future maThs
infinite maThs

maThs E1 E2 E3

maThs Level 1 & 2

Percentage

Course Content: Choose your topic …

MATHS L1 to L2

Whole Number and Functions

HTU	Neg	+/-	÷/×	R	1:6
place value	negative numbers	add and subtract	multiply divide	round numbers	ratio scale

Parts of a whole
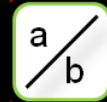
a/b	0.01	%+	equiv
fraction	decimal numbers	percent	percent decimal fraction

Measure and Shape
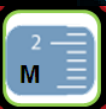
M²	i²	P	x²	x³	3x²=y
metric measure	imperial measure	perimeter	area	volume	formulae bodmas

Handling Data

charts	MMMR	dice
charts data	averages	prob-ability

Topic Introduction : Percentages

Percentagess

This is the third topic that deals with values showing parts of a whole, check out 'Fractions' and 'Decimals' before moving onto this topic. Again percentages are just fractions but this time only the fraction 'Hundredth'. A percentage is just a value showing how many pieces out of a hundred you have.

There are various methods you could use to solve percentage questions and problems due to the ability to change percentage amounts back into fractions and decimals. You will need to try different ways to solve calculations and choose the right one or easiest one at the right time.

Choose an icon to select where to start

Warm up Exercise 1

1	6	5	9	2	8	7	1	4	10
5									
2									
6									
10									
8									
7									
3									
9									
4									

1 x 3 =

2 x 3 =

3 x 3 =

4 x 3 =

5 x 3 =

6 x 3 =

7 x 3 =

8 x 3 =

9 x 3 =

10 x 3 =

DECIMALS L1/L2

An order of cement bags can be made in sets of ten, hundred or thousand from a building company. The cost of an order of either 10, 100 or 1000 orders could be….

L1 at £6.50 per bag…
A) £650 because….
B) £65 because….
C) £65,000 because….

L2 at £7.49 per bag…
A) £749 because….
B) £74.90 because….
C) £7,490 because….

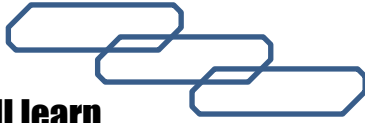Red herring is.. B

appMaths

What do you already know about 'Percentages' ?

How would you rate your skills in using percentages ?

1) **Excellent ability**
2) **Good ability, but working to improve**
3) **Ok, making a start but I know I have lots to still learn**

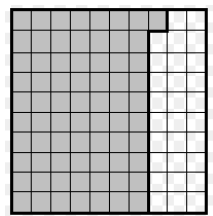My aims for today   date: are... (circle relevant aims for you)
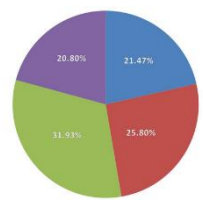
A   Recognise a percentage value, its symbol and meaning, order percentage values

  B   Find percentages of a value

    C   Find percentage increase , decrease and reversals   **Level 2**

$30\% \text{ of } 20 = ?$

$= \frac{30}{100} \times 20 = \frac{30 \times 20}{100}$

$= \frac{600}{100} = 6$

%

50%

25%

10%

Why do people find percentages difficult to calculate ?
When do we use percentage values?

Is there a quick and easy method for finding any percentage of a value ?
What does 'Per' and 'Cent' mean ?

Is finding 1 per cent the same as finding a fraction 1/100 ?
In which situations is it useful to use percentage scores ?

Watch the introductory video and then discuss the above

Your thoughts..

Hundredth

Percent

Discount

Mark up

Sale

Compound Interest

Increase

Decrease

VAT / tax

Money off

Price cut

Percent Reversals

Accountants
Estate Agents
Sports
Payroll
Weather Forecast
Retail
Photography
Horticulture
Transport …. Can you think of more?

