



# Essential Skills - Numeracy for Construction

ES LEVEL 1 RESOURCES FOR CONSTRUCTION STUDENTS - APRIL 2010



Department for  
**Employment  
and Learning**  
[www.delni.gov.uk](http://www.delni.gov.uk)

**construction skills**  
in NORTHERN IRELAND



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ES LEVEL 1 RESOURCES FOR CONSTRUCTION STUDENTS - APRIL 2010





### **Acknowledgements**

We would like to thank Construction Skills in Northern Ireland who had this resource published. We also acknowledge our colleagues in the construction departments of South Eastern Regional College and South West College for their advice in our research prior to preparing this resource. We have also benefited from the expertise of many friends within the industry.

### **Aims**

It is intended that these vocationally contextualised resources will support Essential Skills Numeracy tutors in their efforts to make programmes for construction students vocationally relevant.

This resource should be used in the context of appropriately planned and structured Essential Skills programmes and should be used and adapted appropriately within that context.

### **Guidance for Using Resource**

It is not intended that these materials should be used as a fixed programme of learning but as a resource which tutors can use to aid them in the planning and delivery of programmes suited to the needs of their particular groups of learners. It is envisaged that tutors will bring their own ideas to these materials and extend and enhance them in order to keep activities refreshed and dynamic for learners.

Essential Skills tutors should ensure that they read and understand the following publication before they develop programmes: ESSENTIAL SKILLS GOOD PRACTICE: THE ASSESSMENT PROCESS. DEL NI, July 2007.

All information on this page is current and up to date at the time of printing (April 2010).

Authors: Paula Philpott and William Smyth.

### **Disclaimer**

The contents of this resource are fictional. No actual person, company, or event, is depicted.

### **Essential Skills Numeracy for Construction Students**

To qualify in construction at NVQ level 2 you will need Level 1 in Essential Skills Numeracy.

At Level 1 you will need to do a project on a subject you are interested in and you will take an exam at the end of your course.

This booklet will help you practice the skills you will need to achieve your level 1 in Numeracy.



When you see this symbol you may use a calculator to answer the question.

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## MEASURE, SHAPE AND SPACE

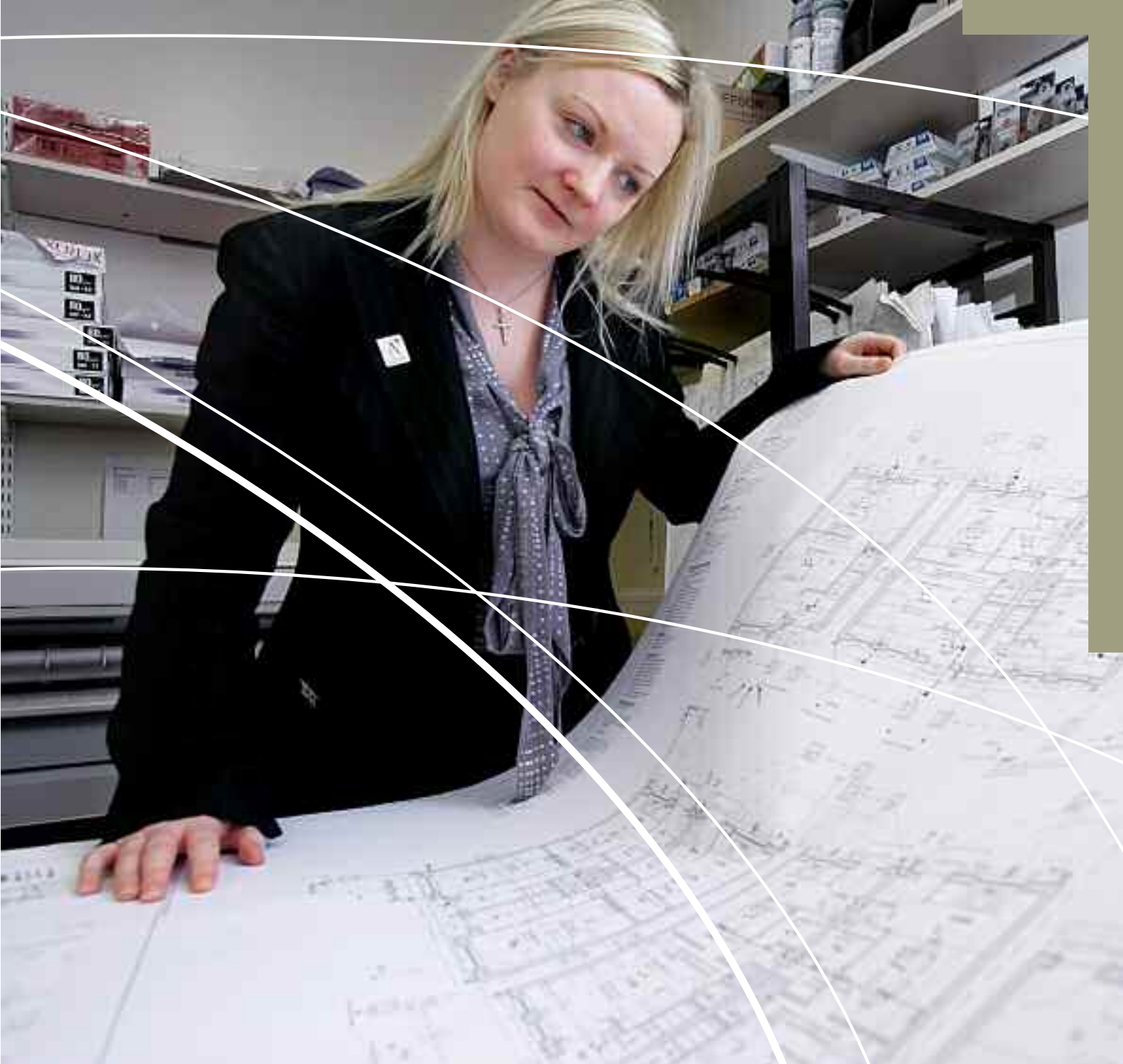
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# Number Tasks and Answers

This section mainly addresses the curriculum area specified, although to allow a more realistic setting for each task, some elements from other curriculum areas may also be mentioned. Decimals are addressed in more detail through the section on measurement.



# NUMBER TASK 1

## PLACE VALUE

Below you will see figures for the construction industry. They are taken from NISRA – Northern Ireland Statistics and Research Agency. The statistics relate to local firms and their turnover. Look at the data and answer the questions below.

In the construction industry in Northern Ireland there are hundreds of thousands of people employed in different jobs and in your job you will be required to work with large numbers for example weights of material, costings for jobs, etc. Therefore it is important that you understand numbers and can work with them.

**Structure of the Construction Industry (2008)**

Turnover (£000) Size Band	Number of Firms	Per Cent of Total
0 – 99	4,430	40%
100 – 499	4,705	43%
500 – 1,999	1,345	12%
2,000 – 4,999	325	3%
5,000 – 9,999	115	1%
10,000 +	95	1%
<b>Total</b>	<b>11,015</b>	<b>100%</b>

Source: NISRA – NI Construction Bulletin 1<sup>st</sup> April to 30<sup>th</sup> June (Nov 2008)

From the table above you can see that there were 11,015 construction firms in Northern Ireland at the time of the survey.

The number 11 015 has:

TEN THOUSAND	THOUSAND	HUNDREDS	TEN	UNITS
1	1	0	1	5

When reading large numbers break them into groups of three (starting at the units end). Sometimes these groups of three digits are separated using commas.



# NUMBER TASK 1

1. Complete the table below the first one is completed for you.

	Millions	Hundred thousands	Ten thousand	Thousand	Hundred	Tens	Units	
2 303 105	2	3	0	3	1	0	5	Two million, three hundred and three thousand, one hundred and five
32 015								
								One hundred and six thousand and forty five
			3	0	2	1	0	
	1	0	0	0	0	2	5	
19 206								
								Forty five thousand and twelve

# NUMBER TASK 1

## 2. Using the table below answer the questions

Turnover (£000) Size Band	Number of Firms	Per Cent of Total
0 – 99	4,430	40%
100 – 499	4,705	43%
500 – 1,999	1,345	12%
2,000 – 4,999	325	3%
5,000 – 9,999	115	1%
10,000 +	95	1%
<b>Total</b>	<b>11,015</b>	<b>100%</b>

*Source: NISRA – NI Construction Bulletin 1<sup>st</sup> April to 30<sup>th</sup> June (Nov 2008)*

a. 4,430 firms had a turnover from £0-£99,000. How many firms is this in words?

b. What is the turnover of £99,000 in words?

c. Most construction firms in Northern Ireland have a turnover between £100,000 and £499,000. What is this in words?

£100,000

£499,000

## 3. What do the figures in the table tell you about the construction industry in Northern Ireland?

# NUMBER TASK 2

## ADDITION AND SUBTRACTION

When costing up a job you will need to be able to add, subtract, multiply and divide. You will have to be able to find a rough estimate and then provide a detailed breakdown of all costs including taxes. If you have others working for you this will mean calculating their wages and keeping accurate records of turnover.

When ordering in materials you will need to ensure that the quantities have been correctly calculated.

### Addition

If the numbers are too big to add in your head, write them down in columns. Separate the numbers into units, tens, hundreds and thousands. Always start adding with the units first.

**Example**  
**3256 + 275**

Th	H	T	U
3	2	5	6
	2	7	5
3	5	3	1

**Start at the unit column first. If the total is more than 10, carry 1 to the next column.**

Structure of the Construction Industry (2008)

Turnover (£000) Size Band	Number of Firms	Per Cent of Total
0 – 99	4,430	40%
100 – 499	4,705	43%
500 – 1,999	1,345	12%
2,000 – 4,999	325	3%
5,000 – 9,999	115	1%
10,000 +	95	1%
<b>Total</b>	<b>11,015</b>	<b>100%</b>

Source: NISRA – NI Construction Bulletin 1<sup>st</sup> April to 30<sup>th</sup> June (Nov 2008)

**1. From the table above what is the total number of construction firms with a turnover under £500,000?**

**2. How many firms have a turnover of £2,000,000 or more?**

# NUMBER TASK 2

## Subtraction

Again line up the numbers so that you subtract units from units, tens from tens etc... Always start subtracting with the units first.

Th	H	T	U
2	5	6	7
1	4	2	5
1	1	4	2

There are different methods you can use to subtract. Look at the examples below and use the method that is most familiar to you.

### Example 1

Start with the units

**Start at the unit column first. If the total is more than 10, carry 1 to the next column.**

Th	H	T	U
<sup>1</sup> 2	<sup>1</sup> 5	6	7
1	9	2	7
	6	4	0

### Example 2

Start with the units

**You cannot subtract 9 from 5. You will need to borrow 1 from the thousands column to make 15 and pay this back by adding 1 to the thousands column of the number you are subtracting. It becomes 2.**

Th	H	T	U
2	<sup>1</sup> 5	6	7
<sup>1</sup> 2	9	2	7
	6	4	0



# NUMBER TASK 2

Use whichever method is most familiar to you to answer these questions.

**3. A construction company employs 111 men and 27 women. How many more men than women does it employ?**

**4. A high visibility jacket costs £17.05 and £13.67 from two different suppliers. What is the difference in price?**

# NUMBER TASK 3

## PAY

In the last task we saw how important it is that you can accurately add and subtract.

