# Applications of Mathematics

- 4 periods of classwork per week
- 1 piece of homework approx. every 2 weeks

- Three unit assessments: Numeracy
  Finance and Statistics
  Geometry and Measure

- Final exam: Paper 1 Non Calculator 65 minutes
  Paper 2 Calculator 120 minutes

Numeracy   05/06/17

## Using the Four Operations 

- you must be able to add, subtract, multiply and divide large numbers
- you need to have strategies to best approach calculations - which operation to choose

# Written methods

Try these in the back of your exercise jotters.

*Always line up the correct place value columns*

$$\begin{array}{r} 4908 \\ +\quad 67 \\ +\ {\scriptstyle 1}\ 529 \\ \hline 5504 \\ {\scriptstyle 1\ 2} \end{array}$$

$$\begin{array}{r} {\scriptstyle 2\ 4} \\ 13456 \\ -\ 9832 \\ \hline 3624 \end{array}$$

$$\begin{array}{r} 427 \\ \times\quad 5 \\ \hline 2135 \\ {\scriptstyle 1\ 3} \end{array}$$

$$7\overline{)\,6804} \quad 972$$

A lot of the difficulty in the Applications course is figuring out what you need to do.

Picking out key words, underlining and highlighting are all good ways of breaking down long problems.

# Using the Four Operations

NOTES

## Examples

1. The scores in a competition were as follows:-

Jones - 12268 Davis - 8512 Murray - 3214 Wills - 14561

a) Who won and by how many votes more than the runner-up?

Wills won by 2293 points more than Jones.

difference → subtract

$$\begin{array}{r} {}^{4}1\,{}^{15}4\,5\,6\,1 \\ -\;1\,2\,2\,6\,8 \\ \hline 2\,2\,9\,3 \end{array}$$

b) How many points were scored in total during the competition?

add

$$\begin{array}{r} 1\,2\,2\,6\,8 \\ 8\,5\,1\,2 \\ 3\,2\,1\,4 \\ +\;1,4,5,6,1 \\ \hline 3\,8\,5\,5\,5 \end{array}$$

In total 38555 points were scored.

2. In a prize draw, the second prize was £512 868.
The prize money for first place was six times that.

NOTES

multiply

a) What was the prize money for first place?

$$\begin{array}{r} 5\,1\,2\,8\,6\,8 \\ \times\quad 1\,5\,4\,4\,6 \\ \hline 3\,0\,7\,7\,2\,0\,8 \end{array}$$

First place has prize money of £3,077,208.

divide

b) 4 people shared the prize for second place.
How much did they each win?

$$4\overline{)\,5\,{}^{1}1\,{}^{3}2\,8\,6\,{}^{2}8} \quad = \quad 1\,2\,8\,2\,1\,7$$

Each person won £128,217.

Numeracy

07/06/17

# Multiplying and dividing by powers of 10

- you must be able to multiply and divide by 10, 100, 1000 etc
- you should use this to help you multiple and divide by numbers such as 30 or 400

## Multiplying by 10, 100 ...

When we multiply by 10 we are making our number 10 times bigger. It moves up by one place value.
When we multiply by 100 we are making our number 100 times bigger. It moves up by two place values.

| | One Millions | Hundred Thousands | Ten Thousands | One Thousands | Hundreds | Tens | Ones | Tenths | Hundredths | Thousandths |
|---|---|---|---|---|---|---|---|---|---|---|
| 245 x 10 | | | | 2 | 4 | 5 | 0 | | | |
| 32.8 x 100 | | | | 3 | 2 | 8 | 0 | | | |
| 4670 x 10 | | | 4 | 6 | 7 | 0 | 0 | | | |
| 0.14 x 1000 | | | | 0 | 1 | 4 | 0 | | | |
| 309.67 x 1000 | | 3 | 0 | 9 | 6 | 7 | 0 | | | |
| 1067.098 x 100 | | 1 | 0 | 6 | 7 | 0 | 9 | 8 | | |

# Dividing by 10, 100 ...

When we divide by 10 we are making our number 10 times smaller. It moves down by one place value.
When we multiply by 100 we are making our number 100 times smaller. It moves up down two place values.

