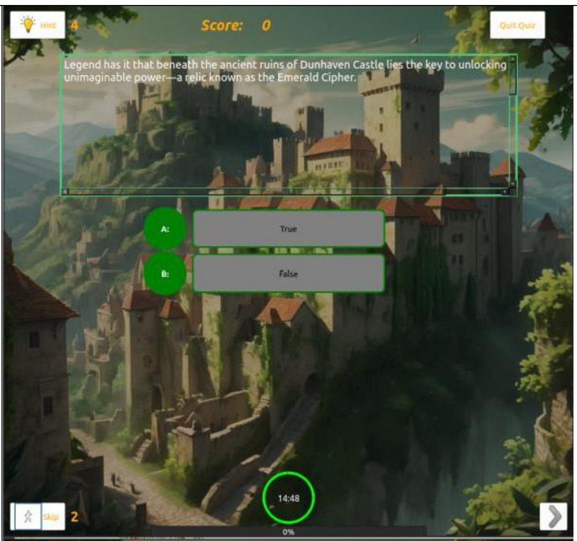
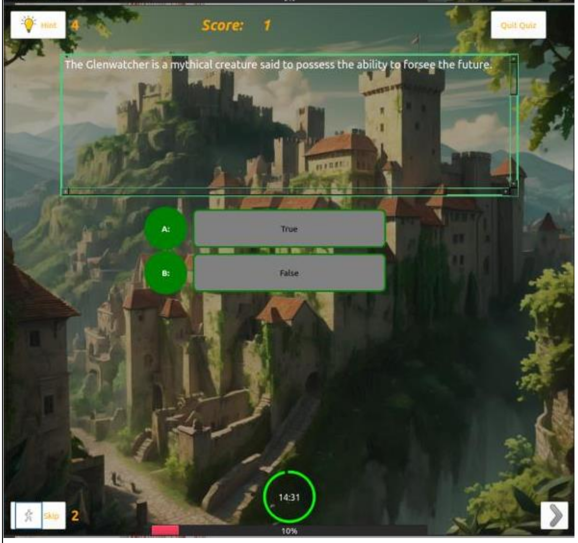
3. Question order is different for every quiz attempt

Screenshot	Explanation
 In the village square, an ancient pedestal holds a riddle: 'I speak without a mouth and hear without ears. I have no body, but I come alive with the v am I?' What is the answer to the riddle? A: FIRE B: WATER C: WIND D: EARTH  Decrypt the following message: 'JRW EB XLI UYIIV MR XLI WSEPPIV' What does the message reveal? A: THE KEY TO THE PUZZLE IS THE HINT B: YOU ARE THE WINNER OF THE GAME C: THE END IS NEAR, KEEP SOLVING D: FIND ME IN THE HIDDEN CHAMBER	

	The progress bar shows that the player has answered one question and is currently in question 2, hence the 10% indication.
	In this screenshot, the player has progressed to the next question and the progress bar is now at 20%. This shows that the question orders are different.

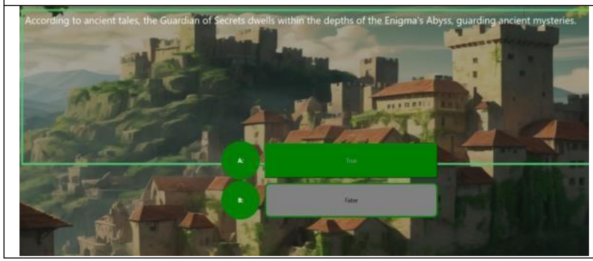
4. Unique question order - no duplicates

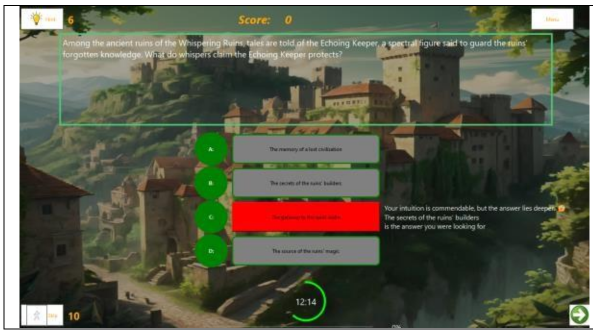
Screenshot	Explanation

	 Hint 4 Score: 0 Quit Quiz A: True B: False 14:48 Skip 2 0% Legend has it that beneath the ancient ruins of Dunhaven Castle lies the key to unlocking unimaginable power—a relic known as the Emerald Cipher.  Hint 4 Score: 1 Quit Quiz A: True B: False 14:31 Skip 2 10% The Glenwatcher is a mythical creature said to possess the ability to forsee the future. The player is currently in question 1 out of 10.
	Here is question 2 out of 10 of this attempt and it is different than the last one. There are no duplicate questions displayed.

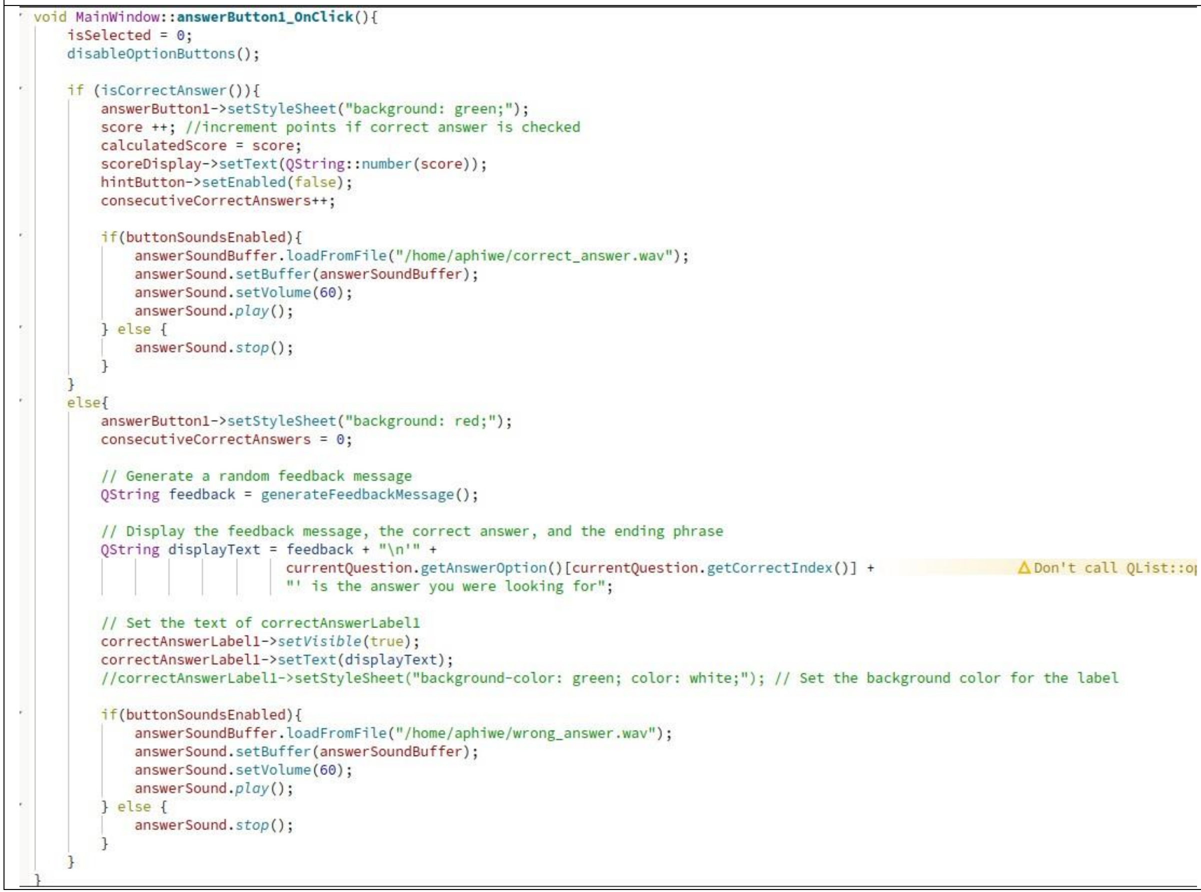
User Interaction

1. User input

Screenshot	Explanation
 According to ancient tales, the Guardian of Secrets dwells within the depths of the Enigma's Abyss, guarding ancient mysteries.	In this screenshot, the answer button turned green because they selected the correct answer.

 Among the ancient ruins of the Whispering Ruins, tales are told of the Echoing Keeper, a spectral figure said to guard the ruins' forgotten knowledge. What do whispers claim the Echoing Keeper protects? Your intuition is commendable, but the answer lies deeper. The secrets of the ruins' builders is the answer you were looking for Hint 6 Score: 0 Menu A: The memory of a lost civilization B: The secrets of the ruins' builders C: D: The source of the ruins' magic 12:14 10	In this screenshot, the answer button turned red because the user selected the wrong answer, and the appropriate feedback is shown.

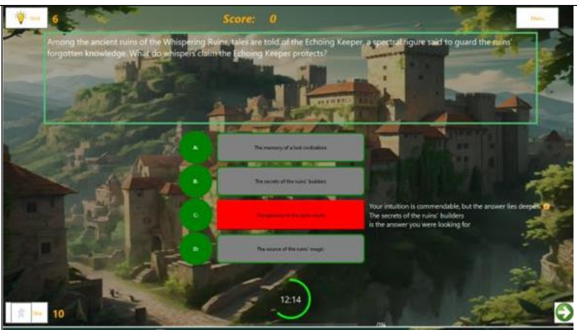
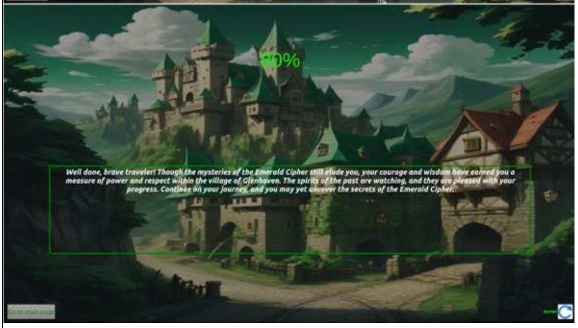
Code Screenshot



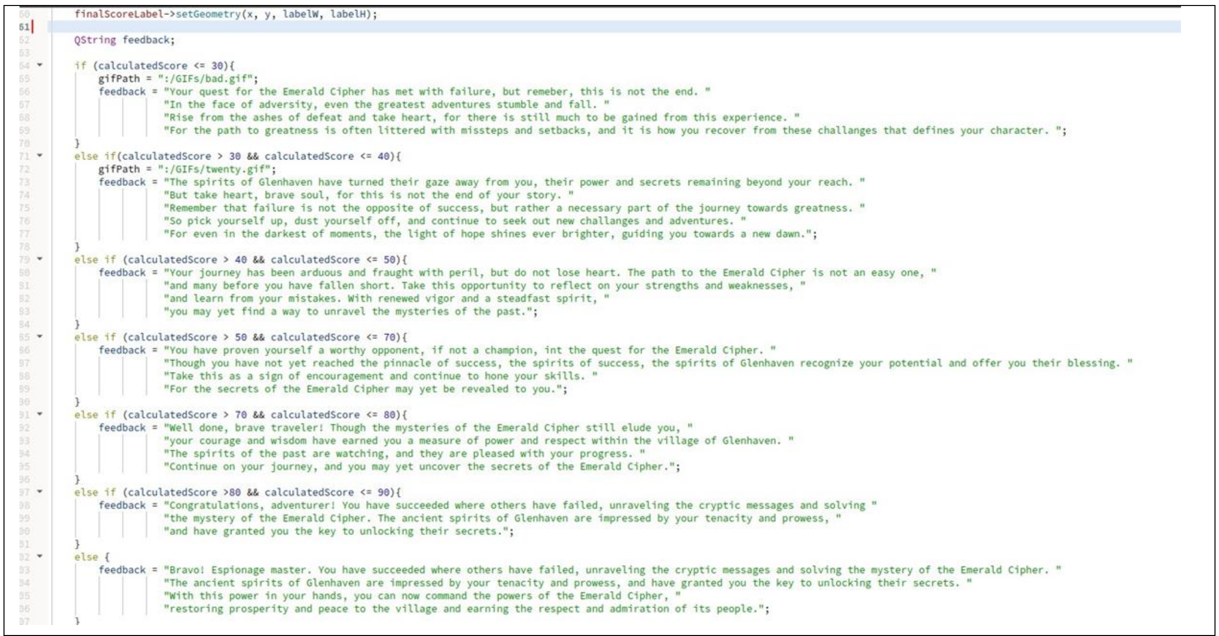
```
void MainWindow::answerButton1_OnClick(){
    isSelected = 0;
    disableOptionButtons();

    if (isCorrectAnswer()){
        answerButton1->setStyleSheet("background: green;");
        score ++; //increment points if correct answer is checked
        calculatedScore = score;
        scoreDisplay->setText(QString::number(score));
        hintButton->setEnabled(false);
        consecutiveCorrectAnswers++;

        if(buttonSoundsEnabled){
            answerSoundBuffer.loadFromFile("/home/aphiwe/correct_answer.wav");
            answerSound.setBuffer(answerSoundBuffer);
            answerSound.setVolume(60);
            answerSound.play();
        } else {
            answerSound.stop();
        }
    }
    else{
        answerButton1->setStyleSheet("background: red;");
        consecutiveCorrectAnswers = 0;

        // Generate a random feedback message
        QString feedback = generateFeedbackMessage();

        // Display the feedback message, the correct answer, and the ending phrase
        QString displayText = feedback + "\n'" +
                                          currentQuestion.getAnswerOption()[currentQuestion.getCorrectIndex()] +            ⚠Don't call QList::o
                                          "' is the answer you were looking for";

        // Set the text of correctAnswerLabel1
        correctAnswerLabel1->setVisible(true);
        correctAnswerLabel1->setText(displayText);
        //correctAnswerLabel1->setStyleSheet("background-color: green; color: white;"); // Set the background color for the label

        if(buttonSoundsEnabled){
            answerSoundBuffer.loadFromFile("/home/aphiwe/wrong_answer.wav");
            answerSound.setBuffer(answerSoundBuffer);
            answerSound.setVolume(60);
            answerSound.play();
        } else {
            answerSound.stop();
        }
    }
}
```

In the provided code, when a user clicks a correct answer, the button stylesheet is set to green and points increment, we also count for consecutive correct answers for help features and play the appropriate sound. When the answer is wrong, we set colour to red, play the buzz sound and show feedback to the user

2. User feedback

Screenshot	Explanation
	 6 Score: 0 A. B. C. D. The memory of a lost civilization The secrets of the ruins' builders The source of the ruins' magic 12:14 10 Among the ancient ruins of the Whispering Ruins, tales are told of the Echoing Keeper, a spectral figure said to guard the ruins' forgotten knowledge. What do whispers claim the Echoing Keeper protects? Your intuition is commendable, but the answer lies deeper. The secrets of the ruins' builders is the answer you were looking for  Well done, brave traveler! Though the mysteries of the Emerald Cipher still elude you, your courage and wisdom have earned you a measure of power and respect within the village of Glenhaven. The spirits of the past are watching, and they are pleased with your progress. Continue on your journey, and you may yet uncover the secrets of the Emerald Cipher. Feedback is shown when wrong answer is clicked.
	Feedback is shown at the end of the game based on percentage.