James works for McLaughlin Builders below and has received his latest payslip. He is worried that the pay is incorrect. Look at the payslip below and answer the questions given.

James is a site manager for a manufacturing firm. His last payslip was:

**McLAUGHLIN BUILDERS****Randalstown****Employee name:** James Greeves**Employee Number:** 25**Pay date:** 31/5/09**Payments**

Basic pay	£3026.25
-----------	----------

Tax code	01 2010
Tax code	355 L
NI Number	NR674590A
NI Code	D

**Deductions**

Tax paid	£497.86
Employee's NI Paid	£256.38

**NET PAY: ?????**

# NUMBER TASK 3

James has been checking his pay and thinks that it has been incorrectly calculated. He thinks his net pay (the remaining amount of an employee's gross pay after deductions such as income tax and national insurance are made) should be £1,372.01. His brother Jason and his wife Amy also check to see what they calculate his net pay should be. Their calculations are shown below:

**James**

$$\begin{array}{r}
 497.86 \\
 + 256.38 \\
 \hline
 754.24 \\
 3026.25 \\
 - 754.24 \\
 \hline
 1372.01 \text{ Net Pay}
 \end{array}$$

**Jason**

$$\begin{array}{r}
 497.86 \\
 + 256.38 \\
 \hline
 754.24 \\
 3026.25 \\
 - 754.24 \\
 \hline
 2272.01 \text{ NET PAY}
 \end{array}$$

**Amy**

$$\begin{array}{r}
 3026.25 \\
 - 497.86 \\
 \hline
 2671.61 \\
 - 256.38 \\
 \hline
 2425.37 \text{ NETPAY}
 \end{array}$$

Look at the calculations they have made.

- Who do you think has calculated the net pay correctly and why?
- Who has calculated it incorrectly and what mistake/s did they make?

Fill your answers in the table below:

	Delete as appropriate	Reason (e.g. what mistake did they make)
James	Correct / incorrect	
Jason	Correct / incorrect	
Amy	Correct / incorrect	

# NUMBER TASK 4

## MULTIPLICATION AND DIVISION

When ordering materials for McLaughlin Builders, James has been double checking his calculations to make sure he orders in the correct quantities. He needs to be able to multiply and divide numbers accurately. The methods used are shown below.

You will need to know your multiplication tables to help you work out multiplication and division problems.

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100



# NUMBER TASK 4

## Multiplication

### Example 2

Start with the units

$$\begin{array}{r}
 \phantom{x} \phantom{00} 4 \phantom{0} 8 \\
 \times \phantom{00} 4 \phantom{0} 6 \\
 \hline
 2 \phantom{00} 8 \phantom{0} 8
 \end{array}$$

Start with the units.  $8 \times 6 = 48$ . Put 8 in the units column and carry the 4. When you multiply the tens column  $4 \times 6 = 24$ , don't forget to add the 4 you carried to get  $24 + 4 = 28$ .

1. If you need to buy two pairs of safety boots at £29.92, how much will the total cost be?

**Estimate your answer first.** £29.92 is approximately £30. 2 pairs of boots at £30 would cost £60. Now calculate the actual cost and see if your answer seems reasonable.

### Example

A 1kg box of galvanised nails costs £2.43. You need to buy 12 boxes. How much will this come to?

$$\begin{array}{r}
 \phantom{+} \phantom{00} 2 \phantom{00} . \phantom{00} 4 \phantom{00} 3 \\
 \times \phantom{00} 1 \phantom{00} 2 \\
 \hline
 4 \phantom{00} . \phantom{00} 8 \phantom{00} 6 \\
 + 2 \phantom{00} 4 \phantom{00} . \phantom{00} 3 \phantom{00} 0 \\
 \hline
 2 \phantom{00} 9 \phantom{00} . \phantom{00} 1 \phantom{00} 6
 \end{array}$$

Start by multiplying by the 2.

$3 \times 2 = 6$ , then  $4 \times 2 = 8$ , then  $2 \times 2 = 4$

This gives the first row of the table.

Next you will multiply the one in the tens column. Put 0 in the units column because you are multiplying tens. Then multiply by 1.

Add them together  $4.86 + 24.30$   
to get £29.16

2. If a site joiner earns £9.25 an hour. How much does he earn for 11 hours work?

# NUMBER TASK 4

## Division

If the numbers are too difficult to divide in your head, use a written method. The example below shows you how.

### Example

Hard hats cost £9.69 for three. How much does one cost?

- Divide the 9 by the 3 first to get 3. Write this above the 9.
- Divide the 6 by the 3 next to get 2. Write this above the 6.
- Divide the second 9 by the 3 next to get 3. Write this above the second 9.

$$\begin{array}{r} 3.23 \\ 3 \overline{) \text{£}9.69} \end{array}$$

A hard hat will cost £3.23.

**3. A length of wood measuring 2450mm, is cut into 5 equal lengths. How long is each piece of wood?**

**4. A bill of £1840 is paid in 8 equal payments. How much is each payment?**

# NUMBER TASK 5

## BUYING A VAN

John is a self-employed plasterer and has decided he needs to change his work van. His local commercial vehicle dealer has the following options available to suit his budget. Read through the information given and help John make up his mind regarding a new work van.

Make/Model/Year	Price (£)		Mileage
	Straight Deal	Trade-in	
2007 Ford Transit	7595	8295	12635
2008 Renault Master	7825	8195	31506
2006 Peugeot Boxer	4995	5295	24382
2009 Iveco Daily	9475	9995	1465
2006 Mercedes Sprinter	6995	7295	31056

**1. Arrange the list of vans above in order of increasing Straight Deal price.**

Van	Price

**2. Arrange the list of vans in order of decreasing mileage.**

Van	Mileage

After some consideration John decides to trade in his current van against the 2008 Renault Master. The dealer offers him £1250 for his old Nissan van.

# NUMBER TASK 5

3. Complete the cheque below with the balance John needs to pay.

Northern Bank  
49-51 UNIVERSITY ROAD  
BELFAST BT7 1ND

95-01-49

Pay to the order of Bridge Commercial Ltd

£ 6,945

11/11/2015

200652 9501490 44

John later decides to take advantage of an offer of extended warranty which includes free servicing. This is available at a cost of 5% of the Straight Deal price of the Renault van. Calculate the new total he must pay and complete the cheque below giving your answer to the nearest pound. You are given some steps involved in the calculation to help you.

4. What is 10% of the Straight Deal price in pounds and pence?

5. What is 5% of the Straight deal price in pounds and pence?  
Use the answer above to help you.



## NUMBER TASK 5

**6. Round this amount to the nearest pound.**

--

7. Now calculate the new total amount he must pay for the van and the extended warranty and complete the cheque below.

--

North Bank

49-51 UNIVERSITY ROAD  
BELFAST BT7 1NB

Date \_\_\_\_\_

To \_\_\_\_\_

AIR PHOTO COPY

£ \_\_\_\_\_

11507008530

NORTH BANK LIMITED

Cheque

2008530 95001490 44

# NUMBER TASK 6

## JOBS IN CONSTRUCTION

There are various jobs associated with construction and as your career develops there will be opportunities to earn more. Have a look at the jobs being advertised below and the salaries associated with them. Consider how your salary may change as you gain new qualifications and skills.

### Job A: Apprentice bricklayer

3rd year Apprentice Bricklayer - (Full-time / Permanent)
Job reference: 885798
Date notified: 31/07/2009
Job location: Various locations
Salary: £5 plus per hour depending on experience
Hours: 40
Worktime: Monday - Friday 8am - 5pm
Age: 16 and over
Closing date: 14/08/2009
Pension type: None

1. The company offer to pay time and a half for any overtime you do. What would the hourly rate be for overtime?

2. If you work 40 hours a week what will your weekly salary be?

# NUMBER TASK 6

3. If you work 45 hours one week what would you earn?

**Job B: Qualified bricklayer**

Bricklayer - (Full-time / Temporary)	
Job reference:	882431
Date notified:	29/06/2009
Job location:	Ballymena
Salary:	£8.60 per hour
Hours:	40
Worktime:	8.00am - 5.00pm
Age:	16 and over
Closing date:	03/07/2009
Pension type:	Prefer Not to Say

4. What will the weekly salary be?

# NUMBER TASK 6

**5. Remembering that there are 52 weeks in a year, what is the annual salary?**

**6. If you got Job A what would your annual salary be for a 40 hour week for 52 weeks? (Use your answer to question 2 where you worked out the weekly salary.)**

**7. How much more would a qualified bricklayer earn in Job B per year?**



# NUMBER TASK 6

## Job C: Site Foreman



**Hays Specialist Recruitment**  
 9th Floor 14 Great Victoria Street Belfast BT2 7BA  
**Tel:** See Below **www:** [www.Hays.com/uk](http://www.Hays.com/uk)  
**Fax:** See Below **Email:** See Below

Ref no:	NJ-44106
Title:	Civil Works Foreman (Belfast)
Date last updated by recruiter:	13 Aug 2009
Location:	Adrian, Belfast, Down
Job type:	Temporary Full-time
Salary:	£25000 - £35000
Additional benefits:	See Description
Role/sic:	Femperson - construction
That best describe this job:	Site manager Site Agent
Qualifications:	See Description
Contact:	Oliver Smith

**APPLY**

8. What is the range in the salary for this job?

# NUMBER TASK 6

9. The successful candidate for this post was given a salary of £27,300. How much does this work out at per month?

Monthly salary =

10. For the annual salary of £27,300 how much will the successful candidate earn per week? Remember there are 52 weeks in a year.



11. If the successful candidate is offered a 10% pay rise at the end of the first year, how much will their annual salary be?

To find 10 % of the salary, divide the total salary by 10.

10 % pay rise =

Annual salary =

# NUMBER TASK 7

## CALCULATIONS

When you price up a job you will need to consider materials, labour and taxes. Calculations will need to be accurate to ensure that the business operates efficiently and your good reputation is maintained. Over ordering materials will add to your costs and reduce your profits, so it is important to work accurately and check quantities carefully.

### Decking

**EXAMPLE:** To calculate how much decking you need for deck measuring 4mx3m use the table below:  
Table showing the number of metres of 144mm deck boards required

METRES	1	2	3	4	5	6
1	7	14	21	28	35	42
2	14	28	42	56	70	84
3	21	42	63	84	105	126
4	28	56	<b>84</b>	112	140	168
5	35	70	105	140	175	210
6	42	84	126	168	210	252

From the table above you can see that a deck measuring 4mx3m you will need 84m of 144mm wide deck board.

If the deck boards you want come in 2.4m lengths, divide 84 by 2.4 = 35. You should buy 35 boards.

The cost of each length of board in B & Q is shown below:



Reversible Treated Deck Board Smooth Grooved Green Treated (L)2400 x (W) 144 x (T)28mm  
EAN: 6022652800611

☒ in store ☐ home delivery

☒ Available for reserve & collect ☐ Not available

Select a store to check stock & reserve & collect

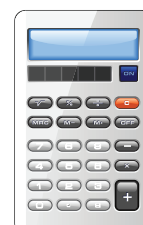
Only £4.46

Qty: 1

add to shopping list

To calculate the total cost of the decking boards using a calculator, the sum is:

$$35 \times £4.46 =$$



# NUMBER TASK 7

1. The answer on the screen is: **156.1**. What does this mean the total cost of the decking is?

2. Using the table below find the number of metres of deck board needed for a decked area measuring 5m by 6m.

Table showing the number of metres of 144mm deck boards required

METRES	1	2	3	4	5	6
1	7	14	21	28	35	42
2	14	28	42	56	70	84
3	21	42	63	84	105	126
4	28	56	84	112	140	168
5	35	70	105	140	175	210
6	42	84	126	168	210	252

Number of metres of deck board required is.....



