

Can It Build Legos?

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Anthropic recently released Opus 4.6,¹ a new LLM that has already received favorable reviews for its coding abilities. While coding puzzles have their charm, we are more interested in how well it can build Lego models. In this investigation, we compare the Lego-building abilities of Opus 4.6 against other frontier LLMs. The LLMs generated their Lego designs in .ldr format which a human inspected with LeoCAD.² The results were scored by a human and by an LLM judge. The results indicate that Opus 4.6 can build Legos.

1 The prompt

This is the prompt given to each LLM in the competition:

Please design a simple chair with Lego pieces. Output an .ldr file that can be imported into LeoCAD. Use only simple Lego pieces.

2 Methods

Each LLM successfully generated a Lego model in .ldr format.³ The .ldr format is a standard, portable text format for Lego models. Each model was imported and displayed with the cross-platform Lego viewer LeoCAD for inspection and scoring by a human. The models were saved in image format, showing a perspective view of the model. The image files were uploaded to an LLM judge (Opus 4.6 in low reasoning mode) for independent scoring.

¹<https://www.anthropic.com/news/claude-opus-4-6>

²<https://www.leocad.org/>

³<https://en.wikipedia.org/wiki/LDraw>

3 Scoring

The human scored the results on the following subjective Likert scales:

- Does it look like a chair? (0 = very unlike a chair ... 5 = very like a chair)
- Would I want to sit on it? (0 = very uncomfortable ... 5 = fits like a glove)
- Physically valid construction? (0 = defies physics ... 5 = very plausible)
- Color aesthetics (0 = butt-ugly ... 5 = paragon of elegance)

Each image was also uploaded to an LLM (Opus 4.6 image upload mode, low effort) with the following prompt:

Please evaluate the image and judge how closely it resembles a chair. Respond showing only your score without additional commentary. Respond with a single-digit score from 0 to 5 (inclusive) where 0 means the image looks nothing like a chair and 5 means the image looks exactly like a chair. For example:

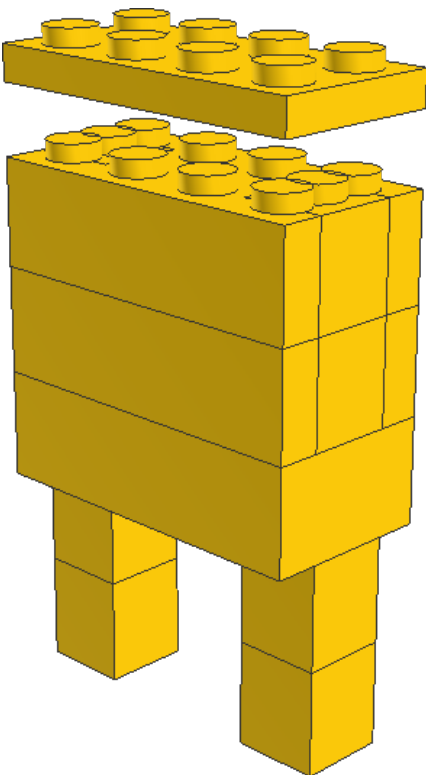
- 0 = The image looks nothing like a chair.
- 1 = The image barely looks like a chair.
- 2 = The image is a poor representation of a chair.
- 3 = The image is a moderately good representation of a chair.
- 4 = The image is a very good representation of a chair.
- 5 = The image is an exact and faithful image of a chair.

A consolidated score was calculated for each image by summing the four human scores and the one LLM score. The possible range of the final score is 0 to 25, inclusive.

4 The Generated Lego Models

4.1 Opus 4.5 non-thinking

This design has no backrest, uses an anti-gravity Lego piece, and appears frightfully unstable. The color palette lacks imagination but gets a score of 1 for not being garish. The LLM judge was surprisingly generous.

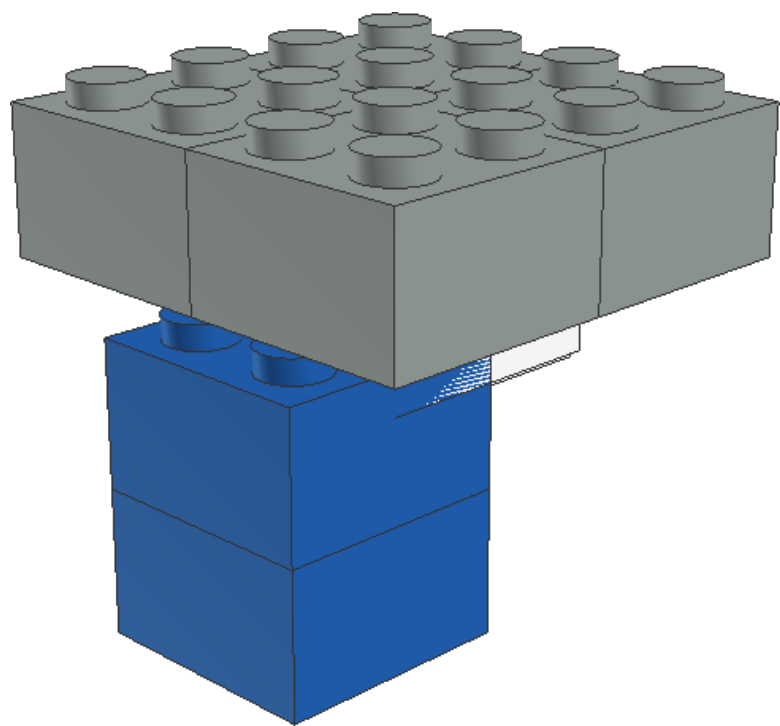


Scores – Opus 4.5 non-thinking

Does it look like a chair?	0
Would I want to sit on it?	0
Physically plausible construction?	0
Color and design aesthetics?	1
LLM score	3
Consolidated score	4