Code Screenshot

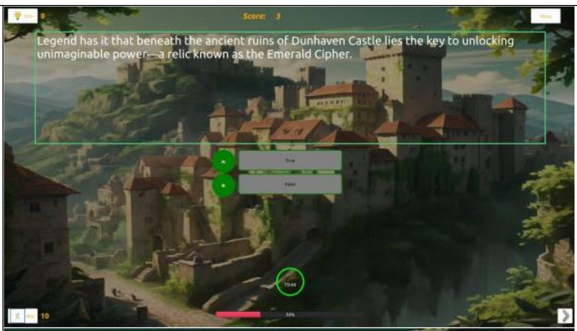
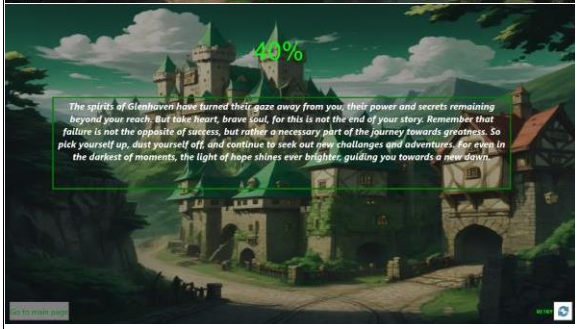


```cpp
    finalScoreLabel->setGeometry(x, y, labelW, labelH);

    QString feedback;

    if (calculatedScore <= 30){
        gifPath = ":/GIFs/bad.gif";
        feedback = "Your quest for the Emerald Cipher has met with failure, but remeber, this is not the end. "
                   "In the face of adversity, even the greatest adventures stumble and fall. "
                   "Rise from the ashes of defeat and take heart, for there is still much to be gained from this experience. "
                   "For the path to greatness is often littered with missteps and setbacks, and it is how you recover from these challanges that defines your character. ";
    }
    else if(calculatedScore > 30 && calculatedScore <= 40){
        gifPath = ":/GIFs/twenty.gif";
        feedback = "The spirits of Glenhaven have turned their gaze away from you, their power and secrets remaining beyond your reach. "
                   "But take heart, brave soul, for this is not the end of your story. "
                   "Remember that failure is not the opposite of success, but rather a necessary part of the journey towards greatness. "
                   "So pick yourself up, dust yourself off, and continue to seek out new challanges and adventures. "
                   "For even in the darkest of moments, the light of hope shines ever brighter, guiding you towards a new dawn.";
    }
    else if (calculatedScore > 40 && calculatedScore <= 50){
        feedback = "Your journey has been arduous and fraught with peril, but do not lose heart. The path to the Emerald Cipher is not an easy one, "
                   "and many before you have fallen short. Take this opportunity to reflect on your strengths and weaknesses, "
                   "and learn from your mistakes. With renewed vigor and a steadfast spirit, "
                   "you may yet find a way to unravel the mysteries of the past.";
    }
    else if (calculatedScore > 50 && calculatedScore <= 70){
        feedback = "You have proven yourself a worthy opponent, if not a champion, int the quest for the Emerald Cipher. "
                   "Though you have not yet reached the pinnacle of success, the spirits of success, the spirits of Glenhaven recognize your potential and offer you their blessing. "
                   "Take this as a sign of encouragement and continue to hone your skills. "
                   "For the secrets of the Emerald Cipher may yet be revealed to you.";
    }
    else if (calculatedScore > 70 && calculatedScore <= 80){
        feedback = "Well done, brave traveler! Though the mysteries of the Emerald Cipher still elude you, "
                   "your courage and wisdom have earned you a measure of power and respect within the village of Glenhaven. "
                   "The spirits of the past are watching, and they are pleased with your progress. "
                   "Continue on your journey, and you may yet uncover the secrets of the Emerald Cipher.";
    }
    else if (calculatedScore >80 && calculatedScore <= 90){
        feedback = "Congratulations, adventurer! You have succeeded where others have failed, unraveling the cryptic messages and solving "
                   "the mystery of the Emerald Cipher. The ancient spirits of Glenhaven are impressed by your tenacity and prowess, "
                   "and have granted you the key to unlocking their secrets.";
    }
    else {
        feedback = "Bravo! Espionage master. You have succeeded where others have failed, unraveling the cryptic messages and solving the mystery of the Emerald Cipher. "
                   "The ancient spirits of Glenhaven are impressed by your tenacity and prowess, and have granted you the key to unlocking their secrets. "
                   "With this power in your hands, you can now command the powers of the Emerald Cipher, "
                   "restoring prosperity and peace to the village and earning the respect and admiration of its people.";
    }
```

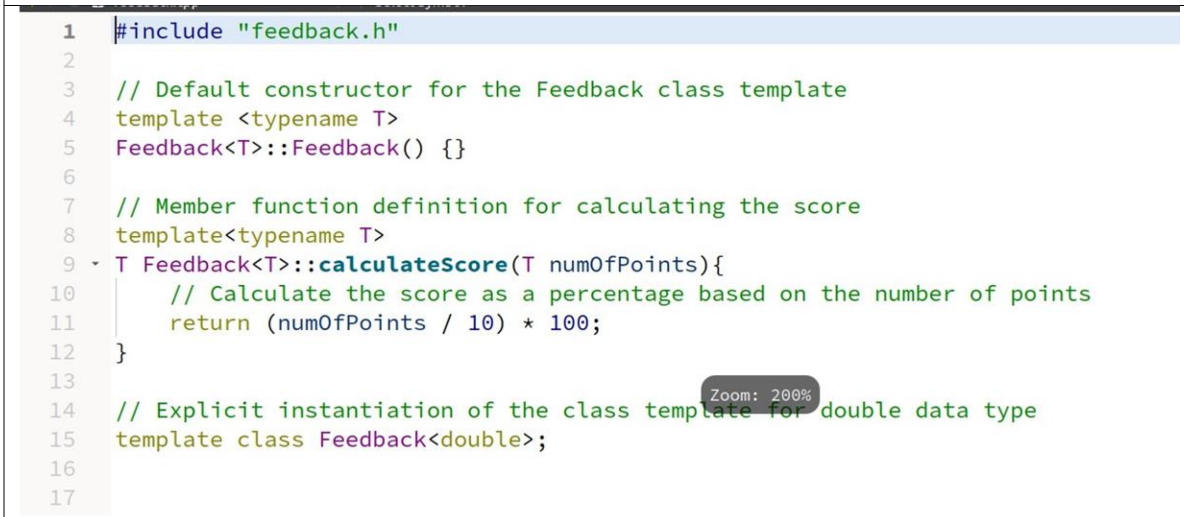
Feedback is available and assigned to ‘feedback’ for every possible score.

3. Score accumulator

Screenshot	Explanation

	 Score: 3 Legend has it that beneath the ancient ruins of Dunhaven Castle lies the key to unlocking unimaginable power—a relic known as the Emerald Cipher.  The spirits of Glenhaven have turned their gaze away from you, their power and secrets remaining beyond your reach. But take heart, brave soul, for this is not the end of your story. Remember that failure is not the opposite of success, but rather a necessary part of the journey towards greatness. So pick yourself up, dust yourself off, and continue to seek out new challanges and adventures. For even in the darkest of moments, the light of hope shines ever brighter, guiding you towards a new dawn. Here, the player has answered three questions correctly.
	Score is converted to a percentage at the end.

Code Screenshot

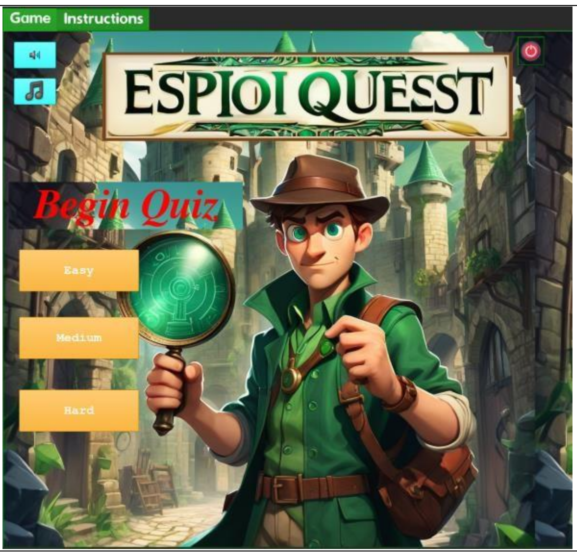


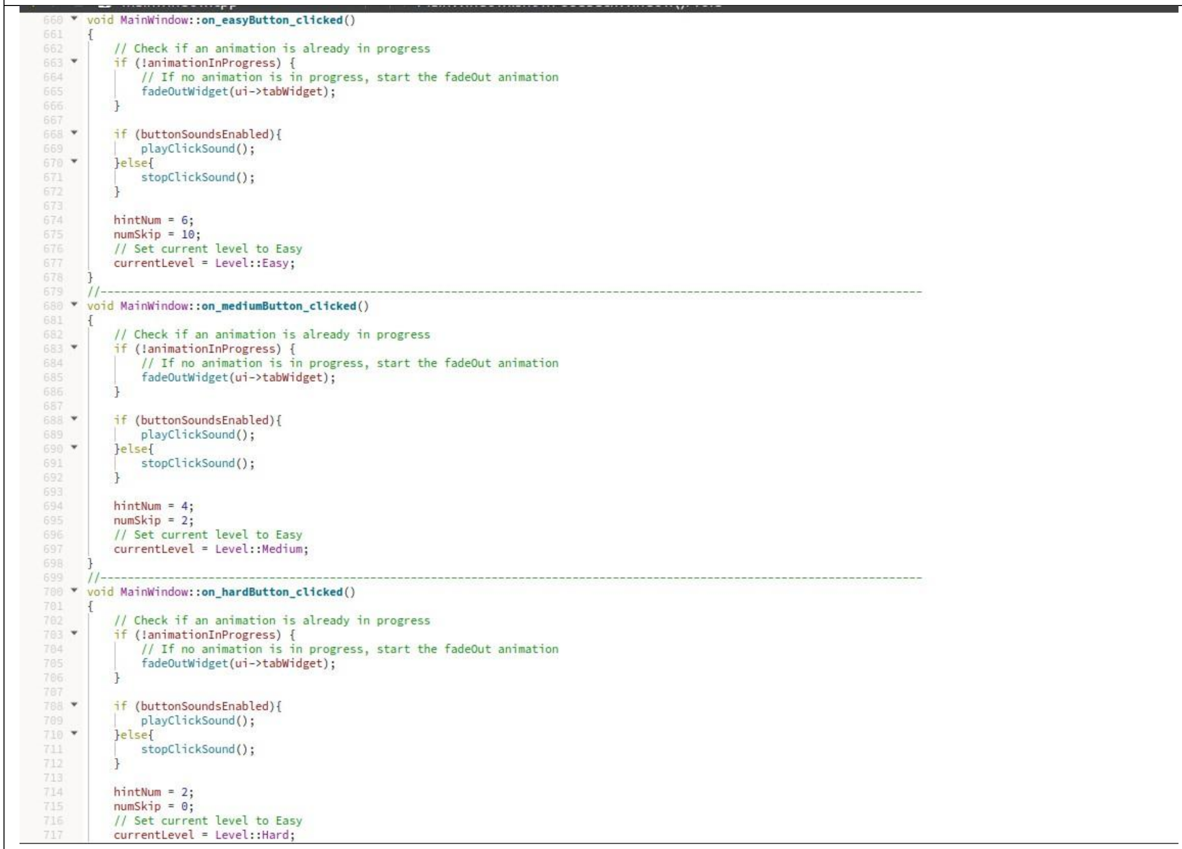
```cpp
#include "feedback.h"

// Default constructor for the Feedback class template
template <typename T>
Feedback<T>::Feedback() {}

// Member function definition for calculating the score
template<typename T>
T Feedback<T>::calculateScore(T numOfPoints){
    // Calculate the score as a percentage based on the number of points
    return (numOfPoints / 10) * 100;
}

// Explicit instantiation of the class template for double data type
template class Feedback<double>;
```

This template class calculates the overall score based on correct answered questions and convert it into a percentage.

