



THE FIVE PERFECT SOLIDS

THE SHAPES IN YOUR DICE BAG, AND WHY THERE ARE ONLY FIVE

DND DICE ROLLER

Five shapes are perfectly regular. Every one of them is in your dice bag, and there will never be a sixth.

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THE MAGE AND THE GOBLIN

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WHY ONLY FIVE

PICK UP A D20 AND TURN IT OVER IN YOUR HAND. Every face is the same triangle. Every edge meets its neighbour at the same angle. Every point has the same five triangles crowded around it. Put it down, pick it up again, and you cannot tell which way it was facing before.

That is what a mathematician means by a **regular** solid: not just identical faces, but identical edges and identical corners too. Take any face and you can rotate the whole shape until that face sits exactly where another one was, and nothing about the object has visibly changed. Ask also that it be **convex** — no dents, no spikes turned inward — and you have described a very small club.

It has five members. Not five that happen to be useful, or five that survived into modern manufacture. Five that can exist at all.

The reason is easier than it sounds. To make a solid corner you need at least three faces meeting at a point, and their angles have to add up to less than a full turn — otherwise the corner lies flat and you have a tiled floor rather than a box. Equilateral triangles have 60° corners, so three, four or five of them will close up, but six will not: that is the d4, the d8 and the d20, and nothing beyond. Squares have 90° corners, so only three will close: the cube. Pentagons have 108° corners, so again only three: the dodecahedron. Hexagons have 120° corners, and three of those lie perfectly flat.

The list runs out there. It is not a limit of engineering or imagination. It is a limit of space.

WHAT THAT BUYS YOU

A die is fair when no face is favoured over another, and perfect regularity is a very thorough way of guaranteeing it. There is no heavier corner for the die to settle onto, no broader face for it to prefer, no axis it would rather spin around. Symmetry does the work that a manufacturer would otherwise have to do with tolerances and testing.

This is why five ancient shapes ended up in a plastic bag in your rucksack. Nobody designed them for gaming. They were the only options.

THE FIVE

Solid	Faces	Face shape	At the table
Tetrahedron	4	triangle	d4
Hexahedron	6	square	d6
Octahedron	8	triangle	d8
Dodecahedron	12	pentagon	d12
Icosahedron	20	triangle	d20

The mathematics is usually credited to Theaetetus, working a generation before Plato. The four elements came from Empedocles before him. What Plato did was weld the two together, and the join has held for two and a half thousand years.



THE TROLL IN THE WOOD

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THE FIVE

IN *TIMAEUS*, WRITTEN AROUND 360 BCE, PLATO GIVES four of the solids to the four elements. He is careful about it — the account is offered as the likely one, argued from what the shapes are like, not handed down as fact. His reasoning runs on sharpness, size and how readily a thing moves.

TETRAHEDRON — FIRE



Four triangular faces and the sharpest corners of the five. Fewest faces means the most acute angles, which made it the most penetrating of the elements in Plato's account, and the quickest to move.

It is also the worst die in the bag: with four faces it barely rolls, and it lands with a *point* upward rather than a face, so the number is read off the bottom edge.

HEXAHEDRON — EARTH



The cube, and the only one of the five with square faces. A square sits flat and broad, and a solid built from squares is the steadiest thing you can put on a table — so Plato gave it to earth, the least movable element wearing the most stable shape. It is also the oldest gaming die by a wide margin, and the only one most people outside this hobby have ever handled.

OCTAHEDRON — AIR



Two square-based pyramids joined at the base. Sitting between fire and water in size, sharpness and mobility, it took the element between them.

Look at one and it seems to have a single waist, a top half and a bottom half. It does not. The numbers are printed upright against one plane, inventing a horizon the shape has no opinion about — turn it and you will find three such cross-sections, not one.

ICOSAHEDRON — WATER



Twenty triangles, and the roundest of the four elemental solids. Largest and least mobile in Plato's ordering, so it went to water, which pours rather than darts. Two thousand years later it became the die every roll in the game passes through, and of the five it rolls best — twenty faces make it nearly a ball.

DODECAHEDRON — THE UNIVERSE



Twelve pentagons, and the odd one out. Plato built his elements from two right triangles — half an equilateral and half a square — and each elemental solid is faced with one or the other. That is what lets fire, air and water break down and rebuild into one another: shared stock. Earth, made of squares, cannot join in.

