Mission Statement:

Our mission is to create tangible experiences for children to help them understand the concept of fraction through interactive stories that explore the relationship between the whole and parts. Research has shown that children in the preoperational stage of development learn best through physical manipulation. Beachball allows abstract concepts such as fractions to be mapped to the physical world and provides immediate feedback. In the long term, we want our product to be integrated with existing educational platform such as Khan Academy, to deliver real-time educational analytics.

Price:

Beachball will be sold for Retail price at $150 each. And we will lease our products at $120 / unit per year, for educational price. The MSRP (Manufacturer's Suggested Retail Price) is $149.

Cost:

The product cost for each unit is $61.09 (current US Dollars). That breaks down into $46 for Material costs per product, $14.5 for Labor costs per product for operating machines, assembly, and packaging, $0.59 for Production costs per product.

Product Functionality:

Beachball has one master node and six slaves. Each node uses a RFM12B-S2 transceiver to communicate with the master node while the master uses a IOIO board with a Bluetooth dongle to communicate with the Android tablet. The Android application updates based on successful completion of the current task.

The pieces are snapped together by magnets, and each piece has a unique magnetic IDs with linear hall effect sensors. Each piece has a Teensy 3.0 microcontroller that reads messages from the master node.
When a user takes a piece out, that piece will turn into a different color from the rest, to represent the one-sixth. When two pieces are taken out, these two will turn into another color which represents one-third. When three pieces are taken out, the color will remain the same as the rest, to represent a-half.

**Intended Market**

We’re continuing to experiment with our business model, but the two most promising models target very different markets. The first model, which we are calling K-5 Subscribe, targets technologically-savvy schools in its first three years, and expanding to a wider school audience shortly thereafter. The second model, which is the Toy model, places Beachball on the shelf at retailers as a direct-to-consumer educational product. We’ll examine both markets in series below.

**Model 1: K-5 Subscribe**

*Description*

Beachball has high capital cost, which is a barrier to getting our product into as many kids’ hands as possible. We’ve developed a subscription model which will maximize exposure while providing Beachball with a reliable revenue stream. Elementary schools will engage with
Beachball to lease quantities of the product to supply their math courses - typically one product per eight students, to allow for rotation of classes during the day. Beachball provides maintenance service, teacher training, and curriculum development. The client school pays a negotiated annual rate for the product plus whatever added service is needed.

Finally, after good market penetration has been achieved, Beachball will sell math education analytics derived from the Beachball device and app to parties interested: Khan Academy, Coursera, and other to-be-determined players in the online educational content space.

**Sizing**

Previously limited to exclusive private schools or thematically-focused charter schools (e.g. High Tech High), mobile computing, specifically the iPad, is finding rapid inroads into general public schools. As of September 27, 2012, 1.5 million iPads have been sold to the education market, of which approximately 8% were to primary education institutions of grades k-5 (target range for fraction instruction). Assuming a purchase size of 200 iPads per institution, we conclude that 600 schools are 'Beachball-ready.' To facilitate simultaneous use in two mathematics classrooms at once, with 30 students per class, we deliver 60 Beachballs to each school, for an initial market size of 36k units, which at a more realistic 10% adoption, we reduce to 3600 units for the first year. Given our retail price of $150, we will lease our products to schools at $120 / unit, annually, including maintenance; curriculum development, teacher training, and other services will add up to $8k/year per school. This brings the immediately addressable market to $432k (product) + $480k (service / training) = $912k, with a total addressable market of $4.3 million (product) + $4.8 million (service) = $9.1 million in the first year.

Mobile computing will only further permeate the education market, so we project a 20% annual increase in iPad-enabled schools for the next five years. Because schools are slow adopters, and procurement varies significantly from school district to district, we project a very slow year-over-year increase in Beachball market penetration of 5% annually. Assuming this growth, by year 5, we expect the immediately addressable market to be $2.7 million, with a total market of $30 million.

Finally, after sufficient market penetration is achieved, Beachball will be able to collect, analyze, and distribute math education analytics. This will be priced at $75k / year, and potential customers include Khan Academy, Scholastic, and other developers of educational content.

**Scenario**

Dr. Sarah Smith is the superintendent of Yoknapatawpha County schools. At a regional educational conference, she hears a presentation about K-5 math education using tangible computing, with Beachball mentioned as a vanguard of the movement. Using Race to the Top funds, Dr. Smith procures 100 iPads for Faulkner Elementary, along with 60 Beachballs on a lease agreement for the school of 600 students.

In May 2013, Math teachers Bryan and Jesse attends curriculum development and training seminars at Beachball headquarters, where they master the Beachball device and learn key
ways that it can be integrated into their instruction plan. They bring it back to their classroom in August 2013, where Beachball, after a difficult introduction, is beloved and used daily by students as a math supplement. Test scores on abstract math for Faulkner increase, and Dr. Smith considers procuring more product.