……………………………………

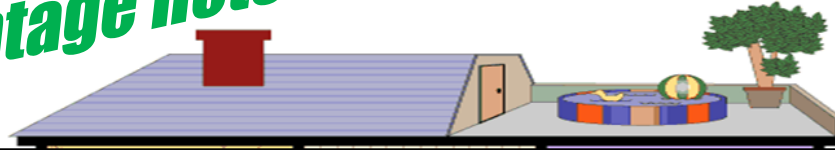……………………………………

These are the words you will be using in this topic

Work together
Pick a floor and room
Can you state what % of the hotel this is

Pick a %, can you find the floor and room number

Choose a number of rooms to rent out. If the whole hotel costs £6000 to hire, how much does your number of rooms cost to rent ?

The Percentage Hotel

floor 10
floor 9
floor 8
floor 7
floor 6
floor 5
floor 4
3rd floor
2nd floor
1st floor

Rm1 Rm2 Rm3 Rm4 Rm5 Rm6 Rm7 Rm8 Rm9 Rm10

What is a 'Per Cent'.. ?

Per....means 'in every'

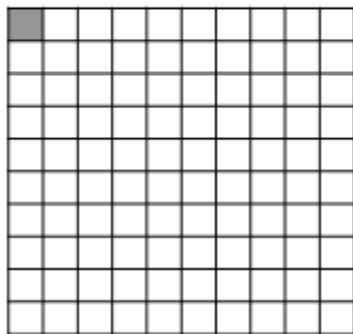Cent... is Latin for 'hundred'

So...'PERCENT' just means in every hundred

If you have one percent you have just one out of a hundred

eg....One penny is one percent of a pound,   and ... one year is one percent of a century !

Different ways to write Percent

1%

$\frac{1}{100}$

0.01

one hundredth, one percent

To find 1% of a number   method 1) move the decimal point in the number 2 digits to the left
                                method 2) divide the number by 100 (or multiply by the fraction 1/100)
                          method 3) multiply the number by the decimal '0.01'
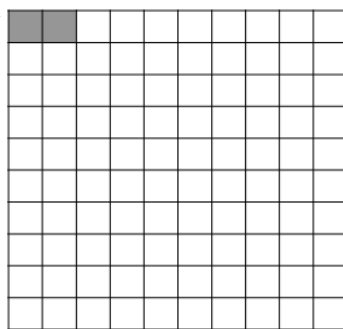
What if you have more than 1% ..?

Here we have 2%

This just means you have 1% twice

The best way to find 2% is to find 1% and then double it !!

Different ways to write Percent

2%

2

100

0.02

two hundredths, two percent

To find 2% of a number

method 1) move the decimal point in the number 2 digits to the left then double the number found

method 2) divide the number by 100 then multiply by 2 (or multiply by the fraction 2/100)

method 3) multiply the number by the decimal '0.02'

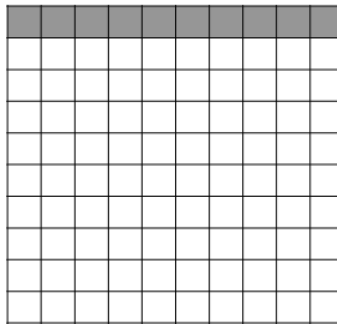**What if you have more than 2% ..?**

Here we have 10%

This just means you have 1% ten times

But... 10% fills out a whole tenth. This means that 10% is also a tenth of a whole amount
Therefore there are lots of ways of showing 10%

Different ways to write Percent
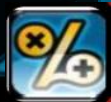
10%

$\dfrac{10}{100}$

0.10

0. 1

$\dfrac{1}{10}$

ten hundreths, ten percent one tenth

To find 10% of a number   method 1) move the decimal point in the number 1 digit to the left
method 2) divide the number by 10 (or multiply by the fraction 1/10)
method 3) multiply the number by the decimal '0.1'

So how do you find ANY percentage of a number ??

Well any percentage of a whole amount is made up of lots of 1%'s

Also a percentage can be shown to be a decimal or fraction of a whole too!