Levels and Progression

1. Various levels

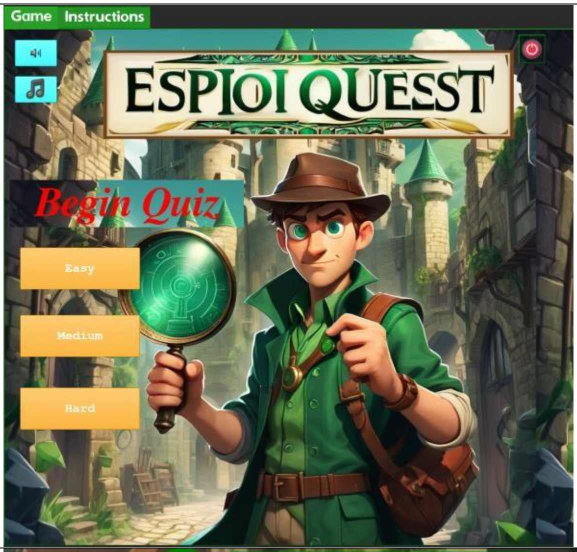
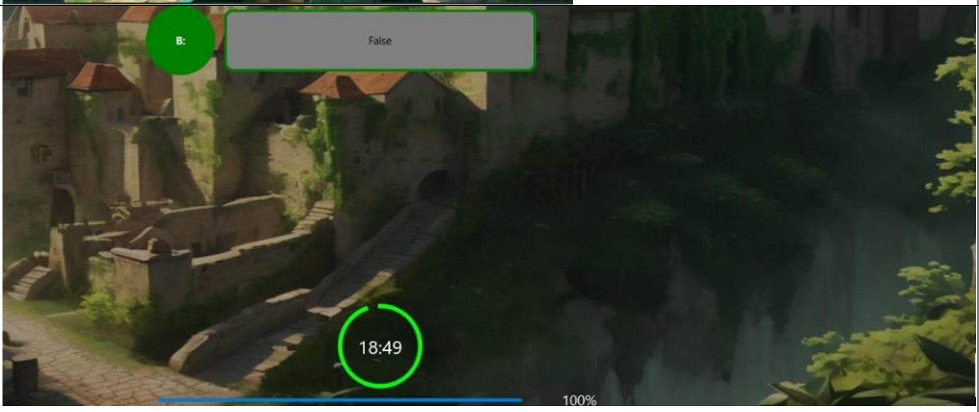
Screenshot	Explanation
 Game Instructions ESPIOI QUESST Begin Quiz Easy Medium Hard	3 levels, “Easy”, “Medium” and “Hard”

Code Screenshot


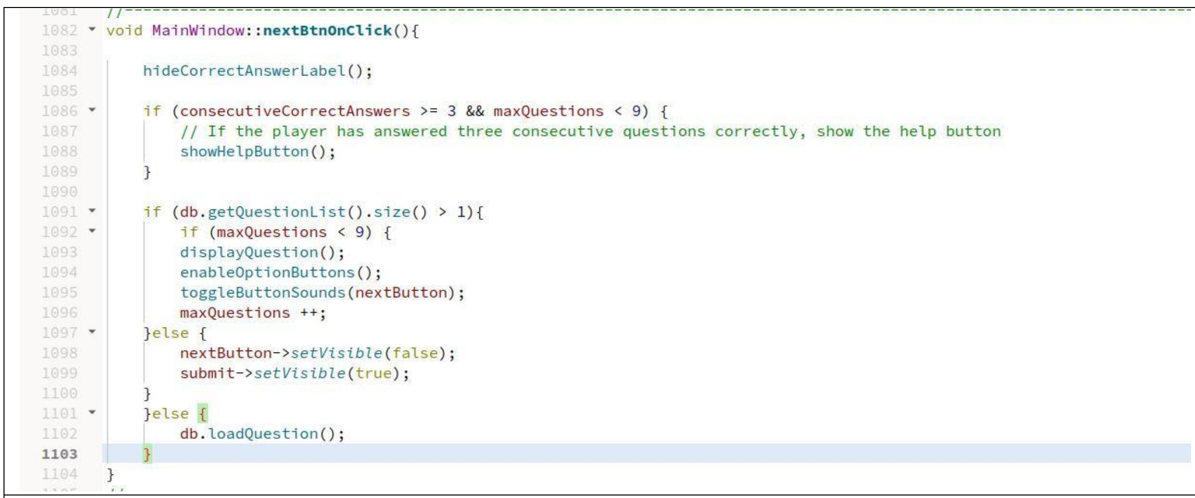
```cpp
void MainWindow::on_easyButton_clicked()
{
    // Check if an animation is already in progress
    if (!animationInProgress) {
        // If no animation is in progress, start the fadeOut animation
        fadeOutWidget(ui->tabWidget);
    }

    if (buttonSoundsEnabled){
        playClickSound();
    }else{
        stopClickSound();
    }

    hintNum = 6;
    numSkip = 10;
    // Set current level to Easy
    currentLevel = Level::Easy;
}
//--------------------------------------------------------------------------------------------------------------------
void MainWindow::on_mediumButton_clicked()
{
    // Check if an animation is already in progress
    if (!animationInProgress) {
        // If no animation is in progress, start the fadeOut animation
        fadeOutWidget(ui->tabWidget);
    }

    if (buttonSoundsEnabled){
        playClickSound();
    }else{
        stopClickSound();
    }

    hintNum = 4;
    numSkip = 2;
    // Set current level to Easy
    currentLevel = Level::Medium;
}
//--------------------------------------------------------------------------------------------------------------------
void MainWindow::on_hardButton_clicked()
{
    // Check if an animation is already in progress
    if (!animationInProgress) {
        // If no animation is in progress, start the fadeOut animation
        fadeOutWidget(ui->tabWidget);
    }

    if (buttonSoundsEnabled){
        playClickSound();
    }else{
        stopClickSound();
    }

    hintNum = 2;
    numSkip = 0;
    // Set current level to Easy
    currentLevel = Level::Hard;
```

Slot functions for each level. Easy is assigned to Level variable easy so we can allocate timer later accordingly, and there is more time, more hints and more skips to indicate the level of difficulty, we do the same for other ones.

2. At least three levels and eight questions each

Screenshot	Explanation
 Game Instructions ESPIOI QUESST Begin Quiz Easy Medium Hard	We have three levels
	The progressbar is at 100%, meaning a aplayer has anwered 10 questions. Meaning we have at least eight questions.

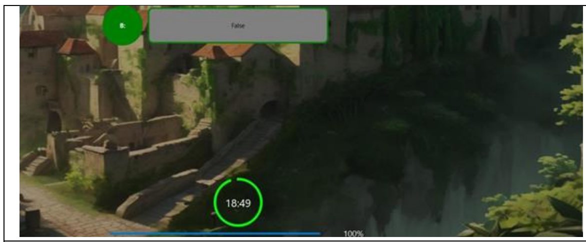
Code Screenshot



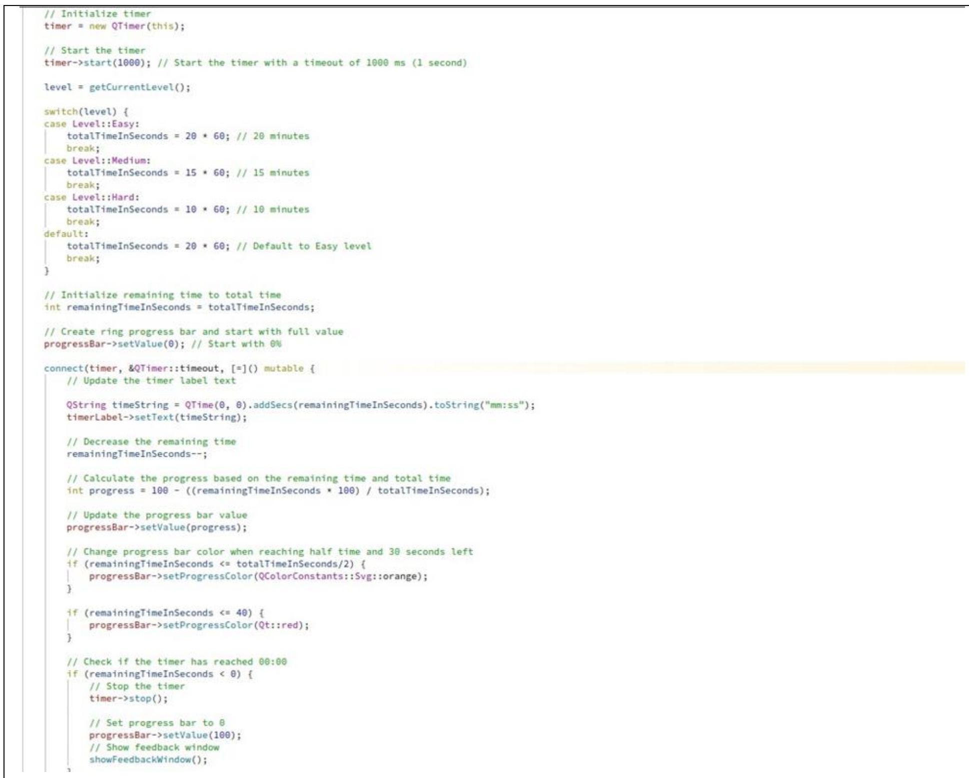
```
//------------------------------------------------------------------------------------------------------------------------
void MainWindow::nextBtnOnClick(){

    hideCorrectAnswerLabel();

    if (consecutiveCorrectAnswers >= 3 && maxQuestions < 9) {
        // If the player has answered three consecutive questions correctly, show the help button
        showHelpButton();
    }

    if (db.getQuestionList().size() > 1){
        if (maxQuestions < 9) {
        displayQuestion();
        enableOptionButtons();
        toggleButtonSounds(nextButton);
        maxQuestions ++;
    }else {
        nextButton->setVisible(false);
        submit->setVisible(true);
    }
    }else {
        db.loadQuestion();
    }
}
```

This code only allows for the maximum of 10 questions per level

3. Display progress of the quiz

Screenshot	Explanation
	The progress bar is at 100%, meaning they are currently in question 1 out of 10

Code Screenshot

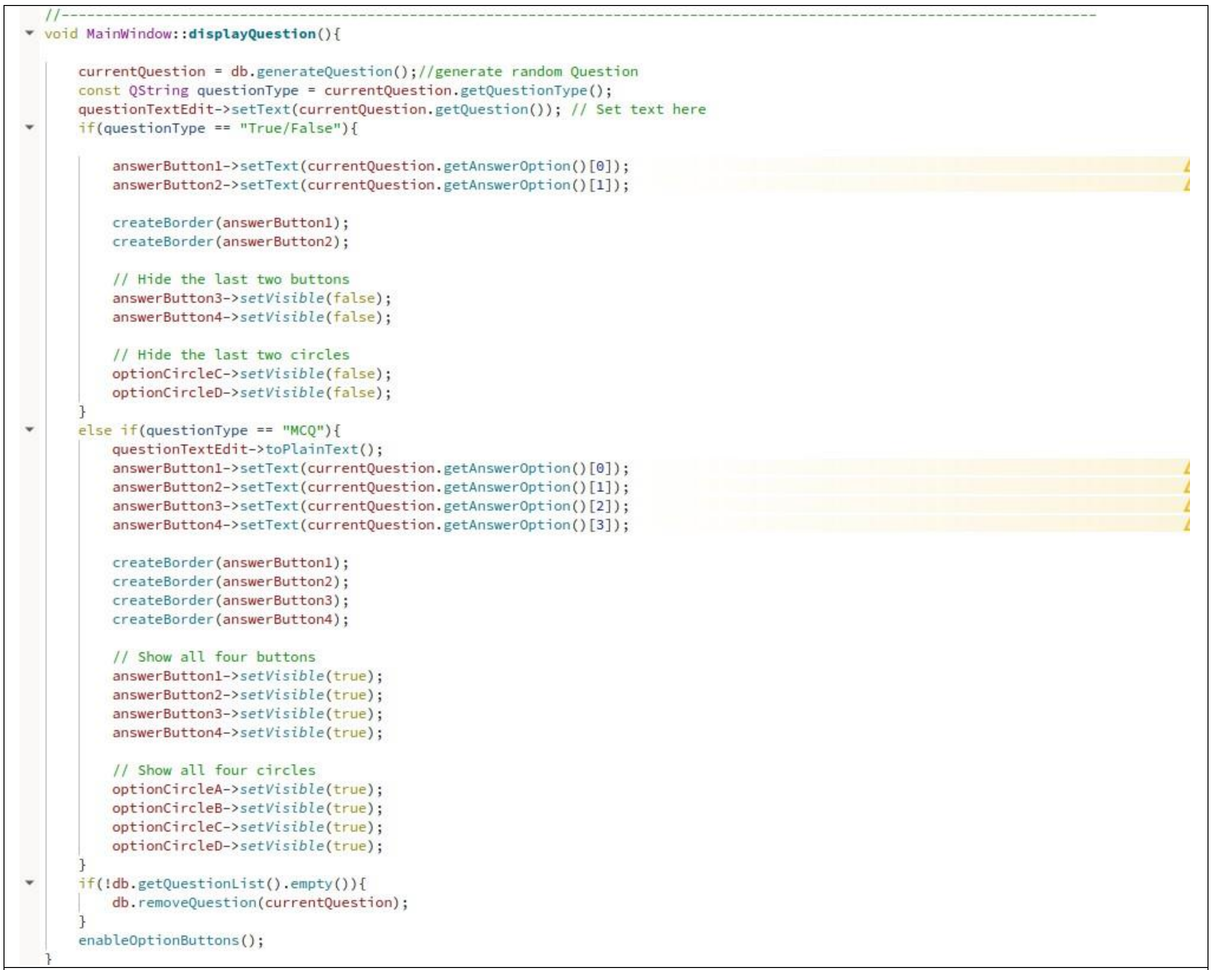


```cpp
// Initialize timer
timer = new QTimer(this);

// Start the timer
timer->start(1000); // Start the timer with a timeout of 1000 ms (1 second)

level = getCurrentLevel();

switch(level) {
case Level::Easy:
    totalTimeInSeconds = 20 * 60; // 20 minutes
    break;
case Level::Medium:
    totalTimeInSeconds = 15 * 60; // 15 minutes
    break;
case Level::Hard:
    totalTimeInSeconds = 10 * 60; // 10 minutes
    break;
default:
    totalTimeInSeconds = 20 * 60; // Default to Easy level
    break;
}

// Initialize remaining time to total time
int remainingTimeInSeconds = totalTimeInSeconds;

// Create ring progress bar and start with full value
progressBar->setValue(0); // Start with 0%

connect(timer, &QTimer::timeout, [=]() mutable {
    // Update the timer label text

    QString timeString = QTime(0, 0).addSecs(remainingTimeInSeconds).toString("mm:ss");
    timerLabel->setText(timeString);

    // Decrease the remaining time
    remainingTimeInSeconds--;

    // Calculate the progress based on the remaining time and total time
    int progress = 100 - ((remainingTimeInSeconds * 100) / totalTimeInSeconds);

    // Update the progress bar value
    progressBar->setValue(progress);

    // Change progress bar color when reaching half time and 30 seconds left
    if (remainingTimeInSeconds <= totalTimeInSeconds/2) {
        progressBar->setProgressColor(QColorConstants::Svg::orange);
    }

    if (remainingTimeInSeconds <= 40) {
        progressBar->setProgressColor(Qt::red);
    }

    // Check if the timer has reached 00:00
    if (remainingTimeInSeconds < 0) {
        // Stop the timer
        timer->stop();

        // Set progress bar to 0
        progressBar->setValue(100);
        // Show feedback window
        showFeedbackWindow();
```

Timer progresses depending on how long a player lasts on the game and what level they are currently on.

