Figure S1. Full list of Japonic languages. Subgroups are coded with colour circles (Hirayama, 1992): yellow, Eastern Japanese; orange, Western Japanese; red, Hachijyo; blue, Kyushu; purple, Northern Ryukyuan; pink, Southern Ryukyuan. Sample 1 to 54 are taken from Hirayama (1992), 55 to 57 were taken from Hirayama (1988), Middle Japanese from Muromachijidaigo Jiten Henshūinikai (2001), and Old Japanese from Jōdaigojiten Henshūinikai (1967), and Yasumoto and Honda (1978).

The data initially consisted of 77 wordlists but because the sources contained multiple entries for a single language/dialect (i.e., multiple samples from an area that a particular language is being spoken) only those with the least amount of missing data were selected, thus a single list with the most amount of data represents a single
language/dialect. Any words that indicated to be borrowing were removed. The lexical data compiled by Hirayama (1992) contained many near-synonyms. Accordingly, we removed any words that were indicated to be derogatory terms or honorific forms as we reasoned that these forms are learnt only after speakers reach maturity (i.e., horizontally transmitted). We also removed onomatopoeia (e.g., *wanwan* meaning 'dog'). After removing these, the majority of word items were left with a single word. When there still were synonyms, we chose the words that the sources identified as the ones being spoken more frequently than others.
Cognate coding scheme

We made cognate judgments by (a) consulting previously identified sound correspondences that were used for internal reconstruction of proto-Japonic (e.g., Frellesvig & Whitman, 2008; Riley, 2003; Whitman, 1985), (b) working out systematic sound correspondences based on the comparative method (Crowley & Bowern, 2009), and (c) consulting previously published cognate judgments on Japonic languages (Hattori, 1961, 1978-1979)).

As Ryukyuan and mainland Japanese are two major branches of Japonic family, sound correspondence examples presented here are mainly those between mainland Japanese and Ryukyuan. We did not assume a direction of change between words. Thus, we identified regular correspondences strictly based on the current states, without considering reconstructed/transitional states between words. Examples of sound correspondences are as follows.

Table s1. Sound correspondences between mainland Japanese and Ryukyuan.

<table>
<thead>
<tr>
<th>Mainland Japanese (MJ)</th>
<th>Ryukyuan (R)</th>
<th>Corresponding words</th>
</tr>
</thead>
<tbody>
<tr>
<td>/k/ preceding vowel /u/</td>
<td>/F/ preceding vowel /u/</td>
<td>kusa (MJ) : Fusa (R) 'grass' kusa- (MJ) : Fusa (R) 'rotten' kutʃi (MJ) : Futʃi (R) 'mouth'</td>
</tr>
<tr>
<td>/c/ after consonant</td>
<td>/ɪ/ after consonant</td>
<td>kee (MJ) : ki (R) 'hair' ame (MJ) : ami (R) 'rain' te (MJ) : ti (R) 'hand'</td>
</tr>
<tr>
<td>/o/</td>
<td>/u/</td>
<td>ki.ro (MJ) : ki.ru (R) 'yellow' omo- (MJ) : umu (R) 'to think' kokono-(MJ) : kukumu-(R) 'nine'</td>
</tr>
<tr>
<td>/u/ after consonant /tʃ/</td>
<td>/i, ɪ/ after consonant /ʃ/</td>
<td>tsuki (MJ) : tʃi-(R) 'moon' itsutsu (MJ) : itʃi-(R) 'five' ʃitosu (MJ) : p'ʃi tʃi (R) 'one'</td>
</tr>
<tr>
<td>/k/ before vowel /i/</td>
<td>/ts, tʃ/ before vowel /i/</td>
<td>ki- (MJ) : ts-, tʃ- (R) 'to hear' ki- (MJ) : ts-, tʃ- (R) 'to cut'</td>
</tr>
<tr>
<td>medial /m/</td>
<td>medial /b/</td>
<td>kemuri (MJ) : kibu-kiwu- (R) 'smoke'</td>
</tr>
<tr>
<td>initial /h/</td>
<td>initial /p/</td>
<td>sema- (MJ) : seba- (R) 'narrow' hane (MJ) : pani (R) 'wing' hana (MJ) : pana (R) 'flower'</td>
</tr>
<tr>
<td>initial /j/</td>
<td>initial /d/ (Yonaguni)</td>
<td>jaku (MJ) : dakuw (Yonaguni) 'to burn' jaQʃu (MJ) : datʃi (Yonaguni) 'eight' wa- (MJ) : ba- (R) 'I' wa- (MJ) : ba- (R) 'We' wa- (MJ) : bar- (R) 'to laugh'</td>
</tr>
<tr>
<td>initial /w/</td>
<td>initial /b/</td>
<td></td>
</tr>
</tbody>
</table>
Four models of language evolution

