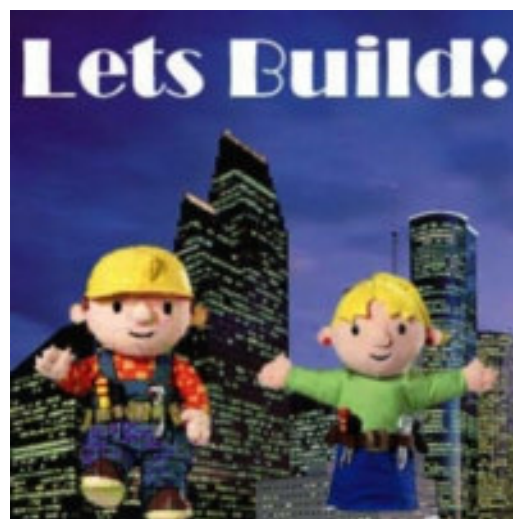


# “Bob and Wendy Build Brooklyn”



## **Group 1:**

James Hess, [hess@drexel.edu](mailto:hess@drexel.edu)  
Bharat Manglani, [bnm22@drexel.edu](mailto:bnm22@drexel.edu)  
Harris Ahmad, [ha34@drexel.edu](mailto:ha34@drexel.edu)  
Robert Yost, [rmy22@drexel.edu](mailto:rmy22@drexel.edu)  
Lay Gauv, [lgy22@drexel.edu](mailto:lgy22@drexel.edu)  
Miguel Nieves, [man27@drexel.edu](mailto:man27@drexel.edu)

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## **Abstract**

Bob and Wendy Build Brooklyn is an educational game for children in grades one through three, and is designed to assist in their learning of geometry. More specifically, the game is focused on the geometric concepts of shape recognition, spatial visualization, and symmetry. Players also have the opportunity to purchase and return shapes, which assists in their understanding of basic monetary transactions. During the construction phase, the children must build structures using shapes that they have purchased from the store. Once they have purchased these shapes they will be presented with the task of fitting it in the ghost image as seen in the cover letter. This fitting process may require turning an object, or flipping it. Once the proper conformation has been found the piece will snap into place. If assistance is needed, either Bob or Wendy will be on hand for a quick review of shapes and geometry. Once all pieces have been filled, the object is complete and the player may move onto a more challenging object. The player also earns money for completing the buildings. Each building has a budget and if the player completes the building under budget then this surplus money is added to his/her award and savings. The player will have money left over in the budget through a mastery of geometry and shapes. The player has the choice of playing the game on three difficulty settings to maintain a relative challenge and keep the player's interest. Level 1 will have graphical representations of the objects, and simple buildings to construct. As the player progresses, the buildings become more complex, and the methods of displaying the shapes available for purchase change.

## **Game Overview**

### **High Concept**

As an architect the player is entrusted with building a city for Mayor Jones. He tells the player to build a structure, and from a blue print the player purchases shapes and places them on top of the blue print. Once the blue print is covered by the appropriate shapes, the player has succeeded in building the structure. At this point, a reward will be given, and the player will be allowed to proceed to the next construction project.

### **Genre**

“Bob and Wendy Build Brooklyn” is an educational children’s game that is aimed at facilitating teaching children shapes and builds upon the basic task of construction that elementary children so enjoy. During game play children create complex objects such as bridges, houses and skyscrapers to develop the city of Brooklyn. The software could also be characterized as a simulation game since game play is modeled around the actual construction of a city with input from the mayor, purchases from the shop and real time project management.

## **Hooks:**

### *Familiar Characters*

The BBC's Bob the Builder children's show is a popular series available on home-video. Parents and children alike will recognize this game as part of that series, and will trust the educational values of the series when deciding to purchase this game.

### *Animation / Audio:*

Interaction with characters in the game is experienced through short animated movies, which players in our target age group should find entertaining. All dialog between characters is both displayed on the screen and spoken aloud with the character's voice. (Since we recognize that the children may not have headphones/speakers, and many of these children playing the lower levels cannot read, this is kept to a minimum at the earlier levels). Additionally, upon the completion of a level, the player will be shown various entertaining and rewarding animated video clips, which display the construction of the city.

### *Attractive Design and Color*

The interface is quite colorful, and visually appealing. These features, along with the animated characters eliminate the intimidation factor of using new software.



## **Background story**

The imagery of both Bob and Wendy are taken from a BBC cartoon called "Bob the Builder". After market research is complete we can further ascertain whether an extension from the storyline of the BBC show would lead to greater profitability, or the cost in royalties would be cost prohibitive. In the case of exorbitant royalties we would just come up with our own characters but keep the same back plot. Our character is an architect who has been hired by the mayor of Brooklyn to build a bunch of structures for the city. The mayor wishes to build new houses for his constituents, new buildings for companies and to improve overall city well being. Through the architectural prowess of the player Mayor Jones will make the city people happy and will hopefully get re-elected.


## **Game Objectives:**

The true goal of this game is to teach children about the different geometric shapes- understanding that such shapes can be manipulated through reflection and rotation to form other shapes. However, as for game-play, the purpose of the game is to successfully complete each construction project using many pieces in the allotted time. Because part of the goal is to accumulate wealth for a high score, the player will need to build "efficiently." This means building with a preference for smaller pieces, as these pieces will be significantly less expensive than their larger counterparts, even when combined to form the larger pieces. The player must also "beat the clock," and thus must successfully build all of the structures within a level to build an entire city.