Programming Techniques

4. Function



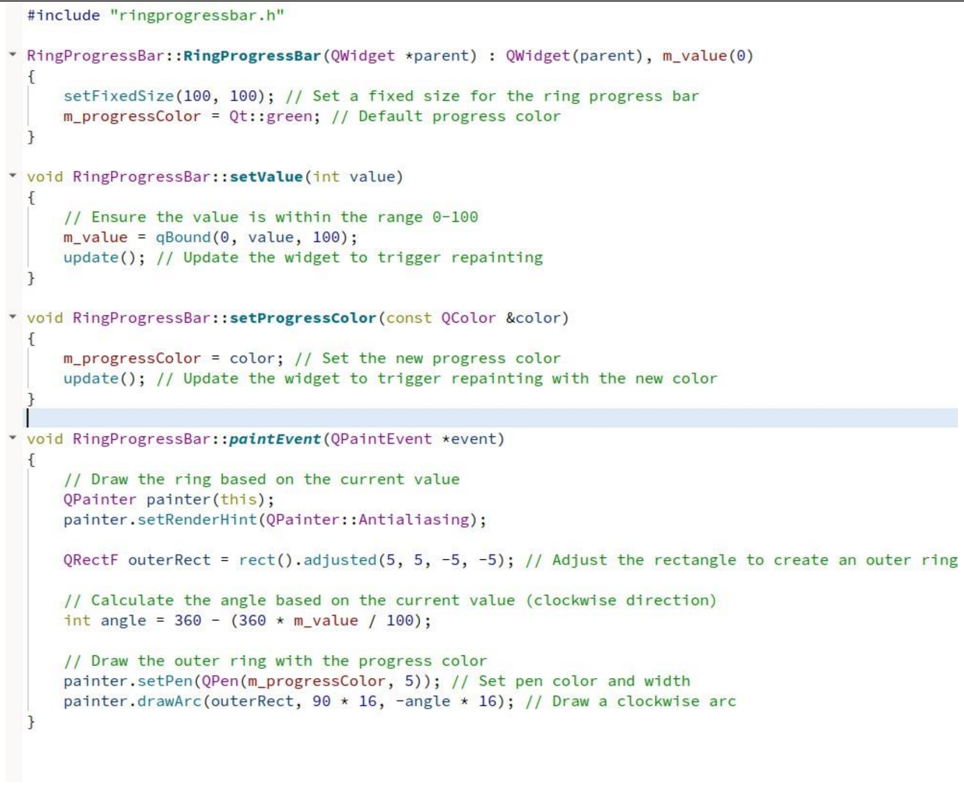
```
//-----------------------------------------------------------------------------------------------------------------------------
void MainWindow::displayQuestion(){

    currentQuestion = db.generateQuestion();//generate random Question
    const QString questionType = currentQuestion.getQuestionType();
    questionTextEdit->setText(currentQuestion.getQuestion()); // Set text here
    if(questionType == "True/False"){

        answerButton1->setText(currentQuestion.getAnswerOption()[0]);
        answerButton2->setText(currentQuestion.getAnswerOption()[1]);

        createBorder(answerButton1);
        createBorder(answerButton2);

        // Hide the last two buttons
        answerButton3->setVisible(false);
        answerButton4->setVisible(false);

        // Hide the last two circles
        optionCircleC->setVisible(false);
        optionCircleD->setVisible(false);
    }
    else if(questionType == "MCQ"){
        questionTextEdit->toPlainText();
        answerButton1->setText(currentQuestion.getAnswerOption()[0]);
        answerButton2->setText(currentQuestion.getAnswerOption()[1]);
        answerButton3->setText(currentQuestion.getAnswerOption()[2]);
        answerButton4->setText(currentQuestion.getAnswerOption()[3]);

        createBorder(answerButton1);
        createBorder(answerButton2);
        createBorder(answerButton3);
        createBorder(answerButton4);

        // Show all four buttons
        answerButton1->setVisible(true);
        answerButton2->setVisible(true);
        answerButton3->setVisible(true);
        answerButton4->setVisible(true);

        // Show all four circles
        optionCircleA->setVisible(true);
        optionCircleB->setVisible(true);
        optionCircleC->setVisible(true);
        optionCircleD->setVisible(true);
    }
    if(!db.getQuestionList().empty()){
        db.removeQuestion(currentQuestion);
    }
    enableOptionButtons();
}
```

Motivation:

The `displayQuestion()` function streamlines the process of presenting questions in the application. By centralizing the logic for question retrieval, text setting, and button configuration, it enhances code readability and organization. Additionally, it facilitates future modifications or updates to the question presentation mechanism, promoting code maintainability.

How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely, provide a short explanation to support the claim
Not met		
Partially		
Completely	X	

5. Class



```cpp
#include "ringprogressbar.h"

RingProgressBar::RingProgressBar(QWidget *parent) : QWidget(parent), m_value(0)
{
    setFixedSize(100, 100); // Set a fixed size for the ring progress bar
    m_progressColor = Qt::green; // Default progress color
}

void RingProgressBar::setValue(int value)
{
    // Ensure the value is within the range 0-100
    m_value = qBound(0, value, 100);
    update(); // Update the widget to trigger repainting
}

void RingProgressBar::setProgressColor(const QColor &color)
{
    m_progressColor = color; // Set the new progress color
    update(); // Update the widget to trigger repainting with the new color
}

void RingProgressBar::paintEvent(QPaintEvent *event)
{
    // Draw the ring based on the current value
    QPainter painter(this);
    painter.setRenderHint(QPainter::Antialiasing);

    QRectF outerRect = rect().adjusted(5, 5, -5, -5); // Adjust the rectangle to create an outer ring

    // Calculate the angle based on the current value (clockwise direction)
    int angle = 360 - (360 * m_value / 100);

    // Draw the outer ring with the progress color
    painter.setPen(QPen(m_progressColor, 5)); // Set pen color and width
    painter.drawArc(outerRect, 90 * 16, -angle * 16); // Draw a clockwise arc
}
```

Motivation:

The motivation for using a class here, such as `RingProgressBar`, lies in encapsulating related functionality and data into a single unit. By doing so, it promotes code organization, reusability, and maintainability. Additionally, using a class allows for the implementation of custom widgets with specific behavior and appearance, enhancing the flexibility and extensibility of the codebase.

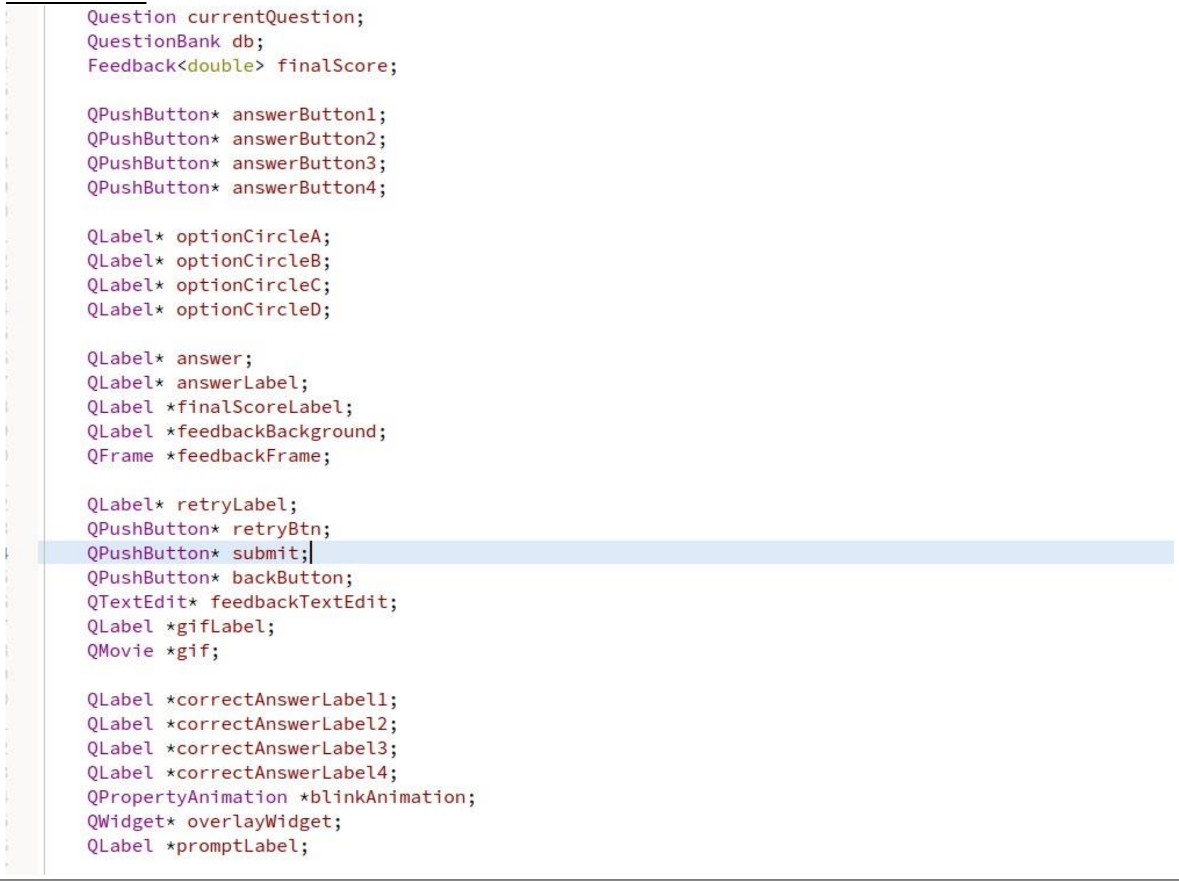
How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely, provide a short explanation to support the claim
Not met		
Partially		
Completely	X	

6. Struct

How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely, provide a short explanation to support the claim
Not met		
Partially		
Completely	X	

7. Pointer

Screenshot:



```
Question currentQuestion;
QuestionBank db;
Feedback<double> finalScore;

QPushButton* answerButton1;
QPushButton* answerButton2;
QPushButton* answerButton3;
QPushButton* answerButton4;

QLabel* optionCircleA;
QLabel* optionCircleB;
QLabel* optionCircleC;
QLabel* optionCircleD;

QLabel* answer;
QLabel* answerLabel;
QLabel *finalScoreLabel;
QLabel *feedbackBackground;
QFrame *feedbackFrame;

QLabel* retryLabel;
QPushButton* retryBtn;
QPushButton* submit;
QPushButton* backButton;
QTextEdit* feedbackTextEdit;
QLabel *gifLabel;
QMovie *gif;

QLabel *correctAnswerLabel1;
QLabel *correctAnswerLabel2;
QLabel *correctAnswerLabel3;
QLabel *correctAnswerLabel4;
QPropertyAnimation *blinkAnimation;
QWidget* overlayWidget;
QLabel *promptLabel;
```

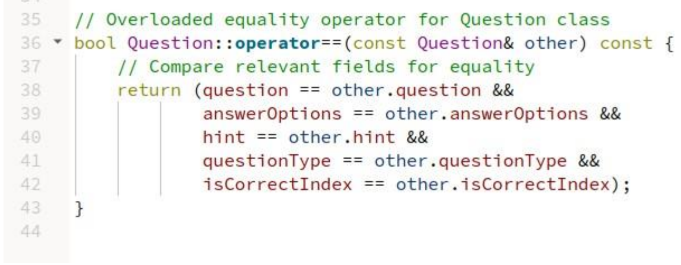
Motivation:

The motivation for using pointers here is to dynamically allocate memory for objects at runtime and to facilitate indirect access to these objects. Pointers allow for the creation of objects whose lifetimes can be managed independently of the scope in which they are declared. This flexibility is especially useful when dealing with objects that need to be created and destroyed dynamically, such as GUI elements in Qt applications. Additionally, using pointers enables polymorphic behavior and facilitates the manipulation of objects through their addresses, enhancing the overall versatility and efficiency of the code.

How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely, provide a short explanation to support the claim
Not met		
Partially		
Completely	X	

8. Reference

Screenshot:



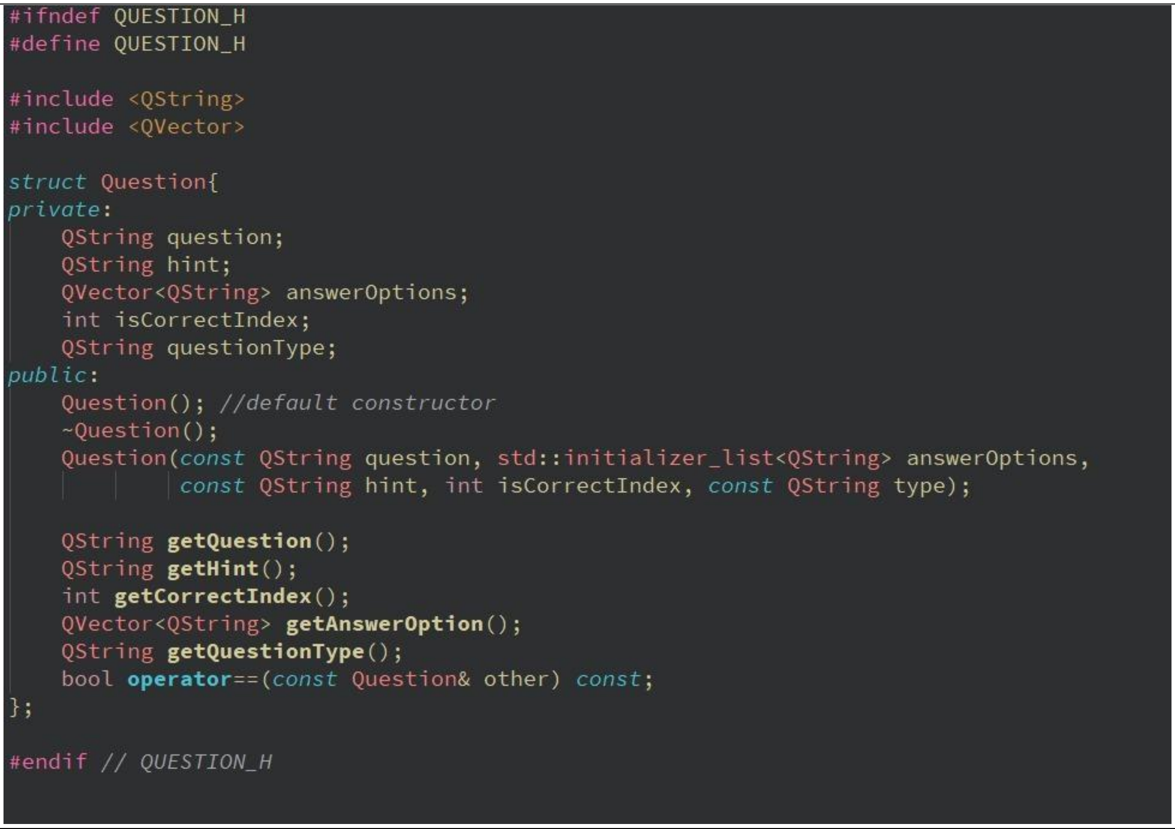
```
// Overloaded equality operator for Question class
bool Question::operator==(const Question& other) const {
    // Compare relevant fields for equality
    return (question == other.question &&
            answerOptions == other.answerOptions &&
            hint == other.hint &&
            questionType == other.questionType &&
            isCorrectIndex == other.isCorrectIndex);
}
```

Motivation:

Firstly, it ensures that the comparison operates directly on the original objects rather than creating copies, which can improve performance and memory efficiency, especially for larger objects or when comparisons are frequent. Secondly, it prevents unnecessary object copying, which can be significant if the objects contain complex data structures or if the copying process is expensive. Lastly, using references aligns with the principle of pass-by-reference in C++, where modifying or comparing objects within functions is often done through references to avoid unnecessary copying and ensure consistency with the original objects.

