

Estimation

When finding an estimate, pupils should know that:

- it is possible to find different estimates that are equally valid
- different mental strategies can be used to find an estimate.

The key to finding an estimate mentally when dividing is to approximate the dividend and divisor so that the mental division is easy.

For example, $239 \div 7$ could be rounded down to $200 \div 7$ but the division is no easier. It is better to approximate with $210 \div 7$, recognising that 21 is in the 7 times table (with $3 \times 7 = 21$). The estimate is then $210 \div 7 = 30$.

A refinement is to straddle 239 with 210 and 280 (as 21 and 28 are both in the 7 times table). So the answer lies between $210 \div 7$ and $280 \div 7$; that is, between 30 and 40.

Steps 1 and 2: Two- and three-digit \div one-digit no carrying

These simple divisions can be carried out mentally without the need for estimates. For example, in **Step 1**, $69 \div 3$ can be partitioned mentally as $60 \div 3$ and $9 \div 3$ to give 20 and 3 and an (exact) answer of 23.

Steps 6, 7, 8 and 10: Three-digit \div one-digit with remainders

The example in Step 7 is $876 \div 4$. Here are three approaches.

Pupil A	Pupil B	Pupil C
<p><i>I will round down to the nearest hundred.</i></p> <p><i>I think of $800 \div 4$</i></p> <p><i>My estimate is 200.</i></p>	<p><i>I will use 880 as an approximate value because it is an easy number to handle mentally.</i></p> <p><i>I think of $880 \div 4$.</i></p> <p><i>My estimate is 220.</i></p>	<p><i>876 lies between 840 and 880.</i></p> <p><i>So $876 \div 4$ lies between $840 \div 4$ and $880 \div 4$.</i></p> <p><i>I estimate that the answer lies between 210 and 220.</i></p>

The exact answer is 219.

Steps 11 to 17: Four- and five-digit \div one-digit with remainders

The example in Step 15 is $7324 \div 8$. Here are three approaches.

Pupil A	Pupil B	Pupil C
<p><i>I will round up to the nearest thousand to make an easy division.</i></p> <p><i>I think of $8000 \div 8$</i></p> <p><i>My estimate is 1000. It will be higher than the exact answer.</i></p>	<p><i>I will take an approximate value of 7200, because 72 is in the 8-times table.</i></p> <p><i>I think of $72 \div 8 = 9$.</i></p> <p><i>My estimate is 900. It will be lower than the exact answer.</i></p>	<p><i>72 and 80 are both in the 8-times table. 7200 and 8000 straddle 7324.</i></p> <p><i>I think of $72 \div 8 = 9$ and $80 \div 8 = 10$.</i></p> <p><i>My estimate is between 900 and 1000.</i></p>

The exact answer is 915 r 4 or 915.5.