## **Characters**

	<p><b>Name:</b> Bob  <b>Age:</b> 22  <b>Role:</b> Bob is a seasoned foreman experienced in construction of buildings. He will provide the player with helpful hints and reviews of various shapes if needed.</p>
	<p><b>Name:</b> Wendy  <b>Age:</b> 20  <b>Role:</b> Wendy is Bob's partner in the construction of buildings. She has the knowledge and experiences that Bob has. She will provide the player with helpful hints and reviews of various shapes if needed.</p>

Regardless of whether the player chooses Bob or Wendy, either of the characters will act as the construction foreman on the project and will give the player feedback, advice, and will assist in furthering our storyline.

	<p><b>Name:</b> Mayor Jones  <b>Age:</b> 56  <b>Role:</b> Mayor Jones is recently elected to be the mayor of Brooklyn. He is the person that hired the player to help construct buildings in the city. After the completion of every building, the mayor cuts the ribbon and gives the player a reward check for a job well done.</p>
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### Story Progression:

The player starts on level 1, and must visit the hardware shop to purchase materials for the project. He/she is given enough money to purchase the necessary shapes, and can still afford even the least efficient shapes. The construction project presented in this first assignment is fairly simple, but these projects become more complex as the game progresses. Additionally, they are presented visually in the first level, by name in the second level, and by description in the third level. The construction foreman is also available to provide information (teaching) about the characteristics of the available shapes. As the player completes construction on each building, they are compensated financially; depending upon the types of pieces they used and the amount of time spent building the structure. The player must construct all buildings within the allotted time to advance, and once this player completes the final structure on the current level,

they have successfully constructed the city, and have subsequently beaten the game. If the player earned a high score, their name will be recorded for the high-score list.

## **Game play Highlights**

1. The game will be split into 3 levels of difficulties.
2. Players will have to the option to pick a guide (Bob or Wendy) who will provide feedback of the player's actions by emotions and hand gestures.
3. Players will use basic shapes (squares, rectangles, triangles, etc.).
4. All 3 levels will have the option of having a time limit. This option can be turned on or off.
5. Players will purchase shapes from the shop. If the wrong shape is purchased, the player can return the shape to the shop but must face a restocking fee. The player will only receive half of what was paid.
6. Shapes dragged onto its corresponding shape on the building layout will expand to the size of that shape on the house. For example, if an 8x8 square is needed for a building, when the player drag any size square to that location, the square will adjust itself to fit the position.
7. Compound shapes (i.e. a square rather than two triangles) will be available for purchase from the store to make game play easier, but will cost more than if the two shapes that it comprises.
8. The more shapes used to construct a building will result in a bigger check reward from the mayor.
9. After the completion of a building, the Mayor will congratulate you on a job well done and you will see they city that you have built so far.
10. The game is over when a player goes bankrupt or completes all the buildings needed for the city of Brooklyn. Once completed, the total amount of money the player has will be recorded on a HIGH SCORE list.
11. Shapes can be "flipped, slid, or turned" to satisfy the shape of the buildings. These actions can be done by the player at no cost.
12. The shop in level 1 will provide the shapes' image for the player to distinguish what they should buy.
13. The shop in level 2 will provide the shapes' name for the player to distinguish what they should buy.
14. The shop in level 3 will provide the shapes' description for the player to distinguish what they should buy.
15. The game will be customized to the player. At the beginning of the game, the player will be prompted for his/her name.

## **Educational Overview**

### **Learning Objective**

The major goal in our product is to promote learning about geometry. Children apply knowledge about shapes and spatial relations by obtaining parts and constructing various structures. Users are motivated to use smaller shapes to construct larger ones to save money and thus earn a higher score. The ability to Flip, Slide, and Turn shapes allows players to explore geometric properties (rotating and reflecting) of shapes. Furthermore, through the purchasing and returning of shapes children become familiar with money and how to use it effectively. For each grade the level of difficulty increases. In giving the user the freedom to choose which pieces they will 'purchase' he/she becomes directly responsible for the success or failure of the game. This focus, combined

with a chance at breaking a High Score will challenge and motivate students to find better and more creative solutions.

### **Objective Breakdown**

- recognize, name, build, and compare, two-dimensional shapes;
- understand attributes and parts of two-dimensional shapes;
- investigate and predict the results of putting together and taking apart two-dimensional shapes;
- recognize and apply slides, flips, and turns;
- recognize and create shapes that have symmetry

### **Users**

This game is targeted towards grades 3-5. This game is non-gender specific, yet has aspects that each will like. There is a competitive “Get the Highest Score” aspect, and a “Correctly Make a Building to See the Next One” aspect. With these motivations, students will be able to learn and have fun at the same time. We don’t expect a high proficiency in literacy and the interface will be highly graphical to compensate for this. We also expect the keyboard to still be a slight challenge to the students and therefore we will be using the mouse as our primary mode of input.

### **Activities**

“Bob and Wendy Build Brooklyn” should be used as a stand-alone application running on the PC or Macintosh environment. It can be used in both the home and classroom environments. Sound and time settings can be configured accordingly (e.g. sound off during class and on at home). Each level raises the complexity of structures that are built and added to the city. The software can be used inside the classroom to supplement the learning of shapes. By building structures using the shapes provided and through the application of the design, definition, rotational and symmetrical properties of these shapes, a child’s knowledge of a shape and its properties is challenged. Children are encouraged to develop innovative solutions to construction problems using smaller shapes and geometric properties because smaller shapes cost less, leading to a higher score.