How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely, provide a short explanation to support the claim
Not met		
Partially		
Completely	X	

9. Struct



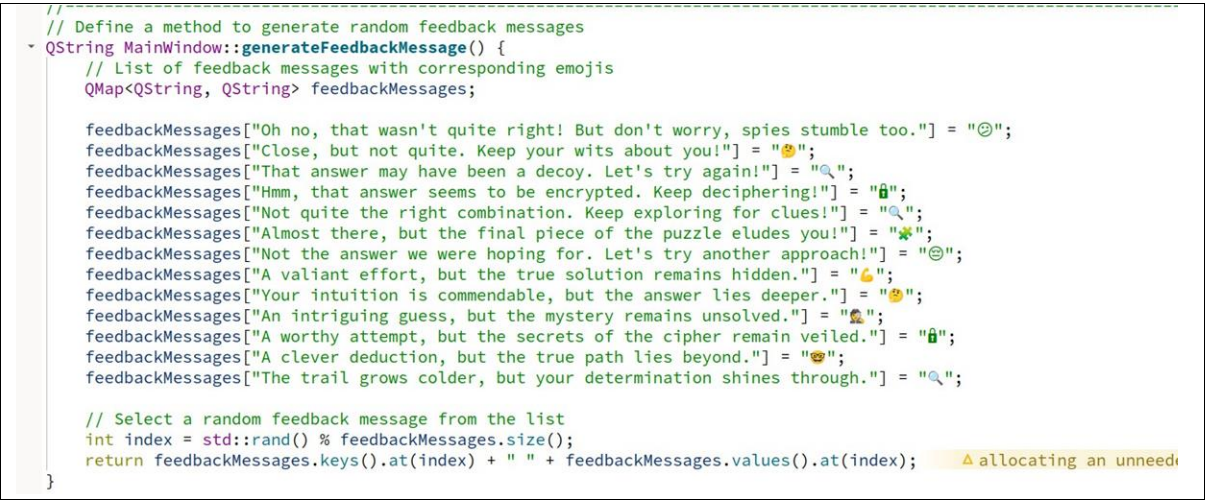
```
#ifndef QUESTION_H
#define QUESTION_H

#include <QString>
#include <QVector>

struct Question{
private:
    QString question;
    QString hint;
    QVector<QString> answerOptions;
    int isCorrectIndex;
    QString questionType;
public:
    Question(); //default constructor
    ~Question();
    Question(const QString question, std::initializer_list<QString> answerOptions,
             const QString hint, int isCorrectIndex, const QString type);

    QString getQuestion();
    QString getHint();
    int getCorrectIndex();
    QVector<QString> getAnswerOption();
    QString getQuestionType();
    bool operator==(const Question& other) const;
};

#endif // QUESTION_H
```

Motivation:

In this context, the `struct` keyword is employed to define a lightweight data container, bundling together the essential attributes of a question. Its use ensures straightforward data organization, simplifying access to question properties without the need for explicit getter and setter functions. Additionally, the default public accessibility of `struct` members enhances code readability and semantic clarity, making it a suitable choice for representing the fundamental components of a question entity.

How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely, provide a short explanation to support the claim
Not met		
Partially		
Completely		

10. Data Structures



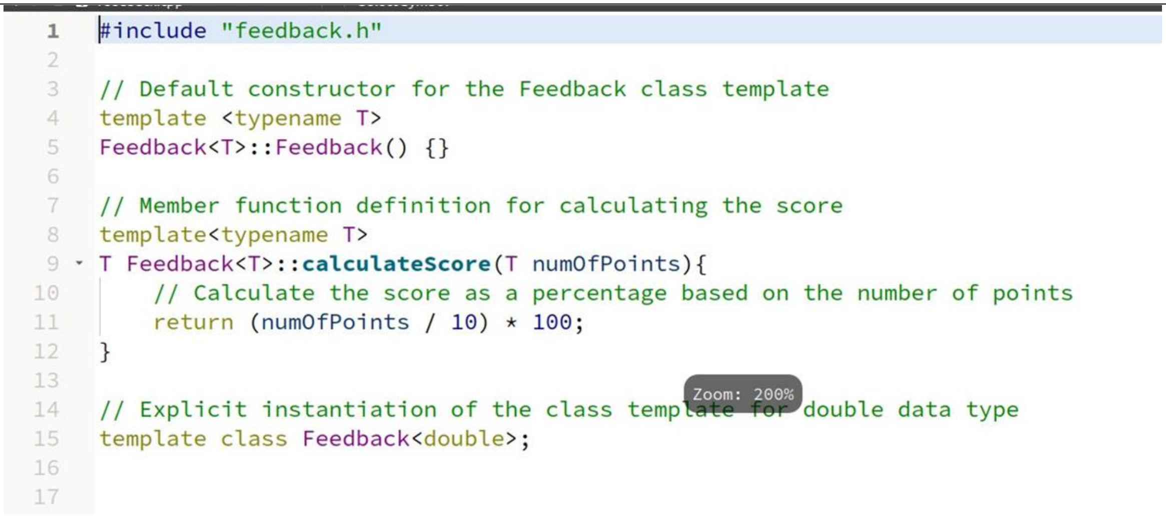
```
//-----------------------------------------------------------------------------------------------------------
// Define a method to generate random feedback messages
QString MainWindow::generateFeedbackMessage() {
    // List of feedback messages with corresponding emojis
    QMap<QString, QString> feedbackMessages;

    feedbackMessages["Oh no, that wasn't quite right! But don't worry, spies stumble too."] = "😕";
    feedbackMessages["Close, but not quite. Keep your wits about you!"] = "🤔";
    feedbackMessages["That answer may have been a decoy. Let's try again!"] = "🔍";
    feedbackMessages["Hmm, that answer seems to be encrypted. Keep deciphering!"] = "🔒";
    feedbackMessages["Not quite the right combination. Keep exploring for clues!"] = "🔍";
    feedbackMessages["Almost there, but the final piece of the puzzle eludes you!"] = "🧩";
    feedbackMessages["Not the answer we were hoping for. Let's try another approach!"] = "😓";
    feedbackMessages["A valiant effort, but the true solution remains hidden."] = "💪";
    feedbackMessages["Your intuition is commendable, but the answer lies deeper."] = "🤔";
    feedbackMessages["An intriguing guess, but the mystery remains unsolved."] = "🕵";
    feedbackMessages["A worthy attempt, but the secrets of the cipher remain veiled."] = "🔒";
    feedbackMessages["A clever deduction, but the true path lies beyond."] = "🤓";
    feedbackMessages["The trail grows colder, but your determination shines through."] = "🔍";

    // Select a random feedback message from the list
    int index = std::rand() % feedbackMessages.size();
    return feedbackMessages.keys().at(index) + " " + feedbackMessages.values().at(index);    ⚠ allocating an unneed
}
```

Motivation:

It allows for easy association between feedback messages and corresponding emojis, making the code more readable and maintainable. Secondly, it provides efficient lookup and retrieval of messages based on keys, which is crucial for selecting a random feedback message from the list. Additionally, using a QMap ensures that each feedback message is unique, preventing duplicates in the selection process. Overall, the QMap data structure is well-suited for this task, providing a convenient way to manage and retrieve feedback messages and emojis in a flexible and efficient manner.

How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely, provide a short explanation to support the claim
Not met		
Partially		
Completely	X	

11. Class Template



```cpp
#include "feedback.h"

// Default constructor for the Feedback class template
template <typename T>
Feedback<T>::Feedback() {}

// Member function definition for calculating the score
template<typename T>
T Feedback<T>::calculateScore(T numOfPoints){
    // Calculate the score as a percentage based on the number of points
    return (numOfPoints / 10) * 100;
}

// Explicit instantiation of the class template for double data type
template class Feedback<double>;
```

Motivation:

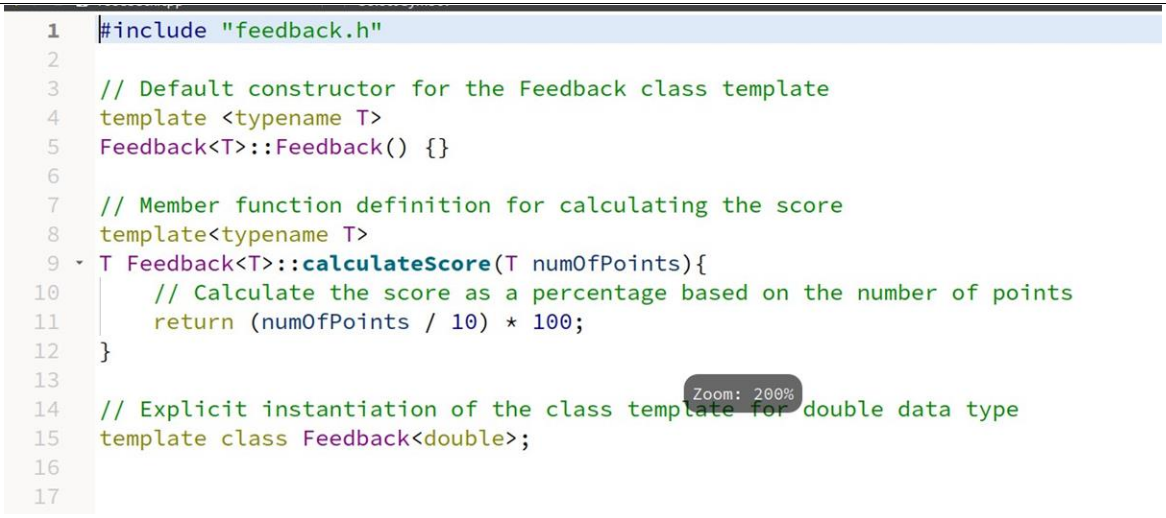
Using a class template in this scenario offers flexibility and reusability across different data types. By defining the `Feedback` class as a template, it allows the same implementation to be used with various numeric types, such as `int`, `float`, `double`, etc., without duplicating code.

This flexibility is particularly useful when dealing with different types of scores or numerical values. For example, in this case, the `calculateScore` function can be used to calculate scores represented by different numeric types, such as `int` or `double`, by simply instantiating the `Feedback` class template with the appropriate data type.

By using a class template, the implementation of `Feedback` can be generic and independent of the specific numeric type used, promoting code reuse and avoiding redundancy. It also provides a more scalable solution that can accommodate future changes or requirements without modifying the existing codebase.

How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely, provide a short explanation to support the claim
Not met		
Partially		
Completely	X	

12. Function Template



```cpp
#include "feedback.h"

// Default constructor for the Feedback class template
template <typename T>
Feedback<T>::Feedback() {}

// Member function definition for calculating the score
template<typename T>
T Feedback<T>::calculateScore(T numOfPoints){
    // Calculate the score as a percentage based on the number of points
    return (numOfPoints / 10) * 100;
}

// Explicit instantiation of the class template for double data type
template class Feedback<double>;


```

Motivation:

Using a function template in this scenario provides a generic solution for calculating scores, regardless of the data type used. Function templates allow the same function implementation to be used with different types of arguments, providing flexibility and code reuse.

In the provided example, the `calculateScore` function template accepts a parameter `numOfPoints` of type `T`, which can be any numeric type such as `int`, `float`, or `double`. This allows the function to calculate scores using different numeric data types without needing separate implementations for each type.

By defining `calculateScore` as a function template, the code becomes more versatile and adaptable to various scenarios where scores need to be calculated. It promotes code reuse and simplifies maintenance by avoiding the need for multiple overloaded functions or duplicated code for different data types.

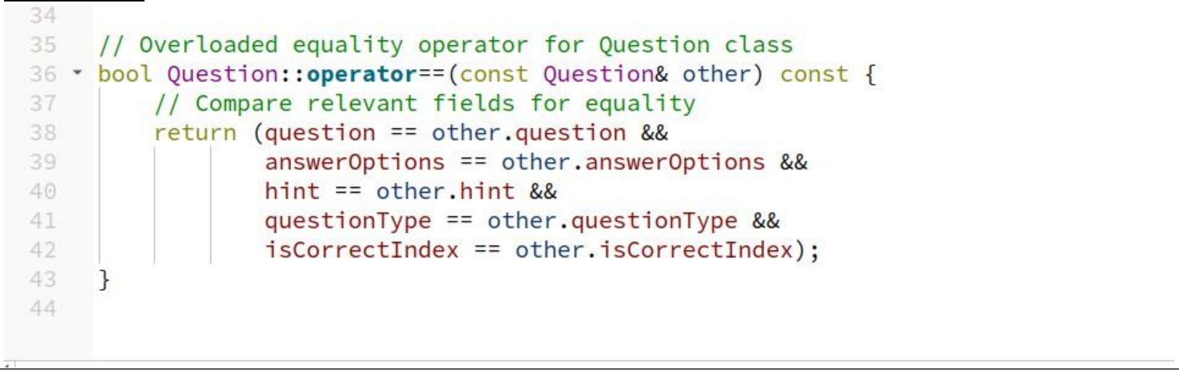
Additionally, function templates enable compile-time type checking, ensuring type safety and preventing unintended type conversions or errors when using the function with different data types. This helps catch potential bugs early in the development process and promotes robustness in the codebase.

