

Science Team Challenge



"Exploring the world God has placed us in!"

Thursday, March 19th

St. Paul's First Lutheran School

11:00am to 3:00pm

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GENERAL GUIDELINES FOR "SCIENCE TEAM CHALLENGE" S.T.C.

1. The "Science Team Challenge"(STC) exists to provide students a fun, inquiry based science competition to explore the world God has placed them in.
2. The STC will be used solely as an in-school competition.
3. STC teams will consist of teams with **four students**. In classrooms with a student number that is not a multiple of four, create the minimum number of **three-student teams**.
4. Teams for STC will be approved by the teacher prior to the competition.
5. Each team in the STC may compete in all of the scheduled events, but they may only compete in each event once.
6. Each team will have a STC score sheet. The team should report to their teacher after each event to report scores. This will allow the teacher to monitor the progress of their class during the competition. Score sheets will require a signature of the supervising adult at each event.
7. To avoid over-crowding at events, teachers will assign teams to at least two events to begin the competition.
8. Each team may take as long as they like to complete each event, with the exception of timed events. Each event will have specific rules in which the participants must follow.
9. Teachers collect each team score sheet at end of the competition.

GUIDELINES FOR EVENT SUPERVISORS "SCIENCE TEAM CHALLENGE"

1. STC teams will consist of four students. There may be an exception with a team of three students.
2. Each team will arrive at your station with a "TEAM SCORE SHEET".
3. After you determine the total score for the event, place it in the designated column and place your SIGNATURE next to it. SCORES OF 0, 1, and 10 SHOULD BE WRITTEN IN CURSIVE. (*Zero, one, ten*)
4. Students may not use more than the designated materials. Once given the material, students must do the best they can-even if they destroy or lose material.
5. Each team may only complete an event once.
6. You should be able to accommodate 3-4 teams at your station at a time. If a long waiting time develops, please advise the students to try another event and return later in the period.
7. Any team using more than the allotted materials may receive a zero for that event.
8. Each of these events can be improved upon for the following year. As the day progresses, please take the time and jot down notes. Improvements can be made in scoring procedures, the materials used or the usefulness of the event itself.
9. Enjoy your time with the students and thank you for your generous donation of time and energy!



"SCIENCE TEAM CHALLENGE"

Team Score Sheet

Team Name: _____ School: _____

Team Members and Grade:

1. Grade:	2. Grade:
3. Grade:	4. Grade:

Teacher: _____

Event	Total Score	Event Supervisor
Reflection Relay		
Rubber Band Cannon		
Grab a Gram		
Aerodynamic "Airplane"		
Large Barge		
Orienteering		

Projectile Motion		
Egg Drop		
Slow Roll		
Straw Tower		
Stack It Up!		



"SCIENCE TEAM CHALLENGE" Teacher Score Sheet

Teacher Name: _____

Team Names →

Event										
Reflection Relay										
Rubber Band Cannon										
Grab a Gram										
Paper Airplane										
Large Barge										
Orienteering										
Projectile Motion										
Egg Drop										
Slow Roll										
Straw Tower										
Stack It Up!										

"REFLECTION RELAY"

Description: Participants will position 4 mirrors around a room so that a light from a bright source (laser) is bounced between all four mirrors to a bulls-eye target.

Materials (per team):

- 4 mirrors (6" x 6")
- 1 laser (operated by supervisor)
- 1 target

1. Position the projector and target in the room similar to figure 1. Try positioning the projector and target at different heights.



Figure 1

2. Students must position themselves around the room along the outer wall.
3. The light must be reflected to each of the 4 mirrors and finally to the target.
4. The beam must stay on the target for a count of 5.