### **Assessment**

A player’s progress in the game can be evaluated in several ways depending on the level (1-3). The first of which is through the game’s score. The score consists of the remaining capital (“Total Savings”) that the player holds at the end of city construction. Managing to hold a high amount of capital requires mastering many elements of the game. Level one does not require the player to complete the project in a given time period. Thus the score would depend on the number and type of shapes purchased. The smaller shapes cost less, resulting in a higher end score. In level two by default, in addition to using smaller shapes, the score can be increased by completing the project within the time period allotted (assuming user has not opted to exclude the time feature). Failure to accomplish the time goal results in the award being gradually reduced. Furthermore, capital is diminished when a player purchases an incorrect shape and must return it, in which case a fraction of the original price of the shape is refunded (one fourth in the first level, one third in the second level and three fifths in the third level). Thus another tool to evaluate a player’s progress is the number of returns that he/she has transacted. In level three, players must accomplish level 1 and level 2 goals with only a description of the shapes

provided (pictures and names are not included). This requirement challenges their understanding of the definitions of shapes. The top ten scores will be recorded and available to view from within the application giving players added incentive to finish the game with a higher score than previously earned.

### **Development & Deployment**

This game will be developed on the PC platform in Macromedia Flash. Due to Flash's multiplatform nature, the game will be able to run on all Web Browsing operating systems. The game environment is kept sweet and simple so large graphics/processing will not be necessary, allowing this game to run on even Pentium II systems. The main interface will be the mouse. The interface's most complex function will be "Drag-and-Drop".

Once the game has been developed and tested, we hope to expand the program to encompass higher skill/grade levels on the Nintendo DS. The DS's Dual screen display will allow us to keep the use focused on completing game functions and learning about shapes as opposed to have to switch back and forth between shop menu and build menu. The DS's stylus will also make it easier to drag and drop.