How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely,
Not met		

Partially	X	**provide a short explanation to support the claim**
Completely		

13. Operator Overloading

Screenshot:



```cpp

// Overloaded equality operator for Question class
bool Question::operator==(const Question& other) const {
    // Compare relevant fields for equality
    return (question == other.question &&
            answerOptions == other.answerOptions &&
            hint == other.hint &&
            questionType == other.questionType &&
            isCorrectIndex == other.isCorrectIndex);
}

```

Motivation:

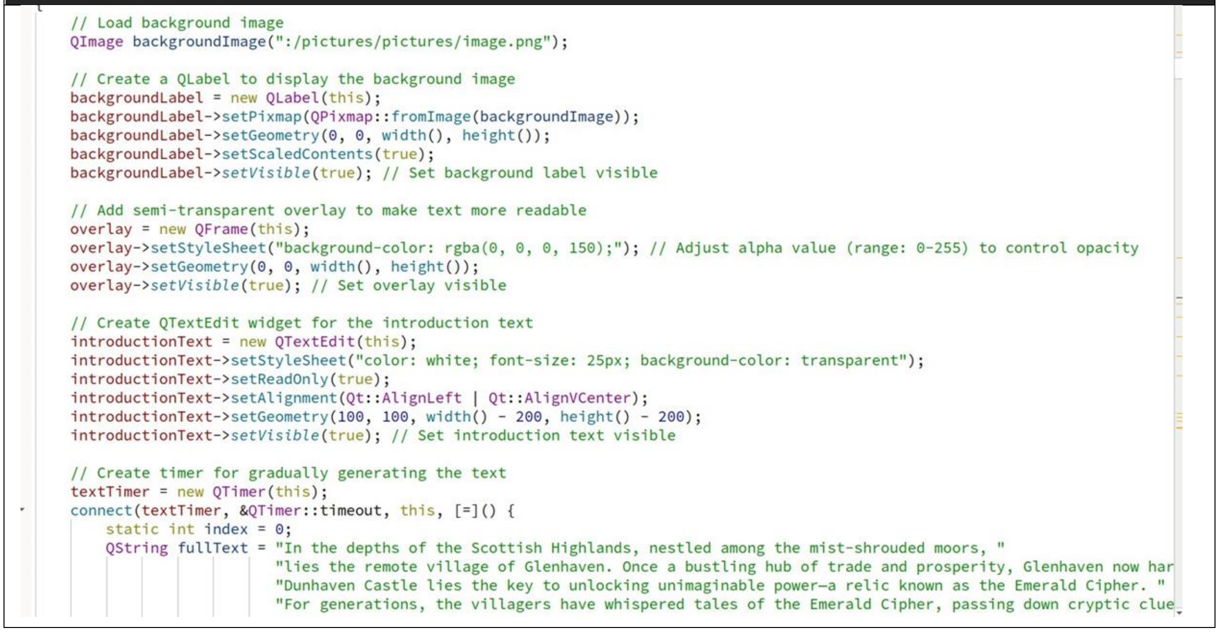
The motivation for using operator overloading in this context is to provide a concise and intuitive way to compare objects of the Question class for equality. By overloading the equality operator (==), you enable the use of familiar syntax for comparing Question objects, which enhances code readability and maintainability.

Instead of relying on a separate function or method to perform the comparison, the overloaded operator== allows you to directly use the equality operator as you would with built-in types. It's to also ensure there are no duplicate questions.

How have you met the objectives?	Cross (X) the appropriate box	If you think that you have met the objective completely, provide a short explanation to support the claim
Not met		
Partially		
Completely	X	

Graphics Interface

Code Screenshot



```
    // Load background image
    QImage backgroundImage(":/pictures/pictures/image.png");

    // Create a QLabel to display the background image
    backgroundLabel = new QLabel(this);
    backgroundLabel->setPixmap(QPixmap::fromImage(backgroundImage));
    backgroundLabel->setGeometry(0, 0, width(), height());
    backgroundLabel->setScaledContents(true);
    backgroundLabel->setVisible(true); // Set background label visible

    // Add semi-transparent overlay to make text more readable
    overlay = new QFrame(this);
    overlay->setStyleSheet("background-color: rgba(0, 0, 0, 150);"); // Adjust alpha value (range: 0-255) to control opacity
    overlay->setGeometry(0, 0, width(), height());
    overlay->setVisible(true); // Set overlay visible

    // Create QTextEdit widget for the introduction text
    introductionText = new QTextEdit(this);
    introductionText->setStyleSheet("color: white; font-size: 25px; background-color: transparent");
    introductionText->setReadOnly(true);
    introductionText->setAlignment(Qt::AlignLeft | Qt::AlignVCenter);
    introductionText->setGeometry(100, 100, width() - 200, height() - 200);
    introductionText->setVisible(true); // Set introduction text visible

    // Create timer for gradually generating the text
    textTimer = new QTimer(this);
    connect(textTimer, &QTimer::timeout, this, [=]() {
        static int index = 0;
        QString fullText = "In the depths of the Scottish Highlands, nestled among the mist-shrouded moors, "
                           "lies the remote village of Glenhaven. Once a bustling hub of trade and prosperity, Glenhaven now har
                           "Dunhaven Castle lies the key to unlocking unimaginable power—a relic known as the Emerald Cipher. "
                           "For generations, the villagers have whispered tales of the Emerald Cipher, passing down cryptic clue
```

Additional Game

Explanation of the Gameplay and screen
When a player answers three consecutive question correctly, they get to unlock this help feature. It eliminates two wrong options from MCQ in your next question or give you two additional free hints if it's True/False

Additional Item/s

[*What is the other additional item that you have provided? Explain the item, the reason that you have used this, and provide some code. Just a segment of code is suffice.*] **Complete this for all of your additional features

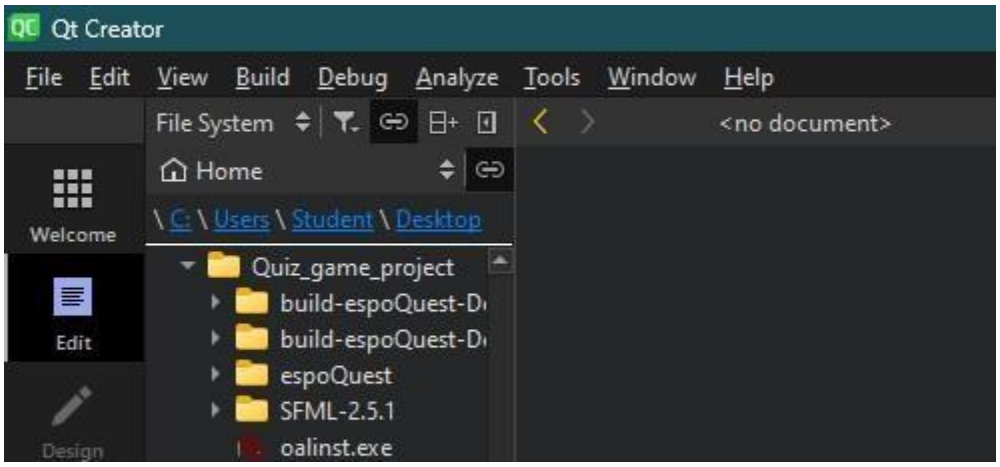
Screenshot	What does your quiz include?
[*Provide a screenshot of the running quiz which displays that this requirement is met*]	**[*Mention the additional features that you have.*]**

Code Screenshot
[*Provide a screenshot of your code that shows how this condition is met*]

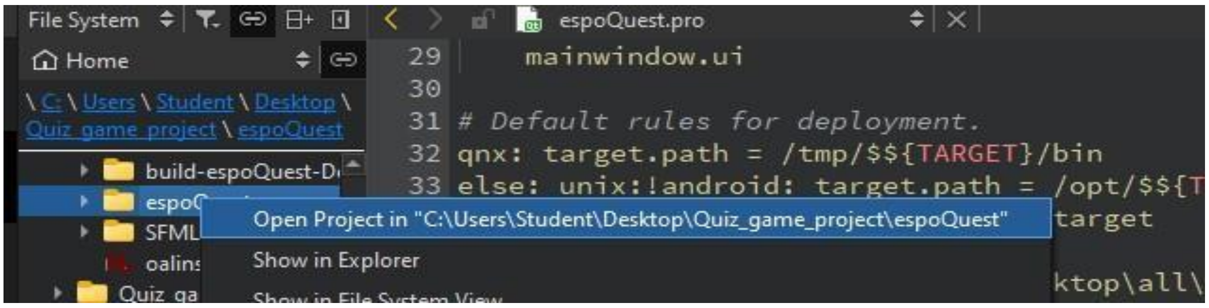
Appendix

INSTRUCTIONS

1. Download and extract Quiz_game_project.zip.
2. Open Qt creator .
3. Go to edit.
4. Click Projects
5. Go to File Systems.
6. Go to where the “Quiz_game_project” folder is on your PC, mine is on Desktop.

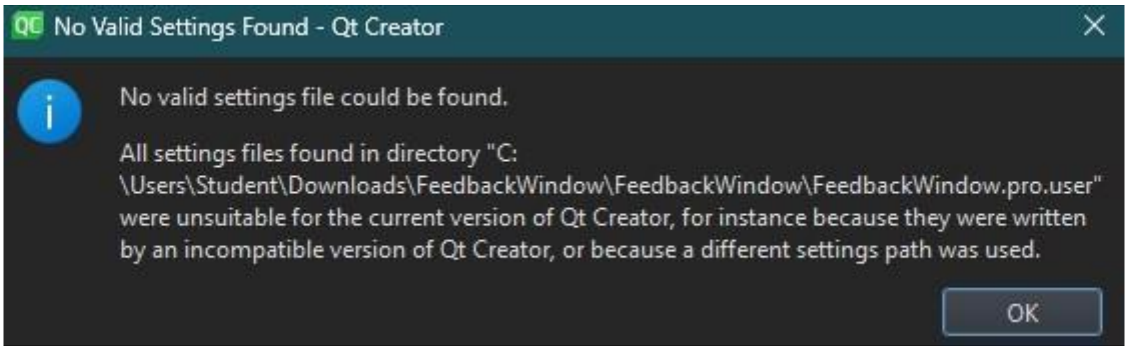


7. Right-click on “espoQuest” and click on “Open projects in…”.


File System
Home
\ C: \ Users \ Student \ Desktop \ Quiz_game_project \ espoQuest
build-espoQuest-D
espoQ
SFML
oalins
Quiz ga
espoQuest.pro
Open Project in "C:\Users\Student\Desktop\Quiz_game_project\espoQuest"
Show in Explorer
Show in File System View

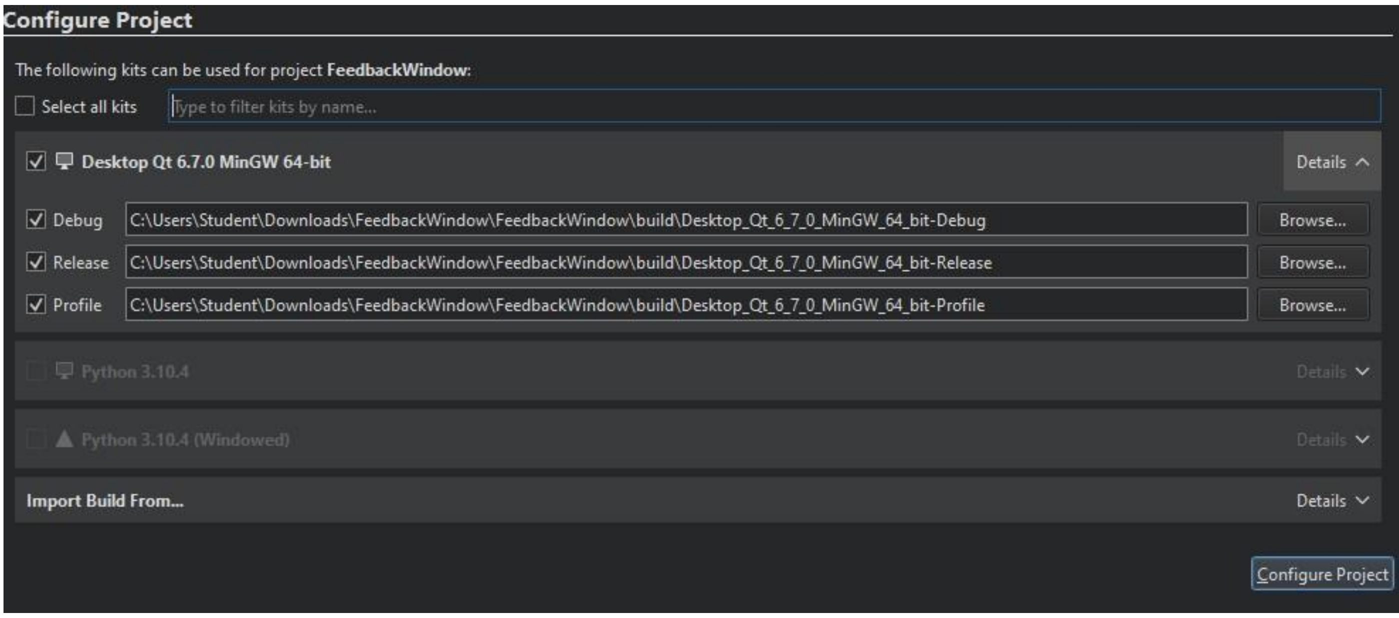
```
    mainwindow.ui

# Default rules for deployment.
qnx: target.path = /tmp/$${TARGET}/bin
else: unix:!android: target.path = /opt/$${T
                                    target

                                    ktop\all\
```

8. Click “Okay” and click on "Configure project” at the bottom right corner.


No Valid Settings Found - Qt Creator

No valid settings file could be found.

All settings files found in directory "C:\Users\Student\Downloads\FeedbackWindow\FeedbackWindow\FeedbackWindow.pro.user" were unsuitable for the current version of Qt Creator, for instance because they were written by an incompatible version of Qt Creator, or because a different settings path was used.