4.2 GPT-5.2 default reasoning

In this design, parts overlap as evidenced by the Z-fighting in the image. If we forgive the physically impossible construction, we might be able to sit on this backless, armless chair without tipping over — if we don't wiggle too much.

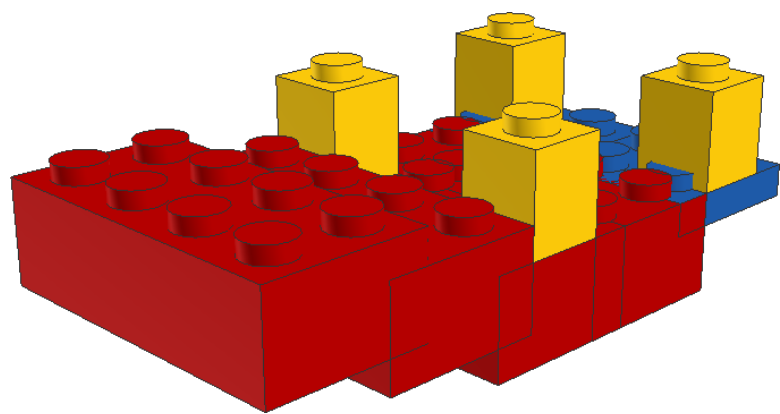


Scores – GPT-5.2 default reasoning

Does it look like a chair?	0
Would I want to sit on it?	3
Physically plausible construction?	0
Color and design aesthetics?	1
LLM score	1
Consolidated score	5

4.3 Sonnet 4.5 non-thinking

It’s not clear where one would position one’s butt on this chair, or how to keep the structure balanced.

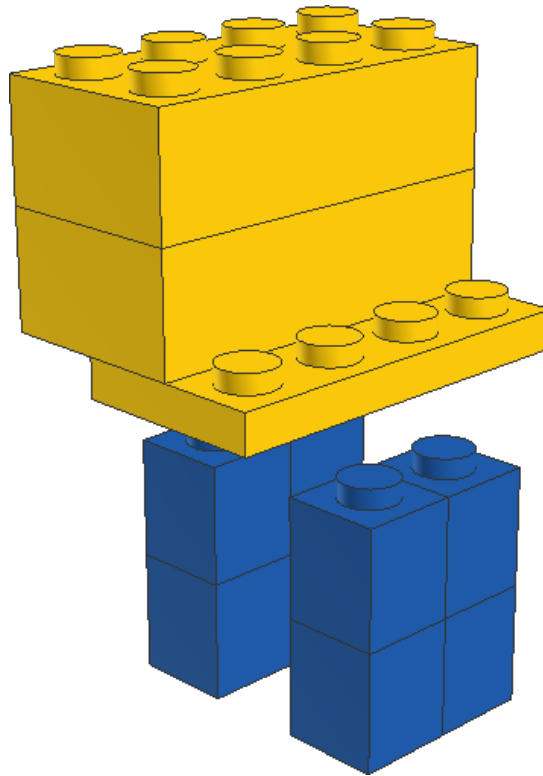


Scores – Sonnet 4.5 non-thinking

Does it look like a chair?	1
Would I want to sit on it?	0
Physically plausible construction?	3
Color and design aesthetics?	3
LLM score	0
Consolidated score	7

4.4 Opus 4.6 low effort

Here we have a seat and a backrest, with a modicum of stability, but only if gravity were not a factor.

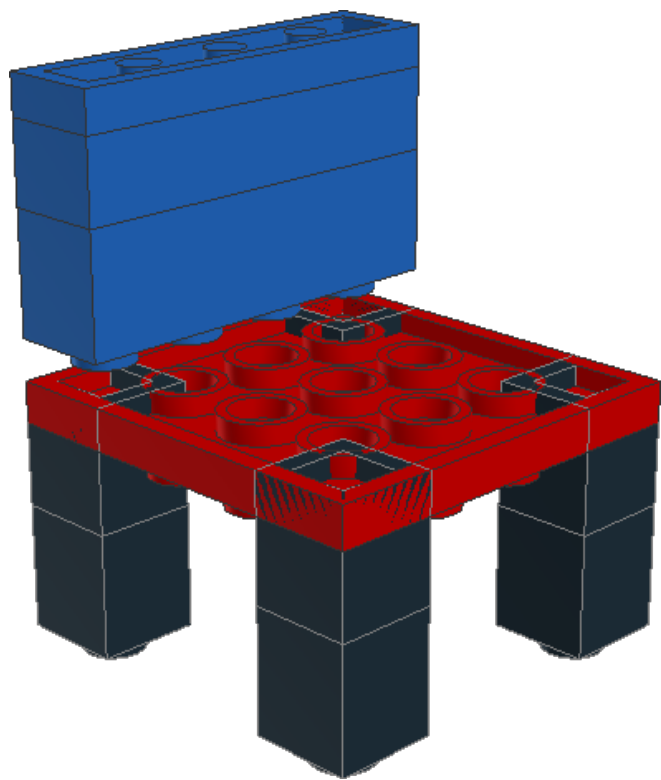


Scores – Opus 4.6 low effort

Does it look like a chair?	1
Would I want to sit on it?	2
Physically plausible construction?	0
Color and design aesthetics?	2
LLM score	2
Consolidated score	7

