



C² Pipeline



Enrichment Lesson Plans Overview

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| Enrichment Title | STEM Chess |
| Enrichment Objective | To promote the use of math in a nontraditional format that will engage students while reinforcing algebra and math concepts, encouraging critical thinking and healthy competition. |
| Grant Alignments & Objectives Addressed | <ul style="list-style-type: none"> • 48.5% of regularly attending students will improve their reading grade by half a letter grade • 48.5% of regularly attending students will improve their math grade by half a letter grade • 77% of regularly attending students will improve in teacher-rated homework completion and class participation • 85% of regularly participating students will report improvements in other school subjects |
| Partner Alignment | <ul style="list-style-type: none"> • Honors college, College of Engineering |
| Academic Subjects | <p>Core Academic Subjects: Mathematics</p> <p>Auxiliary Academic Subjects: Technology and Reading</p> |
| Standards to Address | <p>Common Core Standards:</p> <p>CCSS.Math.Content.HSS.MD.B.5.A CCSS.Math.Content.HSS.MD.B.5.B CCSS.Math.Content.HSS.MD.B.7 CCSS.Math.Content.HSS.MD.A.3 CCSS.Math.Content.HSS.ID.C.9 CCSS.Math.Content.HSS.ID.B.5</p> |
| College & Career Readiness Skills Addressed | <p>[X] Technology & Tools [X] Argument & Reasoning [X] Communication & Collaboration [X] Problem Solving</p> |
| Personal Enrichment Categories | Students will: Learn to utilize math and practical applications. To break processes down into several steps. Use critical thinking to develop strategies. Utilize technology to communicate with others students outside of their school. |

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| Life Skills Identify and describe how these will be utilized | <ul style="list-style-type: none"> • Healthy competition and good sportsmanship will be reinforced throughout the enrichment. • Students will engage in a firsthand experience of practical applications for math. Many students have a hard time connecting math to real world relevance. • Thinking/Problem Solving will be used throughout the curriculum as the students develop chess strategies. |
| Duration of Enrichment | 8 week |
| # of Students & Staff Involved | 15 students: 1 staff |
| Frequency of Enrichment | Meets 1 time per week |
| Week by Week Timeline of SUGGESTED ACTIVITIES If an activity is used that is not listed, please turn in the lesson plan with the ARS to the Site Coordinator who will forward it to the C2 office. | Activity 1: Chess 101 How to Play Activity 2: Test your knowledge Activity 3: Chess Mapping Activity 4 and 5: Math and Chess Activity 6: Student Led Chess Math Activity Activity 7: Online Chess Activity 8: The Final Tournament Activity: Chess Kid Activity: Chess 24 |
| Expected End Result/Product | Students will have a better understanding of multiple math skills and increased cognitive and critical thinking. Students will have had the opportunity to meet other C2 pipeline students from other schools. |
| Connection(s) to Regular School Day | See specific School Improvement Plans and Building Collaboration Guides to observe how this enrichment connects to the regular school day in each site This enrichment plan is directly aligned to the Math Common Core State Standards, and the Career and College Ready Standards. |

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| Adult Family Member Literacy and Involvement | <ul style="list-style-type: none"> • Family members with knowledge of Chess can join the class to assist. • Families will be encouraged and to come to the special event final tournament. |
| Educational Research | <p>(1) Chess in Education Research Summary, Dr. Robert Ferguson. Details see below: http://www.quadcitychess.com/benefits_of_chess.html</p> <p>(2) Mathematics and Chess, by Miodrag Petkovic, Dover Publications, Inc. Mineola, New York, 1997</p> <p>(3) Challenging Mathematics, Cheneliere/McGraw-Hill, Michael Lyons, Robert Lyons, 1995, Montreal, Quebec, Canada</p> <p>(4) Chess Teaching Manual, IM Tom O'Donnell, the Chess Federation of Canada.</p> |
| Additional Resources Used | <p>Advice-for-Starting-a-Chess-Club (word doc.) Basic Chess Rules Quiz (word doc.) CHESS AND COMMON CORE STANDARDS (word doc.) Chess-Guide-for-Teachers, ESpiegel (word doc.) <i>How to Read and Write Chess using Algebraic Notations</i> (word doc.) Chess Activities (PDF) (<i>Enriching Math Using Chess</i>) Let's play basic rules (PDF)</p> |