**Reversible Treated Deck Board Smooth Grooved Green Treated (L)2400 x (W) 144 x (T)28mm**  
EAN: 5022652800611

**in store**

Available for reserve & collect

Select a store to check stock & reserve & collect

**home delivery**

Not available

**Only £4.46**

Qty:

**add to shopping list**

# NUMBER TASK 7

**3. The deck boards you want come in 2.4m lengths. How many lengths of deck board will you need?**



Be careful how you round your answer.

**4. If each length of deck board costs £4.46, what is the total cost of the deck board?**

Total cost

# NUMBER TASK 7

Paul is on his way home after a job. He is already thinking of work tomorrow and about getting tiles. He worked out earlier he needs just under 600 tiles for the next job. A slight detour on the way home would take him past the tile warehouse but as he has no trailer with him he could only fit one pallet in the van. If he needs more than one pallet he will leave it until tomorrow when he could call back with the trailer. It would save quite a bit of time if he could get the tiles today.

He knows from experience that the tiles he needs come in boxes with 4 tiles per box and that the boxes are stacked on the pallet in layers. Each layer has 5 by 6 boxes and there are 6 layers altogether. Paul is trying to work out in his head if this amounts to more than 600 tiles. He knows the calculation he needs to do is  $4 \times 5 \times 6 \times 6$ .

## 5. Can you think of a way to answer his question without having to do the calculation in full?

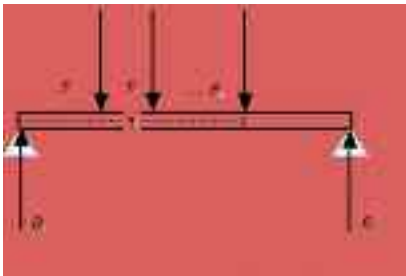
Is  $4 \times 5 \times 6 \times 6$  more than 600?

Will he call for the tiles on his way home? Please explain your reasoning

# NUMBER TASK 8

## NEGATIVE NUMBERS

Negative numbers are numbers to the left (or below) zero on a number line. The use of negative numbers in construction is generally related to temperature, finances, height above/below sea level in surveying, direction of rotation e.g., clockwise or anticlockwise or the direction of forces that act in beams, columns, frames etc. You will need to be able work with negative numbers accurately.



We will consider two construction related uses of negative numbers here; temperature and finances (bank statement).

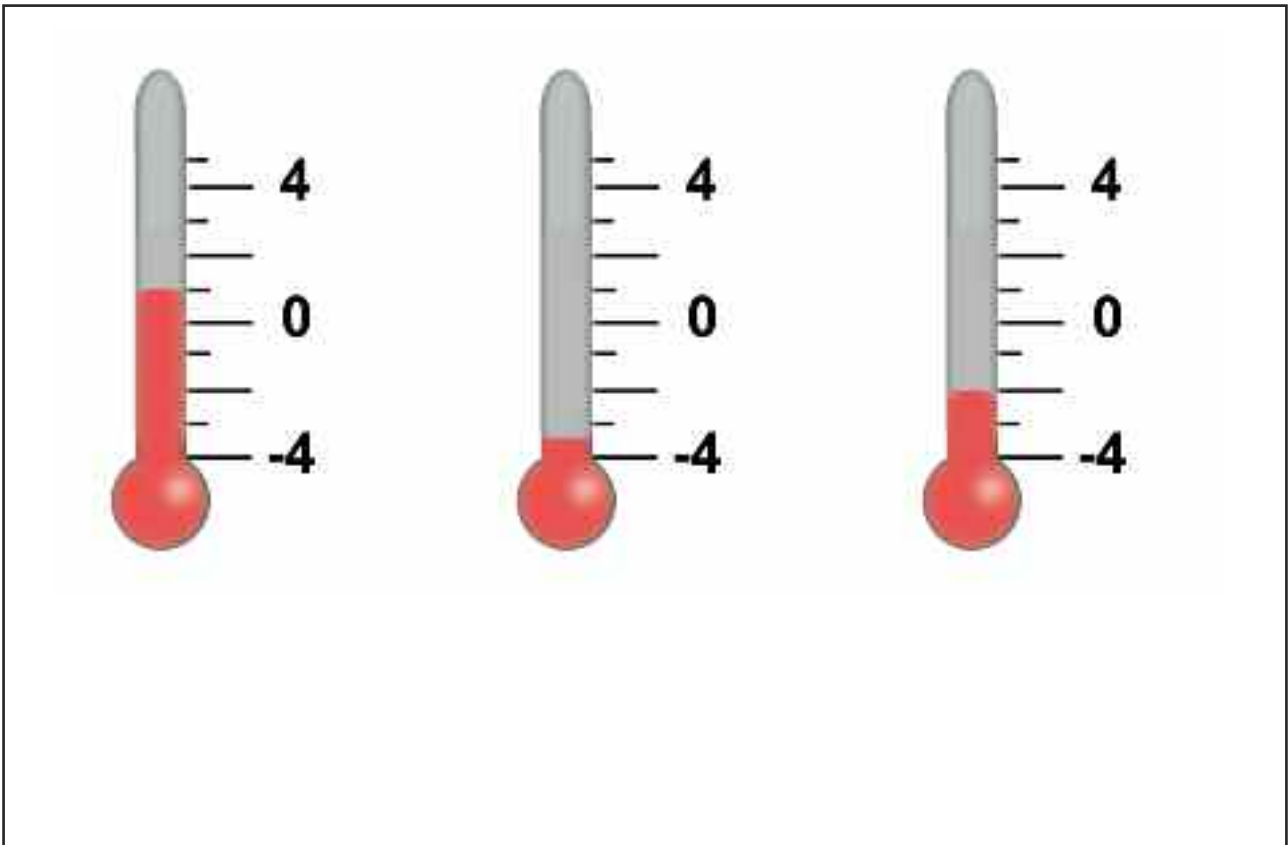
In the Celsius temperature scale  $0^{\circ}\text{C}$  represents the freezing point of water. Be careful, it does not mean there is no heat energy present. It just means there isn't enough heat present for water to exist in liquid form so it freezes. A negative value on the Celsius scale indicates a temperature lower than  $0^{\circ}\text{C}$  where there is less heat energy present and so it feels colder.

- 1. In the space below construct a temperature scale (a number line) that extends from  $-5^{\circ}\text{C}$  to  $5^{\circ}\text{C}$  in steps on  $1^{\circ}\text{C}$ . Use your ruler and work to a scale of 1cm for  $1^{\circ}\text{C}$ . Mark the temperatures  $-4^{\circ}\text{C}$  and  $2^{\circ}\text{C}$**



# NUMBER TASK 8

2. In the space below identify the temperatures marked on the scale.



3. If the answers above referred to external temperatures on a cold evening indicate which one is most likely to result in burst water pipes in a building if the heating was off.

# NUMBER TASK 8

Ambient temperature is very important when laying asphalt. According to relevant British Standards the asphalt itself should be at 85° C but the ambient temperature should be no less than -3°C.

Janine has been checking temperatures over a period of two weeks and here are her results.



December				Temperature (°C)										
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Temp	6	4	6		-5		-3	2	7	1	2		4	5

4. Values for 4th, 6th and 12th December are not shown in the table. The images below show the temperatures for these dates. Make each temperature reading and record the result in the table.

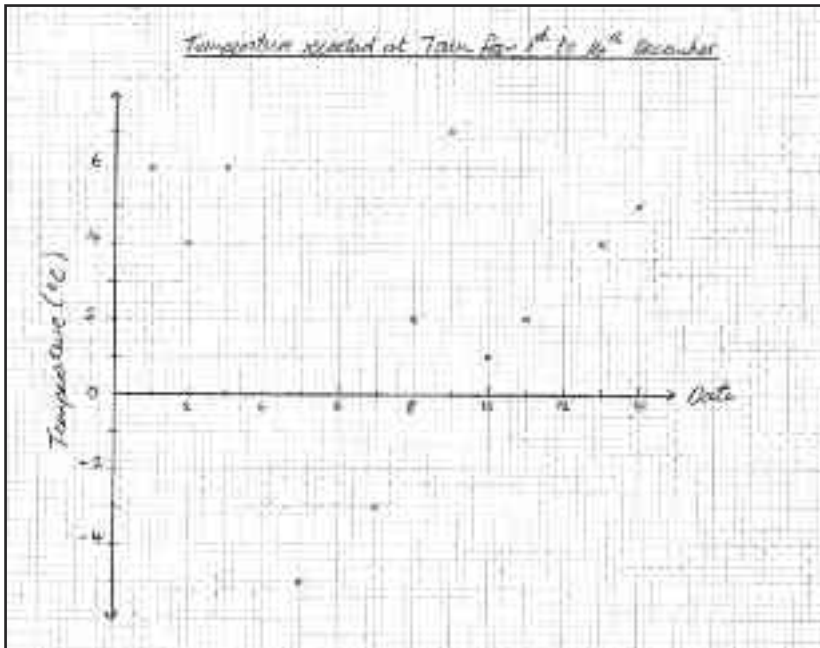
4th December

6th December

12th December

# NUMBER TASK 8

5. Using the graph below plot the remaining points. Join the points using a straight edge to produce a line graph showing how the temperature varied over the two-week period.



6. What was the highest temperature recorded and on which date did this occur?

Highest temperature:

Date:

7. What was the lowest temperature recorded and on which date did this occur?

Lowest temperature:

Date:

# NUMBER TASK 8

**8. What is the range of temperature during the second week in December?**

**9. On 4th December the temperature was  $-2^{\circ}\text{C}$ . By the next day it had fallen to  $-5^{\circ}\text{C}$ . Use the image below to work out by how many degrees the temperature changed?**



# NUMBER TASK 8

Janine wants to work out the average temperature in the second week of December. To calculate the mean she has to add up all the temperatures for that week and divide the total by 7.

**10. Janine's answer is 3.5°C. Her colleague Brendan says that the answer should be 3°C.  
Who is correct?**

Show how you calculated your answer in the space below.



**Write the sum of the temperatures here, Total =**

**Mean temperature = Total ÷ 7 =**

**Who is correct?**

**11. On how many days during the two-week period could asphalt not have been laid?**

# NUMBER TASK 9

## FINANCE

Below is a bank statement for a construction engineering consultancy for the month of April 2009. The consultant wants to check the figures in the statement and this means he will need to look at withdrawals and lodgements on the account. He wants to know whether his account is in credit or debit and if the bank's calculations are correct.

Northern Regional Bank			Statement of Account	
Nicer Branch			Sort: 09-59-01	
Broad St			A/C 555362744	
Lisburn			Date 12.04.09	
Co Antrim				
Tel: 02890909090				
FE Dylan				
18 Mull Rd				
Ballinderry				
Lisburn				
Date	Details	Debits	Credits	Balance
01 Apr	Opening Balance			996.87
03 Apr	Standing order 001	288.44		
04 Apr	Cheque 234016	174.45		
08 Apr	Cash paid in		372.00	
09 Apr	Cheque 234017	277.30		
11 Apr	Cheques paid in		540.50	
15 Apr	Standing order 002	569.45		
16 Apr	Cash paid in		340.18	
21 Apr	Cheques for salary	840.37		
23 Apr	Cash paid in		540.34	
26 Apr	Cheque paid in		2277.45	
29 Apr	Cash paid in		2480.32	
30 Apr	Closing Balance			

# NUMBER TASK 9

1. Fill in the balance column as far as 29th April. The balance on 29th April should be £5397.65, allowing you to check your answer. Use the space below as well if you need to.