| | One Millions | Hundred Thousands | Ten Thousands | One Thousands | Hundreds | Tens | Ones | Tenths | Hundredths | Thousandths |
|---|---|---|---|---|---|---|---|---|---|---|
| 245 ÷ 10 | | | | | | 2 | 4. | 5 | | |
| 32.8 ÷ 100 | | | | | | | 0. | 3 | 2 | 8 |
| 4670 ÷ 1000 | | | | | | | 4. | 6 | 7 | 0 |
| 0.14 ÷ 10 | | | | | | | 0. | 0 | 1 | 4 |
| 309.67 ÷ 1000 | | | | | | | 0. | 3 | 0 | 9 | 6 | 7 |
| 1067.098 ÷ 10 | | | | | 1 | 0 | 6. | 7 | 0 | 9 | 8 | |

If I want to multiply by 50 I split it up:

$2.3 \times 50$

$2.3 \times 10 \times 5$ OR $2.3 \times 5 \times 10$

$2.3 \times 10 = 23$

$$\begin{array}{r} 23 \\ \times\ 5 \\ \hline 115 \end{array}$$

So $2.3 \times 50 = \underline{\underline{115}}$

$$\begin{array}{r} 2.3 \\ \times\ 5 \\ \hline 11.5 \end{array}$$

$11.5 \times 10 = 115$

$2.3 \times 50 = \underline{\underline{115}}$

# If I want to divide by 20 I split it up

$$1.64 \div 20$$

$1.64 \div 2 \div 10$ OR $1.64 \div 10 \div 2$

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.082 | 0.082 | 0.082 | | | | | | | |
| 0.082 | 0.082 | | | | | | | | |

$$2\overline{)1.64} = 0.82$$

$0.82 \div 10 = 0.082$

So $1.64 \div 20 = \underline{\underline{0.082}}$

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.082 | 0.082 | 0.082 | | | | | | | |
| 0.082 | 0.082 | | | | | | | | |

$1.64 \div 10 = 0.164$

$$2\overline{)0.164} = 0.082$$

So $1.64 \div 20 = \underline{\underline{0.082}}$.

Today we are practising multiplying and dividing by a power of ten or hundred etc.

Remember:

- $78.6 \times 60 = 78.6 \times 10 \times 6$ multiply by 10 first then multiply by 6
- $1.57 \div 300 = 1.57 \div 3 \div 100$ divide by 3 first then divide by 100


Exercise Jotter

Page 22: Q1a,b,e,h
Q2a,b,e,h
Q3
Q4

Page 23: Q3
Q5

Numeracy

12/06/17

# Rounding Numbers

- to be able to round numbers up to 3 decimal places
- be able to round to a given significant figure

## Rounding

We round numbers to make them simpler to use and write.
There are two different types of rounding:

- decimal place

only for numbers with digits after the decimal point

- significant figure

for any number, usually larger numbers

## Rounding to a decimal place value

- find the place value you are rounding to
- look at its right hand neighbour
- if that number is 5 or more, we round our value up
- if it is 4 or below, we keep our value the same

Example,
Round 1345.841 to the nearest hundredth.

1345.84 ↑ 1345.841 1345.85

1345.84

Example,
Round 0.267 to one decimal place.

0.267

0.3

Example,
Round 102.998 to the nearest tenth.

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Q2345

103.0 ← need to keep the 0 because we have been asked for tenths

## Rounding to a significant figure

- find the place value you are rounding to
- look at its right hand neighbour
- if that number is 5 or more, we round our value up
- if it is 4 or below, we keep our value the same
- any digits after become zeros

Example,
Round 1345 to the nearest hundred

1300

Example,
Round 130743.267 to the nearest thousand.

131000

Example,
Round 1902990 to the nearest hundred thousand.

