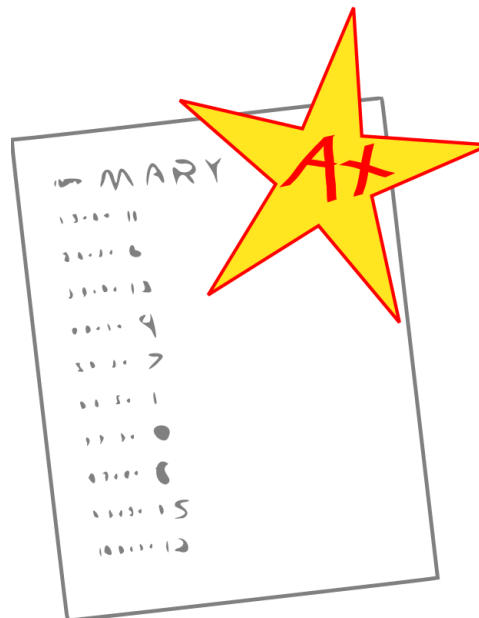
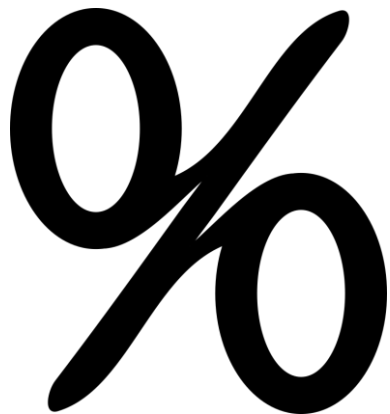




Appropriate Precision





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A series of activities will be provided throughout this presentation for you to **MASTER** appropriate precision!

The activities are graduated with difficulty, and the **answers** are provided after each set of questions



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Give them a go **without** your notes and **do not** skip ahead to the answers! See how far you can get through the activities

Mark your answers as you go, **don't worry** if you get one or two wrong **keep going...**

But **importantly** you need to **understand** where you went wrong if you get an incorrect answer so stop and **think**



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There will be **explanations** on the answer page to **why** the correct answer is the number given...

So make sure you read through and **fully understand** this reasoning **before** going on to the next set of questions...

It will really help you to reflect and understand where you went wrong and **help you learn** for future questions!



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READY?

Use paper and make notes for workings if you need to!



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Question 1

Beginner questions



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How many **significant figures** have been **quoted** in the following measurements?

a) 162 s

b) 10.1 m

c) 600.5 kg

Beginner question answers



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How many significant figures have been quoted in:

a) $162 \text{ s} = 3$

b) $10.1 \text{ m} = 3$

c) $600.5 \text{ kg} = 4$

Significant means having meaning and the closer the digit is to the beginning of a number the more significant it is, it follows that pattern through the number so in 45,078, 4 is the most significant number, followed by 5 and so on, zeros in the middle of a number are counted just as any other digit as it has significant value as a place holder so 0 would be the third significant number here.

So... **1. a)** is 3 as the importance for each digit is the same so they are all counted.

For **1. b)** and **c)** note that zeros anywhere within the middle of the number are counted just as any other digit so you count the numbers as you would if the zeros were any other numbers.

Intermediate questions



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How many **significant figures** have been **quoted** in the following measurements?

d) 0.15 m

e) 0.0013 s

f) 62.0 m

Intermediate question answers



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How many significant figures have been quoted in:

d) $0.15 \text{ m} = 2$

e) $0.0013 \text{ s} = 2$

f) $62.0 \text{ m} = 3$

Initial zeros **don't** count as significant numbers so answers to **1. d)** is 2 and **e)** is also 2, but final zeros after a decimal point do count so the answer to **1. f)** is 3.

Advanced questions



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How many **significant figures** have been **quoted** in the following measurements?

g) $3.28 \times 10^{-4} \text{ m}$

h) 720 kg

i) $1.060 \times 10^3 \text{ s}$

Advanced question answers



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How many significant figures have been quoted in:

g) $3.28 \times 10^{-4} \text{ m} = 3$

h) $720 \text{ kg} = 3$

i) $1.060 \times 10^3 \text{ s} = 4$

The numbers in questions **1. g)** and **i)** are given a scientific notation. The powers of ten should be ignored when counting the number of significant figures, so count the significant figures as normal for the numbers before the powers of 10.

