

Magnitude

In a general scientific way, magnitude means the size of something.

So for earthquakes, it's how big the earthquake was. It tells us both how much we would feel the earthquake, and how much energy there is in the waves.

You might have heard of the Richter scale to measure size of earthquakes. Though this can still be used, it is much more common to use the moment magnitude scale (M_w).

Magnitude scales are logarithmic. This means that an earthquake of $3M_w$ is not 1 times bigger than one of $2M_w$ but 10 times bigger (10^2 vs 10^3); an $8M_w$ earthquake is 10^7 (10,000,000) times bigger than a $1M_w$ earthquake. Have a look at the table below to see what this means about the amount of energy in an earthquake

M_w	E_s (Joules)	TNT-equivalency (tons)	equivalence Hiroshima-bomb (12.5 kT TNT)
3	2.0×10^9	-	-
4	6.3×10^{10}	15	0.0012
5	2.0×10^{12}	475	0.038
6	6.3×10^{13}	15,000	1.2
7	2.0×10^{15}	475,000	38
8	6.3×10^{16}	15,000,000	1200
9	2.0×10^{18}	475,000,000	38,000
10	6.3×10^{19}	15,000,000,000	1,200,000

So that's what magnitude is, but how could we guess how big an earthquake is without a seismometer? What do earthquakes feel like?

Japan's Meteorological Agency created a really useful guide to show you what the different sizes of earthquakes would feel like, it's on the next page.



0

1

2

3

4

6 Lower

High earthquake resistance Low earthquake resistance

5 Lower

6 Upper

High earthquake resistance Low earthquake resistance

5 Upper

7

High earthquake resistance Low earthquake resistance

Image Credit: Japan Meteorological Agency