FIRST® LEGO® LEAGUE

2017/2018 Challenge

HYDRO DYNAMICS℠

Solve problems using:

The Core Values

- We are a team.
- We do the work to find solutions with guidance from our coaches and mentors.
- We know our coaches and mentors don't have all the answers; we learn together.
- We honor the spirit of friendly competition.
- What we discover is more important than what we win.
- We share our experiences with others.
- We display Gracious Professionalism® and Coopertition® in everything we do.
- We have FUN!

The Season's Key Moments

If you need help, look at the sample schedule in the Coaches' Handbook or log into *FIRST*® Steps for a step-by-step guide to your season: http://info.firstinspires.org/fllfirststepsrequest

Read the Challenge. → **Register** for an event. → **Identify** problem and Mission strategies. → **Design** your robot and your Project solutions. → **Practice** your presentations and robot control. Refine as needed. → **Attend** an event and celebrate!

Download the rubrics to help prepare for your event: http://www.firstlegoleague.org/challenge

FIRST LEGO education

Solve problems in:

The Robot Game

- ***Read** the Robot Game Rules in the Challenge Guide: http://www.firstlegoleague.org/challenge*
- ***Identify** one or more Missions to solve*
- ***Design** a robot using LEGO® MINDSTORMS® that can solve the Mission(s)*

Missions as written below are only an overview. For full details, read the Challenge Guide.

Have you ever wondered how you get the water you use in your daily life? Whether it's to brush your teeth, quench your thirst, cook your food, or even take a swim – all of us need water! Does it come from the ground, a river or a lake? How do you make sure it's safe to drink, and what happens when it goes down a drain? In this season's HYDRO DYNAMICS℠ Robot Game, you'll explore these questions and many more, and you'll get to learn about the amazing engineering used to protect your most precious liquid asset – water!!

Note: **Asterisks tell you a specific METHOD is required, and must be observed by the referee. Underlined conditions must be visible at the END of the match.*

M01 - PIPE REMOVAL

*Move the Broken Pipe so it is completely in Base. **20 Points**

M02 – FLOW

*Move a Big Water (one time maximum) to the other team's field *only by turning the Pump System's valve(s). **25 Points**

M03 – PUMP ADDITION

Move the Pump Addition so it has contact with the mat and that contact is completely in the Pump Addition target. **20 Points**

M04 – RAIN

Make at least one Rain come out of the Rain Cloud. **20 Points**

M05 - FILTER

Move the Filter north until the lock latch drops. **30 Points**

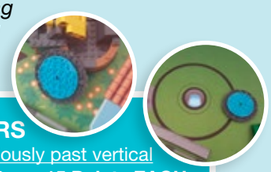
M06 – WATER TREATMENT

Make the Water Treatment model eject its Big Water, *only by moving the Toilet's lever. **20 Points**

M07 – FOUNTAIN

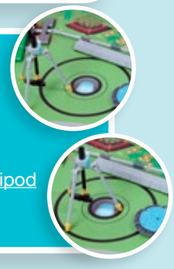
Make the Fountain's middle layer rise some obvious height and stay there, due only to a Big Water in the gray tub. **20 Points**

M08 – MANHOLE COVERS



Flip Manhole cover(s) over, obviously past vertical *without it/them ever reaching Base. **15 Points EACH**
FOR BONUS: Score 30 Manhole Cover points as described above WITH both covers completely in separate Tripod targets. **30 Points Added**

M09 – TRIPOD



Move the inspection camera Tripod so it is
FOR PARTIAL SCORE: partly in either Tripod target, with all of its feet touching the mat. **15 Points**
FOR FULL SCORE: completely in either Tripod target, with all of its feet touching the mat. **20 Points**

M10 – PIPE REPLACEMENT

(Install the Optional Loop first, in Base, if you wish.) Move a New Pipe so it is where the broken one started, in full/flat contact with the mat. **20 Points**

M11 – PIPE CONSTRUCTION

(Install the Optional Loop first, in Base, if you wish.) Move a New Pipe so it is
FOR PARTIAL SCORE: partly in its target, in full/flat contact with the mat. **15 Points**
FOR FULL SCORE: completely in its target, in full/flat contact with the mat. **20 Points**

