

# Rounding & Standard Form

# Things you need to learn to do

- Roudning to a given number of decimal places.
- Rounding to a given number of significant figures.
- Converting numbers to standard form.

# Rounding

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- using a specific number of decimal places (d.p.),
- using a specific number of significant figures (s.f.)

## Rounding - decimal places

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1 d.p.: 6546.5

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1 d.p.: 6546.5

2 d.p.: 6546.55

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1 d.p.: 6546.5

2 d.p.: 6546.55

3 d.p.: 6546.547

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When rounding to decimal places we round to a certain position after the decimal point. If the digit immediately past this position is 4 or less we round down, if it's 5 or more we round up. Let's take the number 6546.54654 as an example. We will round it to:

1 d.p.: 6546.5

2 d.p.: 6546.55

3 d.p.: 6546.547

4 d.p.: 6546.5465

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1 d.p.: 6546.5

2 d.p.: 6546.55

3 d.p.: 6546.547

4 d.p.: 6546.5465

Note that we can also round this number to:

the nearest unit: 6547

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Note that we can also round this number to:

the nearest unit: 6547

the nearest ten: 6550

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1 d.p.: 6546.5

2 d.p.: 6546.55

3 d.p.: 6546.547

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Note that we can also round this number to:

the nearest unit: 6547

the nearest ten: 6550

the nearest hundred: 6500

## Rounding - decimal places

When rounding to decimal places we round to a certain position after the decimal point. If the digit immediately past this position is 4 or less we round down, if it's 5 or more we round up. Let's take the number 6546.54654 as an example. We will round it to:

1 d.p.: 6546.5

2 d.p.: 6546.55

3 d.p.: 6546.547

4 d.p.: 6546.5465

Note that we can also round this number to:

the nearest unit: 6547

the nearest ten: 6550

the nearest hundred: 6500

the nearest thousand: 7000



# Rounding - decimal places - exercises

Round the given given number accordingly:

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a) 25.519

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a) 25.519

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# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit:

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

i. 1 d.p.: 25.5

ii. nearest unit: 26

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.:

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52



# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.:

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred:

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.:

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.: 321.10

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.: 321.10

c) 54001.1



# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.: 321.10

c) 54001.1

- i. nearest hundred:

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Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.: 321.10

c) 54001.1

- i. nearest hundred: 54000

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.: 321.10

c) 54001.1

- i. nearest hundred: 54000
- ii. nearest ten:

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.: 321.10

c) 54001.1

- i. nearest hundred: 54000
- ii. nearest ten: 54000

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.: 321.10

c) 54001.1

- i. nearest hundred: 54000
- ii. nearest ten: 54000
- iii. 2 d.p.:

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.: 321.10

c) 54001.1

- i. nearest hundred: 54000
- ii. nearest ten: 54000
- iii. 2 d.p.: 54001.10

# Rounding - decimal places - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 d.p.: 25.5
- ii. nearest unit: 26
- iii. 2 d.p.: 25.52

b) 321.0990

- i. 3 d.p.: 321.099
- ii. nearest hundred: 300
- iii. 2 d.p.: 321.10

c) 54001.1

- i. nearest hundred: 54000
- ii. nearest ten: 54000
- iii. 2 d.p.: 54001.10

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It is very important to realize the difference between the following numbers 1625.00, 1625.0 and 1625.



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If an answer to certain problem is given as 1625.00, it means that the answer is accurate to 2 d.p., so the actual answer can be any number  $x$ , such that  $1624.995 \leq x < 1625.005$ .

## Rounding - decimal places

It is very important to realize the difference between the following numbers 1625.00, 1625.0 and 1625.

If an answer to certain problem is given as 1625.00, it means that the answer is accurate to 2 d.p., so the actual answer can be any number  $x$ , such that  $1624.995 \leq x < 1625.005$ .

If however the answer is given as 1625, then this is correct to the nearest unit, so the actual number can be any number  $x$ , such that  $1624.5 \leq x < 1625.5$ .

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Of course  $444.60 = 444.6$ , but the rounded answer 444.60 indicates that the actual answer was between 444.595 and 444.605,



## Rounding - decimal places

What's the conclusion of all this? If you were to round 444.5971 to 2 d.p. then the answer is 444.60 and **not** 444.6. The 0 at the end is important because it indicates the accuracy of the rounding.

