



education™

Football STEAM Goals



Engineering
Design Notebook

SKETCH. DESIGN. BUILD!

**This notebook
belongs to:**

.....

.....

.....

.....



**Tape a photo
of yourself here**

The Tallest Trophy!

Work in pairs. Build the tallest possible football trophy in 2 minutes!

Then take a look at all the trophies in the room and guess which is the tallest one. Finally, compare and measure.

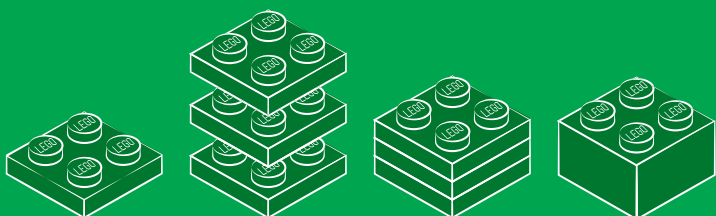
Key Learning Values

- *Cooperation*
- *Developing mathematical skills such as height and comparisons*
- *Measuring using standard and nonstandard units*



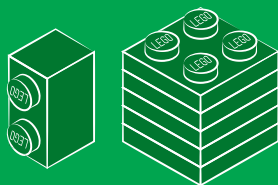
Math with LEGO® bricks

How many plates high is a LEGO® brick? How can you fill that sideways gap in your model? How can you make your LEGO Technic models even stronger? Use these LEGO math tips when you're designing your own custom models!



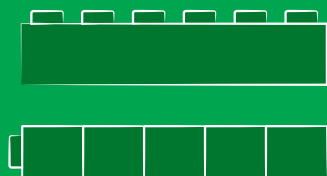
3 Plates = 1 Brick

Does your model need a brick, but all you have are plates? Thanks to this handy LEGO math formula, that's not a problem. Just remember that a stack of three LEGO plates is exactly the same height as one LEGO brick!



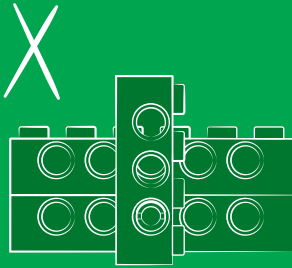
2 Studs = 5 Plates High

A stack of five LEGO plates is exactly as tall as a brick two studs wide is long. This useful equation lets you build more plates into your models, creating more options for patterns and details. Plus, you can stack up five 2x2 plates to make a perfect cube shape!

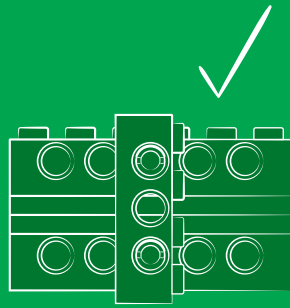


6 Studs = 5 On the Side

Expert LEGO models often have pieces that are built in different directions, but when you're planning out a new creation, it can be tough to make everything line up right. In such situations, it's helpful to know that a stack of five bricks turned on its side is the same length as a single 6-stud-long brick.



Just add
2 plates

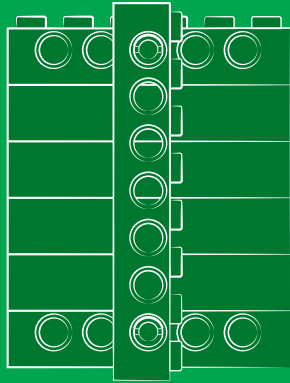


2 LEGO Technic Bricks + 2 plates

Do you need to change the building direction of your LEGO Technic model, or add some reinforcement for extra strength? If you stack two bricks with LEGO Technic holes together, then the holes of a 1×4 LEGO Technic brick or a 3-hole LEGO Technic beam turned on its side won't line up. The solution is simple: just place two plates in between the bricks, and the Technic brick's holes will line up perfectly, letting you snap it on with connector pins to create a strong cross-brace.

2 LEGO Technic Bricks + 4 Bricks

You can use a similar technique to add LEGO Technic reinforcement to taller LEGO models. Place a stack of four bricks in between two LEGO Technic bricks, and the holes on a 1×8 LEGO Technic brick or a 7-hole LEGO Technic beam will line up at the top and bottom. This trick won't work with fewer than four bricks in the middle, but you can stack as many 2 + 4 combinations up as you want to make even taller models (the same is true for the 2 bricks + 2 plates formula above).