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How to Teach Chess, Even If You Don't Know How To Play

A Teaching Guide by Jeff Jantz

Mini Games and chess exercises are a great way to introduce the game slowly. This way new players are learning only one or two pieces or concepts at a time. Below are a few mini games I have used. They are listed in the order I recommend but can be rearranged if necessary. (See additional resources below)

Mini Games and Exercises

1. Pawn Race *Review moves of a pawn*

Setup: Place all 16 pawns on the board in their regular starting spaces; the white pawns in row 2 (a2, b2, c2, ..., h2) the black pawns in row 7 (a7, b7, c7, ..., h7).

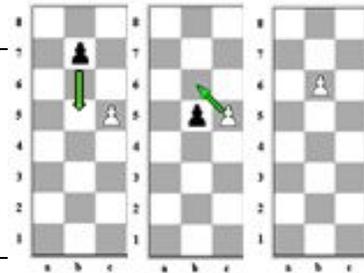
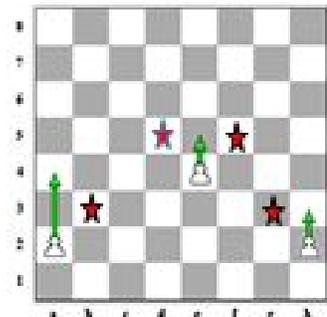
Objective: Get one pawn across the board. The first player to do so wins.

How to play: As always white goes first. The pawns move and capture the same way they would in a regular game.

Optional move: *En Passant* (You may want to wait till the second round to introduce this one.)

En passant (from French: in passing) is a move in **chess**. It is a special pawn capture that can only occur immediately after a pawn moves two ranks forward from its starting square and an enemy pawn that could have captured it had it only moved forward only one square.

Note: This game is very simple and is really just designed to help players grasp how pawns move and the territory they protect. Players still need to think ahead to win.

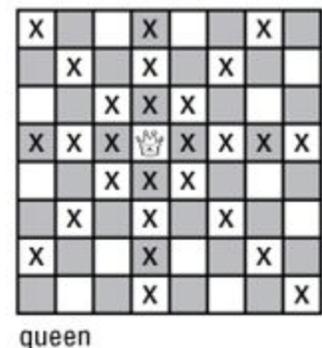


2. Checkmate Drill (with a queen) *Review moves of king and queen and Terminology below*

Setup: Place the black queen (d8) and black king (e8) on the board on their regular starting spaces. Place the white king (e1) on its regular starting space.

Objective: The objective for black is *checkmate*. The objective for white is a *stalemate*.

Note: To make it a little more exciting limit the amount of moves for beginners 25 moves, experienced players should be able to do this in 15 moves or less.



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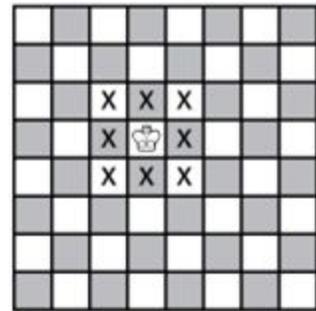
3. Pawn War *Review the moves of a pawn, king and queen*

Setup: Place all pawns and each king on the board in their regular starting spaces; white pawns (row 2), white king (e1), black pawns (row 7), black king (e8). If a pawn makes it all the way across the board it becomes a queen.

Objective: Checkmate!

Note: This is simply a chess game without the the rooks, bishops and knights and where the queen must be earned.

Hint: The king is the most powerful piece on the board (until you get a queen). Don't be afraid to move the king.



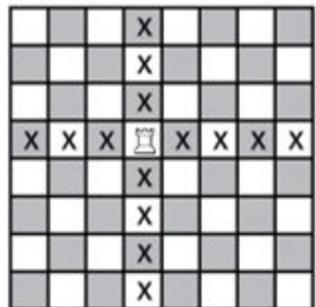
king

4. Checkmate Practice (with a rook)

Setup: Place the black king and one black rook on the board on their regular starting spaces; black king (e8), black rook (a8 or h8). Place the white king 2 spaces up from its regular space (e3).

