APPROXIMATIONS

· Measurements can be rounded to a certain number of significant figures.Approximation- is a process of rounding numbers to a certain degree of accuracy.A number can be rounded to a certain required place value such as to the nearest ten, hundred, and thousand

Rounding Off Numbers

Rounding off Whole Numbers to Given Place Values

Round off whole numbers to given place values

STEPS

- When rounding a number, stand at the digit of the required place value, then look at the next digit to the right; if it is or more, round up (i.e, increase the digit of the required place value by 1) and if it is or less, do not change the digit of the required place value

- Replace all the remaining digits to the right of the required place value with the zeros

Example 1

The population of Tanzania in a census of 2002 was 42,850,671. Round this to the nearest

a. million

b. ten million

Solution

a. The million digit is 2, since the next digit to the right is greater than 5, then we can increase 2 by 1 and put the remaining digits to the right of 2 zeros. There fore;42,850,671 ≈ 43,000,000

b. The ten million digit is 4, since the next digit to the right is less than 5, then we do not change 4 but we put the remaining digits to the right of 4 zeros. There fore;42,850,671 ≈ 40,000,000

Decimals to a Given Number of Decimal Place

Round off decimals to a given number of decimal place

STEPS

- When rounding a decimal, stand at the digit of the required decimal place, then look at the next digit to the right; if it is or more, round up (i.e increase the digit of the required decimal by 1) and if it is or less, do not change the digit of the required decimal place
- Replace all the remaining digits to the right of the required decimal place with the zeros

NOTE

- The first digit after the decimal point is the first decimal place, the second digit after the decimal point is the second decimal place e.t.c
- Example 0.568 is the first decimal place and is the second decimal place

Example 2

Round 0.24736 to the nearest

a. 1 decimal place

b. 2 decimal places

c. 3 decimal places

Solution

a. 0.24736≈ 0.02 (1 d.p)

b. 0.24736≈ 0.025 (2 d.p)

c. 0.24736≈ 0.0247 (1 d.p)

Significant Figures

Significant figures of a number - are the significant digits, counted from left of the number.The first significant figure must be non-zero; following significant figures may take any value.

A Number to a Given Number of Significant Figures

Write a number to a given number of significant figures

Is the number of significant digits including 0 if it is between the first and the last

Examples

a. 13 – has two significant figures

b. 709.43 – has five significant figures

c. 0.0004001 – has four significant figures

STEPS

- When rounding a number to a certain significant figure, stand at the digit of the required significant figure, then look at the next digit to the right; if it is or more, round up (i.e increase the digit of the required significant figure by 1) and if it is or less, do not change the digit of the required significant figure
- Replace all the remaining digits to the right of the required significant figure with the zeros

Example 3

Given the number 45.274 round to

a. 1 first significant figure

b. 2 significant figure

c. significant figure

Solution

a. 50

b. 45

c. 45.3

Example 4

Round 146 400 to

a. 2 first significant figure

b. 4 significant figure

c. 3 significant figure

Solution

a. 150 000

b. 146 400

c. 146 000

Approximations in Calculations

The Knowledge of Rounding Off of Numbers in Computations Involving Large Numbers and Small Numbers

Use the knowledge of rounding off of numbers in computations involving large numbers and small numbers

Approximation can be used in operation to check whether a calculation is correct or not, i.e in addition, subtraction, multiplication and divisione.g 446 x 45 = 20 070

The above calculation can be checked quickly whether it is correct or not by rounding each number to 1 significant figure and then multiply i.e 400 x 50 = 20 000

Therefore, the approximation of 20 000 is close to 20 0070 is correct.Before carrying an operation, each number in a calculation is rounded to 1 significant figure

Example 5

Find the approximate value of

(a) $22.1 + 4.77$
(b) $127 - 79$
(c) $0.53 \ x \ 0.68$
(d) $423 \div 19$
(e) $535 \div 1\,121$

Solution

(a) $22.1 + 4.77 \approx 20 + 5 = 25$
(b) $127 - 79 \approx 100 - 80 = 20$
(c) $0.53 \ x \ 0.68 \approx 0.5 \ x \ 0.7 = 0.35$
(d) $423 \div 19 \approx 400 \div 20 = 20$
(e) $535 \div 1\,121 \approx 500 \div 1000 = 0.5$

Example 6

A school trip of 32 people went to a tour, which costs a transport fee of 580/- each people. What was the approximate total transport cost?

Solution

$32 \times 580 \approx 30 \times 600 = 18\ 000$

The approximate transport cost was 18 000/-