Two years later, Khan Academy purchases weekly analytics data from Beachball to understand with very high temporal precision what concept areas in fractions are especially difficult. Khan Academy uses these insights to redevelop its offering around online math education for k-5.

**Model 2: Off-the-shelf**

*Description*

This is the conventional model: using conventional retail partners (Toys’R’us, Amazon, etc), Beachball channel sells to parents interested in getting their child a fun toy that has strong educational elements.

*Sizing*

As Beachball is an expensive for a toy, we will quickly try to position it as a higher-value educational implement. However, this limits our market significantly; for starters, we assume only families with incomes over $200k annually will be to afford it, representing 2.4 million households. Of these, we assume 200k households have children of fractions-learning age, and we expect 5% penetration in this market, for 10k households addressable.

At $150 a unit, we expect Beachball to have a total addressable market of $1.5 million.

*Scenario*

Sarah Smith is a mother of three children. Seeing a report on Beachball’s success in Better Homes and Gardens, she decides to give it as a Christmas gift to her eldest son, Chip, 6. Chip is delighted to use Beachball with his family’s iPad, but after about six months of play, decides to discard the toy as he’s bored with it. Based on his improved report card, his mother endorses Beachball to other parents, and keeps on to her own because she appreciates the aesthetic and likes showing it off.

**Model and Market: Conclusions**

Based on this analysis, we believe the educational market to be a more stable, if more difficult to penetrate, market, and one that offers more promising growth. Also, as students interested in making a real impact, we believe that the educational market offers Beachball the greatest exposure to young minds, and thus, greatest societal impact.
Manufacturing Costs

We use a standard approach to characterize cost:

Product Cost = (D + T)/N + (M + L + P) + O/N

**D = Design and development costs = $240k.**

Beachball will require significant redesign for robustness and compliance with children’s toy protocols. Accordingly, we expect to have one full-time engineer and one hybrid engineer/standards expert to work at $40 / hour for 9 months ($115k) to develop the physical product. We will require a software developer and interface expertise for 3 months at $80 / hour ($78k) to develop our software interface. Together, along with patent lawyer fees ($500/hour for 40 hours - $20k), we strike total labor for development cost to be $220,000, with $20,000 in materials.

**T = Tooling costs = $60k.**

Making the complex outer shell parts of Beachball will require a hardened steel tool and likely a 10-ton press.

**N = Number of devices sold over the life of the product = 60k.**

**M = Material costs per product = (Plastic + Electronics) * 6 = (.18 + 7.50) * 6 = $46.**

Plastic is polycarbonate for a 2 cubic inch part. Electronics include custom PCB with mounted AtMega microcontroller, three LEDs, two hall effect sensors, wireless transceiver, and eight magnets. At volume, we expect these to cost $7.50 for each set (piece of sphere). This would be assembled by a third-party e.g. Foxconn.

**L = Labor costs per product for operating machines, assembly, and packaging = $14.50.**

Significant assembly is required. Keeping final manufacturing, test, and assembly in the US is important to us and will become a key branding differentiator. We believe that with union partnerships, time-optimization, training, and clever use of jigs and rapid diagnostics, we can cut assembly and QA time to 30 minutes per Beachball. At union wage of $29/hour, this costs $14.50 per set of parts.

**P = Production costs per product = $.59.**

Developed from custompartnet.com

**O = Overhead costs (rental space, computers, telephone, electricity) = $5000/month for $60000 annually at 5 years, $300k.**

Office space in the bay area is extremely expensive, so this is an unexpected point of difficulty.

Product Cost = $61.09.
Target MSRP = $149, 140 % Markup.
Note that because our target customer is schools, we lease units at $120, with an $8k annual training/service contract. To support that contract, we anticipate a first-year expenditure of $100k, followed by $500k the second year, with $1 million annually thereafter. That subsidizes the development and support of service teams, training materials and content, and other critical tools to deliver meaningful support.

Also note that we operate on a subscription model, and treat 100% subscription upkeep - so once we make a sale, we realize revenue on that sale annually, and also assume supplementary annual training as well.

**Operational Costs**

Operational costs are divided into Marketing Costs and Miscellaneous Costs. Marketing cost includes marketing and sales expenses, forging partnerships with local schools, partnerships with renowned professors conducting research in the field and partnerships with various retail channels for distribution. Marketing cost is assumed to be 13% of net sales which approximately comes around to $30,000 in the first year. Miscellaneous costs includes legal and consulting fees, equipment costs, etc. It is assume to be 8% of the net sales, which approximately comes around to $18,000 in the first year.