Objective: The objective for black is *checkmate*. The objective for white is a *stalemate*.

Note: This is basically the same as with a queen just learning how to use a rook. Limit the amount of moves, for beginners 25 moves. Experienced players should be able to do this in 15 moves or less.

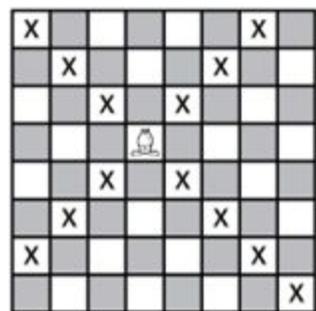


rook

5. Chess Moves Demonstration

Directions: When explaining to students how a piece moves clear the board and place only one piece at a time. Name each piece out loud and demonstrate the movements. Have students practice as well. If you have more advanced students let them show the beginners. This is a short activity but when they actually move the pieces it helps them to remember.

Note: I usually don't tell students about the rook, bishop or knight until after the first 3 activities.



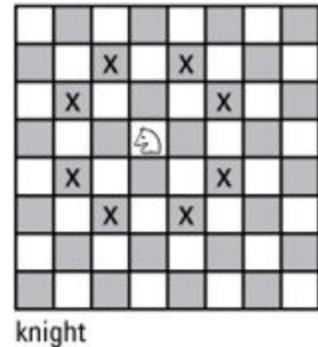
bishop

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6. Territory Observation

Directions: Place one piece on the board at a time and ask students, "How many spaces can this piece move to from this space?" or "How many spaces does it control from this space?". You can even have them place checker pieces (or coins, paper clips or whatever you have) on the board to mark the spaces the piece controls, this works especially well for the knight.



Notes:

- This helps to reinforce how the pieces move.
- Students should notice that some pieces will increase their control from certain areas of the board. Ask them, "Which pieces can increase their territory by improving their position and how?"
- You can ask students "How many spaces a piece controls?" during a game as well. The answer will be different than it was with a clear board because other pieces will be blocking its reach.

7. Play a Full Game

Once students know how the pieces move and understand checkmate they are ready to play.

8. Create a Checkmate Puzzle

Directions: Have each student set up a scenario on a chessboard that is one move away from a checkmate. Let their classmates try to solve the puzzle and also determine if it is indeed a checkmate. Make sure the person solving the puzzle knows what direction the board is going and which color's turn it is.

Tip: it is sometimes easier to start with a setup that is a checkmate and work backwards one move.

Notes:

- There can be anywhere from 3 to 32 pieces on the board to achieve checkmate.
- Let students know it's ok if they don't get the puzzle right right away. Even experienced chess players often think they have a checkmate when it's actually a check.



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Quick Tips and Rules

- Queen on color, when setting up the board each queen should be on it's own color.
- White always goes first. To pick who is white, one player may hold a black and white pawn behind their back one in each hand. The other player chooses a hand.
- A king cannot put itself in check.

Terminology

Check A check is when a player's king is under threat of capture on their opponent's next turn. Players cannot make any move that puts their own king in check. When a king is in check they have 3 potential options:

- 1) Run: Move the king to a safe space.
- 2) Block: Put another piece between the the king and the piece threatening it.
- 3) Eliminate: Capture the piece threatening the king.

Note: Players must announce "check" to inform their opponent they are under threat.

Checkmate (also called mate) is when a player's king is in check and none of the potential options above are possible. If the the king cannot get out of check than it is a checkmate. Once checkmate is achieved the game is over. The king is never actually captured.

Stalemate The game is a stalemate if:

- One player has no possible moves and is not in check.
- Both players only have kings or checkmate cannot be achieved with the pieces remaining on the board.

Castling is a special move for the king and rook where a player moves their king two squares toward one of their rooks, then moves the rook to the square over which the king crossed.