4.5 GPT-5.2 high reasoning

It’s definitely a chair, but the Z-fighting indicates physically impossible overlapping parts. That and the unfortunate color choices limit this model’s score.

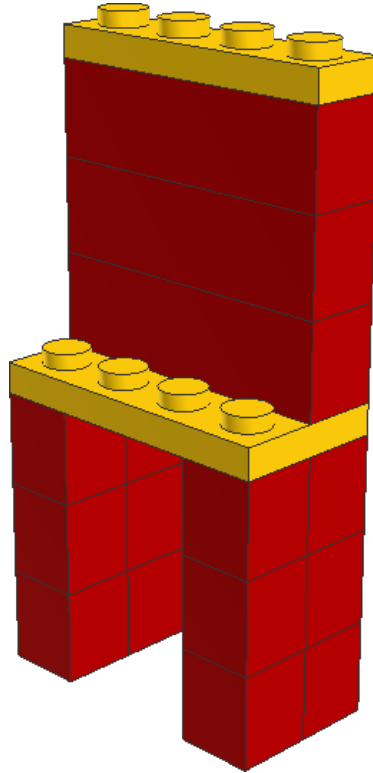


Scores – GPT-5.2 high reasoning

Does it look like a chair?	4
Would I want to sit on it?	4
Physically plausible construction?	0
Color and design aesthetics?	2
LLM score	4
Consolidated score	14

4.6 Opus 4.6 high effort

This design has a seat, a backrest, and a somewhat stable design. The design does not defy physics. The color palette is not totally unpleasant. One could sit on this if one's butt were sufficiently petite.



Scores – Opus 4.6 high effort

Does it look like a chair?	3
Would I want to sit on it?	3
Physically plausible construction?	5
Color and design aesthetics?	4
LLM score	3
Consolidated score	18

5 The Winners and Losers

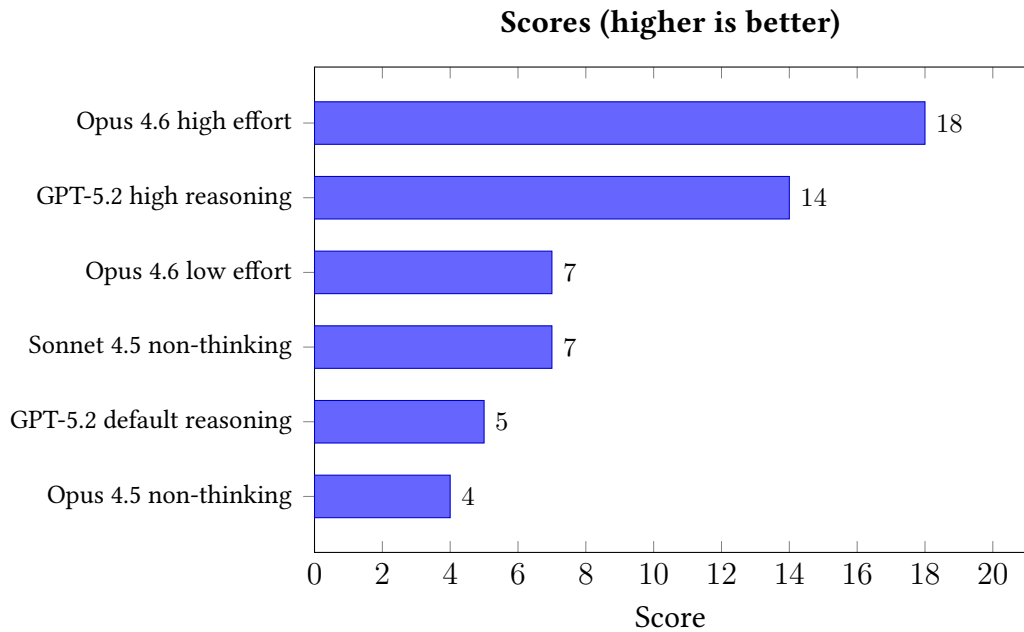


Figure 1: Consolidated scores.

6 Discussion

Anthropic’s new Opus 4.6 LLM in high-effort mode is the winner. Compared to its low-effort reasoning mode, it’s clear that reasoning benefits this model. The trade-off is token use. In low effort mode, Opus 4.6 used only 807 output tokens, while using 6701 tokens in high reasoning mode — 8.3 times as many tokens.

The thinking block and final result blocks from the Opus 4.6 response are shown below in the Exhibit.