So g) would be 3 as the 3 numbers that are stated have the same significance to the value of the number and i) would be 4 as the 4 numbers that are also stated have the same significance to the value of the number.

For question **1. h)** as there is no decimal point before the zero you count it as normal.



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Question 2 are all of similar difficulty you just have to remember certain rules, so have a go at this list of questions!



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Question 2



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Round the following numbers to the degree of precision stated

a) 12.41 to one decimal place

b) 0.065 to two decimal places

Answers



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Round the following numbers to the degree of precision stated:

a) 12.41 to one decimal place = **12.4**

b) 0.065 to two decimal places = **0.07**

Often a decimal number has too many figures for it to be practical. We can overcome this by rounding figures up and discarding a number or keeping them the same and discarding a number.

The **rule** for rounding is the same here, if the number is below 5 you keep the number before it the same then discard that number, if it is 5 or above you round the number before it up by 1 and discard that number.

For example

e.g. 54.678 to one decimal place would be 54.7

e.g. 54.678 to two decimal places would be 54.68

So **2)a** would be 12.4 as you would discard the 1 and not round the number before it up.

2)b would be 0.07 as you would round the number 6 up as 5 determines it to be rounded up.



Round the following numbers to the degree of precision stated

c) 2.017 to two significant figures

d) 248.32 to two significant figures

e) 0.009 91 to one significant figure

Answers



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Round the following numbers to the degree of precision stated:

c) 2.017 to two significant figures = **2.0**

d) 248.32 to two significant figures = **250 (two significant figures) or 2.5×10^2**

e) 0.009 91 to one significant figure = **0.01**

Significant means having meaning and the closer the digit is to the beginning of a number the more significant it is, it follows that pattern through the number so in 45,078, 4 is the most significant number, followed by 5 and so on, zeros in the middle of a number are counted just as any other digit as it has significant value as a place holder. Zeros at the beginning before or after a decimal point are different, with a number like this 0.00068 the most significant number is 6 because the zeros do not tell us enough on their own, the 8 is the next most significant and so on.

We round numbers off to significant figures. The rules for rounding up are :

if the next number is 5 or more we round up

if the next number is 4 or less we do not round up

Examples –

e.g. 37,890 to 1 significant figure is 40,000 (because 3 is the significant number asked for, the digit after that is more than 5 so you round up)

e.g. 45,078 to 2 significant figures is 45,000 (because 5 is the significant number asked for, the digit after that is less than 5 so you do not round up)

e.g. 0.00231 to 1 significant figure is 0.002 (because 2 is the significant figure asked for, the digit after that is less than 5 so you do not round up)

For c) Remember to count the middle zero as a significant number, so you do not round up as the number after zero is 1, so you get 2.0.

For d) the number after the significant digit is 8, so you round the whole number up to 250, you can also write this in scientific notation to make the answer more specific.

For e) remember that zeros after a decimal point do not count as significant numbers, so the first significant number is the first 9, you round this up to reach 0.01.

Round the following numbers to the degree of precision stated

f) 13.0 to two significant figures

g) 2.999 49 to four significant figures

h) 2.999 95 to five significant figures

Answers



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Round the following numbers to the degree of precision stated:

f) 13.0 to two significant figures = **13**

g) 2.999 49 to four significant figures = **2.999**

h) 2.999 95 to five significant figures = **3.0 000**

For f) the number after the 2 significant figures is a zero, so you do not round up, so you get 13.

For g) the number after the first 4 significant figures is 4 so you do not round up, so you get 2.999.

For h) the number after the first 5 significant numbers is 5 so you round up, in this case the number is 2.9999, so you have to round up to the next whole, which is 3.0000.



Round the following numbers to the degree of precision stated

i) 42.5454 to four significant figures

j) 42.55 to three significant figures

k) 42.5454 to three significant figures

Answers



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Round the following numbers to the degree of precision stated:

i) 42.5454 to four significant figures = **42.55**

j) 42.55 to three significant figures = **42.6**

k) 42.5454 to three significant figures = **42.5**

For i) the number after the first 4 significant numbers is 5 so you round up the number before, so you go from 42.5454 to 42.55.

For j) the number after the first 3 significant numbers is 5 so you round up the number before, so you go from 42.55 to 42.6

For k) the number after the first 3 significant figures is 4, so you do not round up the number before, so you go from 42.5454 to 42.5.