# Expressing uncertainty in data

*Education in Chemistry*
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[rsc.li/2Xfd61c](https://rsc.li/2Xfd61c)

Practise handling significant figures, decimal places and uncertainty in measurements.

## Rounding

1. **Answer the questions using the number lines.**

i. Draw an arrow to indicate iii. Draw an arrow to indicate

3.0

4.0

300

400

where 367 is on this number line. where 3.28 is on this

 number line.

ii. What is 367 to the nearest iv. What is 3.28 to 1 decimal

hundred? place?

400 3.3

v. Draw an arrow to indicate vii. Draw an arrow to indicate

1.79

1.80

1700

1800

where 1791 is on this number line. where 1.791 is on this

 number line.

vi. What is 1791 to the nearest viii. What is 1.791 to 2 decimal

hundred? places?

1800 1.79

1. **Fill in the blanks on the number lines and answer the questions.**

i. Draw an arrow to indicate iii. Draw an arrow to indicate

3.08

3.09

200

300

where 203 is on a number line. where 3.089 is on a

 number line.

ii. What is 203 to the nearest iv. What is 3.089 to 2 decimal

hundred? places?

200 3.09

|  |  |  |  |
| --- | --- | --- | --- |
| i. 2527 |  |  |  |
|  | nearest1000 | nearest 100 | nearest 10 |
|  | 3000 | 2600 | 2530 |
| 2000 | 2500 | 2520 |
| up or down? | up | down | up |

|  |  |  |  |
| --- | --- | --- | --- |
| ii. 4458 |  |  |  |
|  | nearest1000 | nearest 100 | nearest 10 |
|  | 5000 | 4500 | 4460 |
| 4000 | 4400 | 4450 |
| up or down? | down | up | up |

1. **Circle the number that is the nearest 1000, 100 and 10 to the number mentioned in each question and indicate whether it is rounded up or down.**

|  |  |  |  |
| --- | --- | --- | --- |
| iii. 2.527 |  |  |  |
|  | nearestinteger | nearest 0.1 | nearest 0.01 |
|  | 3 | 2.6 | 2.53 |
| 2 | 2.5 | 2.52 |
| up or down? | up | down | up |

|  |  |  |  |
| --- | --- | --- | --- |
| iv. 4.458 |  |  |  |
|  | nearestinteger | nearest 0.1 | nearest 0.01 |
|  | 5 | 4.5 | 4.46 |
| 4 | 4.4 | 4.45 |
| up or down? | down | up | up |

1. **Circle the number that is the nearest integer, 0.1 and 0.01 and indicate whether it is rounded up or down.**
2. **Insert the missing numbers so that the table looks like the ones above. Then, circle the number that is the nearest integer, 0.1 and 0.01 and indicate whether it is rounded up or down.**

|  |  |  |  |
| --- | --- | --- | --- |
| i. 4.097 |  |  |  |
|  | nearestinteger | nearest 0.1 | nearest 0.01 |
|  | 5 | 4.1 | 4.10 |
| 4 | 4.0 | 4.09 |
| up or down? | down | up | up |

|  |  |  |  |
| --- | --- | --- | --- |
| ii. 10.893 |  |  |  |
|  | nearestinteger | nearest 0.1 | nearest 0.01 |
|  | 11 | 10.9 | 10.90 |
| 10 | 10.8 | 10.89 |
| up or down? | up | up | down |

### Significant figures

**Circle the correct answer.**

|  |
| --- |
| 1. Round 34.59 to 1 significant figure
 |
| A: 34 | B: 30  | C: 35 | D: 3  | E: 34.5  |
|  |
| 1. Round 35,683 to 1 significant figure
 |
| A: 35683  | B: 30000  | C: 40000 | D: 3  | E: 4  |
|  |
| c. Round 76.984 to 3 significant figures |
| A: 77.0  | B: 76.9  | C: 76.984  | D: 77  | E: 76  |
|  |
| d. Round 0.003865 to 1 significant figure |
| A: 0 | B: 0.003  | C: 0.004  | D: 0.00387 | E: 1  |
|  |
| 1. Round 0.003865 to 3 significant figures
 |
| A: 0.00  | B: 0.003  | C: 0.004  | D: 0.00386  | E: 0.00387  |

### 3. Chemistry contexts

1. Calculate the rate of reaction that produces 25.0 cm3 of gas in 5.90 s.
25.0 ÷ 5.90 = 4.24 cm3 s-1
2. Calculate the rate of reaction that produces 25 cm3 of gas in 5.90 s.
25 ÷ 5.90 = 4.2 cm3 s-1
3. Calculate the rate of reaction that produces 25.0 cm3 of gas in 5.9 s.
25.0 ÷ 5.9 = 4.2 cm3 s-1
4. Calculate the rate of reaction that produces 25 cm3 of gas in 5.9 s.
25 ÷ 5.9 = 4.2 cm3 s-1
5. Calculate the concentration of a sodium chloride solution when 9.80 g of solid was dissolved in 100 cm3 water.
9.80 ÷ 100 = 0.1 g cm-3
6. Calculate the concentration of a sodium chloride solution when 9.8 g of solid was dissolved in 100 cm3 water.
9.8 ÷ 100 = 0.1 g cm-3
7. Calculate the concentration of a sodium chloride solution when 0.98 g of solid was dissolved in 10 cm3 water.
0.98 ÷ 10 = 0.1 g cm-3
8. Calculate the concentration of a sodium chloride solution 0.98 g of solid was dissolved in 10.0 cm3 water.
0.98 ÷ 10.0 = 0.098 g cm-3