Castling may only be done if:

- The king and rook involved have never moved.
- The squares between the king and the rook involved are unoccupied.
- The king is not in check, and the king does not cross over or end on a square in which it would be in check.

Note: Castling is is technically a king move but I usually introduce it with the rook. This is the only time a king can move two spaces in a single turn.

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Resources

ChessKid Lessons: The Magic Of Chess - animated video.

<https://www.youtube.com/watch?v=KITEQZ5Sy4E>

Chess Corner Website

The "learn" tab has a separate page for each piece explaining the moves.

<http://www.chesscorner.com/tutorial/learn.htm>

And some basic chess rules.

<http://www.chesscorner.com/tutorial/basic/rules/rules.htm>

ChessKid - Learn and play chess with kids from around the world. Ideal for younger students.

<https://www.chesskid.com/>

Chess.com - Students can play online chess. Also has an associated free app.

<https://www.chess.com/>

Amerous 12" x 12" Travel Magnetic International Chess Set with Folding Chess Board \$12.99

https://www.amazon.com/Amerous-Travel-Magnetic-International-Folding/dp/B01MQJARNR/ref=sr_1_7?ie=UTF8&qid=1506220322&sr=8-7&keywords=12+x+12+magnetic+chess+set

Thinking Like a Chess Player:

- Think of each piece on the board not in terms of where it is but what territory does it control.
- The goal is to control territory especially the territory around your opponent's king. You are trying to trap the king not capture it.
- Try to think at least 3 moves ahead and predict your opponent's next 3 moves.
- It may help to think of pieces as having a point value system. The most commonly-used values are pawn=1, bishop=3, knight=3, rook=5, queen=9, The king is most valuable but needs no points because the game ends if it is lost. This system can be used to gage who is ahead in pieces but is not always an accurate gage of who is winning.

C² Pipeline Activity Plan

STEM Chess

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| Activity Title | Chess 101 How to Play |
| Driving Question (Open ended; employs higher order thinking skills, evokes curiosity) | How do you play Chess can anyone play? What is this class all about? |
| Activity Objective (what should the students be able to do as a result of the Activity) | TLW gain a basic understanding of how to play chess. TLW be informed of the activities that will take place over the next eight weeks. TLW played at least one game of chess during class. |
| Supplies Needed | 2 to 8 chess sets depending on class size |
| Step By Step Activities | <ul style="list-style-type: none"> • Go over basic rules of chess use <i>Lets play basic rules PDF</i> • Watch “how to” chess video (The one below or comparable.) http://www.chesskid.com/video/player/the-magic-of-chess • Divide class into groups of two have each group playing a game of chess. Have experienced students teach less experience students how to play by pairing them together on teams perhaps the more experience students can act as coaches. |
| Student Reflection Activities | Name a chess piece and explain how it moves. Ask students: Did you feel that chess was intimidating before today’s class do you feel less intimidated by the game now? |
| Additional Resources Used | <i>Lets play basic rules PDF</i> Advice-for-Starting-a-Chess-Club (word doc.) http://www.chesskid.com/video/player/the-magic-of-chess |

C² Pipeline Activity Plan

STEM Chess

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| Activity Title | Test your knowledge |
| Driving Question (Open ended; employs higher order thinking skills, evokes curiosity) | How much do you know about playing chess? What do you need to learn to improve your skills and knowledge? |
| Activity Objective (what should the students be able to do as a result of the Activity) | TWL continue increase their understanding of how to play chess. TWL know where they need to improve in their understanding of how to play chess. TWL played at least one game of chess during class. |
| Supplies Needed | 2 to 8 chess sets depending on class size |
| Step By Step Activities | <ul style="list-style-type: none"> • Use <i>Chess Quiz</i> to check the basic knowledge of students • Go over answers as a group encourage students to explain the answers to the rest of the group. • Divide class into NEW groups of two have each group playing a game of chess. Have experienced students teach less experience students how to play by pairing them together either as opponents as a team. |
| Student Reflection Activities | Share something you learned today perhaps something that you got wrong on the quiz but now understand. |
| Additional Resources Used | <i>Chess quiz PDF</i> |