Configure Project

The following kits can be used for project **FeedbackWindow**:

☐ Select all kits   Type to filter kits by name...

☑ **Desktop Qt 6.7.0 MinGW 64-bit**

☑ Debug   C:\Users\Student\Downloads\FeedbackWindow\FeedbackWindow\build\Desktop_Qt_6_7_0_MinGW_64_bit-Debug

☑ Release   C:\Users\Student\Downloads\FeedbackWindow\FeedbackWindow\build\Desktop_Qt_6_7_0_MinGW_64_bit-Release

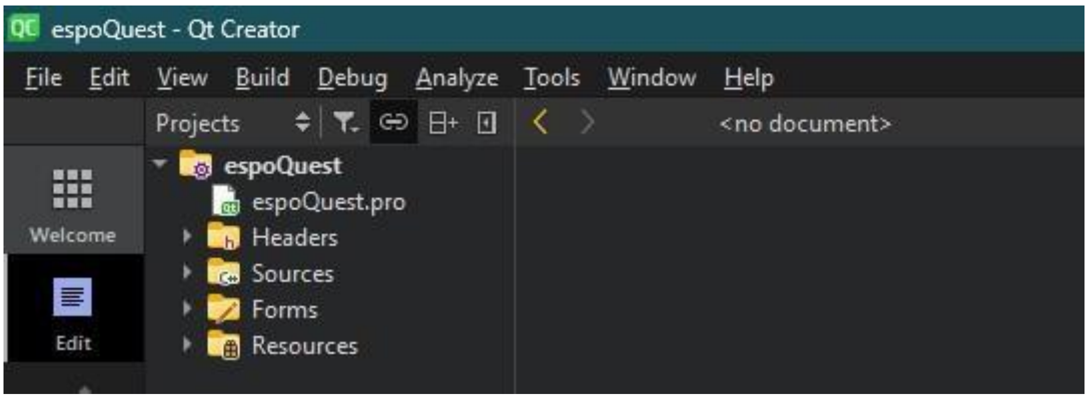
☑ Profile   C:\Users\Student\Downloads\FeedbackWindow\FeedbackWindow\build\Desktop_Qt_6_7_0_MinGW_64_bit-Profile

☐ Python 3.10.4

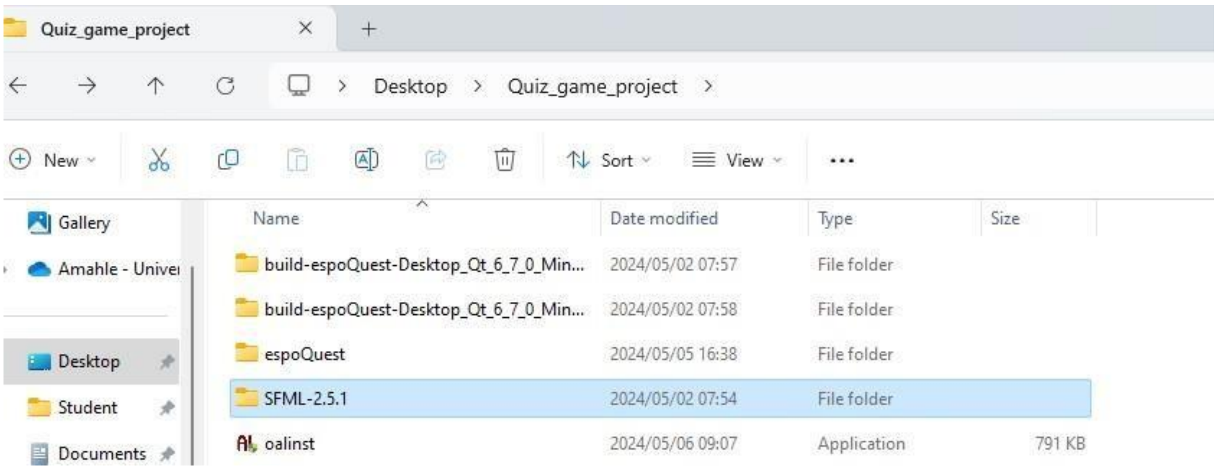
☐ Python 3.10.4 (Windowed)

Import Build From...

9. Click on “File System” and return to “Projects” and the project should appear.

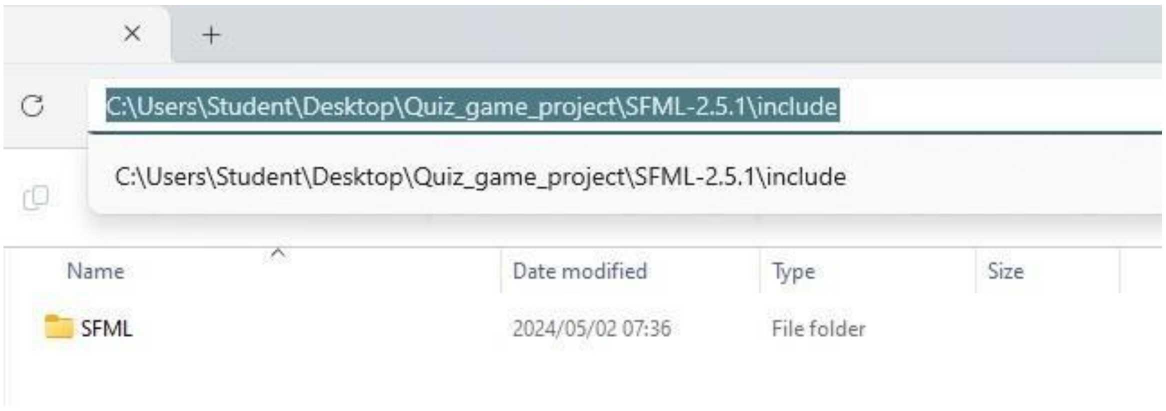

espoQuest - Qt Creator

10. Go to the folder “Quiz_game_project” on your PC.



Name	Date modified	Type	Size
build-espoQuest-Desktop_Qt_6_7_0_Min...	2024/05/02 07:57	File folder	
build-espoQuest-Desktop_Qt_6_7_0_Min...	2024/05/02 07:58	File folder	
espoQuest	2024/05/05 16:38	File folder	
SFML-2.5.1	2024/05/02 07:54	File folder	
oalinst	2024/05/06 09:07	Application	791 KB

11. Click on the folder “SFML-2.5.1”.
12. Go to “include folder” and copy it path.

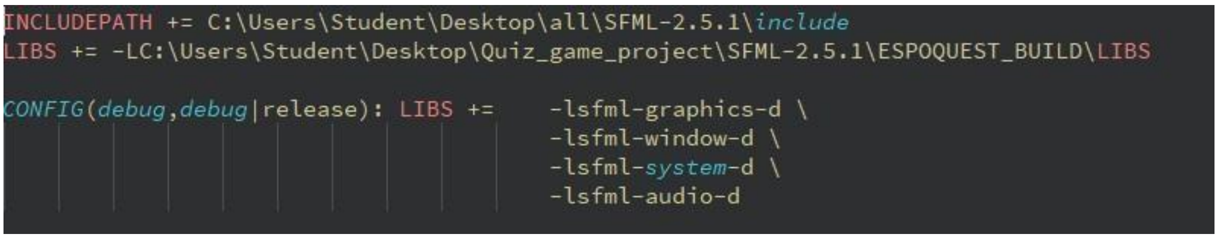


```
C:\Users\Student\Desktop\Quiz_game_project\SFML-2.5.1\include
C:\Users\Student\Desktop\Quiz_game_project\SFML-2.5.1\include
```

Name	Date modified	Type	Size
SFML	2024/05/02 07:36	File folder	

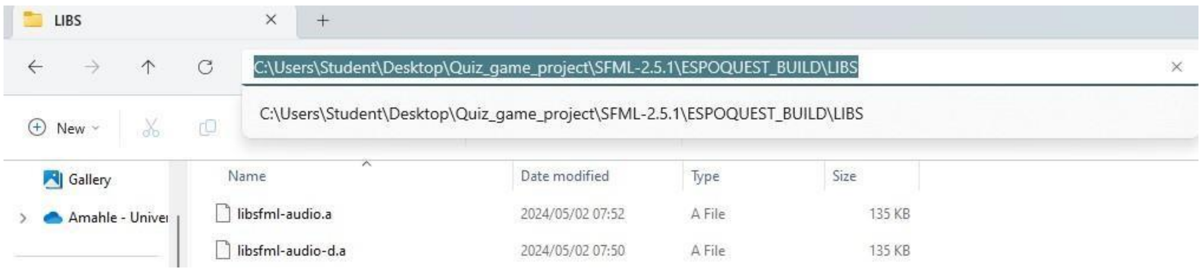
13. Open Qt Creator and open espoQuest.pro file.

14. In “INCLUDEPATH”, after “+=”, replace the path with the one that you copied from the previous steps in line 34 .



```
INCLUDEPATH += C:\Users\Student\Desktop\all\SFML-2.5.1\include
LIBS += -LC:\Users\Student\Desktop\Quiz_game_project\SFML-2.5.1\ESPOQUEST_BUILD\LIBS

CONFIG(debug,debug|release): LIBS +=    -lsfml-graphics-d \
                                        -lsfml-window-d \
                                        -lsfml-system-d \
                                        -lsfml-audio-d
```

15. Go back to “SFML-2.5.1” folder.
16. Open “ESPOQUEST_BUILD” folder and open “LIBS” folder.

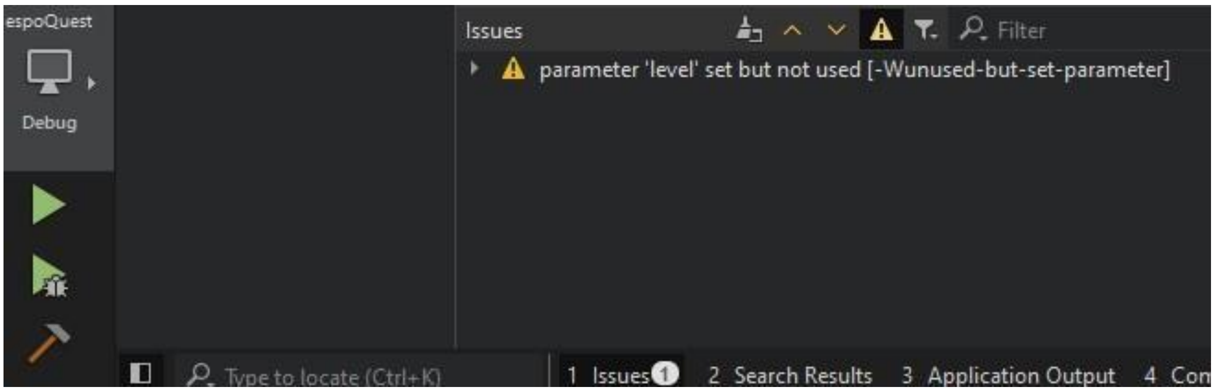


C:\Users\Student\Desktop\Quiz_game_project\SFML-2.5.1\ESPOQUEST_BUILD\LIBS

C:\Users\Student\Desktop\Quiz_game_project\SFML-2.5.1\ESPOQUEST_BUILD\LIBS

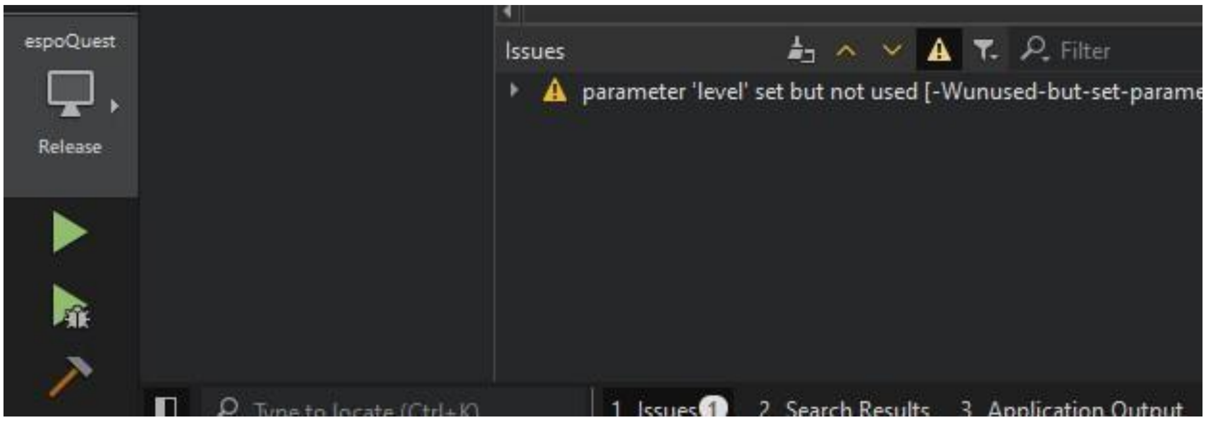
Name	Date modified	Type	Size
libsfml-audio.a	2024/05/02 07:52	A File	135 KB
libsfml-audio-d.a	2024/05/02 07:50	A File	135 KB

17. Open the “espoQuest.pro” file again and in “LIBS”, after “-L”, replace the path with the one you just copied, and make sure you still have “-L” in line 35.
18. Then Build the project in Debug. To build click the Icon like a hammer in the



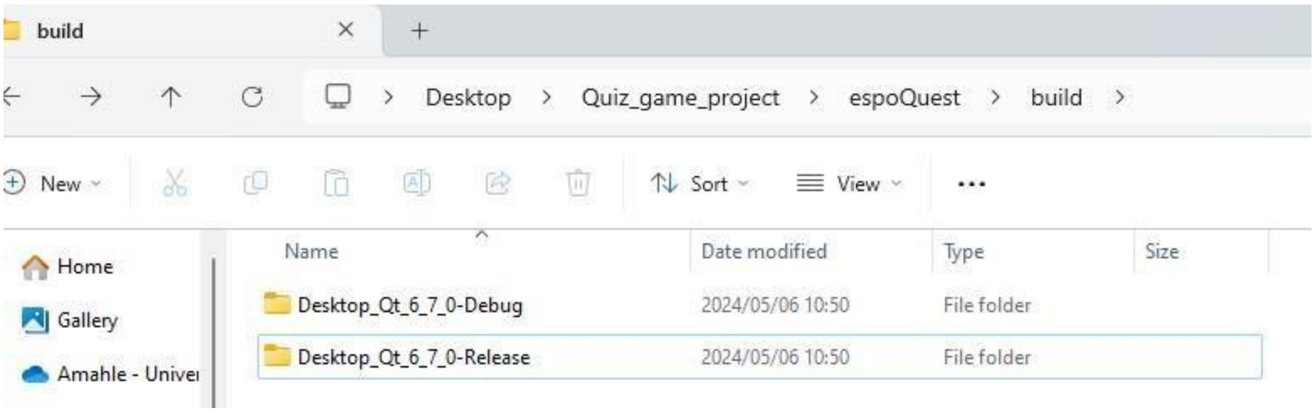
parameter 'level' set but not used [-Wunused-but-set-parameter]