Different ways to write Percent

....%

0. ......
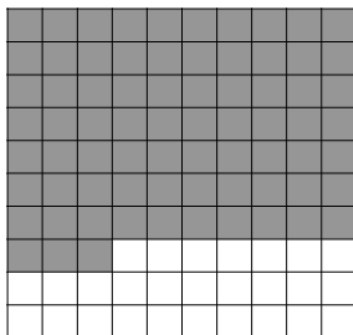
100

To find ANY% of a number   method 1) move the decimal point in the number 2 digits to the
                    left then multiply that value by the number of % you want
             method 2) divide the number by 100 then multiply by the % you want
                    (or multiply by the fraction ANY/100)
             method 3) multiply the number by the decimal '0.ANY'

Examples of the different methods:

This first method moves a decimal point to rewrite values so they are worth less or more.

find 1% of £600

600. becomes 6.00

find 5% of 1300miles

1300. becomes 13.00
but then x5 (because you want 5%)
13.00 x 5 = 65 miles

find 67% of 2M people

2,000,000. becomes 20,000.00
but then x 67 (because you want 67%)
20,000 x 67 = 1,340,000 people

1) % Method

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

1% move decimal
2 places left

£459.00   £4.59

10% move decimal
1 place left

£459.00   £45.90

Examples of the different methods:

This method uses the fact that percentages are also just another word for 'hundredths'

.. therefore the number of % you want to find is also just the fraction over a hundred - look back at how to find fractions of a value if you have forgotten !!

find 1% of £600

        1% is just 1/ 100

so…   600 x 1 / 100 = 600/100 = 6

find 5% of 1300 miles

        5% is just 5/100

so… 1300 x 5/100 = 6500/100 = 65 miles

find 67% of 2M people

        67% is just 67/100

so… 2,000,000 x 67/100 = 134,000,000 / 100 = 1,340,000

2)   Fractional Method

$$\frac{\text{Original}}{100} \quad x \text{ by} \quad \%$$

OR

$$\frac{\text{Original} \quad x \text{ by} \quad \%}{100}$$

Examples of the different methods:

This method uses your knowledge of decimals and the fact that the second decimal place (place value column) IS the 'hundredths' and 'percent' is just another word for hundredths

.. therefore the number of % you want to find is also just the number of hundredths in the hundredths column on the place value chart ie 0.07 is 7% as they both mean 'Seven Hundredths' just written differently !!

find 1% of £600

1% is just 0.01

so... 600 x 0.01 = 6

find 5% of 1300 miles

5% is just 0.05

so... 1300 x 0.05 = 65 miles

find 67% of 2M people

67% is just 0.67

so... 2,000,000 x 0.67 = 1,340,000

3) Decimal Method

- 1%   x0.01
- 2%   x0.02
- 5%   x0.05
- 10%   x0.10
- 85%   x0.85
- 37%   x0.37
- 0.2 %   x0.002
- 0.9 %   x0.009

Percentage Increase/Decrease and Reversals:

There are three types of questions you could come across when using percentages

a) Use a % increase or decrease on a value to find a new value
b) Find the % an original value has changed by when becoming a new value
c) Find the original value after a % increase or decrease has been applied

To solve all these types the method in the triangle can be used

for a)... original x percent = new value
for b)... new value / original = percent
for c)... new value / percent = original

What is really important is that the Percentage is written as a Decimal ie 50% increase is 1.5
50% decrease is 0.5

Percentage Increase/Decrease and Reversals:

Examples

Here a house priced at £100k is marked up by 50%. As 50% extra is 100% plus 50% then the decimal is 1 + 0.50 which is x 1.5

£100k house x 1.5 = £150k house !!

In this example the same house changed from £100k to £75K. To find the percentage decrease the new price is divided by the original

75k / 100k = 0.75

next what does 0.75 mean ?? well if 1.00 is 100% then 0.75 is 75%, that means the house is priced at 75% of what is was SO it has LOST 25% !!