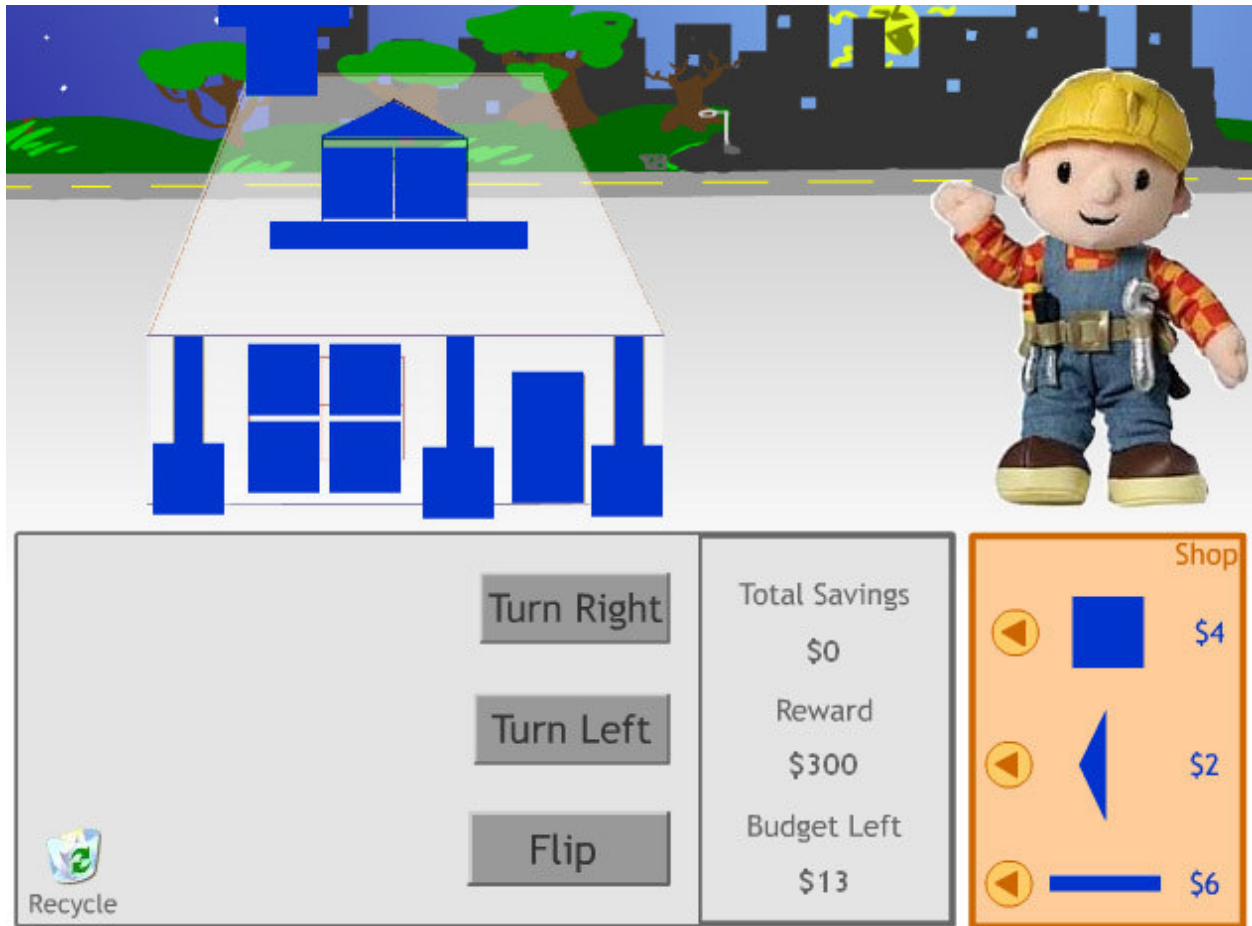
### **Conclusion**

This game builds upon the basic joy of building that kids have while teaching them geometric properties such as "rotating" and "reflecting". The storyline of building a city from scratch for the mayor project by project and the fun ways in which children can flip and drag-and-drop shapes will keep our young players entertained. At the same time they will learn how to manage resources, identify shapes, understand the effects of "rotating" and "reflecting" shapes and learn how larger pieces can be formed using smaller ones. This product maintains a strong balance between education and entertainment and we hope children will have as much fun playing it as we had designing it.

### **Appendix**

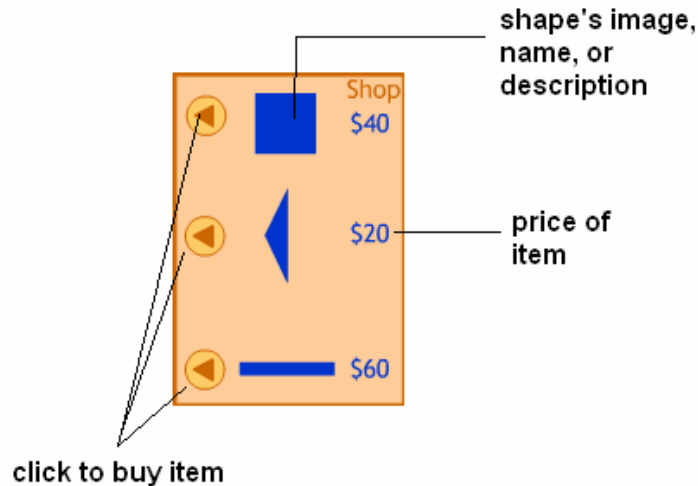
#### **Basic Interface**

The game interface consists of five sections that help in the game play. These five sections include:



## Shop

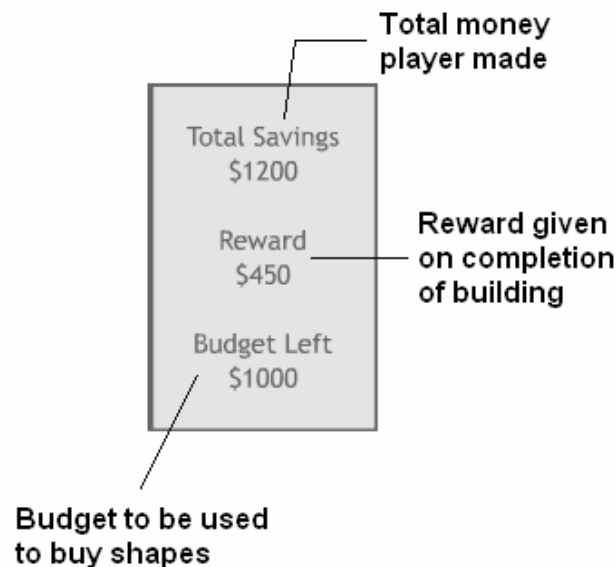
The shop is where the player will do all the purchasing and returning. Each level illustrates the shapes to players in the shop in progressively harder formats. Level one provides only the shape image, level two displays only the shape name and level three has only the shape description. The player will purchase a shape by clicking on the button near the corresponding shape. Once a shape is purchased, the cost will be deducted from the player's budget.



### Money Center

The Total Budget is the total amount of money allotted to the player for a given project. Budget Spent is the total money spent to date on the project. Total Budget minus Budget Spent gives us Budget Left. The Total Savings is the total amount of income the player has accumulated from past projects. The reward amount correlates to the monies given to the player by the mayor upon completion of a project. When a shape is purchased, the total cost of the transaction is deducted from the budget amount.

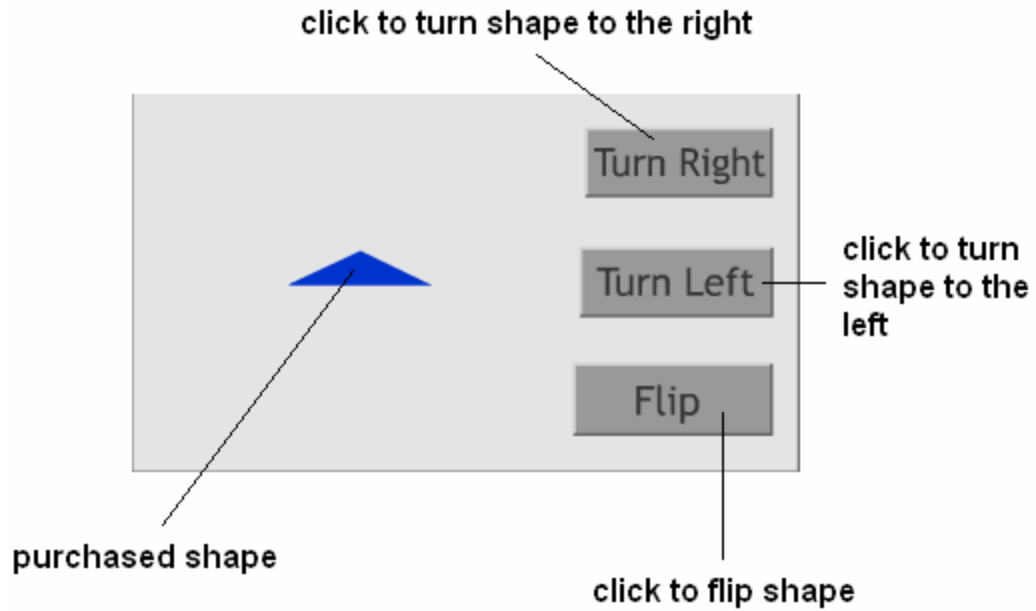
*Please note the screen shot below is from our demo. Time did not allow us to make the change in the demo. The demo is as an as close as possible representation of the real thing.*



