

*Calculator Needed !***2.1 Percentage Increase & Decrease****Example #1**

Suppose George has saved £250 towards the cost of a laptop computer. His Uncle Henry offers to increase his savings by 70%.

The amount George will then have is given by,

$$\begin{aligned} & 250 + \frac{70}{100} \times 250 \\ & = 250 + 0.70 \times 250 \\ & = 250 \times (1 + 0.70) \\ & = 250 \times 1.70 \end{aligned}$$

Thus to increase the £250 by 70%, multiply by 1.70

Notice that the 1.70 is made up of two parts, the 1 which represents George keeping 100% of what he already had, and the 0.70 which is the 70% extra from Uncle Henry.

The entire problem of working out increasing £250 by 70% boils down to one very simple computation,

$$250 \times 1.70 = \text{£}425$$

Ordinarily the 1.70 would be written 1.7 but, if it helps you think, write it as 1.70

**Example #2**

Shares initially worth £1800 on 1<sup>st</sup> January 2014, experience the following annual rate of interest (APR) over a five year period.

Year	2014	2015	2016	2017	2018
APR	3 %	7.5 %	2 %	6 %	5 %

How much are the shares worth on 1<sup>st</sup> January 2019 ?

## 2.2 Exercise

### Question 1

- ( i ) What would £75 be multiplied by to increase it by 75 % ?
- ( ii ) What would \$104 be multiplied by to increase it by 2.4 % ?
- ( iii ) What would a distance of  $x$  miles be multiplied by to increase it by 12% ?
- ( iv ) To increase a mass of  $y$  kg by 134 %, what would  $y$  be multiplied by ?
- ( v ) What should I multiply a number by to increase it by 300% ?

### Question 2

Explain why, to decrease the price of a box of apples by 32 % I should multiply it's current price by 0.68

### Question 3

- ( i ) What would £96 be multiplied by to decrease it by 25 % ?
- ( ii ) What would 25 kg be multiplied by to decrease it by 4 % ?
- ( iii ) What would a mass of  $x$  kg be multiplied by to decrease it by 99 % ?
- ( iv ) To decrease a price of £ $y$  by 7.5 % what would  $y$  be multiplied by ?
- ( v ) Explain why a mass of  $z$  kg cannot be decreased by more than 100 %

**Question 4**

When born, Tobin weighed 2.97 kg.

Over the first two weeks of his life, he lost 7 % of his weight, then gained 22% over the following two weeks.

( i ) Explain why his weight, aged four week, is given by the calculation,

$$2.97 \times 0.93 \times 1.22$$

( ii ) What was his weight, to three significant figures, four weeks after birth ?

**Question 5**

In the shop “Man Cave Essentials” a desk tidy costs £145.

The shop decides to increase all of it's prices by 12 % ahead of a “SALE” two weeks later in which it will reduce those prices by 20 %.

( i ) Write down a calculation that will give the sale price of the desk tidy.

( ii ) What to the nearest penny is the sale price of the desk tidy ?

**Question 6**

In 2018 production of Olive Oil in Italy fell by 65% due to drought, disease and deforestation caused by the start of constructing a Trans Adriatic Pipeline to carry natural gas from the Caspian Sea to Europe.

This followed a decline of 18% the previous year, in 2017.

In 2016 Italy produced 182300 tonnes of Olive Oil.

( i ) Write down a calculation that will give the tonnage of Olive Oil produced by Italy in 2018.

( ii ) How much Olive Oil was produced by Italy in 2018 ?

**Question 7**

An engineering company received 1437 orders in 2015.

In 2016 it experiences a 12 % increase in orders and in 2017 orders increased by 17%.

However, in 2018 orders fell by 18%.

How many orders did the company receive in 2018 ?

**Question 8**

The average circulation of The Sun newspaper in January 2016 was

1 787 096 papers sold per day.

(Data from Audit Bureau of Circulations)

In January 2017 sales were 6.7% lower than the year before.

In January 2018 sales were 7.3% lower than the year before.

In January 2019 sales were 8.7 % lower than the year before.

What was the average circulation of The Sun newspaper in January 2019 ?

**Question 9**

A rectangular plot of land measures 60 m by 50 m.

( i ) Calculate its area in  $m^2$

Another rectangular plot of land has sides that are each 20 % bigger than those of the first plot.

( ii ) Calculate the area of the second plot of land.

Show your working.

( iii ) Calculate, as a percentage, how much greater the area of the second plot is than the area of the first.

### Question 10

The tables below gives the annual inflation rate in the UK between 2000 and 2018.  
(The data is from the UK's office for National Statistics)

Year	2000		2001		2002		2003		2004	
Inflation, %		3.0		1.8		1.7		2.9		3.0
Investment, £	1000				1049		1066			

Year	2005		2006		2007		2008		2009	
Inflation, %		2.8		3.2		4.3		4.0		- 0.5
Investment, £	1130		1162		1199		1251			

Year	2010		2011		2012		2013		2014	
Inflation, %		4.6		5.2		3.2		3.0		2.4
Investment, £			1354		1424		1470		1514	

Year	2015		2016		2017		2018		2019	
Inflation, %		1.0		1.8		3.6		2.5		
Investment, £	1550		1566							

- ( i ) Explain why what was bought for £1000 at the start of 2017 would typically cost, at the start of 2019, £1061.90 to buy.
  
- ( ii ) Rebecca's Dad invested £1000 when she was born on 1st January 2000 in a Government Bond that guaranteed to match the rate of inflation.  
Complete the table to show how the value of the bond has changed with the passage of time. Several values are already in the table.  
On the 1st January 2019, how much was the Bond worth ?
  
- ( iii ) Suppose there is a number,  $x$ , that will multiply the £1000 from 1st January 2000 and give the part ( ii ) answer for 1st January 2019.  
What is  $x$  ?
  
- ( iv ) What percentage does  $x$  suggest that prices have increased by between 1st January 2000 and 1st January 2019 ?

### Question 11

A cube has edges of length  $x$  cm.

- ( i )      What is it's volume, in terms of  $x$  ?
  
- ( ii )     The cube is similar to another larger cube in which each edge is 15 % longer.  
            What is the volume of the larger cube, in terms of  $x$  ?
  
- ( iii )    By what percentage has the volume of the small cube been increased by the enlargement ?  
            Explain your answer.