2. On which day was the account at its lowest point and how much did he have in the bank on that date?

Date:

Balance:

3. A cheque of £6000 for salaries is withdrawn from the account on 30th April taking the account to -£639.31. What does the negative sign mean?

# NUMBER ANSWERS - TASK 1

## PLACE VALUE

Below you will see figures for the construction industry. They are taken from NISRA – Northern Ireland Statistics and Research Agency. The statistics relate to local firms and their turnover. Look at the data and answer the questions below.

In the construction industry in Northern Ireland there are hundreds of thousands of people employed in different jobs and in your job you will be required to work with large numbers for example weights of material, costings for jobs, etc. Therefore it is important that you understand numbers and can work with them.

**Structure of the Construction Industry (2008)**

Turnover (£000) Size Band	Number of Firms	Per Cent of Total
0 – 99	4,430	40%
100 – 499	4,705	43%
500 – 1,999	1,345	12%
2,000 – 4,999	325	3%
5,000 – 9,999	115	1%
10,000 +	95	1%
<b>Total</b>	<b>11,015</b>	<b>100%</b>

Source: NISRA – NI Construction Bulletin 1<sup>st</sup> April to 30<sup>th</sup> June (Nov 2008)

From the table above you can see that there were 11,015 construction firms in Northern Ireland at the time of the survey.

The number 11 015 has:

TEN THOUSAND	THOUSAND	HUNDREDS	TEN	UNITS
1	1	0	1	5

When reading large numbers break them into groups of three (starting at the units end). Sometimes these groups of three digits are separated using commas.



# NUMBER ANSWERS - TASK 1

1. Complete the table below the first one is completed for you.

	Millions	Hundred thousands	Ten thousand	Thousand	Hundred	Tens	Units	
2 303 105	2	3	0	3	1	0	5	Two million, three hundred and three thousand, one hundred and five
32 015			3	2	0	1	5	Thirty two thousand and fifteen
106 045		1	0	6	0	4	5	One hundred and six thousand and forty five
30 210			3	0	2	1	0	Thirty thousand two hundred and ten
1 000 025	1	0	0	0	0	2	5	One million and twenty five
19 206			1	9	2	0	6	Nineteen thousand, two hundred and six
45 012			4	5	0	1	2	Forty five thousand and twelve

# NUMBER ANSWERS - TASK 1

## 2. Using the table below answer the questions

Turnover (£000) Size Band	Number of Firms	Per Cent of Total
0 – 99	4,430	40%
100 – 499	4,705	43%
500 – 1,999	1,345	12%
2,000 – 4,999	325	3%
5,000 – 9,999	115	1%
10,000 +	95	1%
<b>Total</b>	<b>11,015</b>	<b>100%</b>

*Source: NISRA – NI Construction Bulletin 1<sup>st</sup> April to 30<sup>th</sup> June (Nov 2008)*

a. 4,430 firms had a turnover from £0-£99,000. How many firms is this in words?

Four thousand four hundred and thirty

b. What is the turnover of £99,000 in words?

Ninety nine thousand pounds

c. Most construction firms in Northern Ireland have a turnover between £100,000 and £499,000. What is this in words?

£100,000 One hundred thousand pounds

£499,000 Four hundred and ninety nine thousand pounds

## 3. What do the figures in the table tell you about the construction industry in Northern Ireland?

Most construction companies in Northern Ireland have a small turnover.

# NUMBER ANSWERS - TASK 2

## ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION

When costing up a job you will need to be able to add, subtract, multiply and divide. You will have to be able to find a rough estimate and then provide a detailed breakdown of all costs including taxes. If you have others working for you this will mean calculating their wages and keeping accurate records of turnover.

When ordering in materials you will need to ensure that the quantities have been correctly calculated.

### Addition

If the numbers are too big to add in your head, write them down in columns. Separate the numbers into units, tens, hundreds and thousands. Always start adding with the units first.

**Example**  
**3256 + 275**

Th	H	T	U
3	2	5	6
	2	7	1
3	5	3	1

**Start at the unit column first. If the total is more than 10, carry 1 to the next column.**

Structure of the Construction Industry (2008)

Turnover (£000) Size Band	Number of Firms	Per Cent of Total
0 – 99	4,430	40%
100 – 499	4,705	43%
500 – 1,999	1,345	12%
2,000 – 4,999	325	3%
5,000 – 9,999	115	1%
10,000 +	95	1%
<b>Total</b>	<b>11,015</b>	<b>100%</b>

Source: NISRA – NI Construction Bulletin 1<sup>st</sup> April to 30<sup>th</sup> June (Nov 2008)

1. From the table above what is the total number of construction firms with a turnover under £500,000?

$$4430 + 4705 = 9135$$

2. How many firms have a turnover of £2,000,000 or more?

$$325 + 115 + 95 = 535$$

# NUMBER ANSWERS - TASK 2

## Subtraction

Again line up the numbers so that you subtract units from units, tens from tens etc... Always start subtracting with the units first.

Th	H	T	U
2	5	6	7
1	4	2	5
1	1	4	2

There are different methods you can use to subtract. Look at the examples below and use the method that is most familiar to you.

### Example 1

Start with the units

**Start at the unit column first. If the total is more than 10, carry 1 to the next column.**

Th	H	T	U
<sup>1</sup> 2	<sup>1</sup> 5	6	7
1	9	2	7
	6	4	0

### Example 2

Start with the units

**You cannot subtract 9 from 5. You will need to borrow 1 from the thousands column to make 15 and pay this back by adding 1 to the thousands column of the number you are subtracting. It becomes 2.**

Th	H	T	U
2	<sup>1</sup> 5	6	7
<sup>1</sup> 2	9	2	7
	6	4	0

# NUMBER ANSWERS - TASK 2

Use whichever method is most familiar to you to answer these questions.

**3. A construction company employs 111 men and 27 women. How many more men than women does it employ?**

$$111 - 27 = 84$$

**4. A high visibility jacket costs £17.05 and £13.67 from two different suppliers. What is the difference in price?**

$$£17.05 - £13.67 = £3.38$$

# NUMBER ANSWERS - TASK 3

## PAY

In the last task we saw how important it is that you can accurately add and subtract.

James works for McLaughlin Builders below and has received his latest payslip. He is worried that the pay is incorrect. Look at the payslip below and answer the questions given.

James is a site manager for a manufacturing firm. His last payslip was:

### **McLAUGHLIN BUILDERS**

#### **Randalstown**

**Employee name:** James Greeves

**Employee Number:** 25

**Pay date:** 31/5/09

#### **Payments**

Basic pay	£3026.25
-----------	----------

Tax code	01 2010
Tax code	355 L
NI Number	NR674590A
NI Code	D

#### **Deductions**

Tax paid	£497.86
----------	---------

Employee's NI Paid	£256.38
--------------------	---------

<b>NET PAY: ?????</b>
-----------------------

# NUMBER ANSWERS - TASK 3

James has been checking his pay and thinks that it has been incorrectly calculated. He thinks his net pay (the remaining amount of an employee's gross pay after deductions such as income tax and national insurance are made) should be £1,372.01. His brother Jason and his wife Amy also check to see what they calculate his net pay should be. Their calculations are shown below:

James

$$\begin{array}{r}
 497.86 \\
 + 256.38 \\
 \hline
 754.24 \\
 3026.25 \\
 - 754.24 \\
 \hline
 1372.01 \text{ Net Pay}
 \end{array}$$

Jason

$$\begin{array}{r}
 497.86 \\
 + 256.38 \\
 \hline
 754.24 \\
 3026.25 \\
 - 754.24 \\
 \hline
 2272.01 \text{ NET PAY}
 \end{array}$$

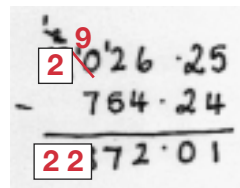
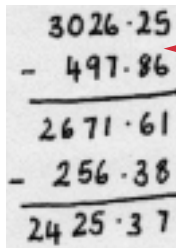
Amy

$$\begin{array}{r}
 3026.25 \\
 - 497.86 \\
 \hline
 2671.61 \\
 - 256.38 \\
 \hline
 2425.37 \text{ NETPAY}
 \end{array}$$

Look at the calculations they have made.

- Who do you think has calculated the net pay correctly and why?
- Who has calculated it incorrectly and what mistake/s did they make?

Fill your answers in the table below:

	Delete as appropriate	Reason (e.g. what mistake did they make)
James	Correct / <b>incorrect</b>	James has added the deductions together correctly but he made a mistake when he subtracted this from the gross pay. 
Jason	<b>Correct</b> / incorrect	Jason added the deductions together correctly and subtracted this total correctly from the gross pay.
Amy	Correct / <b>incorrect</b>	Amy subtracts incorrectly – she simply takes the smallest digit from the largest in each column.  Here she starts off taking 5 from 6 instead of realising it is 5-6 and then borrowing from the tens column and continues with this method throughout.

# NUMBER ANSWERS - TASK 4

## MULTIPLICATION AND DIVISION

When ordering materials for McLaughlin Builders, James has been double checking his calculations to make sure he orders in the correct quantities. He needs to be able to multiply and divide numbers accurately. The methods used are shown below.

You will need to know your multiplication tables to help you work out multiplication and division problems.

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100



# NUMBER ANSWERS - TASK 4

## Multiplication

### Example 2

Start with the units

$$\begin{array}{r}
 \phantom{x} \phantom{2} \phantom{8} \phantom{8} \\
 \phantom{x} \phantom{2} \phantom{8} \phantom{8} \\
 \phantom{x} \phantom{2} \phantom{8} \phantom{8} \\
 \times \phantom{2} \phantom{8} \phantom{8} \phantom{8} \\
 \hline
 2 \phantom{8} \phantom{8} \phantom{8} \phantom{8}
 \end{array}$$

Start with the units.  $8 \times 6 = 48$ . Put 8 in the units column and carry the 4. When you multiply the tens column  $4 \times 6 = 24$ , don't forget to add the 4 you carried to get  $24 + 4 = 28$ .

1. If you need to buy two pairs of safety boots at £29.92, how much will the total cost be?

**Estimate your answer first.** £29.92 is approximately £30. 2 pairs of boots at £30 would cost £60. Now calculate the actual cost and see if your answer seems reasonable.

$$£29.92 \times 2 = 59.84$$

### Example

A 1kg box of galvanised nails costs £2.43. You need to buy 12 boxes. How much will this come to?

$$\begin{array}{r}
 \phantom{+} \phantom{2} \phantom{9} \phantom{1} \phantom{6} \\
 \phantom{+} \phantom{2} \phantom{9} \phantom{1} \phantom{6} \\
 \phantom{+} \phantom{2} \phantom{9} \phantom{1} \phantom{6} \\
 \times \phantom{2} \phantom{9} \phantom{1} \phantom{6} \\
 \hline
 4 \phantom{.} \phantom{8} \phantom{6} \phantom{0} \phantom{0} \\
 + \phantom{2} \phantom{9} \phantom{1} \phantom{6} \phantom{0} \\
 \hline
 2 \phantom{9} \phantom{1} \phantom{6} \phantom{0} \phantom{0}
 \end{array}$$

Start by multiplying by the 2.  
 $3 \times 2 = 6$ , then  $4 \times 2 = 8$ , then  $2 \times 2 = 4$   
 This gives the first row of the table.