### Work Bench

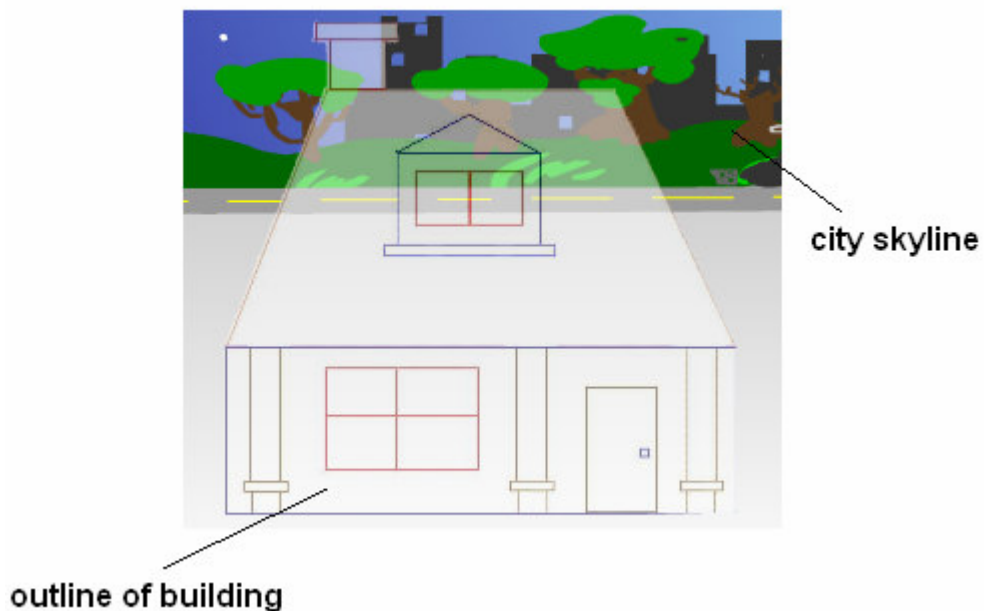
The work bench is where the player's purchased shape appears. With the shape in the work bench, the player can perform geometric operations on the shape. The player will be allowed to

turn the shape to the right, turn the shape to the left, or flip the shape by pushing the appropriate buttons in the work bench. Once the player is finished with modifying the shapes, the player will need to drag the shape onto the outline (ghost image) of the building being constructed. A player may also return the shape to the shop by dragging it into the “Recycle Bin” located in the lower left corner.



### Building Outline

The building outline area is where the “ghost” image of the buildings is located. The “ghost” of the building is there to assist the player with the placement of shapes. The city skyline is located in the background to give the player a sense that they are constructing additions to an actual city. The objective is to drag the purchased shape over the correct portion of the “ghost” image much like fitting the pieces of a jigsaw puzzle. The building is complete when all the “ghost” areas are covered up by shapes.



## Help Area

The help area is where Foreman Bob or Forewoman Wendy will be located. Their main objective is to provide assistance during construction of the buildings. For example if a player clicks on Bob while having a triangle in the work bench, he will respond with “You have a triangle in your work bench.” Clicking on him again will result in Bob explaining the definition of the triangle. At levels 2 and 3, the help is more limited.



## Scoring System

The game will have one variable that will be mission independent for over all scoring. This variable will be the revenue earned thus far, or one's overall score earned from previous building endeavors. Once a player selects the level at the beginning of the game, they will then start the first construction project with a balance of \$99 in this account. Each mission, or construction project, will have two additional variables that are local to only that mission. The budget and award will be mission specific and will be proportional to the size and difficulty of the project. As the missions progress within the level and the construction projects become larger in scope and difficulty; subsequently requiring more pieces, the budget will increase. Mayor Jones, being a fair man, acknowledges that a larger project will consume more of the player's time and will allocate a larger sum as remuneration for successful completion of a construction project. So once a player completes a construction project, the reward and the remaining account balance for the budget variable will be added to the earned revenue variable. The prowess of a player will be evaluated via the earned revenue at the completion of all missions in a level. A player may distinguish him/herself in skill and comprehension by using a greater number of pieces. It shall be noted that the more complex a building object is, the more that it will cost. So therefore the comprehension that a square is composed of two right triangles will reward the player with more money left over in ones budget at the end of the mission. On easier levels there will be compound shapes such as a rectangle and a triangle concatenated together. In the spirit of more shapes being better the player will be rewarded for purchasing a triangle and a rectangle individually instead of the compound shape. The compound shapes will be available for children whose comprehension of geometry and symmetry is not at its zenith. As mentioned earlier the students will be rewarded for a greater comprehension of the material, and therefore through the scoring system encourage a greater knowledge of the mathematical subject.