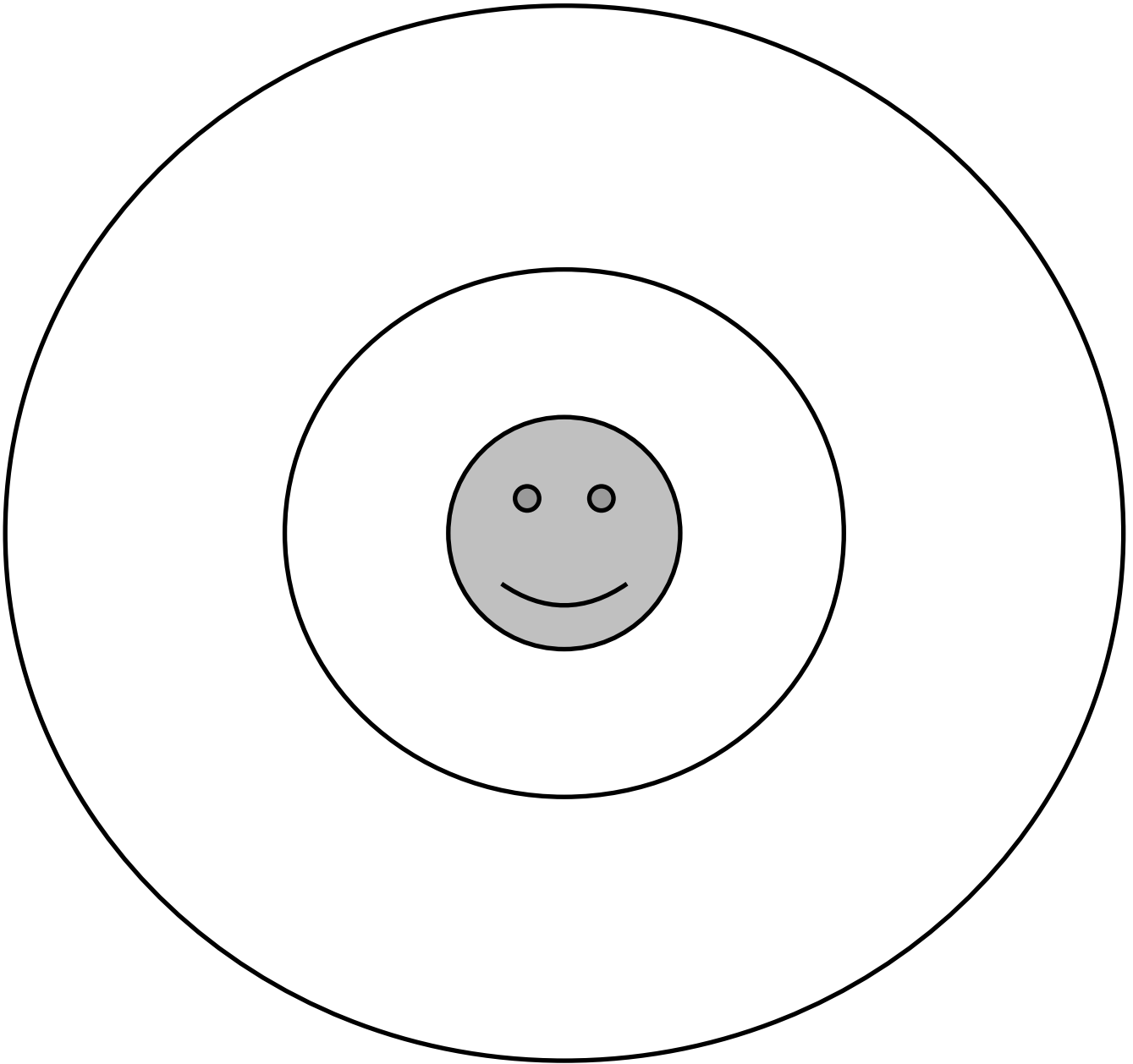
Scoring: Scores will be assigned based on the time it takes to complete the task.

Size of the room will change the difficulty of the task. You may wish to adjust the following suggested scoring according to your own needs.

10pts	under 60 seconds	5 pts	181 – 210 sec.
9 pts	61 – 90 sec.	4 pts	211 – 240 sec.
8 pts	91 – 120 sec.	3 pts	241 – 270 sec.
7 pts	121 – 150 sec.	2 pts	271 – 300 sec.
6 pts	151 – 180 sec.	1 pt	301 + seconds

Keeping time is the responsibility of the event supervisor.

Target



"AERODYNAMICS"

Description: Participants will design, construct and fly aerodynamic device(s) which are flown to a specific target 25 feet away.