Next you will multiply the one in the tens column. Put 0 in the units column because you are multiplying tens. Then multiply by 1.

Add them together  $4.86 + 24.30$   
 to get £29.16

2. If a site joiner earns £9.25 an hour. How much does he earn for 11 hours work?

$$£9.25 \times 11 = £101.75$$

# NUMBER ANSWERS - TASK 4

## Division

If the numbers are too difficult to divide in your head, use a written method. The example below shows you how.

### Example

Hard hats cost £9.69 for three. How much does one cost?

- Divide the 9 by the 3 first to get 3. Write this above the 9.
- Divide the 6 by the 3 next to get 2. Write this above the 6.
- Divide the second 9 by the 3 next to get 3. Write this above the second 9.

$$\begin{array}{r} 3.23 \\ 3 \overline{) \text{£}9.69} \end{array}$$

A hard hat will cost £3.23.

**3. A length of wood measuring 2450mm, is cut into 5 equal lengths. How long is each piece of wood?**

$$2450 \div 5 = 490\text{mm}$$

**4. A bill of £1840 is paid in 8 equal payments. How much is each payment?**

$$\text{£}1840 \div 8 = \text{£}230$$

# NUMBER ANSWERS - TASK 5

## BUYING A VAN

John is a self-employed plasterer and has decided he needs to change his work van. His local commercial vehicle dealer has the following options available to suit his budget. Read through the information given and help John make up his mind regarding a new work van.

Make/Model/Year	Price (£)		Mileage
	Straight Deal	Trade-in	
2007 Ford Transit	7595	8295	12635
2008 Renault Master	7825	8195	31506
2006 Peugeot Boxer	4995	5295	24382
2009 Iveco Daily	9475	9995	1465
2006 Mercedes Sprinter	6995	7295	31056

**1. Arrange the list of vans above in order of increasing Straight Deal price.**

Van	Price
2006 Peugeot Boxer	4995
2006 Mercedes Sprinter	6995
2007 Ford Transit	7595
2008 Renault Master	7825
2009 Iveco Daily	9475

**2. Arrange the list of vans in order of decreasing mileage.**

Van	Price
2008 Renault Master	31506
2006 Mercedes Sprinter	31056
2006 Peugeot Boxer	24382
2007 Ford Transit	12635
2009 Iveco Daily	1465

After some consideration John decides to trade in his current van against the 2008 Renault Master. The dealer offers him £1250 for his old Nissan van.

## NUMBER ANSWERS - TASK 5

**3. Complete the cheque below with the balance John needs to pay.**

Northwest Bank  
49-51 UNIVERSITY ROAD  
BELFAST BT7 1ND

Pay: Bridge Commercial Ltd  
six thousand, nine hundred and  
forty five pounds only

£ 6,945

Signature: [Signature]

\*200852\* 95004400 4 \*02

John later decides to take advantage of an offer of extended warranty which includes free servicing. This is available at a cost of 5% of the Straight Deal price of the Renault van. Calculate the new total he must pay and complete the cheque below giving your answer to the nearest pound. You are given some steps involved in the calculation to help you.

**4. What is 10% of the Straight Deal price in pounds and pence?**

$$10\% \text{ of } £7825 = £782.50$$

**5. What is 5% of the Straight deal price in pounds and pence?**

Use the answer above to help you.

5% is half of 10%

half of £782.50 is £391.25

# NUMBER ANSWERS - TASK 5

6. Round this amount to the nearest pound.

£391

7. Now calculate the new total amount he must pay for the van and the extended warranty and complete the cheque below.

£6945 + £391 = £7336

Northern Bank  
49-51 UNIVERSITY ROAD  
BELFAST BT7 1ND

95-01-49

Date: --/--/--

Pay to the order of Bridge Commercial Ltd

Seven thousand, three hundred and thirty six pounds £ 7,336

forty six pounds only

Signature: P. P. P.

\* 200853 \* 95001491 1.1 \* 002

# NUMBER ANSWERS - TASK 6

## JOBS IN CONSTRUCTION

There are various jobs associated with construction and as your career develops there will be opportunities to earn more. Have a look at the jobs being advertised below and the salaries associated with them. Consider how your salary may change as you gain new qualifications and skills.

### Job A: Apprentice bricklayer

3rd year Apprentice Bricklayer - (Full-time / Permanent)
Job reference: 885798
Date notified: 31/07/2009
Job location: Various locations
Salary: £5 plus per hour depending on experience
Hours: 40
Worktime: Monday - Friday 8am - 5pm
Age: 16 and over
Closing date: 14/08/2009
Pension type: None

1. The company offer to pay time and a half for any overtime you do. What would the hourly rate be for overtime?

$$£5 + 1/2 (£5) = £5 + £2.50 = £7.50$$

2. If you work 40 hours a week what will your weekly salary be?

$$5 \times 40 = £200$$

# NUMBER ANSWERS - TASK 6

**3. If you work 45 hours one week what would you earn?**

$$5 \times 40 = £200$$

$$£7.50 \times 5 = £37.50$$

$$\text{Total } £200 + £37.50 = £237.50$$

**Job B: Qualified bricklayer**

Bricklayer - (Full-time / Temporary)	
Job reference:	882431
Date notified:	29/06/2009
Job location:	Ballymena
Salary:	£8.50 per hour
Hours:	40
Worktime:	8.00am - 5.00pm
Age:	16 and over
Closing date:	03/07/2009
Pension type:	Prefer Not to Say

**4. What will the weekly salary be?**

$$£8.50 \times 40 = £340$$

# NUMBER ANSWERS - TASK 6

**5. Remembering that there are 52 weeks in a year, what is the annual salary?**

$$£340 \times 52 = £17\,680$$

**6. If you got Job A what would your annual salary be for a 40 hour week for 52 weeks? (Use your answer to question 2 where you worked out the weekly salary.)**

$$£200 \times 52 = £10\,400$$

**7. How much more would a qualified bricklayer earn in Job B per year?**

$$£17\,680 - £10\,400 = £7\,280$$



# NUMBER ANSWERS - TASK 6

## Job C: Site Foreman



**Hays Specialist Recruitment**  
 9th Floor 14 Great Victoria Street Belfast BT2 7BA

**Tel:** See Below      **www:** [www.Hays.com/uk](http://www.Hays.com/uk)  
**Fax:** See Below      **Email:** See Below

<b>Ref no:</b>	NJ-44106
<b>Title:</b>	Civil Works Foreman (Belfast)
<b>Date last updated by recruiter:</b>	13 Aug 2009
<b>Location:</b>	Adrian, Belfast, Down
<b>Job type:</b>	Temporary Full-time
<b>Salary:</b>	£25000 - £35000
<b>Additional benefits:</b>	See Description
<b>Role/sic:</b>	For person - construction
<b>That best describe this job:</b>	Site manager Site Agent
<b>Qualifications:</b>	See Description
<b>Contact:</b>	Oliver Smith

**APPLY**

8. What is the range in the salary for this job?

£35 000 - £25 000 = £10 000

# NUMBER ANSWERS - TASK 6

9. The successful candidate for this post was given a salary of £27,300. How much does this work out at per month?

$$£27\,300 \div 12 = £2\,275$$

**Monthly salary = £2 275**

10. For the annual salary of £27,300 how much will the successful candidate earn per week? Remember there are 52 weeks in a year.



$$£27\,300 \div 52 = £525$$

11. If the successful candidate is offered a 10% pay rise at the end of the first year, how much will their annual salary be?

To find 10 % of the salary, divide the total salary by 10.

$$10 \% \text{ pay rise} = £27\,300 \div 10 = £2\,730$$

$$£27\,300 + £2\,730 = £30\,030$$

**Annual salary = £30 030**

# NUMBER ANSWERS - TASK 7

## CALCULATIONS

When you price up a job you will need to consider materials, labour and taxes. Calculations will need to be accurate to ensure that the business operates efficiently and your good reputation is maintained. Over ordering materials will add to your costs and reduce your profits, so it is important to work accurately and check quantities carefully.

### Decking

**EXAMPLE:** To calculate how much decking you need for deck measuring 4mx3m use the table below:  
Table showing the number of metres of 144mm deck boards required

METRES	1	2	3	4	5	6
1	7	14	21	28	35	42
2	14	28	42	56	70	84
3	21	42	63	84	105	126
4	28	56	<b>84</b>	112	140	168
5	35	70	105	140	175	210
6	42	84	126	168	210	252

From the table above you can see that a deck measuring 4mx3m you will need 84m of 144mm wide deck board.

If the deck boards you want come in 2.4m lengths, divide 84 by 2.4 = 35. You should buy 35 boards.

The cost of each length of board in B & Q is shown below:



Reversible Treated Deck Board Smooth/Grooved Green Treated (L)2400 x (W) 144 x (T)28mm  
EAN: 6022652800611

☒ in store ☐ home delivery

☒ Available for reserve & collect ☐ Not available

Select a store to check stock & reserve & collect

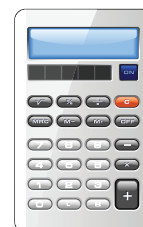
Only £4.46

Qty: 1

add to shopping list

To calculate the total cost of the decking boards using a calculator, the sum is:

$$35 \times £4.46 =$$



# NUMBER ANSWERS - TASK 7

1. The answer on the screen is: **156.1**. What does this mean the total cost of the decking is?

£156.10


2. Using the table below find the number of metres of deck board needed for a decked area measuring 5m by 6m.

Table showing the number of metres of 144mm deck boards required

METRES	1	2	3	4	5	6
1	7	14	21	28	35	42
2	14	28	42	56	70	84
3	21	42	63	84	105	126
4	28	56	84	112	140	168
5	35	70	105	140	175	210
6	42	84	126	168	210	252

Number of metres of deck board required is.....

210m



**Reversible Treated Deck Board Smooth Grooved Green Treated (L)2400 x (W) 144 x (T)28mm**  
EAN: 5022652800611

☒ **in store**

☒ Available for reserve & collect  
Select a store to check stock & reserve & collect

☐ **home delivery**

☒ Not available

Only £4.46

Qty:

[add to shopping list](#)

[Compare](#)

# NUMBER ANSWERS - TASK 7

**3. The deck boards you want come in 2.4m lengths. How many lengths of deck board will you need?**



$$210 \div 2.4 = 87.5$$

Be careful how you round your answer.

**4. If each length of deck board costs £4.46, what is the total cost of the deck board?**



$$88 \times £4.46 = £392.48$$

Total cost

# NUMBER ANSWERS - TASK 7

Paul is on his way home after a job. He is already thinking of work tomorrow and about getting tiles. He worked out earlier he needs just under 600 tiles for the next job. A slight detour on the way home would take him past the tile warehouse but as he has no trailer with him he could only fit one pallet in the van. If he needs more than one pallet he will leave it until tomorrow when he could call back with the trailer. It would save quite a bit of time if he could get the tiles today.