Exhibit – Opus 4.6 Response

The user wants me to design a simple chair using LEGO pieces and output it in LDraw (.ldr) format that can be imported into LeoCAD.

Let me think about how to build a simple chair with basic LEGO bricks.

LDraw format basics:

- Each line describes a part placement

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- Line type 1 format: `1 <color> <x> <y> <z> <a> <c> <d> <e> <f> <g> <h> <i> <part>`
- The transformation matrix is a 3x3 rotation matrix plus translation

- Y axis points down in LDraw, with one LDU equaling 0.4mm
- Standard brick dimensions are 20 LDU wide by 24 LDU tall by 20 LDU deep, while plates are 8 LDU tall

For the chair structure, I need a seat platform, four legs for support, and a backrest to complete the design.

Looking at the available parts, I can use a 2x4 plate for the seat, stack 1x2 or 1x1 bricks for the legs, and build the backrest from additional bricks or plates. Let me map out which specific part files to use: the 2x4 brick, 2x2 brick, 1x2 brick, 1x1 brick, 2x4 plate, and 2x3 plate are all good candidates depending on the proportions I want.

Now I'm working through the actual dimensions. With one stud being 20 LDU wide, a brick at 24 LDU tall, and a plate at 8 LDU, I can build a chair with legs that are 2 bricks high, a single plate for the seat, and a backrest that rises 3 bricks above that. For the top view, I'm thinking the seat should be about 2x2 studs wide.

Actually, let me scale this up a bit and simplify the approach. I'll go with a 2x4 plate for the seat, four 1x1 bricks stacked two high at each corner for the legs, and then add a backrest using some plates and bricks on the rear edge.

Now I'm setting up a coordinate system to position the LEGO pieces: X for left-right, Y for vertical, Z for front-back and starting to lay out the leg pieces using 1x2 bricks at the front corners.

Actually, I'm going to simplify this significantly: a 4-stud-wide by 2-stud-deep seat with four 1x1 brick legs, a 2x2 plate for the seat itself, and a 1x2 brick backrest. Let me just map out the exact stud positions for this 4x2 configuration.

Now I'm working through the LDraw coordinate system and reference points I need to figure out where each part's origin sits relative to the studs, since parts are positioned by their center reference point rather than their corners.

Let me take a step back and build this more systematically. I'll construct a simple chair using 1x1 bricks for the legs, positioning them at the four corners where the seat meets the legs, then extending downward through the Y-axis since LDraw uses inverted Y coordinates. Hmm, this is getting confusing. Let me take a different approach and think in terms of stud grid.

In LDraw:

- 1 stud spacing = 20 LDU in X and Z
- 1 brick height = 24 LDU in Y
- 1 plate height = 8 LDU in Y
- A 1x1 brick (3005.dat) has its origin at the center of the top surface

So stud position (col, row) maps to LDraw coordinates (col*20, row*20). For a 2x4 brick centered at the origin, the studs would be distributed around that center point. Let me think about this

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more practically -instead I'll design a simple chair with a 4-stud-wide seat, 2 studs deep, legs that are 3 bricks tall, and a backrest rising 4 bricks high.

For the structure, I'm picturing 1x1 brick columns at each corner for the legs, a 2x4 plate for the seat, and then extending the back columns upward with a connecting plate at the top for the backrest. But wait, if the backrest columns are only 2 studs apart, I can't use a 1x4 plate to connect them. Let me simplify this to a 2x2 chair instead.

So the layout is straightforward: four 1x1 columns, each 3 bricks tall for the legs, a 2x2 plate for the seat, and the back two columns continue up another 3 bricks with a 1x2 plate bridging them at the top. Now I'm mapping out the -coordinates front legs at $z=0$, back legs at $z=20$, with the seat positioned at $Y=0$ and the legs extending down to $Y=72$ in LDraw's coordinate system where Y increases downward.

I'm realizing the coordinate math needs care here: since brick origins sit at their tops, stacking them means each brick occupies 24 units vertically, so I need to account for how the studs align when placing one brick on top of another. sits on those studs.

Let me reconsider the LDraw coordinate system. In LDraw, Y increases downward, so studs protrude toward negative Y and the reference point for a brick is at its top surface. If I place a brick at $y=0$, its top is at $y=0$ and bottom at $y=24$. To stack another brick on top, I'd place it at $y=-24$ so its bottom connects at $y=0$. I'm working through whether the reference point convention means the origin is at the top or if there's a different stacking offset I'm missing. I'm stacking the bricks upward from that ground level, placing each successive brick 24 units higher in the negative Y direction, then adding the seat plate on top with an 8-unit offset. Let me simplify this and just use $y=96$ as my ground reference point for the chair legs.

Now I'm positioning the four leg bricks at the corners of the stud -grid I need to account for how 1x1 bricks are centered at their origin, so the stud positions should be at multiples of 20 units apart rather than 10.