1900000

## Rounding to a significant figure

- find the place value you are rounding to
- look at its right hand neighbour
- if that number is 5 or more, we round our value up
- if it is 4 or below, we keep our value the same
- any digits after become zeros

Example,
Round 1345 to 1 sig fig

1000

Example,
Round 130743.267 to 2 sig fig

130000

Example,
Round 1902990 to 3 sig fig

1900000

Numeracy

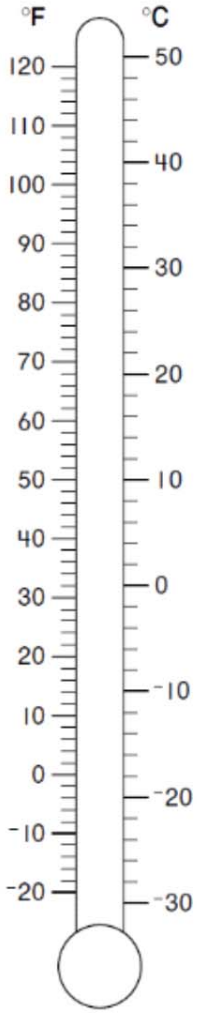
13/06/17

## Negative Numbers

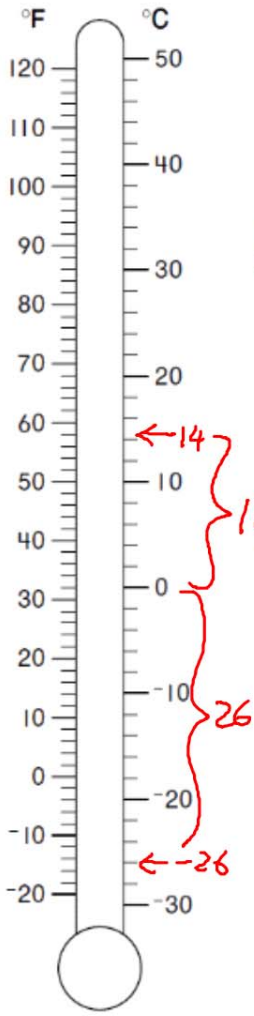
- use negative numbers in a real world context, for example money and temperature
- carry out calculations involving negative numbers

# When can we use negative numbers in real life?




The temperature is 10° at midday, then falls by 15°.
What is the temperature now?




1. The temperature was 14°C at midday, then fell to -26°C.
What was the temperature drop?

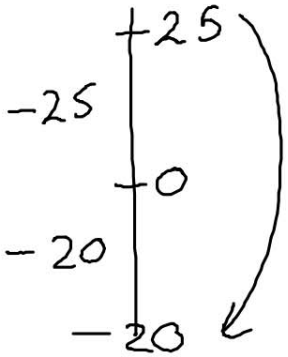
$14 + 26 = 40°C$

2. The temperature was 21°C at midday, then fell to -15°C.
What was the temperature drop?

3. The temperature was -16°C at midday, then rose to 32°C.
What was the temperature rise?

Josie has £25 in her bank account.
She spends £45 on a pair of new trainers.
How much is in her account now?

$25 - 45 = £-20$




She pays £50 into her account.
What is the new bank balance?

$-20 + 50 = 50 - 20 = £30$

Alice has £120 in her account on Friday.
She has to pay rent on Monday morning.
This makes her new balance -£450.
How much is Alice's rent?

$120 + 450 = £570$

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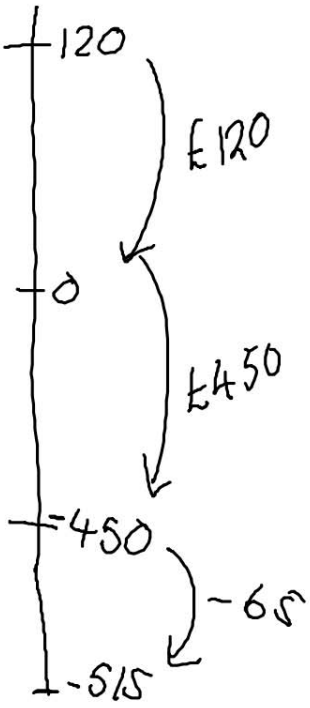
Ex2



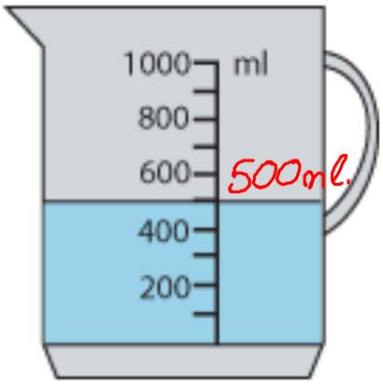

A further £65 is taken out of her account.
What is the balance now?