He knows from experience that the tiles he needs come in boxes with 4 tiles per box and that the boxes are stacked on the pallet in layers. Each layer has 5 by 6 boxes and there are 6 layers altogether. Paul is trying to work out in his head if this amounts to more than 600 tiles. He knows the calculation he needs to do is  $4 \times 5 \times 6 \times 6$ .

## 5. Can you think of a way to answer his question without having to do the calculation in full?

**Is  $4 \times 5 \times 6 \times 6$  more than 600?**

Yes,

a.  $20 \times 36$  is more than  $20 \times 30$  which is 600

b.  $24 \times 30$  is more than  $20 \times 30$  which is 600

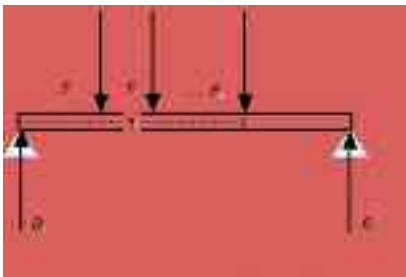
**Will he call for the tiles on his way home? Please explain your reasoning**

Yes

# NUMBER ANSWERS - TASK 8

## NEGATIVE NUMBERS

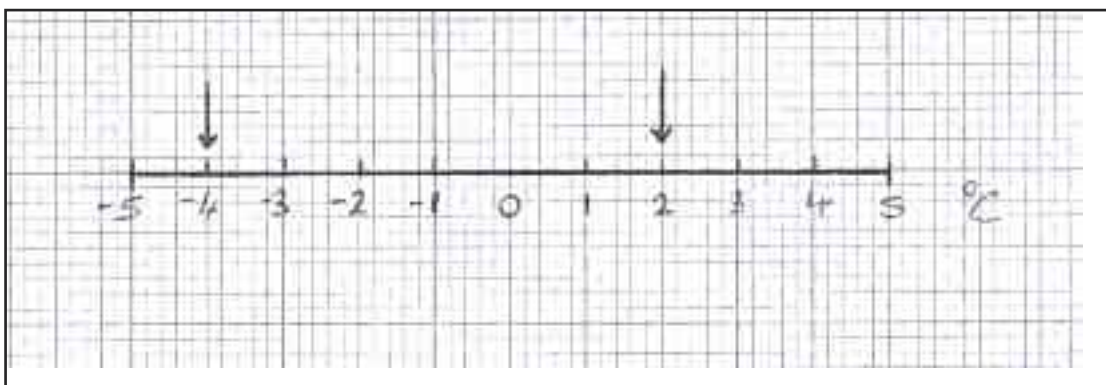
Negative numbers are numbers to the left (or below) zero on a number line. The use of negative numbers in construction is generally related to temperature, finances, height above/below sea level in surveying, direction of rotation e.g., clockwise or anticlockwise or the direction of forces that act in beams, columns, frames etc. You will need to be able work with negative numbers accurately.



We will consider two construction related uses of negative numbers here; temperature and finances (bank statement).

In the Celsius temperature scale  $0^{\circ}\text{C}$  represents the freezing point of water. Be careful, it does not mean there is no heat energy present. It just means there isn't enough heat present for water to exist in liquid form so it freezes. A negative value on the Celsius scale indicates a temperature lower than  $0^{\circ}\text{C}$  where there is less heat energy present and so it feels colder.

1. In the space below construct a temperature scale (a number line) that extends from  $-5^{\circ}\text{C}$  to  $5^{\circ}\text{C}$  in steps on  $1^{\circ}\text{C}$ . Use your ruler and work to a scale of 1cm for  $1^{\circ}\text{C}$ . Mark the temperatures  $-4^{\circ}\text{C}$  and  $2^{\circ}\text{C}$



# NUMBER ANSWERS - TASK 8

2. In the space below identify the temperatures marked on the scale.



1°C, -3.5°C and -2°C respectively from left to right

3. If the answers above referred to external temperatures on a cold evening indicate which one is most likely to result in burst water pipes in a building if the heating was off.

-3.5°C



# NUMBER ANSWERS - TASK 8

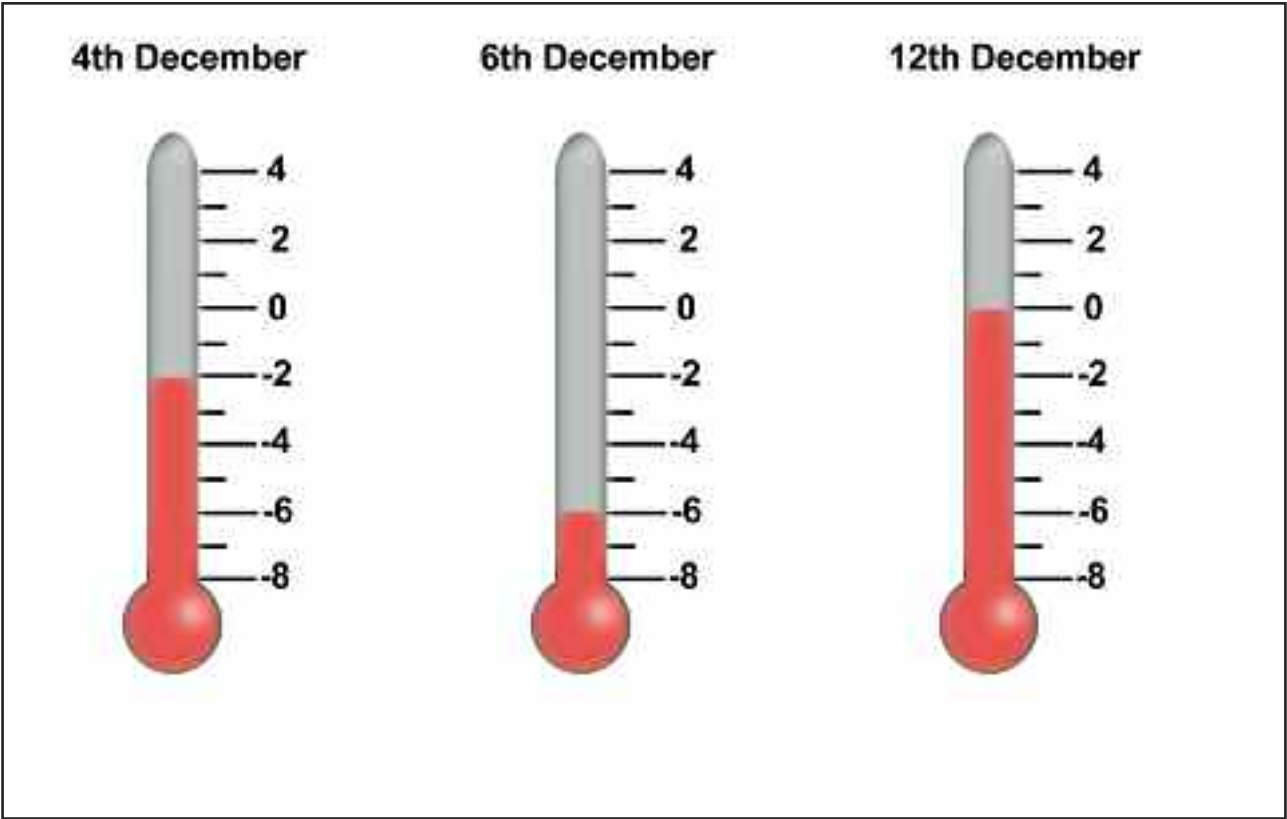
Ambient temperature is very important when laying asphalt. According to relevant British Standards the asphalt itself should be at 85° C but the ambient temperature should be no less than -3°C.

Janine has been checking temperatures over a period of two weeks and here are her results.



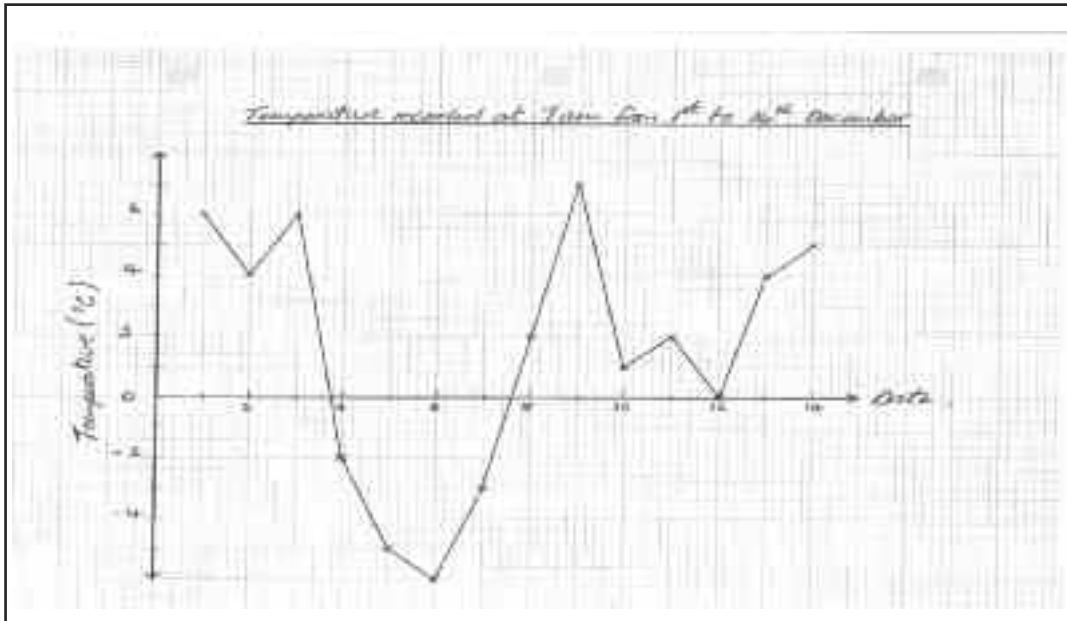
December		Temperature (°C)												
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Temp	6	4	6	-2	-5	-6	-3	2	7	1	2	0	4	5

4. Values for 4th, 6th and 12th December are not shown in the table. The images below show the temperatures for these dates. Make each temperature reading and record the result in the table.



# NUMBER ANSWERS - TASK 8

5. Using the graph below plot the remaining points. Join the points using a straight edge to produce a line graph showing how the temperature varied over the two-week period.



6. What was the highest temperature recorded and on which date did this occur?

Highest temperature: 7°C

Date: 9th December

7. What was the lowest temperature recorded and on which date did this occur?

Lowest temperature: -6°C

Date: 6th December

# NUMBER ANSWERS - TASK 8

**8. What is the range of temperature during the second week in December?**

$$\text{Range} = 7 - 0 = 7^{\circ}\text{C}$$

**9. On 4th December the temperature was  $-2^{\circ}\text{C}$ . By the next day it had fallen to  $-5^{\circ}\text{C}$ . Use the image below to work out by how many degrees the temperature changed?**

$3^{\circ}\text{C}$



# NUMBER ANSWERS - TASK 8

Janine wants to work out the average temperature in the second week of December. To calculate the mean she has to add up all the temperatures for that week and divide the total by 7.

**10. Janine's answer is 3.5°C. Her colleague Brendan says that the answer should be 3°C.  
Who is correct?**

Show how you calculated your answer in the space below.



Write the sum of the temperatures here, Total =  $2+7+1+2+0+4+5 = 21$

Mean temperature = Total  $\div 7 = 21 \div 7 = 3^{\circ}\text{C}$

Who is correct?