For the seat, I'm trying to figure out which plate part number gives me a 2x2 -configuration I'm checking through the standard LEGO plate dimensions to find the right piece. I'm confident about those part numbers. For the seat, I need a 2x2 plate positioned at the -center when placed at the origin, it extends from -10 to 10 on both the x and z axes, so I'd need to offset it to align with the stud positions correctly. at the center of its top surface, and a 2x2 plate has studs offset by 10 units in each direction from that center point. So if I position a 2x2 plate at $(10, y, 10)$, its four studs will align perfectly with 1x1 bricks placed at the cardinal positions around it. Now I'm working out the exact stud positions for the leg assembly. I'm placing the remaining leg bricks at the middle and top positions, then positioning the 2x2 seat plate on -top I need to account for the plate's height so it sits properly at $y=16$, which puts its bottom surface flush with the top of the uppermost leg bricks.

Now I'm working on the backrest, positioning 1x1 bricks at the back corners where the studs of the seat plate protrude upward from $y=16$.

Placing bricks in the BL column at y positions -8, -32, and -56, then starting the BR column at $y=-8$.

Now I'm adding a 1x2 plate on top to connect the two backrest columns at $y=-64$. But I'm realizing

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the 2x2 seat is too small, so I'm reconsidering the design with a larger 2x4 seat instead. I need to think through how the dimensions map in LDraw -coordinates the 2 extends along X and the 4 along Z with the default orientation.

Actually, I want the chair wider than it is deep, so I'm rotating the seat 90 degrees around the Y axis to swap those dimensions. I'm working out the rotation matrix to figure out how this transformation affects the stud positions. I'm realizing the dat file convention actually defines the 2x4 brick and plate with 4 studs along X and 2 along Z by default, so I don't need any rotation to get the dimensions I want for the chair. Now I'm working out where the studs would be positioned relative to the plate's center. x offsets: -30, -10, 10, 30
z offsets: -10, 10

If placed at (0, y, 0):

Studs at: (-30,y,-10), (-10,y,-10), (10,y,-10), (30,y,-10), (-30,y,10), (-10,y,10), (10,y,10), (30,y,10)

OK, that's 4 wide and 2 deep. Good.

So the chair seat at position (0, 0, 0) would have studs at:

Front row (z=-10): x = -30, -10, 10, 30

Back row (z=10): x = -30, -10, 10, 30

For legs, I'll use the four corners:

- Front-left: (-30, y, -10)
- Front-right: (30, y, -10)
- Back-left: (-30, y, 10)
- Back-right: (30, y, 10)

Leg height: 3 bricks (72 LDU). Using 1x1 bricks.

Seat: 2x4 plate at (0, 0, 0). Now I need to clarify the Y coordinate system in -LDraw the origin sits at the top surface of a brick or plate, and positive Y goes downward. Setting the seat's top at y=0 means the plate bottom is at y=8, then the legs extend down from the corners.

For the legs, each 1x1 brick is 24 LDU tall, so three bricks stack to 72 LDU. The top leg brick sits on the seat studs at y=8, extending to y=32. The middle brick goes from y=32 to y=56, and the bottom brick from y=56 to y=80.

The backrest sits above the seat at negative Y values. Bricks placed on the seat's studs have their bottoms snap onto those studs at y=0, so the first backrest brick would be placed at y=-24, with its top at y=-24 and bottom at y=0. , in LDraw, stacking works like this:

- Plate at y=0: top surface at y=0, bottom at y=8
- Brick below: top at y=8, bottom at y=32, placed at y=8
- Brick on top of plate: bottom at y=0, top at y=-24, placed at y=-24

Yes, that's right. The reference Y of a part is its top, and its bottom is at Y + height.

So:

****Seat plate (3020.dat):**** y=0

Center at (0, 0, 0).

****Legs (1x1 bricks, 3005.dat) - 3 bricks per leg:****

Front-left leg: x=-30, z=-10

- Brick 1 (top): y=8, extends to y=32
- Brick 2: y=32, extends to y=56
- Brick 3 (bottom): y=56, extends to y=80

Same for the other three legs at (30,-10), (-30,10), and (30,10).

****Backrest (1x1 bricks on back row):****

I'll position backrest columns at (-30, y, 10) and (30, y, 10), stacking three bricks each at y=-24, y=-48, and y=-72.

****Backrest top bar:****

The backrest columns are 60 LDU apart, so I need to figure out whether a 1x4 plate at 80 LDU long would work or if I should use something smaller. I need to reconsider the coordinate system here. When a part is placed at position (x, y, z), the y-coordinate represents its top surface, not its center. So a brick placed at y=-72 has its top at -72 and extends downward. Let me trace through the stacking: the brick at y=-72 goes down to y=-48, the one below at y=-48 goes to y=-24, and so on.

Now I'm realizing the key insight about how LDraw stacking works: the reference point is where the studs are, at the top of each part. When you place a brick on top of another, you subtract the height to get the next brick's y-value. So if the seat plate is at y=0, the first backrest brick sitting on it would be at y=-24, with its top at -24 and bottom at 0, which connects properly to the seat's studs.

Following that pattern, the second and third backrest bricks stack upward at y=-48 and y=-72, with a top plate finishing at y=-80. For the legs underneath, the seat plate's bottom surface is at y=8, so the first leg brick starts there with its studs connecting into the plate, then the subsequent leg bricks extend downward at y=32 and y=56, with the ground level at y=56.