Of course  $444.60 = 444.6$ , but the rounded answer 444.60 indicates that the actual answer was between 444.595 and 444.605, while the rounded answer 444.6 indicates only that the actual answer was between 444.55 and 444.65.

## Rounding - significant figures

We count significant figures starting from the first non-zero digit from the left and then count **every** digit (including the zeros).

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We count significant figures starting from the first non-zero digit from the left and then count **every** digit (including the zeros). Consider the number 0.004500545. The first non-zero digit from the left is 4, so this is our 1st significant figure, 5 is the second significant figure, 0 is the third, the next 0 is the fourth and so on.

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We count significant figures starting from the first non-zero digit from the left and then count **every** digit (including the zeros). Consider the number 0.004500545. The first non-zero digit from the left is 4, so this is our 1st significant figure, 5 is the second significant figure, 0 is the third, the next 0 is the fourth and so on. We will round the number to

1 s.f.: 0.005

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1 s.f.: 0.005

2 s.f.: 0.0045

## Rounding - significant figures

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1 s.f.: 0.005

2 s.f.: 0.0045

3 s.f.: 0.00450

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1 s.f.: 0.005

2 s.f.: 0.0045

3 s.f.: 0.00450

4 s.f.: 0.004501



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1 s.f.: 0.005

2 s.f.: 0.0045

3 s.f.: 0.00450

4 s.f.: 0.004501

## Rounding - significant figures

We count significant figures starting from the first non-zero digit from the left and then count **every** digit (including the zeros). Consider the number 0.004500545. The first non-zero digit from the left is 4, so this is our 1st significant figure, 5 is the second significant figure, 0 is the third, the next 0 is the fourth and so on. We will round the number to

1 s.f.: 0.005

2 s.f.: 0.0045

3 s.f.: 0.00450

4 s.f.: 0.004501

Now consider the number 918273.222, here 9 is the first significant figure, 1 is the second and so on.

## Rounding - significant figures

We count significant figures starting from the first non-zero digit from the left and then count **every** digit (including the zeros). Consider the number 0.004500545. The first non-zero digit from the left is 4, so this is our 1st significant figure, 5 is the second significant figure, 0 is the third, the next 0 is the fourth and so on. We will round the number to

1 s.f.: 0.005

2 s.f.: 0.0045

3 s.f.: 0.00450

4 s.f.: 0.004501

Now consider the number 918273.222, here 9 is the first significant figure, 1 is the second and so on. We will round it to

4 s.f.: 918300

## Rounding - significant figures

We count significant figures starting from the first non-zero digit from the left and then count **every** digit (including the zeros). Consider the number 0.004500545. The first non-zero digit from the left is 4, so this is our 1st significant figure, 5 is the second significant figure, 0 is the third, the next 0 is the fourth and so on. We will round the number to

1 s.f.: 0.005

2 s.f.: 0.0045

3 s.f.: 0.00450

4 s.f.: 0.004501

Now consider the number 918273.222, here 9 is the first significant figure, 1 is the second and so on. We will round it to

4 s.f.: 918300

3 s.f.: 918000

## Rounding - significant figures

We count significant figures starting from the first non-zero digit from the left and then count **every** digit (including the zeros). Consider the number 0.004500545. The first non-zero digit from the left is 4, so this is our 1st significant figure, 5 is the second significant figure, 0 is the third, the next 0 is the fourth and so on. We will round the number to

1 s.f.: 0.005

2 s.f.: 0.0045

3 s.f.: 0.00450

4 s.f.: 0.004501

Now consider the number 918273.222, here 9 is the first significant figure, 1 is the second and so on. We will round it to

4 s.f.: 918300

3 s.f.: 918000

2 s.f.: 920000

## Rounding - significant figures

We count significant figures starting from the first non-zero digit from the left and then count **every** digit (including the zeros). Consider the number 0.004500545. The first non-zero digit from the left is 4, so this is our 1st significant figure, 5 is the second significant figure, 0 is the third, the next 0 is the fourth and so on. We will round the number to

1 s.f.: 0.005

2 s.f.: 0.0045

3 s.f.: 0.00450

4 s.f.: 0.004501

Now consider the number 918273.222, here 9 is the first significant figure, 1 is the second and so on. We will round it to