Percent, 10% 20% methods

http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/percentages/index.htm

percentage, the basics

http://www.ngfl-cymru.org.uk/vtc/ngfl/maths/caerphilly/percentages/eng/percentages.htm

Percentage loading bar

http://mathematics.hellam.net/maths2000/percent1.html

Percentage ballon pop

http://www.mathplayground.com/balloon_invaders_percent.html

Percentage website

http://www.math.com/school/subject1/lessons/S1U1L7GL.html

Manipulative that lets you see percentage values in diff ways

http://nlvm.usu.edu/en/nav/frames_asid_160_g_2_t_1.html

Lots of videos on percentages

http://www.mathmammoth.com/videos/percent.php

Percentage word problems, questions and answers

http://www.cnm.edu/depts/tutoring/tlc/res/accuplacer/8_Math_550_Percent_Word_Problems__2_.pdf

Level 1

A

1% of £10
1% of £100
1% of £300
1% of £500
1% of £2K
1% of 35M people
1% of 8.2B stars

B

2% of 600
2% of 1500
4% of 300 metres
5% of 900 feet
9% of -1800
6% of 850
5% of 85Gigabytes
3% of £1M
8% of 10K volts

C

10% of 30 floors
10% of 900 flowers
10% of 350 pence
10% of £9
10% of 30 inches
10% of 20M insects
10% of 4.28 B

D

20% of 900ml
40% of 16miles
50% of 980
70% of 1K
30% of £10.50
90% of 700
30% of 842,900
80% of 20minutes
60% of 18cm

E

25% of 90
75% of 800
50% of £3000
25% of 10cm
50% of 26kg
75% of 1500 litres
100% of 20 dvds

F

18% of 200 marks
72% of £15
91% of 3hours
24% of 5000 tiles
88% of 2.3K
59% of 14M
63% of -2B
99% of 800 hotels
15% of 40%

G

10% increase on £300
1% increase on 90
5% increase on 6000
20% more than 950 houses
25% bigger than 35cm
63% mark up on £4

H

10% decrease on 8m
15% decrease on 900
50% less than 8,500
70% less on £3M
35% down from 8km
87% drop from £1.60
100% less than 5
1% less on a loan of £40

Level 2

I

1.2% on £1300 tv
4.9% interest on £8k
0.8% on 30minutes
16.9% of £2M
5.5% off 100kg
0.2% more than 15k
11.5% on top of 30cm

J

£200 x 0.3 = ...
400m x .... = 500m
70p x .... = £1.20
.... x 1.8 = 900
350cm x .... = 200cm
20kg x 0.45 = ...kg
£.............. x 0.7 = £0.70
£6M x .... = £6000
2.3B x 1.002 = ...

1. A house price is increased by 3% from its original price of £185,000. What is the new house price?

Level 2

2. A wage is increased by 2% and is now £1350 per month. What was the original wage before the increase?

3. A packet of cereal went down in a sale by 20% and is now priced at £1.50. What was the higher price before the sale?

4. 79% of a tunnel is completed. The total distance of the tunnel when completed will be 8000 metres. How much further do the tunnel constructors need to complete?

5. A puzzle has just 15 more pieces of its 800 pieces to be put in place to finish it. What percentage of the puzzle has been finished?

6. The tv ratings for a popular soap were 3.2million viewers last year and this year is 4.1 million viewers. By what percentage has the viewing figures changed?

Level 2

7. A thickness of metal can be made to within 2% accuracy. If a piece of metal is stated to be 1 mm thick, find the maximum and minimum thicknesses possible (due to the 2% accuracy)

- ## <u>Debenhams Sale</u>

Item	Price	Discount	New Price
Black ankle boots	£30		£22.50
Ted Baker pyjamas	£25		£17.50
Lego duplo play	£25		£12.50
Diamante bracelet	£20		£6.00
Girls pink fleece	£21		£16.80
Brown leather boots	£115		£86.25
Grey fleck cardigan	£32		£22.40
Floral T-shirt		70% off	£6.75

DEBENHAMS

Use the information on the previous page

- 2. There are some more sale items in the Debenhams sale. The normal retail price and the offer price have been printed up, but the discount has been missed out.

