FIRST® LEGO® League Challenge UNEARTHED™ Building Instructions

Build 8: Site Marking

This build is 106 pieces, and 33 building steps.

Welcome to text-based instructions from Bricks for the Blind. Before you start building, here are some terms we'll be using:
- In Front of/Front: towards you.
- Behind/Back: away from you.
- Up: towards the ceiling.
- Down: towards the floor.
- Stud: the bump on a LEGO brick. Example: A 2x1 brick has two studs on it.
- Vertically: going from front to behind.
- Horizontally: going from left to right.
- Upright: pointing up towards the ceiling.
- That one/ppp: previously placed piece.
- Plate: piece with studs.
- Tile: smooth piece without studs (unless otherwise specified)
- Symmetrically: a mirror image. Example: If you place a 2x1 brick with technic connector on the front wall at the right, connector to the front, and then place another such piece symmetrically on the back wall, at the right, the technic connector of the second piece should point to the back, since it will be placed symmetrically.
- Centered-vertically: even amount of space in front of and behind the piece
- Centered-horizontally: even amount of space left and right of the piece.
- Row: studs lined up horizontally (left to right/side to side).
- Column: studs lined up upright or vertically (top to bottom/back to front).
- Standing upright: the piece is perpendicular to the ground, like a wall.
- Lying flat: the piece is parallel to the ground, like a piece of toast which fell off the table.
- Anti-stud: the portion of a piece which accepts studs, like the bottom of a plate.
- Jumper plate: a 1x2 plate with a single stud on top, or a 1x3 plate with only two studs on top.

A note on LEGO Technic™ part names. These parts are somewhat different from regular LEGO bricks. Here are some definitions in case the builder or helper is not familiar with LEGO Technic™.

Axles - An axle is a connector which has an X shaped cross-section. Because their cross section is not round, anything connected to an axle using an axle-hole will rotate with that axle. Axles are longer than they are wide, and the length of an axle corresponds with how many bricks long it is. Aka a 3L axle is three bricks long. Axles come in a variety of lengths, with a 2L axle being the shortest available. They may be combined with pins, or have circular stops on them. A stop prevents the axle from sliding through an axle-hole at a specific point on the axle.

Pins - A pin is a connector which has a circular cross section and a flanged notch out of one or both ends. This flanged notch allows them to click into bricks with a pin-hole. Pins come with and without friction ridges, which are small bumps on the pin which prevent them from rotating freely. For standard pins, black is a high friction pin, and gray is a low friction pin. A standard length pin is two brick lengths long, with a stop in the middle. This prevents a brick from being pushed from one side of the pin to the other. A 1L pin is one brick long and still retains the stop, however it also includes a hollow stud at the other end. A 3L pin is three bricks long, and only contains a stop at one side, allowing two bricks to be pushed onto the other side of the pin. Pins may also have one side which is an axle.

Lift-arms - A lift-arm is a basic structural element, similar to a brick or a plate, but usually without any studs. It is a beam with rounded ends and with holes in it, with the same spacing as the studs on a LEGO brick. lift-arms come in a variety of lengths, including a 1x1 lift-arm which looks like a cylinder. Thick lift-arms are as wide as a LEGO brick, and thin lift-arms are half as wide as a LEGO brick, but not the same thickness as a LEGO plate! The holes in a lift-arm arm may accept axles or pins. They also come in a variety of shapes, including tees, ells and triangles.

Gears - A gear is a functional element. They are typically discs with teeth on the outside, there are also worm gears which look like a spiraling cylinder! Gears connected by axles transmit or even transform rotational motion!

Axle and Pin Connectors - These elements are typically smaller than lift-arms and are used to connect some combination of pins or axles. They might have pins or axles, as well as axle or pin-holes. They have a lot of different angle combinations! The simplest just connects two axles or pins together in a straight line.

Bushes/Bushings - LEGO Technic™ uses bushes largely as spacers, but they also can reduce friction between rotating parts, or can form useful elements such as handles. Bushes are typically light gray, generally cylindrical, and have an axle-hole running through the middle. They have a flange at the front and back to make them easier to pull on and off.

Technic™ Bricks and Plates – There are also regular bricks and plates that are adapted for use with Technic™ elements. Technic™ bricks have holes for either pins or axles on the sides and are only one brick wide. One of the most common of these is a 1x2 brick with a single pin hole. Most often, these bricks have pin holes, not axle holes. Technic™ plates have holes on the flat surface between the studs and are a minimum of two bricks wide. The holes in these plates can accept pins or can allow an axle to pass through and still spin.