Bonus tip:

Switch the LEGO Technic bricks for LEGO bricks with studs on their sides, and you'll be able to connect sideways-facing bricks or plates in the same way.

With experimentation and practice, you'll be able to find more LEGO Math tricks of your own!

3 steps

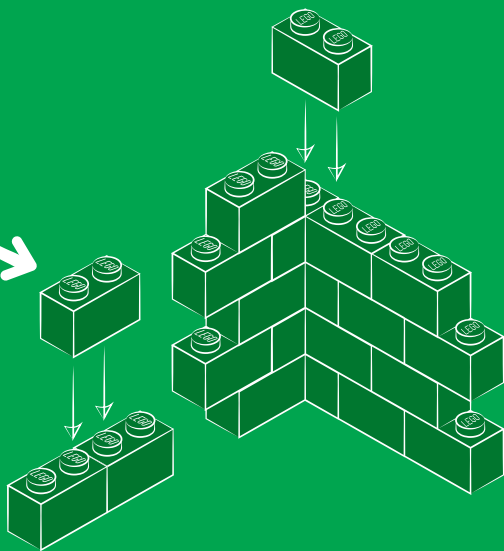
For Building a Strong LEGO® Model

Step 1

Interlocking

If you don't want your custom models to fall apart, then try building like the LEGO® Master Builders do: use plenty of interlocking!

1 brick holds
2 bricks
together!

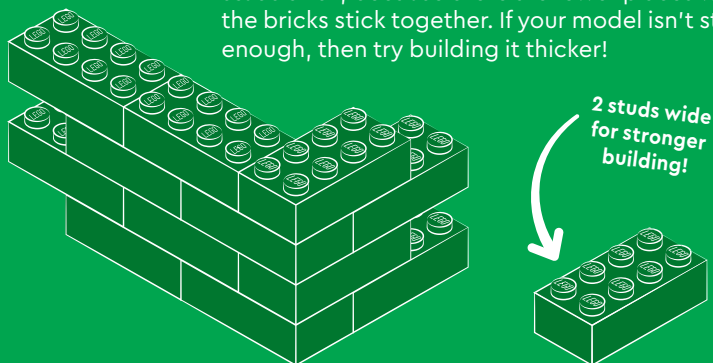


Interlocking your bricks means building your model so that each new brick you put down connects two or more bricks beneath it together, bridging the seams between them like real bricks in a wall. When you use lots of interlocking, all of your model's pieces will hold each other together, making the whole model much stronger.

Step 2

Build It Thicker

Another way to make your model stronger is to make it thicker. Every stud connection in a model makes it a little sturdier. A model that is built to be one stud thick has less strength from its connections than a model that is two or more studs thick, because there are fewer places where the bricks stick together. If your model isn't strong enough, then try building it thicker!



Step 3

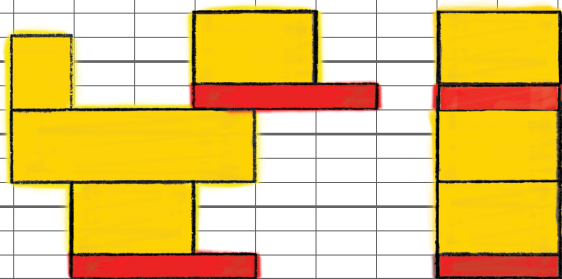
Use LEGO® Technic Pieces

To make your model as strong as possible, try adding LEGO Technic pieces. The pin-and-hole connections between Technic parts are even stronger than the stud-and-tube connections between regular LEGO bricks. Try using LEGO Technic pieces to hold layers of bricks together and reinforce any weak or fragile parts of your models!



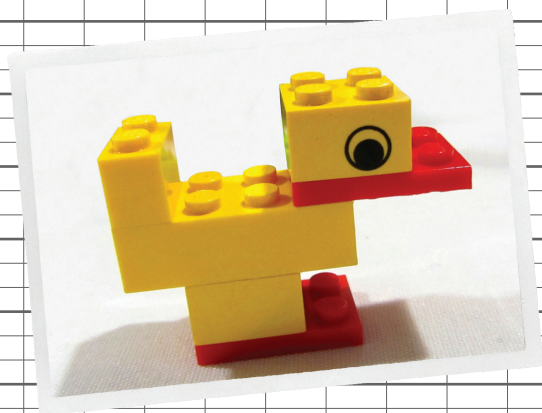
LEGO® Brick Paper!