There will be a timer present in the interface (optional feature in level one). There will be a limited amount of time to complete the mission proportional to the size and difficulty of the building. In context of the game dialog and plot, the player will be given a contract so to speak and the player must execute it under the allotted time or else suffer breach of contract penalties. The penalties will manifest themselves in the form of a reduced award. Eventually if the player takes long enough the reward will decrement it self to zero. If this is the case, then a reward of zero will be added to the revenue. Whatever budget surplus remains will still be added to the players score. It should be mentioned that this variable shall remain independent of time.

## **Level Descriptions**

Our game has three levels. The overall objective in each level is to “build” a city, one structure at a time. The structures in each level increase in complexity. In each level there is a shop, a work bench area, and a construction area. The player must buy shapes from the shop and move them to the work bench. The player has the ability to rotate and reflect the shapes, as needed in the work bench and then drag them to the construction area. The construction area has a ghosted image (blue print) of the structure we are trying to build. If the shape the player is trying to drag to the image fits, it snaps in place, otherwise it snaps back. Each level is optionally timed. You have ninety-nine dollars in your bank account to begin with. Each shape costs money. It is also possible to buy two or more smaller shapes to make a larger shape. The player is rewarded for buying smaller shapes instead of the larger ones, because the smaller shapes cost less. You may also sell shapes back to the shop, for half the price. This is a penalty for buying incorrect shapes. The player must complete 20 structures in each level to complete the level. At the end of the level, the player is rewarded with money. This bonus is based on the complexity of the structures completed, the number of shapes used to complete the project and the time taken to complete it.

The common aspects of each level are described in detail below:

### **Money**

The money aspect of the game is divided into three components: Capital, Award and Budget. Initially, a player is given \$99 for capital. Each project is allotted a certain budget and has an award associated with it upon completion.

### **Punishment for Buying Incorrect Shapes**

The consequence for purchasing an incorrect shape is that it can only be refunded for one fourth the amount that was spent on it in the first level, one third the amount in the second level and three fifths the amount in the third level. If the player should exceed the time limit for a given project, the award amount would start to decrement as time went on until it reached zero (if time limit is turned on).

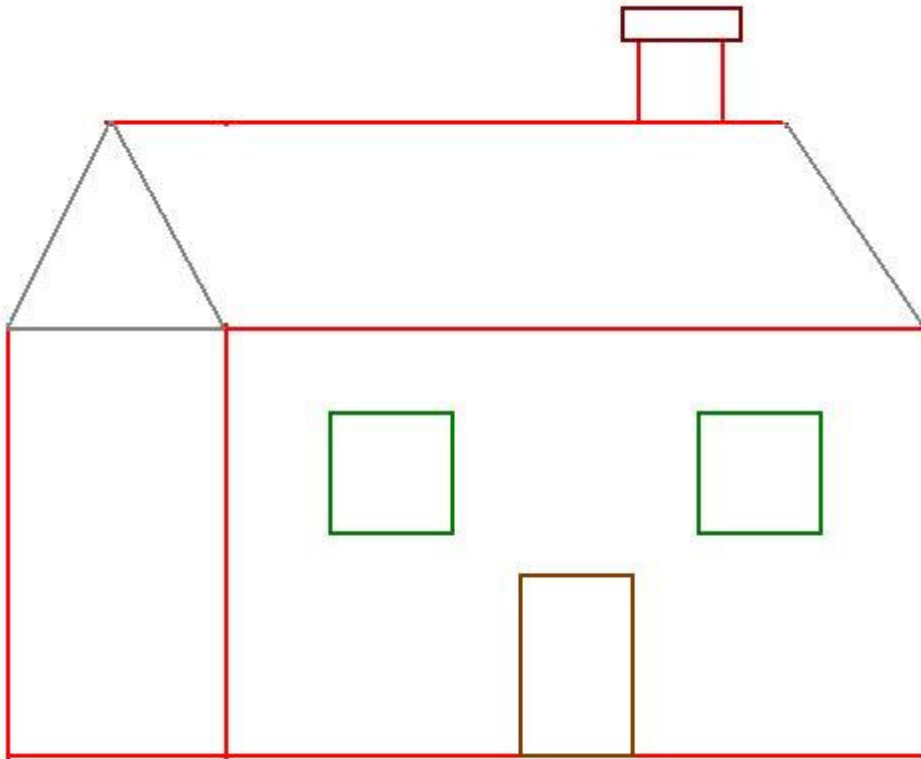
### **Cost**

The basic idea with the shapes is that bigger shapes cost more while smaller ones cost less. There are four basic shapes. They are: triangle, rectangle, trapezoid and square. The pricing for each is as follows: triangle (2 dollars), square (5 dollars), rectangle (11 dollars) and trapezoid (16 dollars). The pricing is significant because buying smaller pieces instead of one big piece is cheaper (For example, buying two squares, instead of a rectangle is cheaper. The two squares will cost you 10 dollars and the one rectangle will cost you 11 dollars).