**Organizational Structure**

Following chart shows the organizational structure of the company. Due to complexities of the project and multiple challenges on various fronts, functional divisions are preferred to the flat structure. This will allow various departments to focus on their own set of responsibilities and avoid distraction, allowing company as a whole to move forward in one consistent direction.
Competitive Landscape

Digital manipulatives and electronic educational toys have seen considerable academic and consumer interest in recent years so there will likely be strong competition for Beachball in an already crowded marketplace. The most successful product in the digital manipulatives space are Sifteo Cubes. Sifteos’ specs are definitely an upgrade from Beachball’s (LCD screen, 3-axis accelerometer, touch screen, more robust networking and proximity sensing, etc.) which might make the product more appealing to consumers trying to get the most bang for their buck. Sifteo also provides a platform which allows developers to create and sell their own applications and repurpose the cubes for novel interactions. While technically more advanced than Beachball, Sifteo lacks focus on a particular domain/application which we feel hurts the learning process. We see Sifteo’s lack of focus as an opportunity for Beachball to increase the appeal of the product to educators and/or parents.

Beachball is fairly competitive with Sifteo from a price perspective. A three pack of Sifteos retails for $129.95 with individual add on pieces retailing for $29.95 per cube while a six pack of Sifteos retails for $199.95. In the off-the-shelf model, Beachball retails for $149. Beachball is cheaper but lacks some of the bells and whistles. To increase competitiveness with Sifteo, Beachball should either focus on reaching the $99 dollar price point and/or add additional sensors/functionality such as an accelerometer or additional math applications to increase perceived value.

Another competitor to Beachball, Cuisenaire Rods, have been on the market for decades and use different colors and lengths to teach the base 10 number system. Unlike Sifteo or Beachball, these blocks are not digital meaning they do not provide dynamic feedback as the child uses them. On the plus side, they are incredibly cheap, around $20 for a complete set, however, in this electronic age, we do not feel that traditional blocks are a serious threat.
### 5 Year Cost Model

Note, at 60 Beachballs / school, 3000 units sold represents contracts with 50 new schools.

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Sale Price</strong></td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td><strong>B. # Units Sold</strong></td>
<td>900</td>
<td>2000</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td><strong>C: Net Sales</strong></td>
<td>228000</td>
<td>1241333</td>
<td>2457333</td>
<td>3926666</td>
<td>5699999</td>
</tr>
<tr>
<td><strong>D: Cumulative Net Sales</strong></td>
<td>228000</td>
<td>1469333</td>
<td>3926666</td>
<td>7853332</td>
<td>13553331</td>
</tr>
<tr>
<td><strong>E: Unit Cost (Target)</strong></td>
<td>71.09</td>
<td>71.09</td>
<td>71.09</td>
<td>71.09</td>
<td>71.09</td>
</tr>
<tr>
<td><strong>F: Cost of Product Sold</strong></td>
<td>163981</td>
<td>642180</td>
<td>1213270</td>
<td>1213270</td>
<td>1213270</td>
</tr>
<tr>
<td><strong>G: Gross Margin</strong></td>
<td>64019</td>
<td>599153</td>
<td>1244063</td>
<td>2713396</td>
<td>4486729</td>
</tr>
<tr>
<td><strong>H: % Gross Margin</strong></td>
<td>39.04</td>
<td>93.30</td>
<td>102.54</td>
<td>223.64</td>
<td>369.80</td>
</tr>
<tr>
<td><strong>I: Development Cost</strong></td>
<td>150,000</td>
<td>150,000</td>
<td>150,000</td>
<td>150,000</td>
<td>150,000</td>
</tr>
<tr>
<td><strong>J: Marketing (40%)</strong></td>
<td>91,200</td>
<td>496,533</td>
<td>982,933</td>
<td>1,570,666</td>
<td>2,280,000</td>
</tr>
<tr>
<td><strong>K: Other/Overhead (10%)</strong></td>
<td>22,800</td>
<td>124,133</td>
<td>245,733</td>
<td>392,667</td>
<td>570,000</td>
</tr>
<tr>
<td><strong>L: Total Operating Expense</strong></td>
<td>264,000</td>
<td>770,667</td>
<td>1,378,667</td>
<td>2,113,333</td>
<td>3,000,000</td>
</tr>
<tr>
<td><strong>M: Pretax Profit</strong></td>
<td>(199,981)</td>
<td>(171,514)</td>
<td>(134,604)</td>
<td>600,063</td>
<td>1,486,730</td>
</tr>
<tr>
<td><strong>N: % Profit</strong></td>
<td>-75.75</td>
<td>-22.26</td>
<td>-9.76</td>
<td>28.39</td>
<td>49.56</td>
</tr>
<tr>
<td><strong>O: Cumulative Profit</strong></td>
<td>(199,981)</td>
<td>(171,514)</td>
<td>(134,604)</td>
<td>600,063</td>
<td>1,486,730</td>
</tr>
</tbody>
</table>