For builders with low vision, or a sighted building partner who may want to follow along with the printed visual instructions that come with each set. As low vision users may benefit from viewing the instructions on a personal device where they can zoom in on content and use assistive technologies to enhance the visuals.

Sorting Instructions:

This LEGO set comes in the bag labeled 12 and some large pieces from bag 0. Sort the pieces into groups as described below. Note that where there are multiple colors of the same brick in a step, the colors will be split across two groups to make telling the difference easier for the builder! LEGO includes a few spare parts in case you lose something. Set these into their own group away from the rest, in case you need them later.

Build 8
Group A contains all of the black 2L pins from this bag. These pins have friction ridges.
Group B contains all of the blue 3L pins from this bag. These pins have friction ridges.
Group C contains all of the blue 2L axle/pin combos from this bag. These pins have friction ridges.

Bag 12 (6 groups of bricks)
Main Build
Group 1 contains the pieces for steps 1-7. Include two brown 15L liftarms and a black 3x13 hollow frame from bag 0.
Group 2 contains the pieces for steps 8-13. Include two light gray 13L liftarms from bag 0.
Group 3 contains the pieces for steps 14-15. Include a light gray 13L liftarm from bag 0.
Group 4 contains the pieces for steps 16-21. Include a black 7x13 hollow frame from bag 0.
Group 5 contains the pieces for steps 22-28. Include a light gray 13L liftarm from bag 0.
Group 6 contains the pieces for steps 29-33.

Building Instructions:

Groups A, B, C and 1. You will use the pins from groups A, B and C throughout the build.

Main Build

1.1. Let's start by building the base. Place a light gray 7L liftarm in front of you, horizontally with the holes facing the front and back.

1.2. Place a black 2L pin from group A, from the front, into the leftmost and rightmost holes of the previous piece.

2. Find a light gray 3x11 panel. This piece has three pin holes on each short end, seven pin holes on each long side, and four pin holes on the top and bottom. One side is flat, and one side has a gap between the two long rows of pin holes. Push the back row of holes of this piece, horizontally with the flat side at the bottom, from the front onto the two pins from the previous step. The left and right holes of the back row of seven holes should attach to the pins.

3. Find a light gray 3L pin connector with two pins. This looks like a 3L liftarm where the middle pin hole is perpendicular to the end holes. There are also two pins extending parallel to the middle pin hole on one side of the piece. When viewed from the front, it looks like a letter C. Push the two pins, with the liftarm vertically on top, from the top into the right column of holes on the top of the previous piece. Repeat symmetrically on the right side. These are on the second columns from the left and right.

4.1. Push a black 2L pin from group A, from the front, into the leftmost and rightmost holes on the front side of the 3x11 panel.

4.2. Push a light gray 2L pin connector, from the front, onto each of the previous two pins.

5.1. Push a tan 3L pin, horizontally with the stop ring on the right, from the left into the back hole of the left previous piece. It should extend 2L to the left. Repeat symmetrically on the right side. These pins do not have friction ridges and they should spin freely.

5.2. Push a black 2L pin from group A, horizontally, from the left into the front hole of the left 3L pin connector with two pins from step 3. It should extend 1L to the left. Repeat symmetrically on the right side.

6. Push the back and third from the back hole of a brown 15L liftarm, vertically with the holes facing left and right, onto the pair of pins on the left and right sides of the base. Push these two pieces all the way in so the tan 3L pin extends 1L past the liftarm.

7.1. Find a black 3x13 hollow frame. This looks like two 13L liftarms connected by two 3L liftarms on the ends and one in the middle, forming two open rectangles. Place this horizontally in front of you.

7.2. Push the pins of a light gray 3L pin connector with two pins, with the liftarm vertically on top, from the top into the left two corner holes of the previous piece. Repeat symmetrically on the right side.

7.3. Rotate the hollow frame 90 degrees away from you so the pieces from the previous step stand upright at the back. The two open rectangles should face the front. Slide the open rectangles over the two 15L liftarms from step 6. Slide the hollow frame all the way to the back.

Group 2.

8.1. Let’s make a small assembly. Find a light gray double split perpendicular axle and pin connector. This looks like a 2L thick liftarm with a 1L thin liftarm sticking out at each end. It kind of looks like a letter U when viewed from the front. The thin liftarms have axle holes. Place this in front of you, with the pin holes facing the front and the thin liftarms pointing up.