Materials (per team):

In one standard file folder (letter size):

Four 8 1/2" x 11" pieces of standard copy paper

Four adhesive labels – 1" x 2 1/2"

8 paper clips

To Share:

Scissors

Rulers

Pencils

Small desk

Materials (Event Supervisor):

Hula Hoop

Tape Measure

Masking Tape

1. **Layout the field as shown in figure 1.**



Figure 1

2. **Students will build up to four aerodynamic devices at the competition with the materials provided by the event supervisor. The file folder may be utilized. Not all of the above listed materials need to be used. However, no other materials may be used. Devices may be airplanes, helicopters, fling rings, or any other aerodynamic design that produces lift (not a wadded ball, etc.)**
3. **After the team completes all of the designs desired with the allotted materials, they may test the planes. Any device not launched at this time will not be considered for scoring. All energy imparted to the device must originate from the participant's throwing arm.**
4. **The team will be allowed a maximum of four flights. This may be any single device, launched four times, or four devices launched individually. Any team member may be designated to launch any device. The "launchers" feet must remain behind the designated point. Students may have one re-launch in the case of a foot fault (foot crossing the launch line). A second foot fault will result in a score of zero.**

5. The device which lands closest to the center of the target will be the scoring flight. All aerodynamic devices will be returned to the event supervisor following the event.
6. Each flight is measured from the center of the hula hoop to the device's landing point. **MEASUREMENT IS DETERMINED BY WHERE OBJECT FIRST TOUCHES THE GROUND, NOT WHERE IT SLIDES TO!**

Scoring: Scores will be assigned based on the accuracy of the flight.

10 pts	Inside target	5 pts	6 ft – 7 ft
9 pts	2 ft – 3 ft	4 pts	7 ft – 8 ft
8 pts	3 ft – 4 ft	3 pts	8 ft – 9 ft
7 pts	4 ft – 5 ft	2 pts	9 ft – 10 ft
6 pts	5 ft – 6 ft	1 pts	10 ft – 11 ft

Measurement will be the responsibility of the event supervisor. The team may select which of the devices should be measured for scoring.

"FOIL BOAT"

Description: Participants will construct a barge out of a given material which will support the greatest load without sinking.

Materials:

Four pieces of aluminum foil
300 1/4" washers
plastic basin (18"x24") filled with 3-3½ inches of water

Materials(event supervisor):

2 large plastic storage boxes (18" x 24")
600 1/4" washers
paper towels
small garbage can, pitcher, or jug to transfer water

Competition:

- 1. Each team will be given four pieces, and only four pieces, of aluminum foil with which to construct the barge.**
- 2. Each team may construct four barges.**
- 3. A barge may be made of only ONE PIECE of foil.**
- 4. No other materials may be used to construct the barge.**
- 5. The team will tell the event supervisor when they are ready to begin and they will place the washers into their barges, filling one barge at a time.**
- 6. Washers are added ONE AT A TIME.**
- 7. Each team's score is determined by adding together the number of washers held by each of the four barges.**
- 8. A barge is finished when it sinks.**

Scoring:

10 points	>200 washers
9 points	195 - 200
8 points	180 - 194
7 points	160 - 179
6 points	140 - 159
5 points	120 - 139
4 points	100 - 119
3 points	80 - 99
2 points	50 - 79
1 points	<50
0 points	Boat sinks with no load

"GRAB A GRAM"

Description: Student teams will cooperate to pick up four different substances (water, sand, paper clips and cedar shavings) in the assigned amounts, not to exceed 100 grams.

Materials: 5 clear tennis ball containers (of IDENTICAL WEIGHT-30 grams)

400 grams of sand

400 grams of cedar shavings

400 grams of water

400 grams of paper clips

Reference weights: 40, 60, 80, 100 grams (washers tied to a string)

2 calculators

20 plastic cups used for "scoops"

Competition:

1. Each team member is assigned one reference weight.
2. Each team member is assigned the appropriate substance they will measure.
3. Substances:
 - 40 grams of cedar shavings
 - 60 grams of sand
 - 80 grams of paperclips
 - 100 grams of water
4. Each team member will attempt to pick up an amount of the selected substance equivalent to the reference weight they were assigned.
5. Each team member will place the substance into the clear tennis ball containers.
6. When all four team members are finished, all four containers will be weighed individually.