Now I'm double-checking my stacking logic: the studs on a brick protrude upward from its reference position while the anti-stud tubes sit at the bottom, so when one brick sits on another, the studs of the lower brick align with the anti-studs of the upper brick. This confirms my coordinate calculations are working correctly for both the backrest and leg sections.

For the seat plate itself, I'm setting up the LDraw command with a yellow color code and verifying the standard color numbering system to make sure I'm using the right values for each component.

Now I'm deciding on a color scheme for the chair. I could go with reddish brown for a wood-like appearance, or keep it simple with a single color like red. I'm leaning toward using red for consistency, though I'm also reconsidering whether the current design with thin 1x1 leg columns and a minimal backrest actually looks proportional enough for a proper chair structure.

Let me rethink the proportions more carefully. I could make the legs sturdier by using 1x2 bricks instead, or I could simplify by treating the back legs and backrest as one continuous column that way the structure feels more cohesive and realistic. I'm settling on a 2x4 plate for the seat with

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1x1 brick columns for the front legs and taller back legs that extend directly into the backrest, eliminating the need for a separate connector piece. the back columns need to be -positionedI could add a middle connecting plate for stability, but keeping it simple with just the four leg columns, seat plate, backrest columns, and top plate should work structurally since the seat plate has connection points on both sides.

Now I'm reconsidering the orientation and -positioningwith the seat as a 2x4 plate, I should clarify that the front of the chair faces one direction and the backrest columns sit at the back edge for better proportions.

I'm settling on 1x1 bricks for the legs to keep the design simple, and now I'm thinking through the actual dimensions to make sure everything looks proportional.

Looking at the measurements, the total height from the bottom of the legs to the top of the backrest comes out to about 64mm, which feels a bit short relative to the seat width. The seat is only 2 studs deep, making it pretty narrow, so I'm considering expanding it to a 4x4 plate instead to give the chair better proportions.

Now I'm positioning the studs and legs for this wider seat, placing them at the corners and setting up the backrest columns at the back edges. I'm realizing though that positioning the backrest at z=30 might make this look more like a bench than a proper chair, since a typical chair would have the backrest positioned further back.

Actually, for a minifig-scale LEGO chair, something like a 2x4 seat is more practical than what I was planning. Let me simplify this design to make it clearly read as a chair rather than a bench. I'll go with a 4-stud-wide, 2-stud-deep seat, a backrest that's 4 studs wide and rises 4 bricks high, and legs that are 3 bricks tall. This means I need 12 individual bricks for the four legs and a single 2x4 plate for the seat.

For the backrest, I'm realizing I could use 1x2 bricks instead of all those 1x1 -piecestwo of them placed side by side at each level would be cleaner. But wait, that wouldn't actually span the full 4-stud width properly.

Let me reconsider the whole structure. I'll make the backrest a solid wall using 1x4 bricks oriented lengthwise, which gives me the right proportions. For the chair itself, I'm thinking a 2x4 plate for the seat with 1x4 bricks as the front and back -legsthat's much simpler than my previous attempts.

Now I'm working through the actual positioning: the seat plate is 2 studs deep, but if my front and back leg panels are each only 1 stud deep, I need to figure out how they align. The seat plate should sit on top of both leg rows, so I need to make sure the geometry works out correctly.

Actually, I think individual corner legs would look better than solid -panelsless like a bench and more like an actual chair. So I'm going with 1x1 bricks at each corner for the legs, stacked 3 high for the seat height, then taller back legs at the rear corners to support a backrest, and a 2x4 plate for the seat itself. Though I'm second-guessing whether 1x1 legs will look sturdy enough, so maybe I should beef them up with 1x4 bricks instead.

You know what, let me just commit to the design and work out the -coordinatesI can always adjust if it looks off once I see it.

Defining the LEGO brick positions... Continuing with the back-right leg and now adding the backrest support columns to complete the chair structure. I'm verifying the y-coordinate for the top -plate the last backrest brick sits at $y=-96$, so placing the plate at $y=-104$ should align its studs with the column positions at $x=-30, -10, 10, 30$. Now I'm counting up the total pieces and realizing 22 is quite a lot, so I should optimize by using larger bricks like 1x4 or 1x2 pieces instead of individual 1x1 bricks. For the legs, I could replace the four columns of 1x1 bricks with 1x2 bricks positioned on the left and right sides, which would significantly reduce the piece count.

Actually, rotating bricks to span different directions is getting too complicated, so I'll stick with the simpler 1x1 approach. Let me trim down the design -instead reducing the backrest to 3 bricks tall and the legs to 2 bricks tall keeps things manageable while still looking proportional.

Now I'm mapping out the exact coordinates for each piece: the seat plate goes at the origin, the four leg positions are placed at the corners with two bricks stacked at each, and the backrest columns rise up from the back corners with three bricks each, totaling 16 pieces.

Writing the LDR file... I'm looking at the data file entries and need to verify my understanding of how the 3020.dat and 3710.dat parts are -oriented specifically checking the stud dimensions and origin points for each piece. (0, 0, 0).

These coordinates look right for what I'm building.