Brendan is correct

**11. On how many days during the two-week period could asphalt not have been laid?**

2

# NUMBER ANSWERS - TASK 9

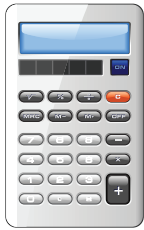
## FINANCE

Below is a bank statement for a construction engineering consultancy for the month of April 2009. The consultant wants to check the figures in the statement and this means he will need to look at withdrawals and lodgements on the account. He wants to know whether his account is in credit or debit and if the bank's calculations are correct.

Northern Regional Bank			Statement of Account	
Nicer Branch			Sort: 09-59-01	
Broad St			A/C 555362744	
Lisburn			Date 12.04.09	
Co Antrim				
Tel: 02890909090				
FE Dylan				
18 Mull Rd				
Ballinderry				
Lisburn				
Date	Details	Debits	Credits	Balance
01 Apr	Opening Balance			996.87
03 Apr	Standing order 001	288.44		708.43
04 Apr	Cheque 234016	174.45		533.98
08 Apr	Cash paid in		372.00	905.98
09 Apr	Cheque 234017	277.30		628.68
11 Apr	Cheques paid in		540.50	1169.18
15 Apr	Standing order 002	569.45		599.73
16 Apr	Cash paid in		340.18	939.91
21 Apr	Cheques for salary	840.37		99.54
23 Apr	Cash paid in		540.34	639.88
26 Apr	Cheque paid in		2277.45	2917.33
29 Apr	Cash paid in		2480.32	5397.65
30 Apr	Closing Balance			5397.65

# NUMBER ANSWERS - TASK 9

1. Fill in the balance column as far as 29th April. The balance on 29th April should be £5397.65, allowing you to check your answer. Use the space below as well if you need to.



2. On which day was the account at its lowest point and how much did he have in the bank on that date?

**Date:** 21st April

**Balance:** £99.54

3. A cheque of £6000 for salaries is withdrawn from the account on 30th April taking the account to -£602.35. What does the negative sign mean?

The account is overdrawn by the amount £602.35



# Measure, Shape & Space Tasks and Answers

This section mainly addresses the curriculum area specified, however to allow a more realistic setting for each task, some elements from other curriculum areas may also be mentioned.



# MEASURE, SHAPE & SPACE TASK 1

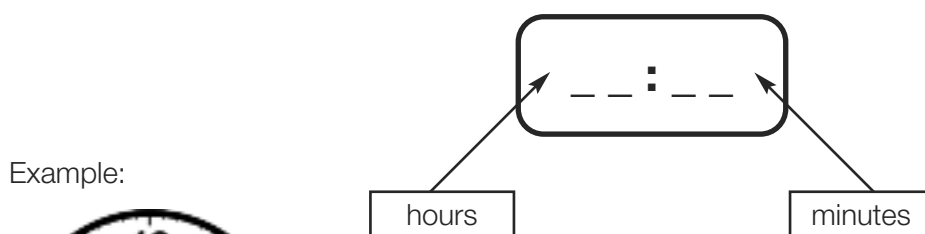
## TIME

In construction time is money. It is important that you manage time effectively and estimate the time required to complete a job as accurately as possible. It is also important to record time accurately. On 25 September 2009 an accident occurred on a construction site. The contractor was McClure Construction. Jason Shepherd was on scaffolding when he fell. The accident occurred at 13:09. An ambulance was called for and arrived at 14:06.

With 12 hour clock each day is split into two halves, am (before mid day) and pm (after mid day).

**24 hour clock** is used in digital clocks, timers and timetables. The hours are numbered up to 24 instead of using am and pm, starting at 00:00 for midnight.

4 digits are used when writing times in 24 hour clock:



- Twenty five minutes to two in the morning
- 1:35am is the time as 12 hour clock
- 01:35 is the time as 24 hour clock



- Quarter past four in the afternoon
- 4:15pm
- 16:15

- Add 12 Hours to pm times.
- Subtract 12 Hours to find the pm time.

### Finding the difference between times

Example:

If you start work at 08:15 and stop for lunch at 12:40, how long have you worked for?

- Find the number of minutes to the next hour i.e.  
8:15 to 9:00 => **45 minutes**
- Then find the number of hours and minutes to the final time:  
9:00 to 12:40 => **3 hours and 40 minutes**
- Total the hours and the minutes separately:  
3 hours + 40 minutes + 45 minutes = 3 hours and 85 minutes = **4 hours and 25 minutes**

85 minutes = 60 mins + 25 mins  
= 1 hour and 25 minutes



# MEASURE, SHAPE & SPACE TASK 1

**1. What time did the accident occur in 12 hour clock?**

**2. What time did the ambulance arrive in 12 hour clock?**

**3. How long after the accident did the ambulance arrive?**

**4. If the call was placed for the ambulance at 13:51, how long did it take between the ambulance being called and it arriving?**

**5. Jason arrived on site that morning at 8:50am. How is this written in 24 hour clock?**

# MEASURE, SHAPE & SPACE TASK 1

**6. The site foreman calculates that if Jason arrived on site at 8:50am and the accident occurred at 13:09, then he had been on site:**

$13:09 - 8:50 = 4:59$  i.e. 4 hours 59 minutes.

Has he calculated this correctly? If he has made an error, what mistake did he make and what is the correct length of time?

**7. The employees on site that day started and finished at the times shown below:**

EMPLOYEE	START TIME	FINISH TIME
Claire	08:30	Twenty five minutes to five in the afternoon
Sean	Quarter past eight	4:15
Peter	09:05	16:41
Adrian	7:59	Quarter to five in the afternoon
Dean	08:35	16:30

Calculate how long each employee worked that day.

EMPLOYEE	TIME WORKED
Claire	
Sean	
Peter	
Adrian	
Dean	

# MEASURE, SHAPE & SPACE TASK 1

- 8. Peter had started at 08:05 and agrees to start a quarter of an hour earlier the next day. What time will he start at?**

- 9. Dean started work at 08:35. Is this 12 hour or 24 hour clock?**

- 10. 7 days after the accident Jason is well enough to return to work. What date did he return to work?**

Accident date: 25/09/09

Return to work date:

- 11. When Jason returns to work he started at 8:05am and worked 7 hours and 50 minutes. What time did he finish?**

# MEASURE, SHAPE & SPACE TASK 1

12. Jason gets a lift to work with Sean. The journey from Dungannon takes 85 minutes because of delays on the M1. How long did the journey take in hours and minutes?

13. If Jason and Sean arrive on site at 8:05am, what time did they leave Dungannon? (Remember the journey took 85 minutes).

14. In order to make it to back to Dungannon for an appointment at quarter to six that evening, what time will Jason need to get the bus from Belfast?.

(Note that timetables sometimes omit the colon)

Belfast, Europa Buscentre - Dungannon - Enniskillen														Goldline Express Service 261			
Monday to Friday																	
Belfast, Europa Buscentre	0805	0905	1005	1105	1135	1205	1305	1405	1505	1605	1705	1805	1905	2005	2205		
Dungannon, Bus Station	0900	1000	1100	1200		1300	1400	1500	1600	1700	1800	1900	2000	2100	2300		
Dungannon, Bus Station	0903	1003	1103	1203		1303	1403	1503	1603	1703	1803	1903	2003	2103			
Enniskillen, Buscentre	1020	1120	1220	1320	1325	1420	1520	1620	1720	1820	1920	2020	2120	2220			
Saturday																	
Belfast, Europa Buscentre	0905	1005	1105	1205	1305	1405	1505	1605	1705	1805	2005						
Dungannon, Bus Station	1000	1100	1200	1300	1400	1500	1600		1800	1900	2100						
Dungannon, Bus Station	1003	1103	1203	1303	1403		1603			1903	2103						
Enniskillen, Buscentre	1120	1220	1320	1420	1520		1720	1810		2020	2220						
Sunday																	
Notes:																	
Belfast, Europa Buscentre	0945	1305	1445	1605	1745	2005											
Dungannon, Bus Station	1040	1400	1540	1700	1840	2100											
Dungannon, Bus Station	1045	1403		1703		2103											
Enniskillen, Buscentre	1200	1520		1820		2220											
Departure times are shown from main Ulsterbus depots, intermediate stopping points show estimated times which are dependent on traffic conditions																	

A — Passengers to/from Belfast are required to change at Dungannon from Service 273.

Departure times are shown from main Ulsterbus Stations, intermediate timing points show estimated times which are dependent on traffic conditions.

# MEASURE, SHAPE & SPACE TASK 1

**15. How long did the bus take?**

**16. How much shorter was the journey home than the journey to work?**

**17. Claire usually works 8 hours 15 minutes each day. How long does she work over the course of the 5 day working week?**

# MEASURE, SHAPE & SPACE TASK 2

## MEASURING

Many trades associated with the construction industry rely on accurate measurements being taken. Where inaccuracies occur this may lead to loss in profit, time or even compromise safety on site.

In Northern Ireland we use miles to measure distance on the road. In the rest of Europe, long distances are measured in kilometres.

1 mile is longer than 1 kilometre  
 $1 \text{ km} = 1000\text{m}$

km stands for kilometre  
 m stands for metre

On a tape measure centimetres and millimetres are marked.

$1\text{m} = 100\text{cm} = 1000\text{mm}$   
 m stands for metre  
 cm stands for centimetre  
 mm stands for millimetre



Some rulers are marked in centimetres and millimetres.




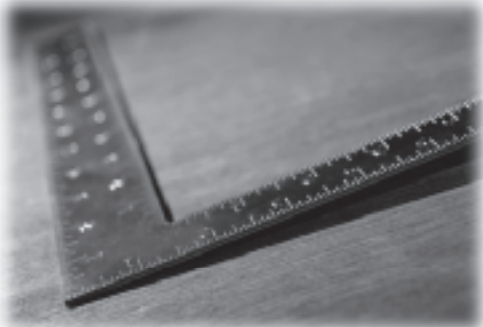

$1\text{cm} = 10\text{mm}$

Notice from the ruler that the line is 22mm. This is the same as 2.2cm.






# MEASURE, SHAPE & SPACE TASK 2

On site you will measure using various instruments. What do each of the devices below measure and what unit will they measure in?

Instrument	Used to measure?	Unit
		
		
		
		
		

# MEASURE, SHAPE & SPACE TASK 2

Instrument	Used to measure?	Unit
		
		
		

In construction we mainly use **metric units** for measuring. Where have you come across the metric units below at work?

Fill in examples of where you have come across that unit in work.