Scoring: Maximum score per team – 10 points

Scores will be assigned according to the following scoring tables(figures 1-4), added together and then divided by four.

Event Supervisors: You will need...

1. Plastic cups for "scoopers"
2. Enough materials for 3 teams
3. Reference weights (washers tied on string)
4. Scoring tables
5. 1 scale / balance (electronic, if possible)
6. 2 calculators
7. 12+ clear tennis ball containers

"Grab a Gram" scoring tables:

Target weight: 40 grams (tennis ball container weighs 30 grams)

	Points	
70 grams	10	70 grams
65-69	9	71-75
60-64	8	76-80
55-59	7	81-85
45-54	6	86-90
35-44	5	91-95
30-34	4	96-100
20-29	3	101-110
10-19	2	111-120
0-9	1	>120

Target weight: 60 grams (30 gram container)

	Points	
90	10	90
85-89	9	91-95
80-84	8	96-100
75-79	7	101-105
70-74	6	106-110
65-69	5	111-115
60-64	4	116-120
50-59	3	121-130
40-49	2	131-140
<40	1	>140

Target weight: 80 grams (30 gram container)

	Points	
110	10	110
105-109	9	111-115
100-104	8	116-120
95-99	7	121-125
90-94	6	126-130
85-89	5	131-135
80-84	4	136-140
70-79	3	141-150
60-69	2	151-160
<60	1	>160

Target weight: 100 grams (30 gram container)

	Points	
130	10	130
125-129	9	131-135
120-124	8	136-140
115-119	7	141-145
110-114	6	146-150
105-109	5	151-155
100-104	4	156-160
90-99	3	161-170
80-89	2	171-180
<80	1	>180

"RUBBER BAND CANNON"

Description: A team of four students will use a "cannon" device to shoot a rubber band at a target that is placed within a given range.

Materials: Rubber bands – about 1 lb. of size 16
 Cannons
 Targets
 Masking Tape for target area

Competition:

1. Layout target area similar to figure 1 below.

2	3	4	5	7	5	4	3	2	
			7	8	7				
					9				
		6	8	10	8	6			
			7	8	7				
		4	5	7	5	4			

1/2 meter between vertical lines except for the middle section (1 meter)

Launch area (cannon) should be located approximately 2 meters from the edge of the target area.

2. Students will be provided a cannon and 12 rubber bands.
3. Targets will be rectangular in shape and placed at a predetermined distance from the cannon.
4. The base of the cannon may not extend beyond the starting line.
5. Contestants will shoot three rubber bands each. (Note: A team of three will shoot four bands each...each team to receive 12 rubber bands.)

- 6. Rubber band size: 16 – Note: for size reference, the rubber band extends to about 15 cm when cut and placed in a line.**
- 7. Students may have a practice period, not to exceed three minutes. Once the team chooses to begin the competition all rubber bands fired from the cannon count for a score.**
- 8. Each team will complete the event in FIVE MINUTES.**

Scoring: Points are given for each rubber band according to where the rubber band lands in the target area. Supervisor will determine scores for rubber bands which rest on a line. Final score for the team is calculated by taking the teams total points for 12 rubber bands and dividing by 12.

Any rubber band that contacts the ceiling or a wall before landing on the ground will receive a "0" score for that attempt.

Scoring decisions of the event supervisor will be final.

"ORIENTEERING"

Description: Students will navigate a numbered court. They will use metric length measurement and directional skills to correctly find the final position.