$-£450 - 65 = £515$

## Starter

Reading scales - What number is the arrow pointing towards?

1

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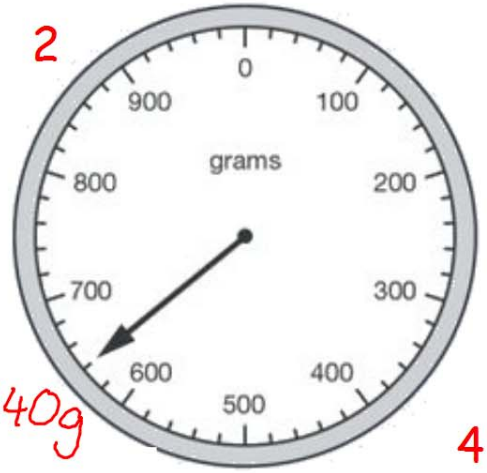


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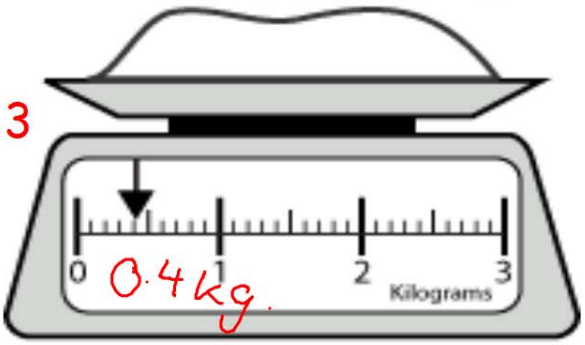


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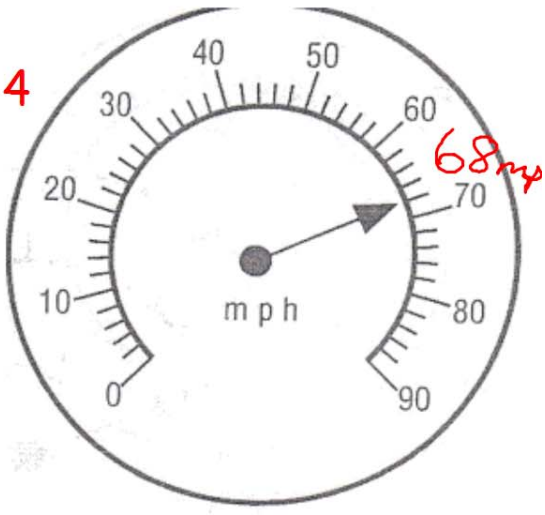


# Tolerance

- tolerance is another way of saying 'give or take'

If someone says 'my brother is 30 years old, give or take', what does this mean?

Tolerance is the mathematical way of writing this down.

The symbol we use for tolerance is ±

Eg. The height of a tree is 8 ± 0.2m

## Example 1

If the length of a nail is 18mm ± 2mm

The maximum length is $18+2 = 20mm$

The minimum length is $18-2 = 16mm.$

(16, 20)

## Example 2

If the temperature ice cream freezes is -12°C ± 0.5°C

The maximum temperature is $-12+0.5 = -11.5°C$

The minimum temperature is $-12-0.5 = -12.5°C$

$(-12.5, -11.5)$

### Exam Style Question

A construction company produces parts for furniture manufacture.
They sell bolts in various lengths. One particular model comes with a guarantee that the the length is 20±2 mm.

During a quality check, several bolts are measured and found to have lengths:

| | | | |
|---|---|---|---|
| 19mm ✓ | 21.5mm ✓ | 14mm ✗ | 22mm ✓ |
| 18.5mm ✓ | 21 mm ✓ | 20.2mm ✓ | 22.01mm ✗ |

How many of the bolts fail to pass the quality inspection?

6 bolts will pass inspection.

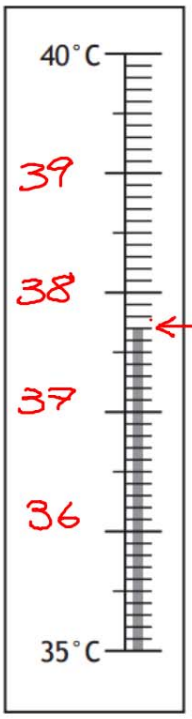
# Past Paper Question (NonCalc 2014)

2. Frances is not feeling well.

She takes her temperature using a thermometer.