Use your Brick Paper to plan out your own custom LEGO® models before you build them.



Side View

Front View



After you've sketched and colored your idea, you can start building your new creation!



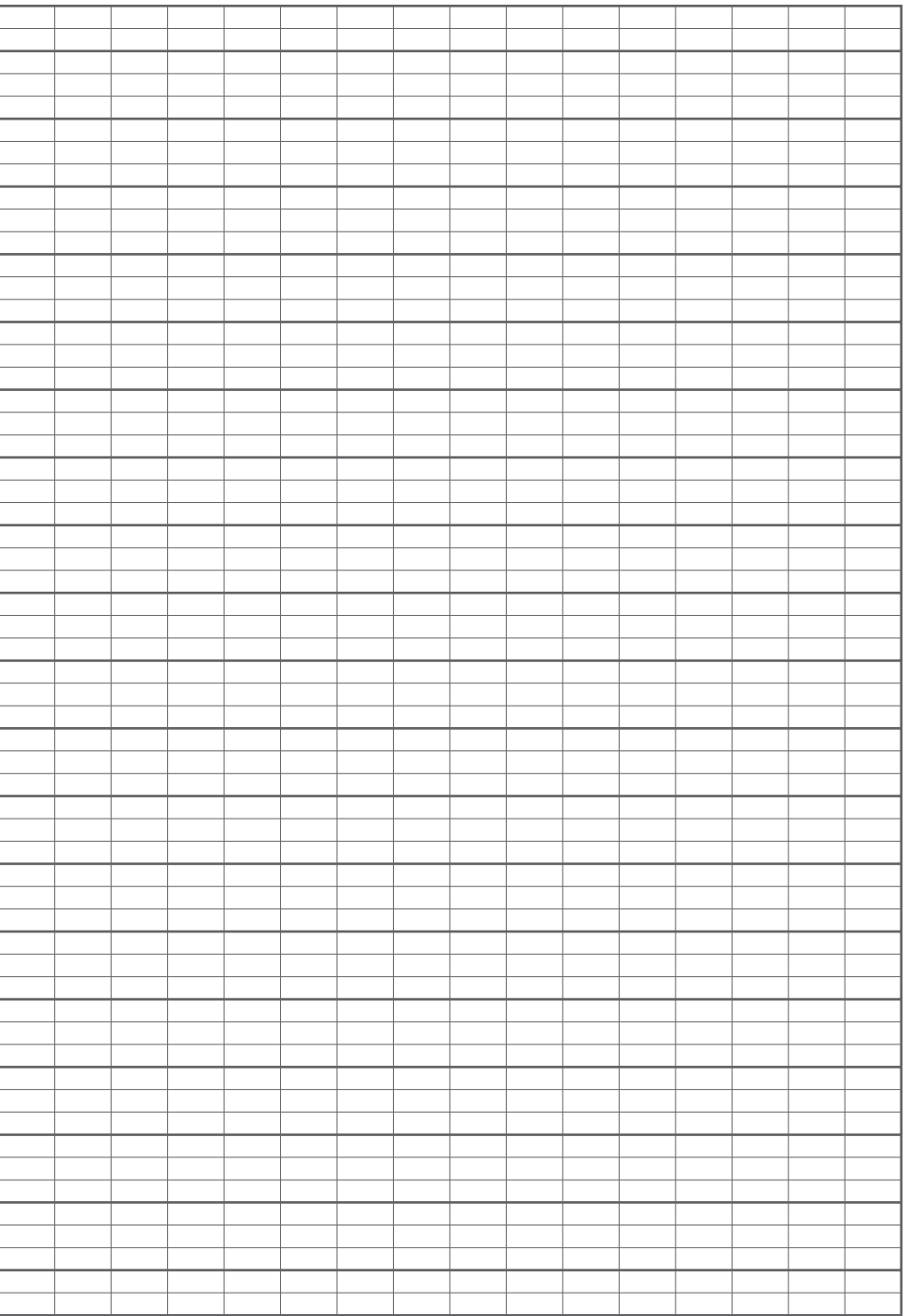
LEGO Plate



LEGO Brick

Each line in this Brick Paper is the height of a LEGO plate, and 3 plates stacked are the height of a LEGO brick.