Materials: Each team will be provided:

- A meter stick
- A pencil
- A set of directions – either A, B, C, or D
- A compass

Competition:

1. Layout course similar to figure 1 below.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

-Figure 1

Numbers are approximately 2 meters apart

- 2. Students will be told all measurements are approximate and to select the closest number to write in each blank space.**
- 3. The students may be reminded that:
100 cm = 1 meter = 1000 mm**
- 3. Students will walk the course.**
- 4. There is no time limit.**

Scoring: Students will receive a point for each blank with the correct number filled in. Highest possible score: **11**

Event Supervisor:

- Copies of all four sets of directions
- 4 meter sticks

- **6 pencils**

- **6 clip boards**
- **Notes:**
 - **all degree measurements are in multiples of 45.**
 - **Navigation sheets were created from grid with space 1 at the North West corner.**
 - **Course can be laid out differently but answers will vary from the provided sheet. Example: numbers may be spaced 1 meter apart instead of 2 meters**

- **SIMPLIFICATION: Mark "NORTH" on your grid and eliminate the use of a compass.**

Group A
All numbers are approximate from center of number to center of next number. Always choose the closest number!

Begin at 1

Proceed south 3.7 m

East 550 cm

Turn counterclockwise 45 degrees and move to next number

Go south 3700 mm

Turn Clockwise 135 degrees and move to the next number

East 185 cm

Turn clockwise 180 degrees. Move 740 cm

North 1850 mm

SouthEast 2 m

West 1850 mm

Go north 3.7 meters

Group B
All numbers are approximate from center of number to center of next number. Always choose the closest number!

Begin at 1

Proceed east 3.7 m

South 555 cm

Turn counterclockwise 45 degrees and move to next number

Go north 3750 mm

Turn Clockwise 135 degrees and move to the next number

East 180 cm

Turn clockwise 180 degrees. Move 740 cm

North 1850 mm

SouthEast 2 m

West 3700 mm

Turn clockwise 90 degrees. Move 5.5 m

Group C
All numbers are approximate from center of number to center of next number. Always choose the closest number!

Begin at 1

Proceed south 7.4 m

East 740 cm

Turn counterclockwise 45 degrees and move to next number

Go East 3700 mm

Turn Clockwise 135 degrees and move to the next number

East 185 cm

Turn clockwise 180 degrees. Move 740 cm

North 1850 mm

SouthWest 2 m

North 7400 mm

Turn clockwise 90 degrees. Move 3.7 m

Group D
All numbers are approximate from center of number to center of next number. Always choose the closest number!

Begin at 1

Proceed south 7.4 m

East 555 cm

Turn counterclockwise 45 degrees and move to next number

Go East 3700 mm

Turn Clockwise 135 degrees and move to the next number

East 185 cm

Turn clockwise 180 degrees. Move 740 cm

North 1850 mm

SouthEast 2 m

North 7.4 m

Turn clockwise 90 degrees. Move 5.5 m

Group A
All numbers are approximate from center of number to center of next number. Always choose the closest number!

Begin at 1

Proceed south 3.7 m

East 550 cm

Turn counterclockwise 45 degrees and move to next number

Go south 3700 mm

Turn Clockwise 135 degrees and move to the next number

East 185 cm

Turn clockwise 180 degrees. Move 740 cm

North 1850 mm

Southeast 2 m

West 1850 mm

Go north 3.7 meters

Group B
All numbers are approximate from center of number to center of next number. Always choose the closest number!

Begin at 1

Proceed east 3.7 m

South 555 cm

Turn counterclockwise 45 degrees and move to next number

Go north 3750 mm

Turn Clockwise 135 degrees and move to the next number

East 180 cm

Turn clockwise 180 degrees. Move 740 cm

North 1850 mm

Southeast 2 m

West 3700 mm

Turn clockwise 90 degrees. Move 5.5 m

Group C
All numbers are approximate from center of number to center of next number. Always choose the closest number!

Begin at 1

Proceed south 7.4 m

East 740 cm

Turn counterclockwise 45 degrees and move to next number

Go East 3700 mm

Turn Clockwise 135 degrees and move to the next number

East 185 cm

Turn clockwise 180 degrees. Move 740 cm

North 1850 mm

Southwest 2 m

North 7400 mm

Turn clockwise 90 degrees. Move 3.7 m

Group D
All numbers are approximate from center of number to center of next number. Always choose the closest number!