- a) Calculate the discounts for each item and complete the chart.

- b) Produce discount cards for a display

- c) One item has a discount card already, but has no original price. Find the original price

GET ANSWERS

A

10p
£1
£3
£5
£20
350HK people
82M stars

B

12
30
12 metres
45 feet
-162
51
4.25 Gigabytes
£0.03M or £30K
0.8K volts, or 800v

C

3 floors
9 flowers
35 pence
90p
3 inches
20 insects
0.428 B or 428M

D

180 ml
6.4 miles
490
700
£3.15
630
252,870
16 minutes
10.8 cm

E

15
600
£1500
2.5 cm
13 kg
1,125 litres
20 dvds

F

36 marks
£10.80
2.73 hours
1,200 tiles
2.024K or 2,024
8.26 M
-1.26 B
792 hotels
6%

G

£330
90.9
6030
1140 houses
43.75cm
£6.52

H

7.2 m
765
4,250
£0.9 M or 900k
5.2 km
£0.208 or 21p
0
£39.60

I

£1315.60
£8.392k or £8,392
30.24 minutes
£0.338M or £338K
94.5 kg
15.03k or 15,030
33.45 cm

J

£60
1.25 (ie 25% more)
1.71 (ie 71% more)
500
0.57 (ie 43% less)
9 kg
£1
0.001 (ie 0.1%)
2.3046 B

GET ANSWERS

WORD PROBLEM ANSWERS

1) £185,000 x 1.03 = £190,550   (using original x percentage gives new)

2) 1350 / 1.002 = £1323.53   (using new divided by percentage gives original)

3) £1.50 / 0.8 = £1.86   (using new divided by percentage gives original)

4) 79% of 8000m is 8000 x 0.79 = 6320
The tunnel has 6,320 metres complete   so.. there is another 8000-6320 metres to go = 1680 m

5) 800 pieces – 15 left to do is = 785 done. As a percent this is   785 / 800 = 0.98 = 98% finished

6) 4.1 / 3.2 = 1.28   so   28% increase in viewing figures

7)   1mm + 2% = 1 x 1.02 = 1.02mm   maximum thickness
      1mm - 2% = 1 x 0.98 = 0.98 mm   minimum thickness

| Item	Price	Discount	New Price
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Grey fleck cardigan	£32	**30% off**	£22.40
Floral T-shirt	**£22.50**	70% off	£6.75

What do you now know about 'Percentages' ?

How would you now rate your skills in using percentages ?

1)   Excellent ability
2)   Good ability, but working to improve
3)   Ok, making a start but I know I have lots to still learn
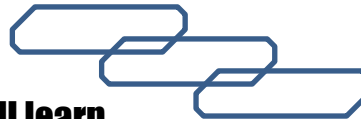
My aims achieved were... (circle relevant aims for you)
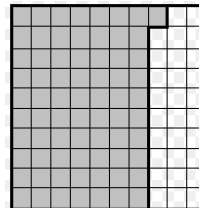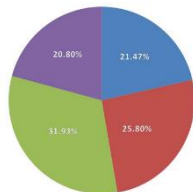
A   Recognise a percentage value, its symbol and meaning, order percentage values
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                C   Find percentage increase , decrease and reversals   Level 2

$$30\% \text{ of } 20 = ?$$

$$= \frac{30}{100} \times 20 = \frac{30 \times 20}{100}$$

$$= \frac{600}{100} = 6$$

%

20.80%   21.47%
11.93%   25.80%

50%

25%

10%

What else can you do to help yourself to learn and practice? Here are ten suggestions, record which you do each week and also record your progress.

Internet websites
  Repeat the lesson, make notes, organise a folder, revise
Own maths workbook
  Study together with a friend or family member
Finish activities in this book
  Complete class handouts or tasks
Practice exams / past papers
  Use maths skills learnt at home or at work in real situations
Play games
  Experiment yourself, try new things ask yourself questions

Try making a graph of number of practice methods you use against your progress score in each topic. Are you showing more practice gives better results?