The first model used a strict clock model with an eight-category gamma correction of rates (STRICT+Γ). This model assumes that evolutionary rate between languages is relatively constant with a strict clock model but could vary within languages with gamma correction. The gamma correction assigns different rates of evolution across cognates by giving slow rates for rarely appearing cognate sets and fast rates for frequently appearing sets with a parameter alpha (α) (Yang, 1996). Under the gamma correction, the rates across sites are maintained from the time of origin to the present.

The second model applied an uncorrelated lognormal relaxed clock model in addition to the gamma correction (UCLD+Γ). Under the relaxed clock model, rate variation between languages is accommodated by assigning different rates (which are drawn from a lognormal distribution) to different languages (Drummond, Ho, Phillips, & Rambaut, 2006). Therefore, coupled with the gamma correction that accounts for within-language rate variation, this model explores the possibility of rate variation both between and within languages.

The third model was based on the relaxed clock model with a covarion approach (UCLD+Cov). This model also assumes rate variations between languages as well as within languages but unlike the models using the gamma correction, the rate is allowed to switch between fast or slow rates during evolution. This is achieved by incorporating two parameters into the model: Phi (φ), which allows some proportion of sites to vary freely and Delta (δ), which allows some sites to switch between variable and invariable sites (Penny, Mccomish, Charleston, & Hendy, 2001). Put differently, the covarion approach assumes that most cognate sets evolve
neutrally; and there are some cognate sets that do not vary at all; but at the same time, the invariant sets can become variable sets over the course of time.

The fourth model assumed the covarion model in addition to the strict clock model (STRICT+Cov). This model assumes that the evolutionary rate is relatively constant between languages with the strict clock model but it could be different within languages with the covarion approach.
Figure s2. Maximum clade credibility tree of 9 Japonic languages. Subgroups are coded with colour circles: yellow, Eastern Japanese; orange, Western Japanese; red, Hachijyo; blue, Kyushu; purple, Northern Ryukyuan; pink, Southern Ryukyuan. Green bar represents the age range predicted by the farming/language dispersal theory (1,700 - 2,400 YBP).

Method and results
The data (Starostin, Dybo, & Mudrak, 2003) is available from http://starling.rinet.ru/main.html. This data consists of 110 Swadesh list on 9 Japonic languages. After the cognate sets were conversed to binary codes, a series of model testing was conducted. The same calibration priors as used in the main text were incorporated into all analyses: a relaxed sample date calibration on Old Japanese and a probabilistic calibration on Tokyo-Kyoto pair. All analyses were run for 10,000,000
steps with samples taken every 1,000 steps. This produced a sample of 9,000 trees for each model after discarding the first 1,000 trees as burn-in. Post-run inspections on four analyses revealed that UCLD and Cov significantly over-parameterised the data. More specifically, the standard error for the UCLD clock rate frequently reached 0, and the covarion rate of switching between slow and fast rates frequently amassed at 0. Therefore, STRICT + Γ model was chosen as the most appropriate model. All node heights in the tree are scaled to match the posterior median node heights. A value on each branch of the tree is the posterior probability, showing the percentage support for a node following a particular branch. The maximum clade credibility tree from the chosen model indicates that the median root divergence time is 1,976 YBP (the mean: 2,080 YBP; the standard error: 9.13 years; 95% HPD: 1,232 - 3,279 YBP) in close agreement with the estimation from our data.

Interestingly, a previous glottochronological study also suggests the root time of Japonic languages is between 1,500-2,000 YBP (Hattori, 1976), in consistent with our results.