Begin at 1

Proceed south 7.4 m

East 555 cm

Turn counterclockwise 45 degrees and move to next number

Go East 3700 mm

Turn Clockwise 135 degrees and move to the next number

East 185 cm

Turn clockwise 180 degrees. Move 740 cm

North 1850 mm

Southeast 2 m

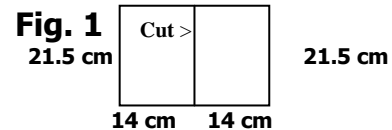
North 7.4 m

Turn clockwise 90 degrees. Move 5.5 m

"PROJECTILE MOTION"

Description: To successfully place your paper projectile in a proper parabolic path into a downrange target.

Materials: 12 sheets of paper (21.5cm x 14cm) fig.1 – same color per team
Each team receives a different color so that multiple teams can participate simultaneously and the event supervisor will be able to score separately.



2-4 paper cannon launch devices
33 gallon garbage can for target
Tape to mark off point area, about 4' x 4', with garbage can placed in center.

2-4 tables (8ft) for launch area
-Place tables equidistant (3 meters) from target area.
(fig. 2)

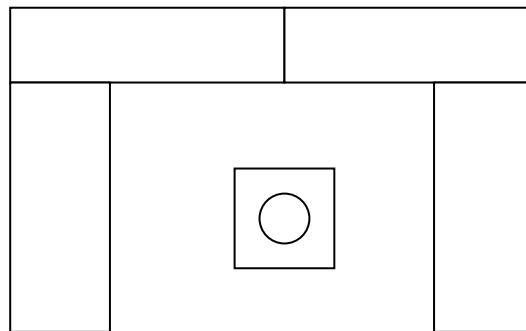


Fig. 2

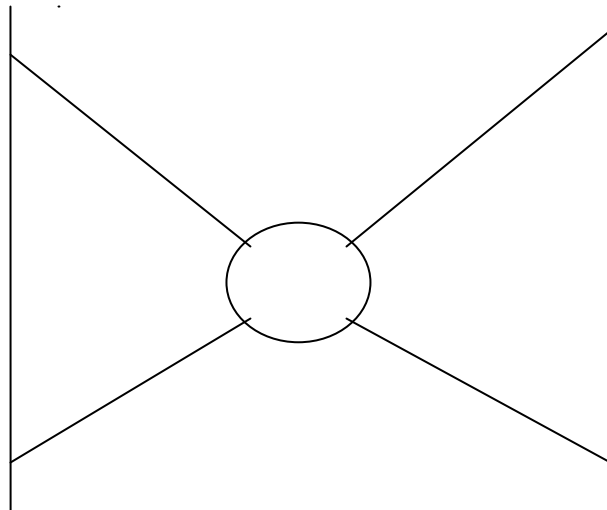
Competition:

1. Teams will divide paper equally among team members.
2. The competitors will fashion the paper into any desired projectile shape. No additional materials may be used.
3. The launch site will be a table and the target will be a standard 33 gallon garbage can. Official launchers will be used.
4. The target will be 3 meters from the launch tables.
5. Each cannon ball will be launched one at a time.
6. The base of the launcher may be moved but **MUST** be kept behind the outer edge of the table at all times.

- Scoring:**
1. Each team member will have 5 attempts (20 shots per team).
 2. 2 points for each paper landing in the target
 3. 1 point for each paper cannon ball landing in the designated target area
 4. **FINAL SCORE:** Total points of team divided by number of teammates.
 5. **Maximum Score per team: 10 points**

Event Supervisor:

- paper balls can be reused with different groups
- give fresh paper if requested
- use different colors to differentiate between different teams
- *have extra rubber bands, pre-bundled paper in packs of twelve, broom
- *masking tape left on floor too long may be difficult to remove



"Egg Drop"

Description: A team will construct a cargo crate to protect an egg from breaking. The crate will be dropped free fall from a spot selected by STC director.

Materials: "Egg Drop Kit"

One lunch bag containing the following:

15 drinking straws

15 wooden sticks

5 rubber bands

100 cm of string

100 cm of masking tape

1 raw egg

*students may select a Styrofoam cup OR a paper plate to add to their egg drop kit to be used in their design.