8.2. Push a black 2L pin from group A, from the front, into both pin holes on the previous piece.

8.3. Push a light gray 2L liftarm, horizontally with the holes facing the front and back, from the front onto the previous two pins.

8.4. Repeat steps 8.1-8.3.

8.5. Keeping the thick liftarms at the bottom, place the two thin liftarms of one of the assemblies we just made around the front hole of the left 15L liftarm from step 6. Repeat symmetrically on the right side.

8.6. Push the axle side of a light gray 1L liftarm with a 3L axle on one side, with the hole on the left facing the front and back, from the left through the axle holes of the previous assembly. Push it through until the right end of the axle is flush with the right side of the right thin liftarm. Repeat symmetrically on the right side.

9.1. Place a black 6L axle horizontally in front of you.

9.2. Push a black 2L axle connector onto each end of the previous piece.

9.3. Line up the axle connectors with the two 1L liftarms with 3L axles from step 8.6, then push the 1L liftarms with axles into the axle connectors to attach them to the base.

10.1. Find a red 3x7 panel. This looks like the 3x11 panel from step 2, except that it has rows of three studs on the long sides instead of rows of seven. Place this in front of you, horizontally with the flat side at the bottom.

10.2. Push a tan 3L pin, with the stop ring at the left, into the back hole on the right side of the previous piece. It should extend 2L to the right. This pin does not have friction ridges and it should spin freely.

10.3. Push a black 2L pin from group A, from the right, into the front hole on the right side of the 3x7 panel.

10.4. Find the left 3L pin connector with two pins from step 7.2. This is attached to the back of the 3x13 hollow frame and it has two holes on the left side. Rotate the 3x7 panel 90 degrees towards you so the flat side is at the back and the pins are on the right, with the 3L pin on top. Push the pins into the two holes on the 3L pin connector with two pins we just found. Push it all the way to the right. The top pin should extend 1L to the right past the 3L pin connector with two pins.

11. Rotate the base 90 degrees so the 3x7 panel is now at the front. Find the other 3L pin connector with two pins from step 7.2. This one is now at the back. Push a light gray 2L pin, from the front, into the top hole of this piece.

12. Now, take the 3x13 hollow frame and slide it all the way to the right of the base.

13. Push the back hole of a light gray 13L liftarm, horizontally with the holes facing the front and back, from the front onto the previous pin from step 11. Repeat symmetrically on the front side. The second one will attach to the 3L pin attached to the 3x7 panel.

Group 3.

14.1. Let’s make a liftarm assembly! Place a light gray 13L liftarm in front of you, horizontally with the holes facing up and down.

14.2. Push a red 1L pin with a stud on one side, with the stud on top, into the third and fifth holes from both the left and right sides on top of the previous piece. You will place a total of four pins.

14.3. Place a tan 1x4 tile, horizontally, onto each pair of pins from the previous step. Attach these tiles so they are centered on the studs, that means there will be one and a half free holes to the left of the left tile, and to the right of the right tile. Rotate the liftarm 90 degrees away from you so it is horizontal, with the tiles at the back and the ball on the right.

Push a black 1L pin with a ball, with the ball on the bottom, into the second hole from the right on the 13L liftarm.

14.4. Push the leftmost hole onto the pin on the back left corner of the base. The ball on this liftarm should rest on the back 13L liftarm from step 13.

15.1. Place a black 6L axle vertically in front of you.

Push a black 2L axle connector onto the back side of the previous piece.

15.2. Find a black axle and pin connector #2. This piece has two 1L axle connectors on opposite sides, and a perpendicular pin hole between them. Push the back axle hole of this piece, with the axle holes facing the front and back and the pin hole facing up and down, from the front onto the 6L axle from step 15.1.

Push a red 1L pin with a stud on one side, with the stud on top, from the top into the pin hole of the previous piece.

15.3. Push the bar of a light gray 1L bar with a clip on one side, with the clip on top and the clip fingers at the front and back, from the top into the hollow stud of the previous piece.

15.4. Clip a silver fish, with the tail at the right, into the previous piece.

15.5. There are two 13L liftarms on the back row of the base, which are each only connected to the base by one pin. We want to connect these two liftarms to each other. Slide the axle side of a dark tan 3L axle with a stud on one side, with the stud at the back, through the middle hole of the back 13L liftarm. This is the hole between the two 1x4 tiles. Slide the axle forward through the next liftarm until the front of the axle is even with the front of the liftarm.