Now I'm checking the placement of the backrest top plate at (0, -80, 10)-its studs would align at (-30, -80, 10), (-10, -80, 10), (10, -80, 10), (30, -80, 10). The backrest columns' top studs sit at (-30, -72, 10) and (30, -72, 10), so there's a gap between where the columns end and where the plate sits. But actually, the plate's bottom anti-studs at $y=-72$ should connect to those column studs, so the connection works out. Let me double-check this alignment though.

In LDraw's coordinate system where negative Y is up, the bricks' tops are at $y=-72$ with studs protruding upward, and when I place the plate at $y=-80$, its bottom lands at $y=-72$, which connects perfectly to those studs. The plate's studs are only at $z=10$ since it's a 1x4 piece, and that matches where the backrest columns are positioned.

The studs at $x=-10$ and $x=10$ on the plate don't have bricks directly below them, but they're still supported through the plate's connection to the columns at $x=-30$ and $x=30$. The design feels solid as-is, though I could add a cross-bar between the front legs if needed. The key thing I'm checking is whether the seat plate properly mediates the connection between the leg structure below and the backrest structure above. (8,10) and (30,8,10) connect to the leg bricks below. So structurally it's sound.

But wait: the seat plate's studs (on top, at $y=0$ level) are where the backrest bricks attach. And the seat plate's anti-studs (on bottom, at $y=8$ level) are where the leg bricks attach. The plate is at $y=0$, top at 0, bottom at 8.

The backrest bricks at $y=-24$ have bottom at $y=-24+24=0$, connecting to plate top at $y=0$. The leg bricks at $y=8$ have top at $y=8$, connecting to plate bottom at $y=8$.

Everything checks out.

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The 2x4 plate already provides the seat with visible studs across the front and sides, and only the back corners have backrest bricks attached. I notice the back row has studs at $x=-30$, -10 , 10 , 30 along $z=10$, but the backrest columns only occupy $x=-30$ and $x=30$, leaving the studs at $x=-10$ and $x=10$ exposed.

Now I'm thinking about adding structural support by placing 1x4 plates at the bottom of both the front and back leg assemblies. The front plate would sit at $y=56$ (where the lowest leg brick ends), and the back plate would do the same. These plates would connect the legs horizontally and give the chair more visual stability. I'm working out the exact positioning and making sure the studs and anti-studs align properly with the brick connections. I'm considering making the backrest a solid panel instead of separate -columnsI'd stack three 1x4 bricks vertically to create a 4-stud-wide, 3-brick-tall panel, then cap it with a 1x4 plate for a finished look.

This brings the total piece count down to 13 parts, which is more efficient than the original design. Now I'm double-checking the positioning and dimensions to make sure the 1x4 bricks align properly along the X-axis when placed at those coordinates. I'm realizing there's a structural conflict: the backrest brick at the front uses all four stud positions on the seat plate's top surface, which means those same studs can't also support the back leg bricks. I need to reconsider how the legs and backrest share the plate's connection points.

Actually, -waitthe legs connect to the bottom of the plate while the backrest connects to the top, so there's no actual conflict. Now let me verify the backrest stacking: each row connects properly to the studs of the row below it, creating a stable vertical structure from the seat plate all the way up to the top plate.

I'm second-guessing whether I need additional bracing for the front legs, but they're already anchored directly beneath the seat, so extra support probably isn't necessary for a visual model.

Now I'm deciding on colors for the different -partsI could go with a natural wood tone for the legs and backrest with a contrasting seat, or just keep everything uniform. Let me settle on white for the seat and red for the structural pieces, or maybe just use a single color throughout to keep it simple.

Actually, I'll go with yellow for the seat and top plate, red for the legs and -backrestthat gives it some visual interest. Now I'm writing out the LDraw file...

Generating LDraw model... Completing the back-left leg definition and adding the backrest structure with three 1x4 bricks stacked vertically.

Now I'm verifying the part numbers for the LDraw -componentschecking that 3010.dat is indeed the correct identifier for a 1x4 brick, and confirming the plate part number for the backrest top. Looking at the coordinate system more carefully, the 1x4 brick's Z-axis extends from $z=0$ to $z=20$ when positioned at $z=10$, which means it properly aligns with the seat plate studs at $z=10$. The brick's footprint spans the correct stud positions on the plate. in the Z direction.

The seat plate studs at $z=10$ (the back row) - yes, $z=10$ is the center of the back row studs.

But the back of the brick would be at $z=20$, which extends beyond the seat plate (which goes from $z=-10$ to $z=10$ for the 2-stud depth). That's actually fine - the backrest protrudes slightly beyond

the seat, which is how real chairs are!

Wait, actually, let me reconsider. The 2x4 plate has 2 studs in Z. The center of the plate is at $z=0$. The studs are at $z=-10$ and $z=10$. The back edge of the plate is at $z=10+10=20$ (half a stud width beyond the last stud center).

The 1x4 brick is 1 stud in Z, centered at $z=10$, so it spans from $z=0$ to $z=20$ - perfectly aligned with the plate's back edge. Now I'm checking the overall proportions: the legs are about 19mm tall, the seat is roughly 3mm thick, the backrest rises about 32mm, and the seat width comes to around 32mm. I'm verifying the plate connections are correct, then reconsidering the proportions. I think taller legs and a taller backrest would make it look more like an actual chair, so I'm recalculating with 3 bricks for the legs and 4 for the backrest to see if that improves the overall look.