4 s.f.: 918300

3 s.f.: 918000

2 s.f.: 920000

1 s.f.: 900000

# Rounding - significant figures - exercises

Round the given given number accordingly:

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Round the given given number accordingly:

a) 25.519



# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

i. 1 s.f.:

## Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

i. 1 s.f.: 30

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

i. 1 s.f.: 30

ii. 2 s.f.:

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

i. 1 s.f.: 30

ii. 2 s.f.: 26

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.:

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

i. 1 s.f.: 30

ii. 2 s.f.: 26

iii. 3 s.f.: 25.5

b) 321.0990

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

i. 1 s.f.: 30

ii. 2 s.f.: 26

iii. 3 s.f.: 25.5

b) 321.0990

i. 3 s.f.:



# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.:

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.:

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.: 321.10

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.: 321.10

c) 0.002999

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.: 321.10

c) 0.002999

- i. 1 s.f.:

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.: 321.10

c) 0.002999

- i. 1 s.f.: 0.003



# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.: 321.10

c) 0.002999

- i. 1 s.f.: 0.003
- ii. 2 s.f.:

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.: 321.10

c) 0.002999

- i. 1 s.f.: 0.003
- ii. 2 s.f.: 0.0030

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.: 321.10

c) 0.002999

- i. 1 s.f.: 0.003
- ii. 2 s.f.: 0.0030
- iii. 3 s.f.:

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.: 321.10

c) 0.002999

- i. 1 s.f.: 0.003
- ii. 2 s.f.: 0.0030
- iii. 3 s.f.: 0.00300

# Rounding - significant figures - exercises

Round the given given number accordingly:

a) 25.519

- i. 1 s.f.: 30
- ii. 2 s.f.: 26
- iii. 3 s.f.: 25.5

b) 321.0990

- i. 3 s.f.: 321
- ii. 4 s.f.: 321.1
- iii. 5 s.f.: 321.10

c) 0.002999

- i. 1 s.f.: 0.003
- ii. 2 s.f.: 0.0030
- iii. 3 s.f.: 0.00300

## Rounding - significant figures

Again we need to remember that there is a difference between the answer 300 correct to 1 s.f. and 300 correct to 2 s.f. etc.

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Again we need to remember that there is a difference between the answer 300 correct to 1 s.f. and 300 correct to 2 s.f. etc.

If the answer given is 300 correct to 1 s.f., then the actual answer could have been any number between 250 and 350,

## Rounding - significant figures

Again we need to remember that there is a difference between the answer 300 correct to 1 s.f. and 300 correct to 2 s.f. etc.

If the answer given is 300 correct to 1 s.f., then the actual answer could have been any number between 250 and 350, and if the answer given is 300 correct to 2 s.f., then the actual answer could have been any number between 295 and 305.



# Standard form

A number is written in a standard form if it's in the form  $a \times 10^k$ , where  $1 \leq a < 10$  and  $k \in \mathbb{Z}$

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Note the term **standard form** is used in UK, while the term **scientific notation** is used in US. Both mean the same thing. We will use 'standard form', but you should know both.

# Standard form

A number is written in a standard form if it's in the form  $a \times 10^k$ , where  $1 \leq a < 10$  and  $k \in \mathbb{Z}$

Note the term **standard form** is used in UK, while the term **scientific notation** is used in US. Both mean the same thing. We will use 'standard form', but you should know both.

Consider the following list of numbers:

12112,      0.453,      9,       $0.56 \times 10^3$ ,       $353 \times 10^{-5}$

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How many of these numbers are written in standard form? None.

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How many of these numbers are written in standard form? None. The first three are missing the  $10^k$  part, for the last two  $a$  is not between 1 and 10.

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How many of these numbers are written in standard form? None. The first three are missing the  $10^k$  part, for the last two  $a$  is not between 1 and 10. We can turn them all into the standard form:

$$1.2112 \times 10^4, \quad 4.53 \times 10^{-1}, \quad 9 \times 10^0, \quad 5.6 \times 10^2, \quad 3.53 \times 10^{-3}$$

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If you have any questions or doubts email me at [T.J.Lechowski@gmail.com](mailto:T.J.Lechowski@gmail.com)