A pentagon comes from neither triangle, so the dodecahedron sits outside the scheme entirely. Plato says only that there was a fifth combination, used for the whole universe, and leaves it there. Later writers handed it *aether*.

Which leaves the d12 the least-used die in the bag, and by some way the one with the grandest job description.

THE ONES THAT ARE NOT

YOUR BAG HOLDS MORE THAN FIVE DICE, AND everything past the five is a compromise of one kind or another. They are not lesser dice. Most of them are perfectly fair. They simply buy their fairness with less symmetry than a Platonic solid has to spend.

THE D10

Ten kite-shaped faces, five above the waist and five below, and it is not a regular solid at all. Its corners come in two different kinds: five points around the middle are nothing like the two spikes at top and bottom.



It is still a perfectly fair die, and that fact is worth sitting with, because it tells you what fairness actually needs. Not that everything about the shape be identical — only that every **face** be identical, since the face is what you read. The Platonic solids have more symmetry than a die requires. The d10 has exactly enough.

Look closely and its faces do not line up across the middle; they are staggered. They have to be. With five faces on each side, lining them up would leave an edge pointing at the ceiling when the die settled, instead of a number.

THE D100

A hundred small facets on a body that is very nearly a sphere. It is neither regular nor built on the d10's plan, and it pays for the ambition: it rolls for an embarrassingly long time, and when it finally stops you have to hunt for the number among ninety-nine others.



Most tables ignore it and read two d10s instead — one for the tens, one for the units — which is faster, more reliable, and a great deal less dramatic.

THE D2 AND THE D3



There is no two-sided solid and no three-sided one, but there are real d2s and real d3s, and they get there by repeating themselves. Number a d6 as 1,1,2,2,3,3 and you have a fair d3. Do the same with two numbers, then round each trio of faces into one continuous curved side, and you have a d2 that genuinely rolls.

Players did this with ordinary dice for years before anyone thought to print them — *one or two is a one, three or four is a two* — and the printed versions only save you the arithmetic.

You could flip a coin. But you did not come here to flip coins.



ON THE ROAD

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WHICH DIE DOES WHAT

DICE ARE SMALL SOMETIMES-POINTY THINGS MADE OF *plastic or metal — or sometimes wood or gemstone — that go clickety-clack and then give you a number. If in doubt, roll a d20.*

— SwiftSign, *D&D Beyond* forums

That is genuinely most of it. The d20 decides whether a thing *happens* — every attack roll, saving throw and ability check in fifth edition runs through it. The other dice decide *how much*: damage, healing, distance, gold. The rules always name the die, so nobody is expected to memorise this table. You will anyway, within three sessions.

EVERY DIE AND ITS JOB

Die	Rolled for	At the table
d20	attacks, saves, checks	“roll to hit”
d12	greataxe damage, barbarian hit dice	“the barbarian’s friend”
d10	heavy crossbow; paired as percentile	“tens and units”
d8	longsword, rapier, most hit dice	“roll damage”
d6	shortsword, sneak attack, <i>fireball</i>	“eight dee six, everyone”
d4	dagger, <i>magic missile</i> , healing potion	“ow”

There is even a quiet pattern to it: the wizard’s d4 sits in both the dagger and *magic missile*; the rogue’s d6 in the shortsword and sneak attack; the cleric’s d8 in the mace; the barbarian’s d12 in the greataxe. Class, hit die and signature weapon travel together.

WORKED EXAMPLES

ONE ROUND, THREE DICE

Your fighter swings a longsword at a goblin (AC 15) with a +5 to hit.

Attack $1d20+5$ — you roll a **14**, total **19**. That beats 15: a hit.

Damage $1d8+3$ — you roll a **6**, total **9** slashing.

Result the goblin had 7 hit points. It does not any more.

THE FAMOUS ONES

Fireball $8d6$ — eight dice, added. Average 28, and the whole table leans in for the count.

Magic missile three darts of $1d4+1$ — the caltrop’s finest hour.

Ability scores $4d6d11$ six times — drop the lowest, keep three. A character in nine keystrokes.

READING PERCENTILE

Roll two d10s: one is the tens, one the units. A **4** and a **7** is **47**. Double zero is 100, not nothing. This is why dice sets ship a second d10 marked 00–90 — it saves the argument about which die was which.