M12 – SLUDGE

Move the Sludge so it is touching the visible wood of any of the six drawn garden boxes. **30 Points**

M13 – FLOWER

Make the Flower rise some obvious height and stay there, due only to a Big Water in the brown pot. **30 Points**
FOR BONUS: Score Flower Points as described above WITH at least one Rain in the purple part, touching nothing but the Flower model.
30 Points Added

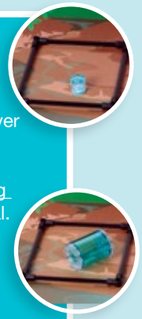
M14 – WATER WELL

Move the Water Well so it has contact with the mat and that contact is
FOR PARTIAL SCORE: partly in the Water Well target. **15 Points**
FOR FULL SCORE: completely in the Water Well target. **25 Points**

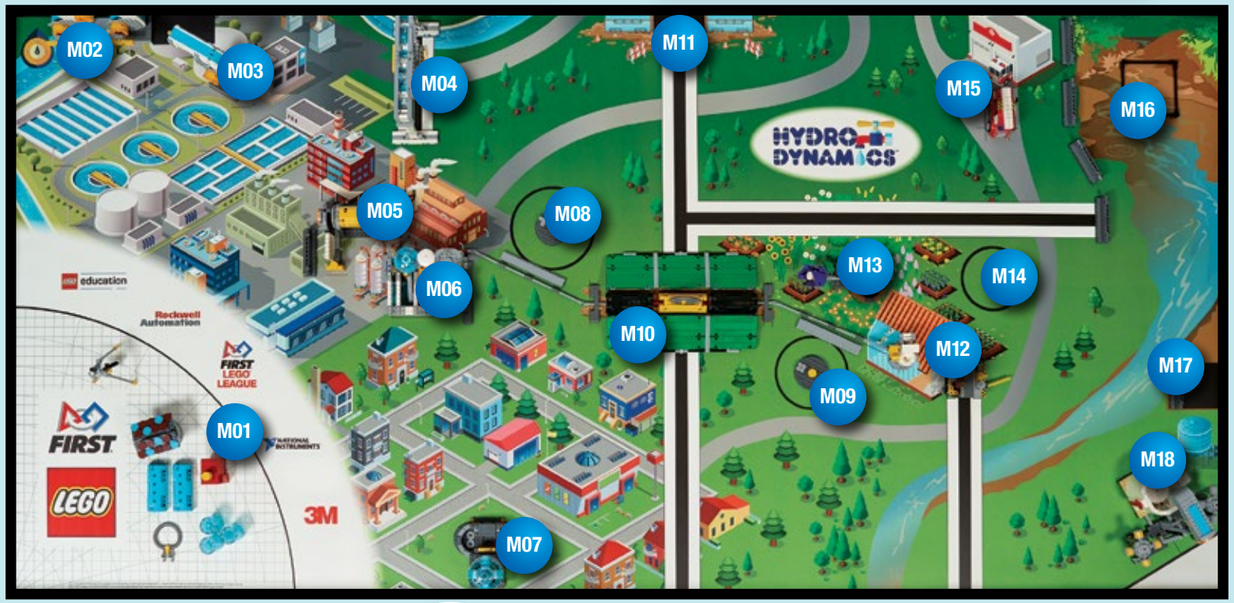
M15 – FIRE

Make the fire drop *only by making the Firetruck apply direct force to the House's lever. **25 Points**

M16 – WATER COLLECTION



Move or catch Big Water and/or Rain water (one Rain maximum; no Dirty Water) so it is touching the mat in the Water Target, *without the target ever reaching the white Off-Limits Line shown below. Water may be touching the target, and/or other water, but not be touching nor guided by anything else. Each water model is scored as an individual.
— At least one Rain: **10 Points**
— Big Water: **10 Points EACH**
FOR BONUS: Score at least one Large Water in its target as described above WITH one on top, which is touching nothing but other water. **30 Points**
(Maximum only one Bonus can score)



M17 – SLINGSHOT

Move the Slingshot so it is completely in its target. **20 Points**
FOR BONUS: Score Slingshot points as described above WITH the Dirty Water and a Rain completely in the Slingshot target. **15 Points Added**

M18 – FAUCET

Make the water level obviously more blue than white as seen from above the cup, *only by turning the Faucet handle. **25 Points**