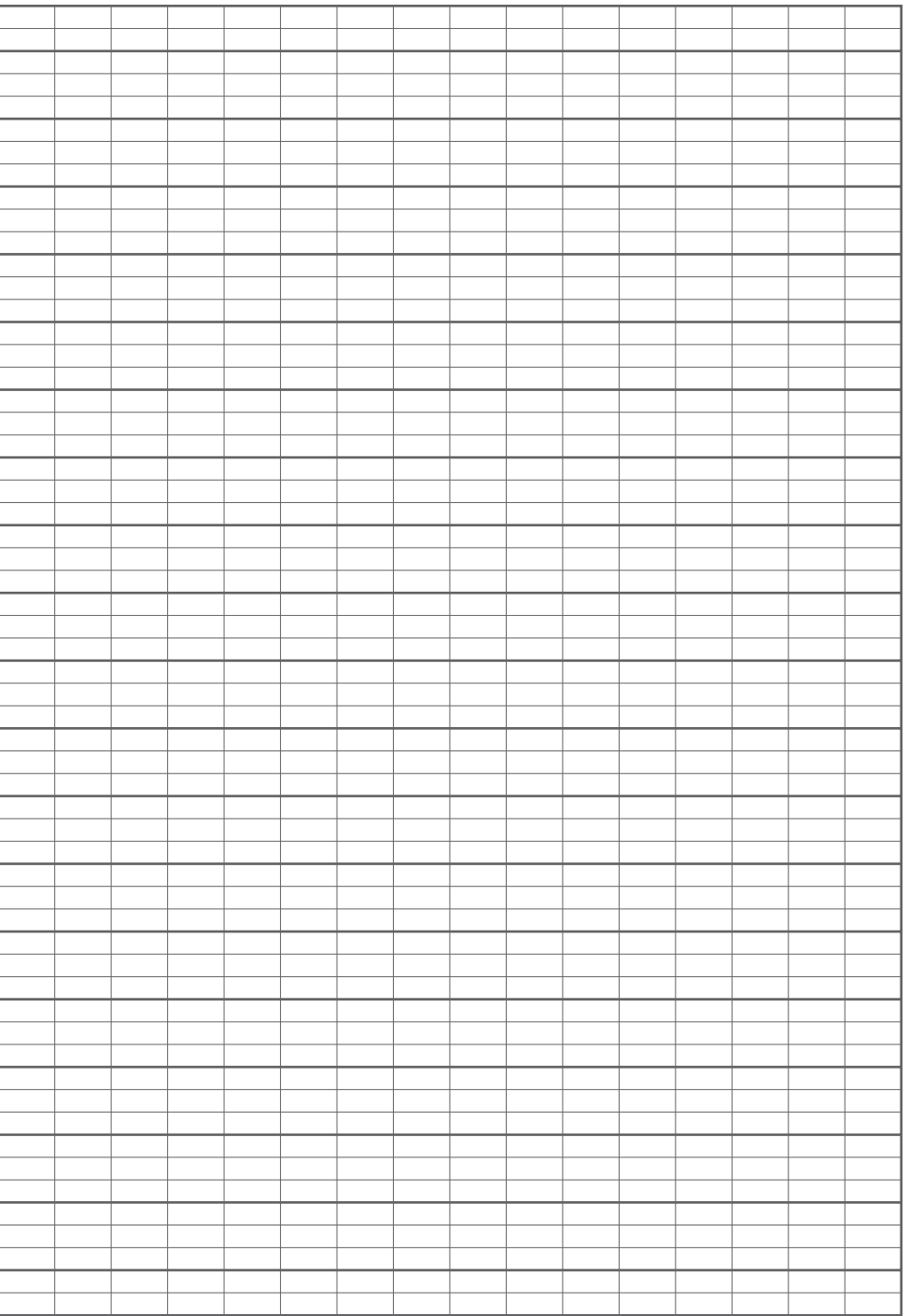
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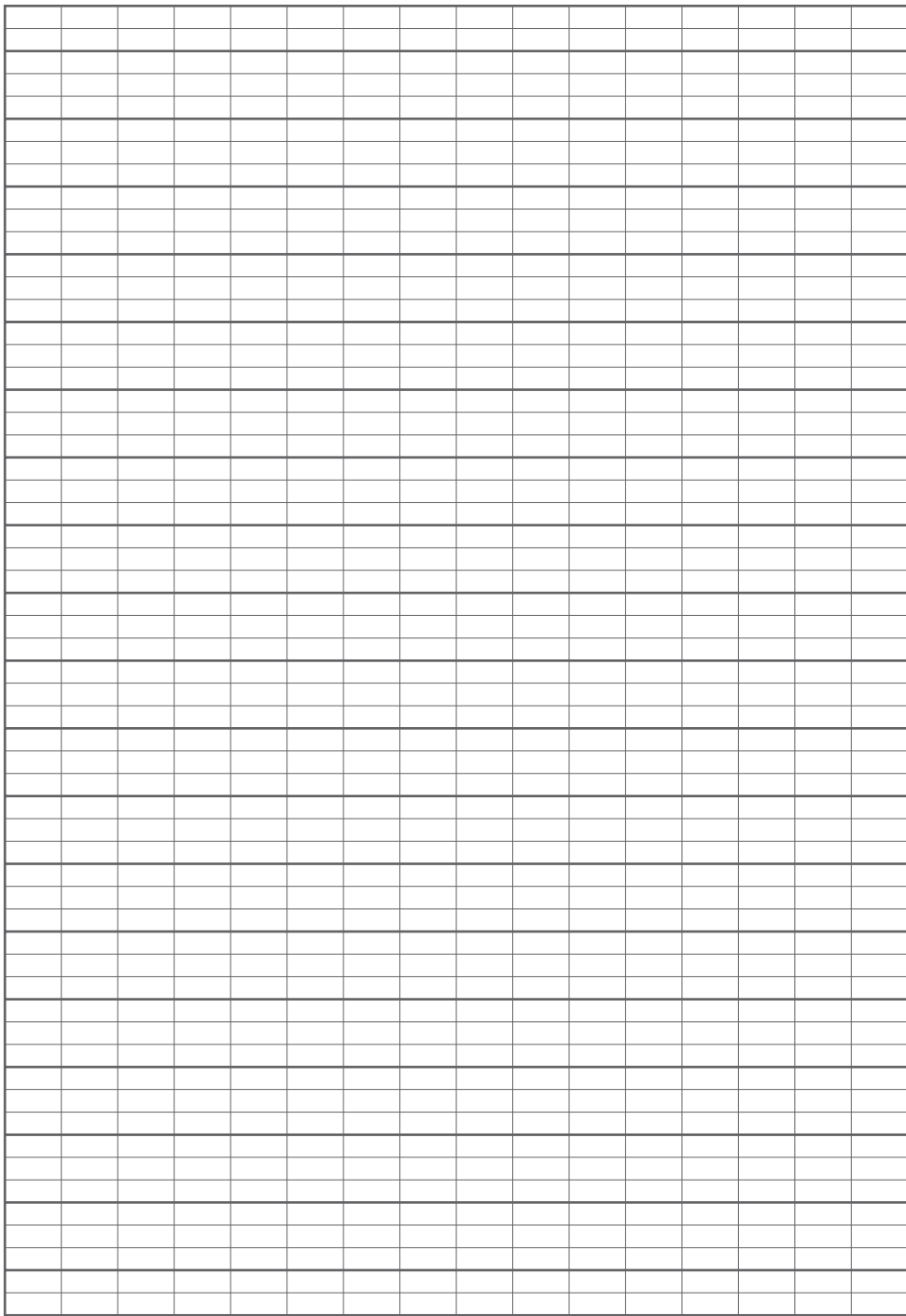
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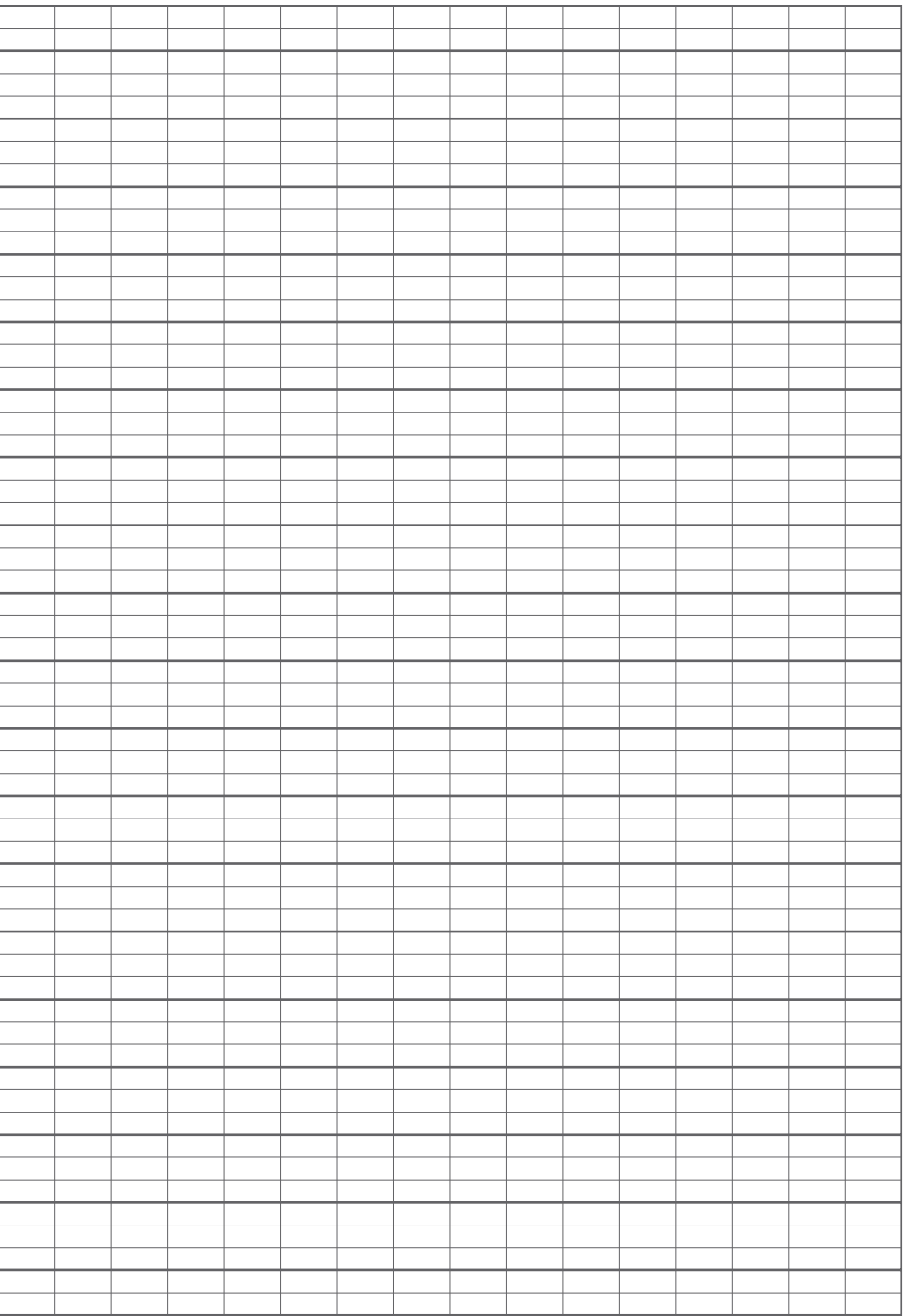
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Fun Facts!



The LEGO® name is an abbreviation of the Danish words "LEG GODT", meaning "Play Well".

The LEGO Group patented the LEGO brick with the familiar tubes inside and studs on top on 28 January 1958. All 2x4 LEGO bricks manufactured since have been made to the exact same measurements.

On average, every person on earth owns 86 LEGO bricks.

In 2012, 45.7 billion LEGO bricks were produced at a rate of 5.2 million bricks per hour.

Laid end to end, the number of LEGO bricks sold in one year would stretch around the planet more than 18 times.

If you build a column of 40 billion LEGO bricks, it would reach all the way to the Moon.

More than 4 billion LEGO minifigures have been made since 1978, making them the world's largest population group.

Six 2x4 LEGO bricks can be combined in 915,103,765 different ways.

My favourite football model



Tape a photo
of your
creation here

Get inspired, design, build.

Have fun!

- The LEGO® Education Team