After checking the math, a 3-brick leg with a 3-brick-plus-plate backrest gives me better proportions where the seat height is about 50% of the total, which matches real chairs. I'm settling on these final dimensions and updating the coordinate system accordingly.

Now I'm listing out all the pieces needed: 12 leg bricks across the four legs, 3 backrest bricks, and a plate for the top, totaling 17 pieces. Time to write out the LDraw file...

Writing LDraw model... Defining the back leg positions...

Now I'm working on the backrest structure, stacking 1x4 bricks vertically and adding a plate on top, but I'm noticing the backrest pieces might not be properly anchored to the seat at the connection point.

Actually, looking more carefully at the stud positions, the back corners where the legs attach are the same x,z coordinates where the backrest bricks connect, just on opposite faces of the seat plate. This is a valid LEGO configuration, so the structure is sound. I'm ready to finalize this design.

Let me verify the part numbers are correct and available in LeoCAD's library: the 1x4 plate, the 2x4 plate, the 1x1 bricks, and the 1x4 bricks are all standard parts that should be there. Now I'm deciding on colors: I could go with a contrasting scheme using red legs and yellow seat, or keep it unified with a brown tone throughout to give it a wooden chair appearance.

Generating the LDR file... Continuing through the dataset entries...

@assistant

```
# Simple LEGO Chair - `chair.ldr`
```

Here's the LDR file. Save the text below as `**`chair.ldr`**` and open it in LeoCAD.

```
## Design Overview
```

Part	Piece	Qty	Color
---	---	---	---
Seat	Plate 2x4 (`3020.dat`)	1	Yellow

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```
| **Legs** | Brick 1x1 (`3005.dat`) | 12 | Red |  
| **Backrest** | Brick 1x4 (`3010.dat`) | 3 | Red |  
| **Backrest cap** | Plate 1x4 (`3710.dat`) | 1 | Yellow |
```

****Structure:**** 4 corner legs (3 bricks tall each) 2x4 plate seat solid 1x4 brick backrest (3 bricks tall) along the back edge, capped with a plate.

The File

```
``ldr  
0 Simple LEGO Chair  
0 Name: chair.ldr  
0 Author: Assistant  
0 !LDraw_ORG Unofficial_Model  
  
0 // ===== Seat - Plate 2x4 (Yellow) =====  
1 14 0 0 0 1 0 0 0 1 0 0 0 1 3020.dat  
  
0 // ===== Front-Left Leg - Brick 1x1 (Red) =====  
1 4 -30 8 -10 1 0 0 0 1 0 0 0 1 3005.dat  
1 4 -30 32 -10 1 0 0 0 1 0 0 0 1 3005.dat  
1 4 -30 56 -10 1 0 0 0 1 0 0 0 1 3005.dat  
  
0 // ===== Front-Right Leg =====  
1 4 30 8 -10 1 0 0 0 1 0 0 0 1 3005.dat  
1 4 30 32 -10 1 0 0 0 1 0 0 0 1 3005.dat  
1 4 30 56 -10 1 0 0 0 1 0 0 0 1 3005.dat  
  
0 // ===== Back-Left Leg =====  
1 4 -30 8 10 1 0 0 0 1 0 0 0 1 3005.dat  
1 4 -30 32 10 1 0 0 0 1 0 0 0 1 3005.dat  
1 4 -30 56 10 1 0 0 0 1 0 0 0 1 3005.dat  
  
0 // ===== Back-Right Leg =====  
1 4 30 8 10 1 0 0 0 1 0 0 0 1 3005.dat  
1 4 30 32 10 1 0 0 0 1 0 0 0 1 3005.dat  
1 4 30 56 10 1 0 0 0 1 0 0 0 1 3005.dat  
  
0 // ===== Backrest - Brick 1x4 (Red) =====  
1 4 0 -24 10 1 0 0 0 1 0 0 0 1 3010.dat  
1 4 0 -48 10 1 0 0 0 1 0 0 0 1 3010.dat  
1 4 0 -72 10 1 0 0 0 1 0 0 0 1 3010.dat  
  
0 // ===== Backrest Top Cap - Plate 1x4 (Yellow) =====  
1 14 0 -80 10 1 0 0 0 1 0 0 0 1 3710.dat  
  
0  
```
```

## Coordinate Notes

## Can It Build Legos?

| Element         | Y range (LDU) | Notes                    |
|-----------------|---------------|--------------------------|
| Backrest cap    | -80 - 72      | Plate on top of backrest |
| Backrest bricks | -72 0         | 3 × Brick 1×4, stacked   |
| **Seat plate**  | **0 8**       | **Reference datum**      |
| Leg bricks      | 8 80          | 3 × Brick 1×1 per corner |

\*(LDraw Y-axis points \*\*down\*\*, so negative Y = upward.)\*

The seat is \*\*4 studs wide × 2 studs deep\*\*. The four 1×1 legs sit at the corners under the plate, and the three 1×4 backrest bricks form a solid panel along the back edge. All connections are stud-to-antistud – a fully legal LEGO build.