Type any of these into the roller at dnddiceroller.com and it shows every die as it lands, not just the total.



THE DUEL

[DNDICEROLLER.COM](https://dnddiceroller.com)

A HISTORY OF THE DICE

OLDER THAN EVERY EMPIRE

Dice are older than the games we play with them by thousands of years. The Egyptian board game *senet* was using two-sided throwing sticks around 3000 BCE, and before that, people cast the four-sided ankle bones of animals. Rome gambled on six-sided dice with pips that a modern player would recognise at a glance. And icosahedra — real twenty-siders, cut from stone and glass and marked with symbols — survive from at least the second century BCE, though nobody now knows what they were rolled *for*.

The modern story starts in hobby wargaming. In 1963 an inventor named Fredda Sieve patented *Zazz Polyspheres*, a game played with a full family of polyhedral dice — twenty, twelve, eight, six and four sides. Through the 1960s the Japan Standards Association sold precision icosahedra as “Random Numbers Generating Dice”, and by 1971 a British wargaming newsletter would sell you a pair of twenty-siders for \$1.20. Gary Gygax found polyhedral dice through a schoolroom supplier called Creative Publications — and when *Dungeons & Dragons* arrived in 1974, it asked its players to own the whole set.

THE CRAYON YEARS

Early d20s were numbered 0–9 *twice*. Gygax’s advice was to colour one set of faces with a crayon and read those as ten higher. Early dice were also notoriously bad — soft plastic, uneven faces — while Lou Zocchi’s precision dice went the other way: corners so sharp they were infamous for denting game boards.

DICE THROUGH THE EDITIONS

A TIMELINE

Year	Edition	What changed
1974	Original D&D	full polyhedral set required; d20 read with a crayon
1977	Holmes Basic	a five-dice set shipped in the box
1981	B/X Basic	the d10 joins the set; percentile explained
1983	BECMI	“virtual dice”: d2, d3 and d5 by halving
1989	AD&D 2e	the set is standard; no die added since
2000	3rd edition	the <i>d20 System</i> — the die becomes the brand
2008	4th edition	percentile dice quietly dropped
2014	5th edition	advantage: roll two d20s, keep the better

The 1981 Basic Set even told players how to roll the d4 — spin it and toss it straight up — because everyone already knew it would not roll on its own.

WHY WE ROLL OUR OWN

Psychologists call it *sense of agency*: the same instinct that makes a gambler throw hard for high numbers and soft for low ones — a real, measured finding — makes a player reach across the table rather than let the DM roll their save. It changes nothing about the dice. It changes everything about how the roll feels.

DICE JAIL IS NOT FOR THE DICE. IT IS FOR US.

Fifty years on, the bag has not changed since 1981. Seven dice, five of them perfect, all of them older than the game they serve.

THE OLD WOOD

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THE FIVE PERFECT SOLIDS

There are only five shapes in which every face, every edge and every corner is the same as every other. Every one of them is sitting in your dice bag.

Why there can never be a sixth, what Plato thought they were made of, which die to reach for at the table, and how all of them found their way into the box.

CREDITS

Written and set for dnddiceroller.com.

Cover: *The Party* – after the classic adventuring-party covers. Interior art: *The Mage and the Goblin*, *The Troll in the Wood*, *On the Road* – from the dnddiceroller.com library. Dice diagrams by dnddiceroller.com.

SOURCES

Euclid, *Elements* XIII; Plato, *Timaeus*; after Theaetetus and Empedocles. Greg Gbur, “The geometry of weird-shaped dice”. Dice history after the D&D Lore Wiki contributors (CC BY-SA). Psychology after Jamie Madigan, *The Psychology of Dungeons & Dragons*.

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DND DICE ROLLER

ROLL WITH US

dnddiceroller.com is the free roller that remembers your lists, follows you from laptop to phone, and never asks you to install anything. Six thousand of you a day can't be wrong. Well, you can, but the dice aren't.

UNCURSE YOUR DICE

Convinced your d20 hates you? **True Randomness** cuts every roll from a signed public pulse published by the US National Institute of Standards and Technology, and shows you which one. Blame physics, not the dice. Find it under **Unlock**.

FIND YOUR PEOPLE

The **Directory** at dnddiceroller.com/directory lists 59 dice makers, map artists, rules tools and table gear we'd actually use. Sell something for the table? Get listed.

TAKE IT TO THE PUB

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