The differences in each level are described below:

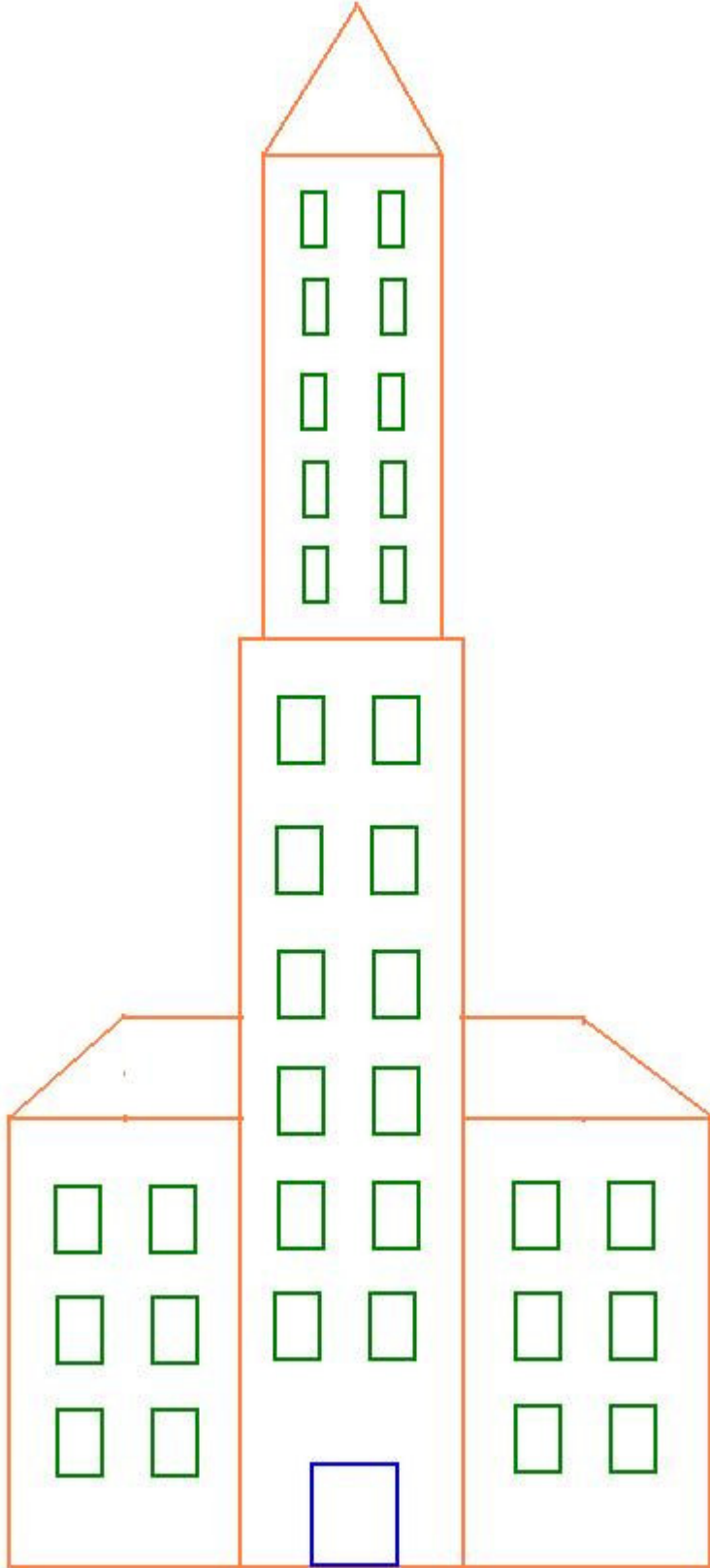
### **Level One**

You start out with ninety-nine dollars. In this level there is a shop, a work bench area, and a construction area. The player must buy shapes from the shop and move them to the work bench. The player has the ability to rotate and reflect the shapes as needed in the work bench and then drag them to the construction area. The construction area has a ghosted image of the structure we are trying to build. If the shape the player is trying to drag to the image fits, it snaps in place, otherwise it snaps back. The user has the option of turning time limit on or off. The time limit for each structure is based on the complexity of the structure. In this level the shapes in the shop are shown as pictures, making it easier for the player to identify which shapes he or she wants. The player then drags the shapes he or she buys into the workbench area. Here he/she can rotate or reflect the shapes as needed and then drag them onto the ghosted image in the construction area. The cost of the shapes is the same in each level, and has been outlined above in the “Shapes” section. Again once the player completes all the structures in this level, he/she receives a bonus which is based on the complexity of the structures completed, the number of shapes used to complete the project and the time taken to complete it. An example of a structure we may build in this level is below:



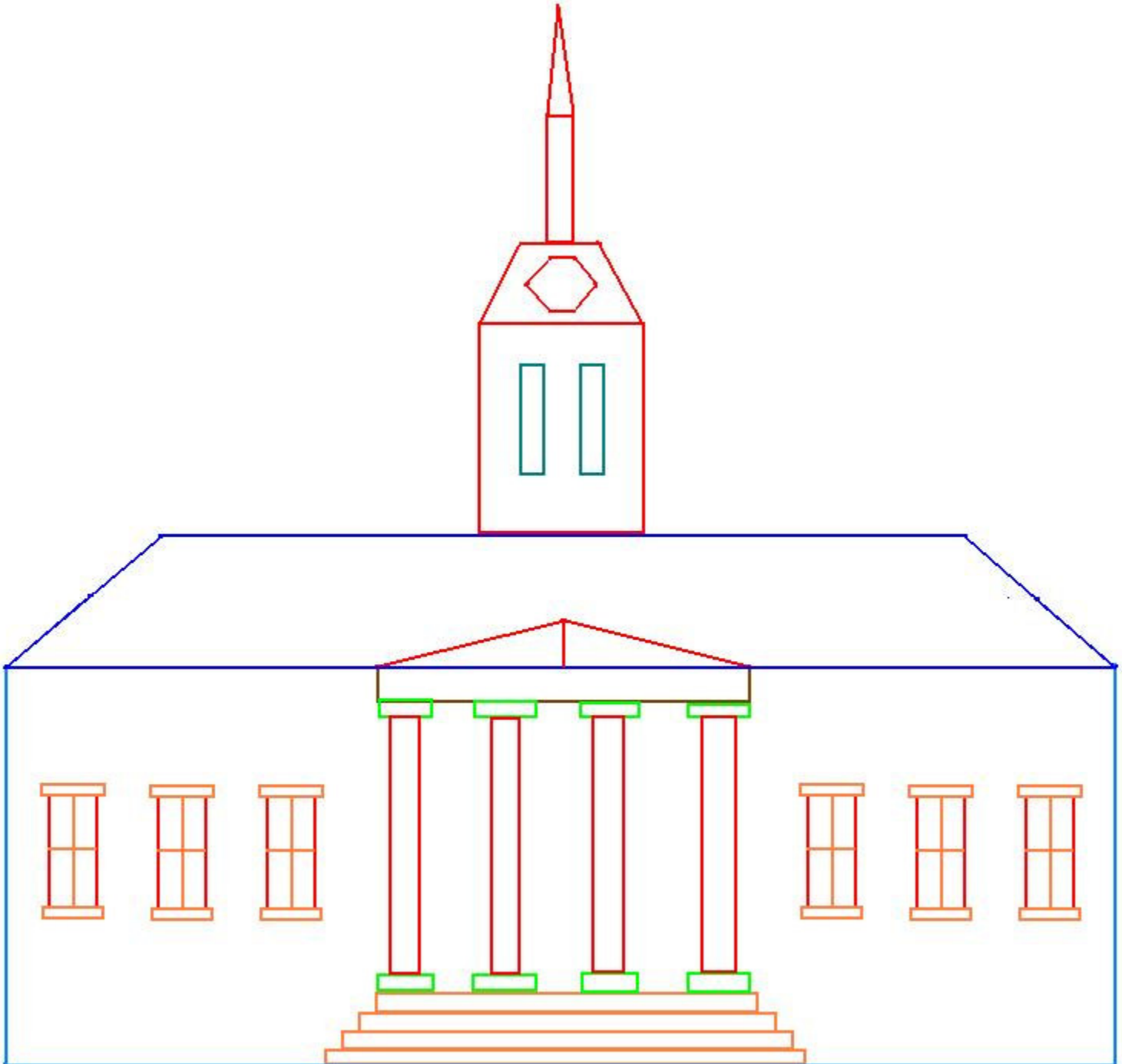
## Level Two

The differences in this level are as follows. You start off with a variable bank account, based on your bonus from level one. The shapes in the shop are identified by name, instead of pictures. The structures are more complex. An example of a structure we may build in this level is shown below:



### Level Three

The differences in this level are as follows. You start off with a variable bank account, based on your bonus from levels one and two. The shapes in the shop are identified by characteristics, instead of pictures or name. The structures are the most complex. An example of a shape we can build in this level is below:



## Walk-Through of Level 1

Level 1 begins in the shop in which the player is presented with a “blueprint” of the structure he/she is to build, along with their budget for the current project, revenue earned thus far, and the potential financial reward for completing the current project, as well as the items available for purchase. Although the structure will be randomly selected, and the budget will be established accordingly, the player will be provided with enough money to purchase the pieces necessary to build such a structure, whether it is with the least (largest) or most (smallest) pieces. The pieces available are triangles, squares, rectangles, and trapezoids. Many of these shapes can be constructed from the others, and these shapes are priced accordingly- a combination of small shapes used to make a bigger shape is cheaper than just buying the larger shape. The construction foremen (Bob the Builder or Wendy) are present to provide assistance.

For example: Two triangles can be used to form a square, and four triangles can be used to form a rectangle, as can two squares. A rectangle and two triangles can be used to create a trapezoid, as can two squares and two triangles or six triangles.

The shapes must be positioned correctly to conform to the outline of the structure. As such, a “work bench” is provided which allows the player to rotate and reflect the shape accordingly. So, upon dragging a shape into the work bench, the player can customize its position.

The player will then drag-and-drop shapes onto a graphical outline of the structure. These shapes will “snap-to” the area to which they are being dragged, assuming they fit in that area. Otherwise, these shapes will return to the “work bench.” The player will also be able to return to the shop to purchase more shapes, if necessary. The player can return unneeded items with a penalty of only being returned half of the amount used to purchase the item. These items cannot be carried over from project to project. So, if any such items are purchased, they are lost at the end of that particular construction, and no refund is given. If the game is played in timed mode (optional), the clock will be running, so the player must ensure that he/she completes construction within the allotted time for that structure. Assuming the player completes the structure in the time allotted (if playing in timed-mode), he/she will receive one-hundred percent of the financial reward for completing the project. Otherwise, the reward will decrease as time passes until it reaches zero.

As the player must build an entire city, this process is repeated twenty times, for twenty different structures. Upon the completing all of these structures, the player is rewarded with a 3D animation of the city “coming together,” with fireworks, etc. The player will also be offered the option to enter his/her name (much like an 80’s arcade game) if he/she finishes among the top ten players (most money).