15.5. Line up the axle connector from step 15.1 with the axle from the previous step, keeping the fish on the top. Push the 3L axle from the previous step forward so it attaches to the axle connector. Now the two 13L liftarms should be connected. Set the base aside for now.

Group 4.

16.1. Let’s make a big plate. Place a black 7x13 hollow frame horizontally in front of you.

16.2. Push a red 1L pin with a stud on one side, with the stud on top, into every hole on top of the previous piece, except for the corner holes. You will place a total of twelve pins.

17. Push a light gray 2L pin, from the left, into the back hole on the left side of the 7x13 hollow frame. Repeat symmetrically on the right side. These pins do not have friction ridges and they should spin freely.

18.1. Place a light gray 6x8 plate, upside down and vertically, in front of you.

18.2. Place the left four columns of a tan 2x8 plate, upside down and horizontally, on the third and fourth anti-stud rows from the front of the previous piece so the 2x8 plate overhangs four columns to the right. Place another behind the first.

Place a light gray 6x8 plate, upside down and vertically, under the previous two pieces to the right of the first 6x8 plate.

18.3. Flip the plates we made right side up and place them, centered vertically and horizontally, on the hollow frame. The 2x8 plates should sit inside of the hollow frame.

19.1. Place a tan 1x2 tile, horizontally and centered horizontally, on the second row from the front.

19.2. Place a green 1x1 plate on the fourth stud from the front on the third column from the left.

19.3. Place a light green 1x1 tile on the second stud from the back on the third column from the right.

20. Keeping the hollow frame horizontal, flip it upside down. The light gray 2L pins on the left and right sides of the frame should be at the back. Push the pin of a black 1L pin with a ball on one side, with the ball on top, into the front corner holes on top of the hollow frame.

21. Place the base back in front of you with the red 3x7 panel from step 10.1 at the right side near the back. The two 13L liftarms we connected should be vertically on the left. Flip the big plate right side up again and rotate it so the light gray 2L pins are at the back pointing left and right. Push the left pin into the back hole of the top 13L liftarm on the left side of the base. This is the liftarm with the ball on it, and the pin goes right behind the ball. The plate itself won't rest flat, instead it will sit on the ball.

Group 5.

22.1. Rotate the base 90 degrees clockwise so the 3x7 panel is vertically on the right.

Place a light gray 13L liftarm in front of you, horizontally with the holes facing up and down.

22.2. Push a red 1L pin with a stud on one side, with the stud on top, into the third and fifth holes from both the left and right sides on top of the previous piece. You will place a total of four pins.

22.3. Place a tan 1x4 tile, horizontally, onto each pair of pins from the previous step. Attach these tiles so they are centered on the studs, that means there will be one and a half free holes to the left of the left tile, and to the right of the right tile. Rotate the liftarm 90 degrees towards you so it is horizontal, with the tiles at the front and the ball on the right.

Push a black 1L pin with a ball, with the ball on the bottom, into the second hole from the right on the 13L liftarm.

22.4. Push the leftmost hole onto the pin on the front left corner of the base. The rightmost hole should attach to the pin on the front side of the big plate. The ball on this liftarm should rest on the front 13L liftarm from step 13. This should be the mirror of the 13L liftarms on the back.

23. Now we will connect the front pair of 13L liftarms like we did with the back pair. Push a dark tan 3L axle with a stud on one side, with the stud at the front, into the middle hole of the front 13L liftarm, pushing the axle all the way to the back so it connects to the axle with the fish on it. This axle goes into the hole between the two 1x4 tiles.

24.1. Now we'll add some more details to the front of the base. Place a red 3x5 L-shaped liftarm, with the 3L leg at the bottom pointing to the front and the 5L leg upright at the back, in front of you.Push a tan 3L pin, with the stop ring at the right, from the right into the corner hole of the previous piece. Push it all the way in so it extends 1L to both sides. This pin does not have friction ridges and should spin freely.

24.2. Push a gray 2L pin, from the left, into the front hole of the 3x5 L-shaped liftarm. This pin does not have friction ridges and should spin freely.

24.3. Place a red 5L liftarm, horizontally with the holes facing up and down, in front of you.

Push the pin side of a red 2L pin with a bushing on one side, with the bushing on top, from the top into the rightmost hole of the previous piece. Push it down until the bottom side is even with the bottom side of the 5L liftarm.