The Robot Game Missions can provide real-world examples for your Project research. Learn about the stories behind the Missions in the Challenge Guide: http://www.firstlegoleague.org/challenge

PENALTIES: Before the match starts, the Ref removes the six red Penalty discs from the Field, and holds on to them. If you Interrupt the Robot, the Ref places one of the removed Samples in the white triangle, in the southeast, as a permanent/untouchable Interruption Penalty. You can get up to six such penalties, worth **-5 Points EACH**

Solve problems in **The Project**

- ***Identify*** a problem within the **human water cycle**
- ***Design*** a solution that makes this problem better
- ***Share*** your problem and solution with others

People use water every day, but they don't think much about how and why they use water. Whether it's directly (drinking or washing) or indirectly (manufacturing the products they use or producing food or energy), humans have a lot of different water needs. **Your Project challenge for the HYDRO DYNAMICS℠ season is to improve the way people find, transport, use, or dispose of water.**

Identify Think about all the ways you use water. These might include everything from quenching your thirst to swimming in a pool or lake. Water might be part of the process used to produce your food, energy, mobile phones, or other products. You probably use water in ways that seem too small, boring, or gross to even mention – like flushing the toilet. But all of these uses are a part of the **human water cycle.**

In the HYDRO DYNAMICS℠ Challenge, the human water cycle describes the ways people find, transport, use, and dispose of water in order to meet a specific need or desire.

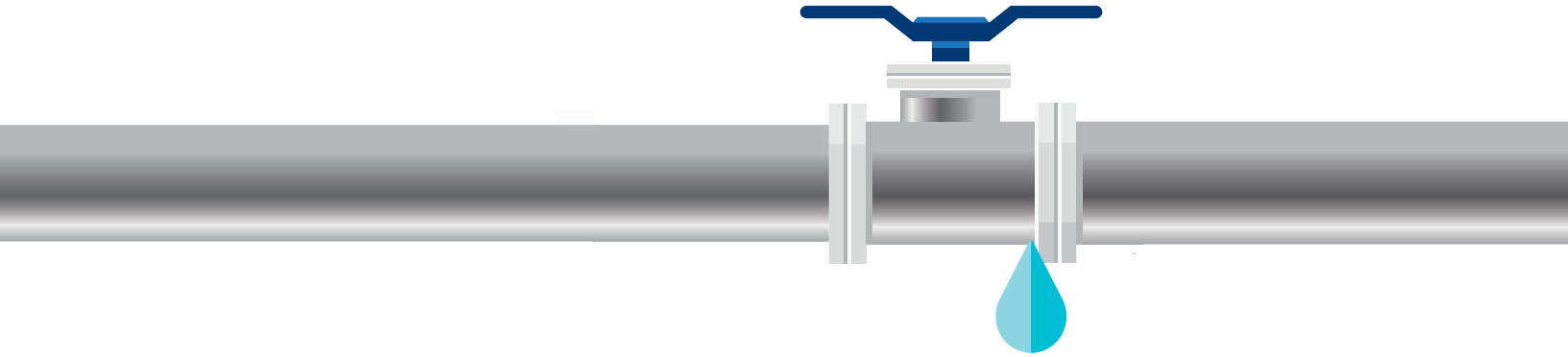
Choose a part of the human water cycle that interests you and identify a specific problem you want to solve.

After you select a problem, find out about the current solutions that people are already using to try to fix it. Why does this problem still exist? Why aren't the current solutions good enough? What could be improved?

Design Next, design a solution to your problem. Any solution is a good start. Your ultimate goal is to design an **innovative** solution that adds value to society by improving something that already exists, using something that exists in a new way, or inventing something totally new.

Share Think about who your solution might help. Share your idea with at least one person. Present your solution to people who clean, store, transport, or use water. Maybe share with a professional or someone who helped you learn about your problem. Can you think of any other groups of people who might be interested in your idea? You can find out about the types of people in your community who solve water problems in the HYDRO DYNAMICS℠ Challenge Guide.

Finally, prepare a presentation to share your work with the judges at a tournament. Your presentation must be live and may include posters, slideshows, models, multimedia clips, props, costumes, and more. Be creative, but make sure you introduce your problem, solution, and how you shared your idea.



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