Her temperature is shown below.

The temperature of a person in good health is 36·8 °C ± 0·4 °C.




37.7 °C

max 36.8 + 0.4 = 37.2

min 36.8 − 0.4 = 36.4

She is not in good health as 37.7 °C is higher than the maximum tolerance.

Is Frances in good health?

**Give a reason for your answer.** 3

Numeracy

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## Finding a fraction of an amount

- you must split the number into the parts
- then multiply by the number of parts we want

If we are finding $\frac{1}{6}$ of a quantity, we are splitting it into 6.

If we want $\frac{5}{6}$ then we need 5 of those 6 pieces.

So to find $\frac{5}{6}$ of something we divide by 6 then multiply by 5.

To find a fraction of an amount:

- divide by the denominator
- multiply by the numerator

1. Two hundred people work in an office.
   Two fifths of them have their own computer.
   How many people do not have their own computer?

2. William decides to share his pay bonus of £2000.
   He gives half to his mum and a fifth of what he had left to his brother George.
   How much will he then have left?

3. Harry decides to share 300 marble. He will get half, Sam will get a third and Jake will get a quarter.
   What is wrong with Harry's calculations?

Numeracy

21/06/17

# Improper Fractions and Mixed Numbers

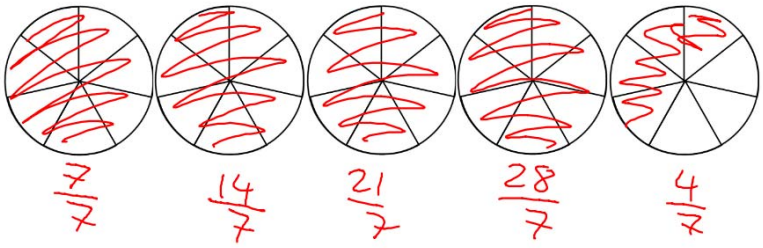
- you must be able to convert between top heavy fractions and mixed numbers
- this relies on you knowing your times tables!

## Top heavy to mixed number

- divide the top by the bottom to get the 'wholes'
- the leftover stays a fraction

Example: $\frac{32}{7} \Rightarrow 32 \div 7 \Rightarrow 4\frac{4}{7}$

4 r 4



$\frac{7}{7}$ $\frac{14}{7}$ $\frac{21}{7}$ $\frac{28}{7}$ $\frac{4}{7}$

Example: $\frac{28}{8} \Rightarrow 28 \div 8 \Rightarrow 3 \text{ r } 4 \Rightarrow 3\frac{4}{8} \Rightarrow 3\frac{1}{2}$

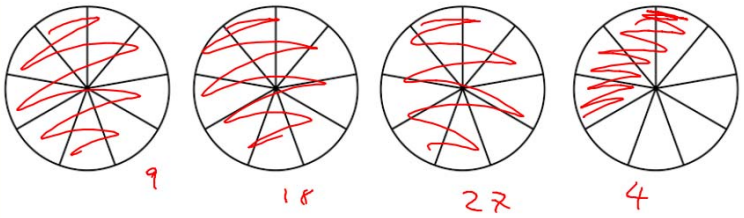
$\frac{25}{3} \rightarrow 25 \div 3 \rightarrow 8 \text{ r } 1 \rightarrow 8\frac{1}{3}$

$\frac{32}{6} \rightarrow 5\frac{2}{6} \rightarrow 5\frac{1}{3}$

## Mixed number to top heavy

- multiply the whole by the denominator
- add the numerator

Example: $3\frac{4}{9} = \frac{31}{9}$




$2\frac{1}{4} \rightarrow 2 \times 4 + 1 \rightarrow \frac{9}{4}$

$7\frac{3}{4} \rightarrow 7 \times 4 + 3 \rightarrow \frac{31}{4}$

$3\frac{1}{2} \rightarrow 3 \times 2 + 1 \rightarrow \frac{7}{2}$

$6\frac{4}{5} \rightarrow 6 \times 5 + 4 \rightarrow \frac{34}{5}$