19. Then build the project in Release.



parameter 'level' set but not used [-Wunused-but-set-parame

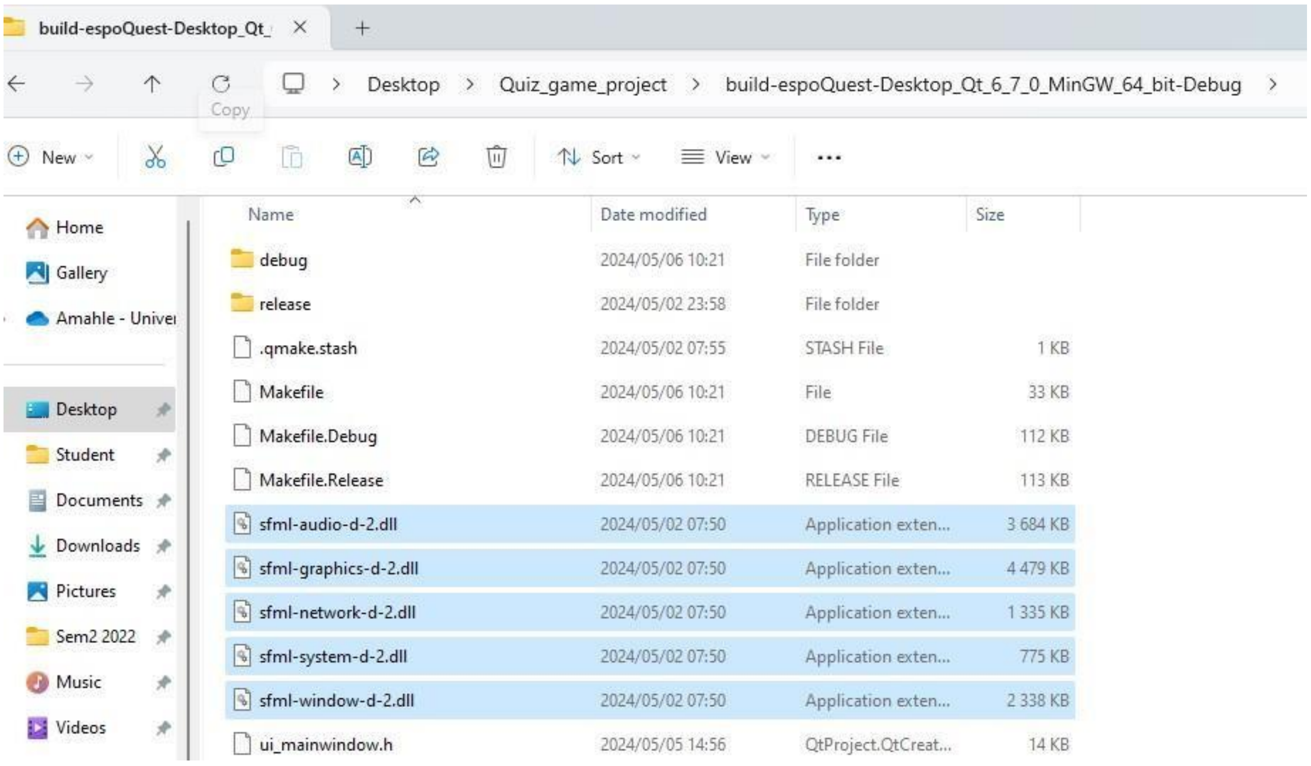
20. Once you have built the project, it will create a new folder called build in the "espoQuest" folder.



Name	Date modified	Type	Size
Desktop_Qt_6_7_0-Debug	2024/05/06 10:50	File folder	
Desktop_Qt_6_7_0-Release	2024/05/06 10:50	File folder	

21. You can run the project if it does not create a new folder.

22. Else, go to the "Quiz_project_game" folder, open "build-espoQuest-Desktop_Qt_6_7_0_MinGW_64_bit-Debug" and copy the files that are highlighted below and paste them into the folder that ends with "Debug" in the "build" folder above.


build-espoQuest-Desktop_Qt_
Desktop > Quiz_game_project > build-espoQuest-Desktop_Qt_6_7_0_MinGW_64_bit-Debug
Copy
New
Sort
View
Home
Gallery
Amahle - Univer
Desktop
Student
Documents
Downloads
Pictures
Sem2 2022
Music
Videos

Name	Date modified	Type	Size
debug	2024/05/06 10:21	File folder	
release	2024/05/02 23:58	File folder	
.qmake.stash	2024/05/02 07:55	STASH File	1 KB
Makefile	2024/05/06 10:21	File	33 KB
Makefile.Debug	2024/05/06 10:21	DEBUG File	112 KB
Makefile.Release	2024/05/06 10:21	RELEASE File	113 KB
sfml-audio-d-2.dll	2024/05/02 07:50	Application exten...	3 684 KB
sfml-graphics-d-2.dll	2024/05/02 07:50	Application exten...	4 479 KB
sfml-network-d-2.dll	2024/05/02 07:50	Application exten...	1 335 KB
sfml-system-d-2.dll	2024/05/02 07:50	Application exten...	775 KB
sfml-window-d-2.dll	2024/05/02 07:50	Application exten...	2 338 KB
ui_mainwindow.h	2024/05/05 14:56	QtProject.QtCreat...	14 KB

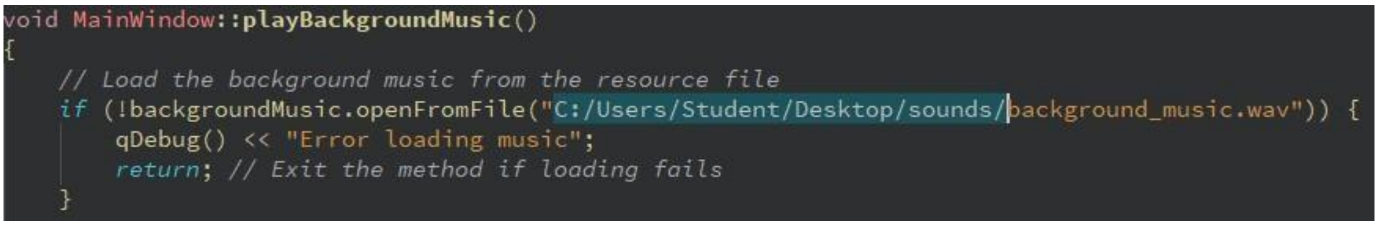
23. Again, go to the "Quiz_project_game" folder, open the "build-espoQuest-

Desktop_Qt_6_7_0_MinGW_64_bit-Release" folder now, and copy the files that are highlighted below and paste them into the folder that ends with "Release" in the "build" folder above.

24. Lastly, in the "espoQuest" folder there is a "sounds" folder copy the folder and paste it anywhere on your PC but outside the project folder, open it, copy the path, and then replace the path highlighted in the screenshots below with the path you copied .

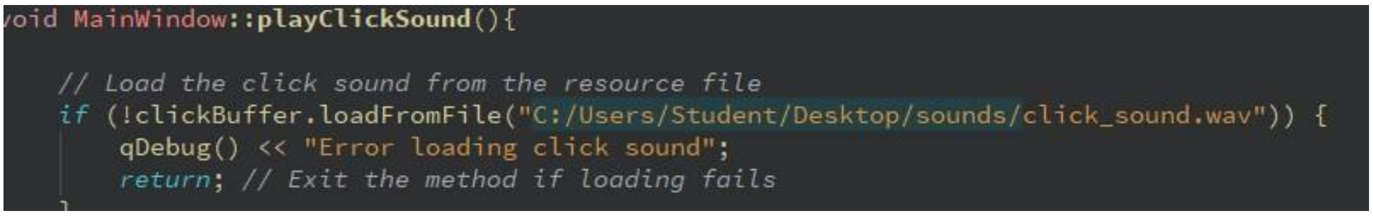
<u>Screenshots</u>: In the "mainwindow.cpp" you will find the code in the lines specified below.

line: 1294



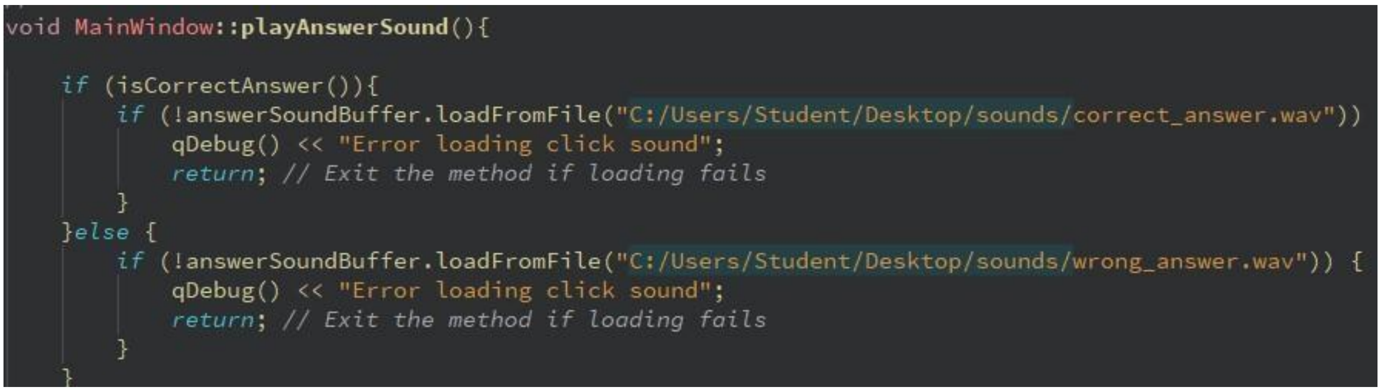
```
void MainWindow::playBackgroundMusic()
{
    // Load the background music from the resource file
    if (!backgroundMusic.openFromFile("C:/Users/Student/Desktop/sounds/background_music.wav")) {
        qDebug() << "Error loading music";
        return; // Exit the method if loading fails
    }
```

Line: 1312



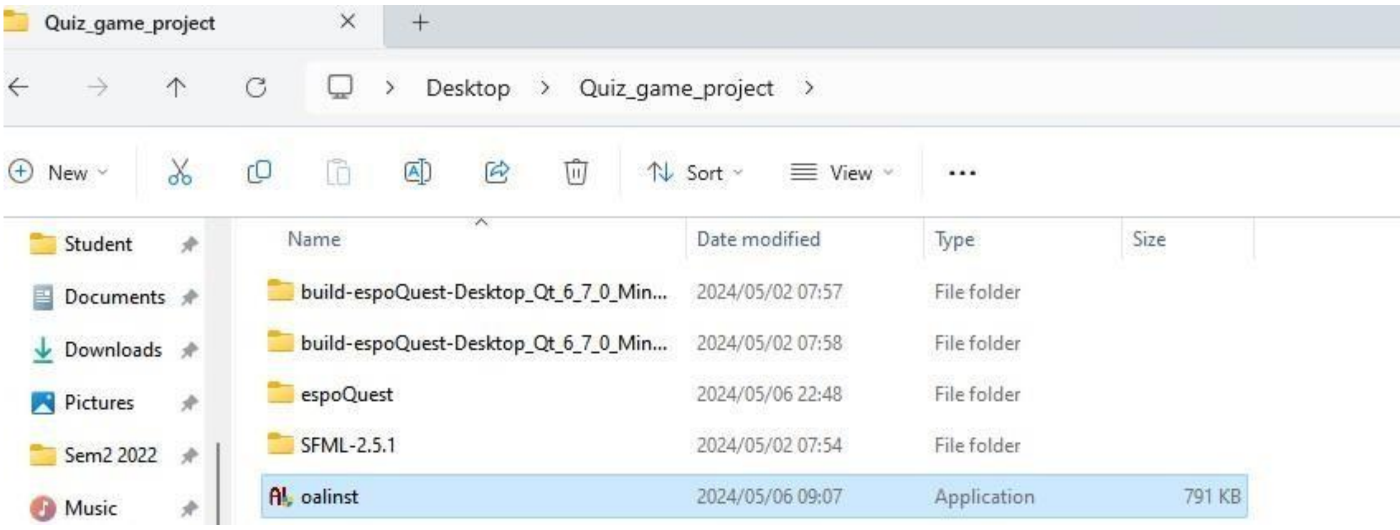
```
void MainWindow::playClickSound(){

    // Load the click sound from the resource file
    if (!clickBuffer.loadFromFile("C:/Users/Student/Desktop/sounds/click_sound.wav")) {
        qDebug() << "Error loading click sound";
        return; // Exit the method if loading fails
```

Lines: 1337 and 1342



```
void MainWindow::playAnswerSound(){

    if (isCorrectAnswer()){
        if (!answerSoundBuffer.loadFromFile("C:/Users/Student/Desktop/sounds/correct_answer.wav"))
            qDebug() << "Error loading click sound";
            return; // Exit the method if loading fails
        }
    }else {
        if (!answerSoundBuffer.loadFromFile("C:/Users/Student/Desktop/sounds/wrong_answer.wav")) {
            qDebug() << "Error loading click sound";
            return; // Exit the method if loading fails
        }
    }
```

25. Try to run the project if it shows an error that needs OpenAi.32, Install the "oalinst" application in the "Quiz_game_project" folder.



Name	Date modified	Type	Size
build-espoQuest-Desktop_Qt_6_7_0_Min...	2024/05/02 07:57	File folder	
build-espoQuest-Desktop_Qt_6_7_0_Min...	2024/05/02 07:58	File folder	
espoQuest	2024/05/06 22:48	File folder	
SFML-2.5.1	2024/05/02 07:54	File folder	
oalinst	2024/05/06 09:07	Application	791 KB

26. Run the project. Have FUN!!