Estimation, Approximation and significant figures

Significant figures

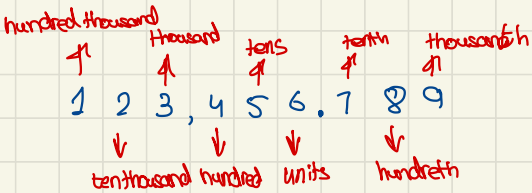
$\frac{1}{3} \approx 0.33$ → Rounded off

↓ Exact form.

$\frac{25}{8} = 3.125$ → Exact forms.

$\sqrt{2} \approx 1.41$ → Rounded off

↳ Exact form



① 20,000 1 significant figure

trailing zeros

② 3,000,000 1 sf

③ 2,500 2 sf

④ 2,005 4 sf

⑤ 2,020 3 sf

→ Trailing zeros may or may not be significant.

Example

756,384

a) 5 sf → 756,380
b) 4 sf → 756,400
c) 3 sf → 756,000
d) 2 sf → 760,000
e) 1 sf → 800,000

→ Decimals.

① 0.00009 — 1 sf

Leading zeros are not significant.

② 3.00005 — 6 sf.

③ 1.200 — 4 sf

In a decimal, trailing zeros are significant

3.8 — 3 sf ✗
3.80 — 3 sf ✓

④ 1.500320 — 7 sf

Estimate the value, correct to one significant figure $\frac{4.03^2 \times 24.88}{\sqrt{150}}$

$\frac{4^2 \times 30}{\sqrt{144}} \rightarrow \frac{4 \times 4 \times 30}{12} = \boxed{40}$

Estimate the value, correct to one significant figure $\frac{8.62 \times 2.04^2}{0.285}$

$\frac{4 \times 2^2}{0.3} \approx \frac{36}{0.3} \times \frac{10}{10} = \frac{360}{3} = \boxed{120}$

A basketball stadium has 13 492 seats.
During a season a basketball team played 26 matches and every seat was sold for each match.
At each match a seat cost £9.80
Estimate the value, correct to one significant figure, to estimate the total amount of money paid to watch these matches during the season.

No. Of seats $\approx$ 10,000
No. of matches $\approx$ 30
cost/seat $\approx$ 20

$10{,}000 \times 30 \times 20 = \boxed{£6\,000\,000}$

(a) Write 405 917 628 correct to three significant figures

$\boxed{406\,000\,000}$

(b) Estimate the value, correct to one significant figure $\frac{41.3}{9.79 \times 0.765}$

$\frac{40}{10 \times 0.8} \rightarrow \frac{40}{8} = \boxed{5 \text{ Ans}}$

(c) Estimate the value, correct to two significant figures, of $\sqrt{110.94 - 0.2834 \times 368.62}$

estimate correct to one s.f

$\sqrt{110 - 0.20 \times 370}$

$\sqrt{110 - 74}$

$\sqrt{36} = \boxed{6 \text{ Ans}}$

By writing each number correct to 1 s.f estimate the value of $\frac{48.9 \times 0.207^2}{3.94}$

$\frac{50 \times 0.2^2}{4}$

$\frac{50 \times 0.04}{4}$

$\frac{2}{4} = \boxed{0.5}$

Standard Form Past Paper Qs

Country	No. of bags per year
Brazil	4.8×10^7
Vietnam	1.85×10^7
Colombia	9.2×10^6
Indonesia	8.5×10^6

(a) In 2020, Brazil produced 48 million bags of coffee.
Complete the table with the coffee production for Brazil using standard form

(b) How many more bag of coffee were produced in Vietnam than Colombia?

$1.85 \times 10^7 - 9.2 \times 10^6$

$18.5 \times 10^6 - 9.2 \times 10^6 = \boxed{9.3 \times 10^6}$

(c) The mass of a bag of coffee is 60kg
Work out the number of kilograms of coffee produced in Indonesia.
Give your answer in standard form

$60 \times 8.5 \times 10^6$
$85 \times 10^6 \times 6$
$510 \times 10^6 =$ $\boxed{5.1 \times 10^8}$

The table below shows the populations of some countries in 2010

Country	Population
Indonesia	2.4×10^8
Mexico	1.2×10^8
Russia	1.4×10^8
Senegal	1.4×10^7
South Korea	4.8×10^7

a) The population of Mexico was 111 240 000
In the table above, complete the row for Mexico
Give your answer in standard form correct to 2 s.f

b) Complete the following sentences
The population of Russia is ten times the population of Senegal

$1.4 \times 10^8 \div 10 = 1.4 \times 10^7$ = Senegal

The population of South Korea is one fifth of the population of Indonesia

2.4×10^8 $\frac{1}{5} \times 2.4 \times 10^8$
$\frac{1}{5} \times 240 \times 10^6$
48×10^6
$\boxed{4.8 \times 10^7}$ = South Korea.

(c) Calculate the difference in population between South Korea and Senegal.
Give your answer in standard form

$4.8 \times 10^7 - 1.4 \times 10^7 = \boxed{3.4 \times 10^7}$