C² Pipeline Activity Plan

STEM Chess

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| Activity Title | Chess Mapping |
| Driving Question (Open ended; employs higher order thinking skills, evokes curiosity) | How can a recording a chess game improve strategy? |
| Activity Objective (what should the students be able to do as a result of the Activity) | TWL continue increase their understanding of how to play chess. TWL have a better understanding a grid system. TWL played at least one game of chess during class. |
| Supplies Needed | 2 to 8 chess sets depending on class size |
| Step By Step Activities | <ul style="list-style-type: none"> • Distribute and go over <i>How to Read and Write Chess using Algebraic Notations</i> handout. • Divide class into groups of two have each group start a game of chess and record each step of the game based on instructions from the handout. • Once two groups have completed a game have them switch records and recreate the other group's game step by step. Encourage them to critique each other's game and give feedback on how to improve their strategy. |
| Student Reflection Activities | Explain where one of the chess games played today went wrong and how it could be improved upon. |
| Additional Resources Used | <i>How to Read and Write Chess using Algebraic Notations</i> handout. |

C² Pipeline Activity Plan

STEM Chess

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| Activity Title | Math and Chess |
| Driving Question (Open ended; employs higher order thinking skills, evokes curiosity) | How is math involved in tangible processes? |
| Activity Objective (what should the students be able to do as a result of the Activity) | TLW continue increase their understanding of how to play chess. TLW reinforce and learn math skills during a hands-on activity. TLW played at least one game of chess during class. |
| Supplies Needed | 2 to 8 chess sets depending on class size |
| Step By Step Activities | <ul style="list-style-type: none"> • Each week the activity facilitator will choose a math activity from the <i>Enriching Chess</i> PDF or an equivalent activity. Explain the planned activity to the class and have them work through the problem individually or in groups. • If time remains divide class into groups of two, have each play chess until the end of class. They can switch opponents after each game if desired. • Encourage students to utilize the activities from the beginning of class to improve their chess game. • Ask students to start thinking about creating their own chess related math problem/activity. |
| Student Reflection Activities | <p>Explain in your own words and math concepts you learned today.</p> <p>Explain how math can relate to real life.</p> |
| Additional Resources Used | Enriching Chess PDF |

C² Pipeline Activity Plan

STEM Chess

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| Activity Title | Student Led Chess Math Activity |
| Driving Question (Open ended; employs higher order thinking skills, evokes curiosity) | How is math involved in tangible processes? |
| Activity Objective (what should the students be able to do as a result of the Activity) | TLW continue increase their understanding of how to play chess. TLW reinforce and learn math skills during a hands-on activity. TLW played at least one game of chess during class. |
| Supplies Needed | 2 to 8 chess sets depending on class size |
| Step By Step Activities | <ul style="list-style-type: none"> Ask each student to either find or come up with their own chess related math problem or activity (they may use the internet for research). It can be a story problem or an activity as long as if it involves math. They could also come up with a mathematical system to rank and graph the wins and losses of chess games played. Alternative: assign activities from <i>Enriching Chests PDF</i> two groups and have them present to the class. Have each student present their activity to the class. If time remains at the end of class allow students to play chess. |
| Student Reflection Activities | How can what we learned today help improve your chess game. Explain how math can relate to real life. |
| Additional Resources Used | <i>Enriching Chess PDF</i> |

C² Pipeline Activity Plan

STEM Chess

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|--|--|
| Activity Title | Online Chess |
| Driving Question (Open ended; employs higher order thinking skills, evokes curiosity) | How can increasingly your knowledge and skills in chess relate to school and work? |
| Activity Objective (what should the students be able to do as a result of the Activity) | TLW continue increase their understanding of how to play chess. TLW correspond with a person they have never met before. TLW played at least one game of chess during class. |
| Supplies Needed | 2 to 8 chess sets depending on class size |
| Step By Step Activities | <p>Week 7: Online Chess</p> <ul style="list-style-type: none"> • Begin the class with a short math warm up activity. • For the remainder of class students will play chess online. Preferably with students from other C2 pipeline sites. If this is not possible than they can play online chess games. It may be possible to put students on teams of two to work together and collaborate on strategies. • Alternative: If online chess is not possible than repeat Activity plans from weeks 4 and 5 utilizing new activities from enriching chests PDF |
| Student Reflection Activities | <p>Do we need to up our skills to make us more competitive?</p> <p>How does increasing your skills relate to the job market?</p> <p>How is online chess different from playing someone in person?</p> |
| Additional Resources Used | <p><i>Enriching Chess PDF</i> if needed for a warm up activity.</p> <p>Online resources will have to be explored.</p> |