Scissors

Competition:

1. The team may use part or any part of the material listed.
2. Any team found to use more than the listed amount of materials will be disqualified.
3. When the team determines that the crate is complete, the event supervisor will direct them to the drop location. The team member selected will climb the platform and drop the crate and attempt to hit the target.
4. All parts of the crate must begin above the designated drop line.
5. Parachute and helicopter designs are permitted.

Scoring: Each crate will be dropped from a height of 1.5 meters and at a location designated by the event supervisor. The object of the contest is to land and remain on the center of the target area without breaking the egg (as defined by cracking the egg enough to leave a wet spot on a paper towel). The score will be determined by measuring the distance between the farthest edge of any part of the crate and the center of the target area.

0"-4" – 10 points	12"-15" – 5 points
4"-6" – 9 points	15"-20" – 4 points
6"-8" – 8 points	20"-30" – 3 points
8"-10" – 7 points	30"-35" – 2 points
10"-12" – 6 points	35"- or greater – 1 point

ANY TEAM WHOSE EGG BREAKS (liquid escapes) WILL RECEIVE 1 point for crate construction.

ANY TEAM WHOSE EGG CRACKS, with no liquid lost, will subtract 4 points from their final score-down to zero.

"SLOW ROLL"

Description: Teams will a course that a marble will follow as it travels from a down a board. Students will earn points for the slowest time for the marble to travel to the end position.

Materials:

One large board with Velcro loop attached to its face
2 funnels
1 marble per team
Assortment of PVC tubing with Velcro hook used for course design

Competition:

- 1. Each team will be given an assortment of PVC that is color coded to a board.**
- 2. Teams will arrange the PVC in any way that they choose as long as the marble is returned to the end position.**
- 3. Teams will have *five minutes* to complete their course and present it for competition.**
- 4. Event supervisor will start the stopwatch when the marble is released into the funnel and will stop the watch when the marble makes contact in the bottom end target.**
- 5. Teams will get one trial run; may take up to 1 minute to make changes.**
- 6. Marbles that stop and don't complete the course will receive one point for course design.**

Scoring:

Time	Points
0-1 seconds	1
1-2 seconds	2
2-3 seconds	3
3-4 seconds	4
4-5 seconds	5
5-6 seconds	6
6-7 seconds	7
7-8 seconds	8
8-9 seconds	9
9 + seconds	10

"STRAW TOWER"

Description: Students will build a straw tower that is able to support a tennis ball for thirty seconds.

Materials: per team

50 straws

paper clips

tennis ball (used by event supervisor)

Competition:

1. Each team will receive fifty, seven inch plastic drinking straws
2. Teams may use paper clips to bind the straws together in the building process.
3. No other materials may be used.
4. Teams will have thirty minutes to complete the task.
5. When the teams have completed the structure, the event supervisor will bring the tennis ball over to test the tower.

Scoring:

Tennis Ball supported for :30 seconds	Points awarded with tower height	Points awarded if Tennis Ball is supported for :10-:29 seconds	No points awarded if Tennis Ball is not supported for at least :10 seconds
4"-6"	10	1	0
6"-8"	11	2	0
8"-10"	12	3	0
10"-12"	13	4	0
12"-14"	14	5	0
14"-16"	15	6	0
16"-18"	16	7	0
18"-20"	17	8	0
20"-22"	18	9	0
22"-24"	19	10	0
24"-26"	20	11	0
26" +	25 bonus	12	0

"STACK IT UP!"

Description: Teams will use sixteen blocks of wood to build a "pier" or cantilever to extend as far as possible without touching the scoring placemat.

Materials:

**16 wooden blocks which measure: 1" x 4" x 9"
scoring placemat**

Competition:

- 1. Teams will be provided the wooden blocks and may stack them in any way to create the longest structure which is suspended above the placemat.**
- 2. No block may touch more than two other blocks at the same times.**
- 3. The "pier" or cantilever must be fully suspended and not touching any portion of the scoring placemat.**
- 4. This is not a timed event.**
- 5. The block "pier" or cantilevers are measured from the farthest outside edge of the bottom block to the outside of the "pier" or cantilever which is not on the placemat.**
- 6. The finished product must stand alone and cannot be stabilized in any way such as with a finger.**

Scoring: The placemat will display the score totals.