Rotate the 5L liftarm so it is standing upright with the previous piece on top on the left. Push the bottom hole of the 5L liftarm onto the left side of the 3L pin from step 24.1. Push the 2L pin with a bushing in so it connects the 5L liftarm to the 3x5 L-shaped liftarm.

24.4. Push a red 6L axle, from the left, into the bushing part of the red 2L pin with a bushing.

Push a red ball onto the left side of the previous piece.

24.5. The base should be in front of you with the big plate at an angle on the right. The leftmost side should have a 7L liftarm at the bottom. Push the right pin on the bottom of the L-shaped liftarm, from the left, into the second hole from the back on the left side of the base.

25.1. Place a light gray 3L liftarm, vertically with the holes facing left and right, in front of you.

25.2. Push a light gray 2L pin, from the right, into the back hole of the previous piece. Push another, from the left, into the front hole. These pins do not have friction ridges and should spin freely.

25.3. Push the back pin from the previous step into the second hole from the front on the left side of the base.

26.1. Let’s make an assembly of technic bricks. Place a light gray 1x6 technic brick horizontally in front of you.

Push a blue 3L pin from group B, with the stop ring at the back, into the second holes from the left and right of the previous piece. These pins will extend 2L to the front.

26.2. Push a light gray 3L liftarm, horizontally with the holes facing the front and back, onto the previous two pins. Push it all the way back until it touches the 1x6 technic brick.

26.3. Push the second holes from the left and right of a light gray 1x6 technic brick, horizontally with the holes facing the front and back, onto the pins.

26.4. Find the two pins on the front of the base. One is on the L-shaped liftarm, and another is on a 3L liftarm. Push the left and right holes of the back 1x6 technic brick onto these pins. Set the base aside for now.

27.1. Now we’ll build a plate with some artifacts on it. Place a brown 4x6 plate horizontally in front of you.

27.2. Place a white egg on the back left corner of the previous piece.

28.1. Place a light blue 1x1 round tile on the back stud on the third column from the left of the 4x6 plate.

28.2. Place a light blue 1x1 round plate on the second stud from the back on the second column from the left.

28.3. Place a dark gray 2x2 round plate on the back right corner of the 4x6 plate.

Group 6.

29.1. Place a light gray 2x2 round plate on the previous piece.

29.2. Place a light gray 1x1 technic brick with the hole facing the front and back, on the second stud from the front on the third column from the left of the 4x6 plate.

30.1. Find a 1L liftarm with three towballs on it. Place this in front of you, with the hole facing the front and back and the balls on the left, right, and top.

30.2. Slide the axle of a dark tan 3L axle with a stud on one side, with the stud on the back, from the back into the hole of the previous piece.

30.3. Find a light blue axle and pin connector #3. This piece has two 1L axle connectors which form an angle almost 180 degrees, and a perpendicular pin hole between them. Slide the pin hole, with the axle connectors pointing up and slightly to the left of straight down, over the previous piece.

30.4. Next, we will connect the axle to the central axle hole on top of the two 2x2 round plates on the back right corner. The previous two pieces are not held on by friction, so you will have to hold them on while you rotate the axle to point down. The balls should be at the front, left, and right, and the axle connectors should point straight to the front, and slightly to the left of straight back. Push the axle all the way down.

31.1. Now we'll make an old-fashioned scale. Place a dark gray 1L liftarm with a 1L axle on one side, with the hole pointing to the front and back and the axle pointing to the left, in front of you.

Push a yellow 2L pin, from the back, into the hole of the previous piece.

31.2. Find a black axle connector with two perpendicular bar holders. This looks like a 1L cylinder with an axle hole through it. There are two perpendicular hollow cylinders extending from either side of the axle hole which are bar holders. Rotate the axle from step 31.1 so it points up. Push the axle connector, with the bar holders pointing left and right, onto the axle.

31.3. Push the bar of a gold frying pan, with the pan on the left with the open side on top, into the left bar holder. Repeat symmetrically on the right side.

31.4. Push the pin on the back of the scale into the hole of the 1x1 technic brick from step 29.2.

32. Place the base back in front of you, with the 3x7 panel at the back right. The two 1x6 technic bricks should be at the front. Place the plate with artifacts on the two technic bricks so the front sides are even. The plate should extend one row behind the back technic brick.

33. Now, take the 3x7 panel and pull it forwards. The two pairs of connected 13L liftarms should lift the big plate so it is flat and above the rest of the base.

Congratulations! Now this build is complete!

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