C² Pipeline Activity Plan

STEM Chess

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|--|---|
| Activity Title | The Final Tournament |
| Driving Question (Open ended; employs higher order thinking skills, evokes curiosity) | How can increasingly your knowledge and skills in chess relate to school and work? |
| Activity Objective (what should the students be able to do as a result of the Activity) | TLW continue increase their understanding of how to play chess. TLW correspond with a person they have never met before. TLW played at least one game of chess during class. TLW graph data based on winnings. |
| Supplies Needed | 2 to 8 chess sets depending on class size |
| Step By Step Activities | <ul style="list-style-type: none"> The final day will be the ultimate championship ideally this would happen between two or more C2 pipeline sites through an online resource. The Tournament could also be arranged as a Special Event with one Pipeline site hosting another for an in-person meet on a separate date, such as a Friday. Alternative: if a championship with another site is not possible than have a championship within your own class or invite family members and wore school day staff to compete with the students. Utilize some type of ranking system and involve students and graphing the rankings. |
| Student Reflection Activities | How is the experience of playing someone new different from playing people you are used to playing? |
| Adult Family Member Literacy & Involvement | Invite family members in for the final championship. |
| Additional Resources Used | <i>Enriching Chess PDF</i> if needed for a warm up activity. Online resources will have to be explored. |



C² Pipeline Stem Chess Potential Moves Tracing Sheet



Count out how many different squares each piece on the board can move before each turn and add the total.

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| Payer one name: _____ | Player two name: _____ |
| Turn 1: Pawn = 16 Rook = 0 Knight = 4 Bishop = 0 Queen = 0 King = 0 <hr style="width: 80%; margin-left: 0;"/> Total = 20 | Turn 1: Pawn = 16 Rook = 0 Knight = 4 Bishop = 0 Queen = 0 King = 0 <hr style="width: 80%; margin-left: 0;"/> Total = 20 |
| Turn 2: Pawn = _____ Rook = _____ Knight = _____ Bishop = _____ Queen = _____ King = _____ <hr style="width: 80%; margin-left: 0;"/> Total = _____ | Turn 2: Pawn = _____ Rook = _____ Knight = _____ Bishop = _____ Queen = _____ King = _____ <hr style="width: 80%; margin-left: 0;"/> Total = _____ |
| Turn 3: Pawn = _____ Rook = _____ Knight = _____ Bishop = _____ Queen = _____ King = _____ <hr style="width: 80%; margin-left: 0;"/> Total = _____ | Turn 3: Pawn = _____ Rook = _____ Knight = _____ Bishop = _____ Queen = _____ King = _____ <hr style="width: 80%; margin-left: 0;"/> Total = _____ |
| Turn 4: Pawn = _____ Rook = _____ Knight = _____ Bishop = _____ Queen = _____ King = _____ <hr style="width: 80%; margin-left: 0;"/> Total = _____ | Turn 4: Pawn = _____ Rook = _____ Knight = _____ Bishop = _____ Queen = _____ King = _____ <hr style="width: 80%; margin-left: 0;"/> Total = _____ |
| Turn 5: Pawn = _____ Rook = _____ Knight = _____ Bishop = _____ Queen = _____ King = _____ <hr style="width: 80%; margin-left: 0;"/> Total = _____ | Turn 5: Pawn = _____ Rook = _____ Knight = _____ Bishop = _____ Queen = _____ King = _____ <hr style="width: 80%; margin-left: 0;"/> Total = _____ |

What player won? _____

After each player has taken and totaled five turns continue to play the game. At the end of class compare the numbers to see if there is a correlation between the options a pieces has in the first five turns and who won the game.