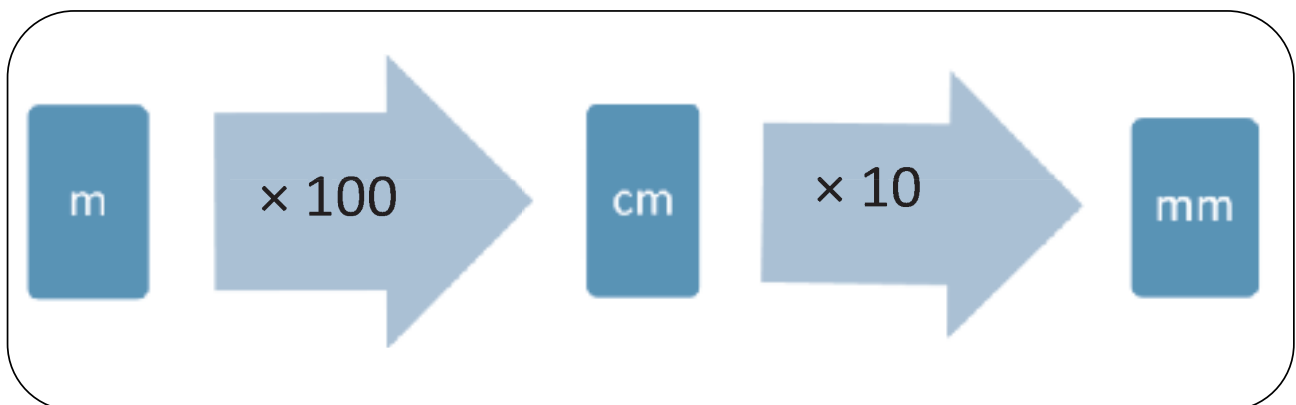
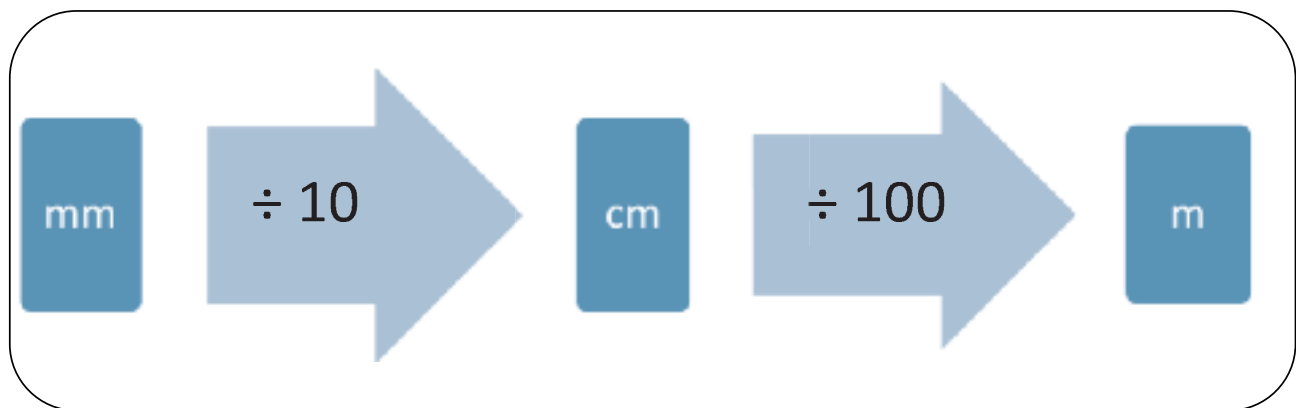
# MEASURE, SHAPE & SPACE TASK 2

## METRIC UNITS

	ABBREVIATION	FULL NAME	EQUIVALENT	EXAMPLES
MEASUREMENT OF LENGTH	mm	millimetre	10 mm = 1 cm 1 000 mm = 1 m	
	cm	centimetre	100 cm = 1 m	
	m	metre	1 000 m = 1 km	
	km	kilometre	1 000 m = 1 km	
MEASUREMENT OF WEIGHT	g	gram	1000g = 1 kg	
	kg	kilogram	1kg = 1000g	
	t	tonne	1t = 1000kg	
MEASUREMENT OF CAPACITY	ml	millilitre	1l = 1000ml	
	l	litre	1l = 1000ml	

# MEASURE, SHAPE & SPACE TASK 3

## CONVERTING BETWEEN METRIC UNITS OF MEASURE



### EXAMPLES

700mm = 70cm  
1200mm = 1.2m  
1.3m = 1300mm

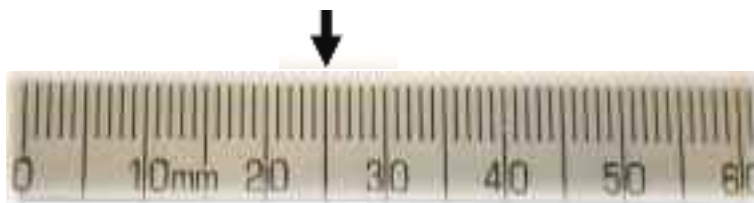
$700 \div 10 = 70$   
 $1200 \div 1000 = 1.2$   
 $1.3 \times 1000 = 1300$

# MEASURE, SHAPE & SPACE TASK 3

Rulers and tape measures are marked off in cm



1. The arrow is pointing at what measurement? (give your answer in cm and in mm)



2. The arrow is pointing at what measurement? (give your answer in cm and in mm)



3. The arrow is pointing at what measurement? (give your answer in cm and in mm)

# MEASURE, SHAPE & SPACE TASK 3



4. The arrow is pointing at what measurement? (give your answer in cm and in mm)



5. The arrow is pointing at what measurement? (give your answer in cm and in mm)

6. You have to cut skirting to measure 1010mm. If your tape measure is in cm, what length is 1010 mm in cm?

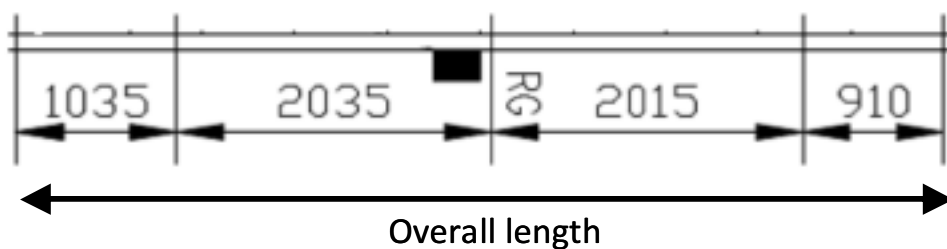
7. A length of pipe needs to be 1570mm long. What is this length in metres?

# MEASURE, SHAPE & SPACE TASK 4

## SITE PLANS

Karen works for a construction firm and needs to be able to translate the measurements from the plans she has been given to actual lengths on site. This requires her to accurately measure lengths on the drawings and interpret what these lengths mean on the site. Look at the plans below and check your understanding of site plans.

Measurements are in mm



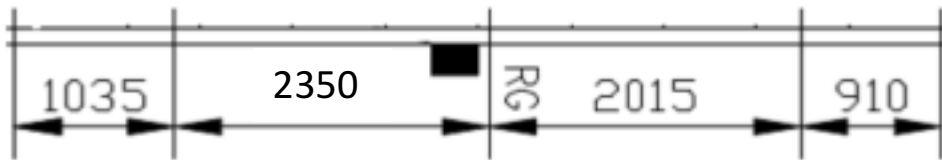
1. What is the overall length of this section of the site?

2. What is 2035mm in metres?

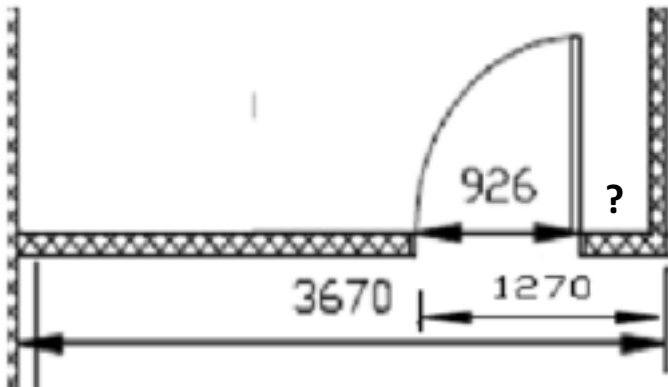
3. The architect thinks he has made a mistake and the 2035mm measurement should be 2.35m. Are these two measurements different? If so, what is the difference?

# MEASURE, SHAPE & SPACE TASK 4

The plan is changed to incorporate the changed measurement.

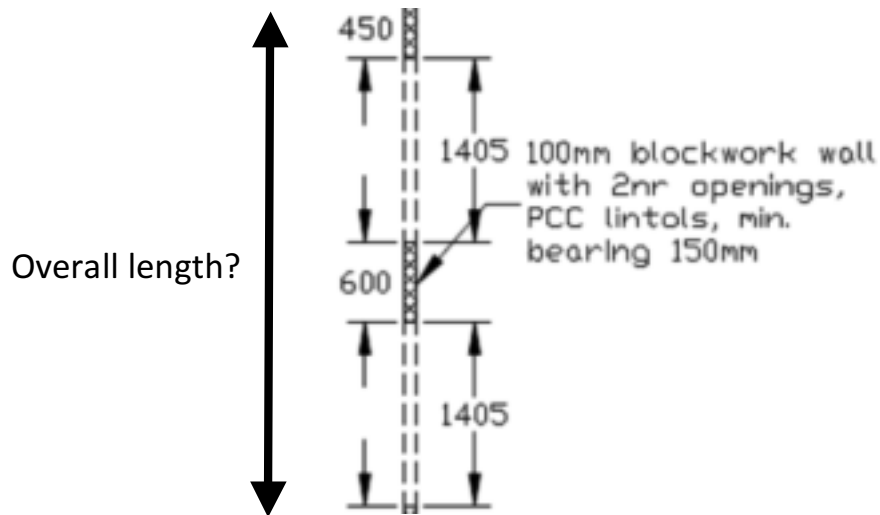


4. Calculate the overall length now.



5. There is a measurement missing from the plan above. What is the missing measurement?

# MEASURE, SHAPE & SPACE TASK 4



6. What is the total overall length shown by the arrow?

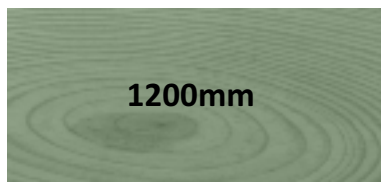
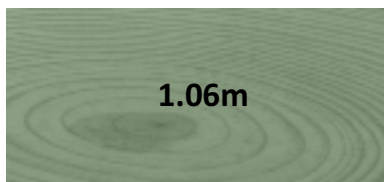
# MEASURE, SHAPE & SPACE TASK 5

## MATERIALS

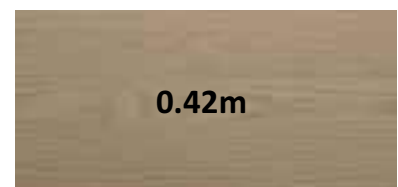
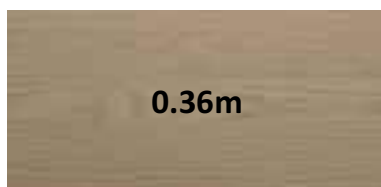
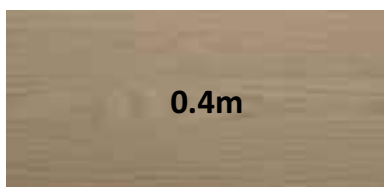
When working with different materials on site you will need to be able to compare quantities accurately. You will come across weights and lengths frequently on site. From the weight of a steel H section which will need to be accurately counterbalanced when using a crane on site, to quantities of stone and other building materials, you will need to be able to work with metric measurements.

Lengths of timber, pipe and steel etc need to be accurately known. Measurements may be given in a variety of units and you need to be able to convert from one unit to another. Test your understanding in the questions below.

**1. Put these lengths in ascending order.**



**2. Put these lengths in ascending order.**



**3. Put these weights in order of size.**



23.06kg



23.6kg



23500g



# MEASURE, SHAPE & SPACE TASK 5

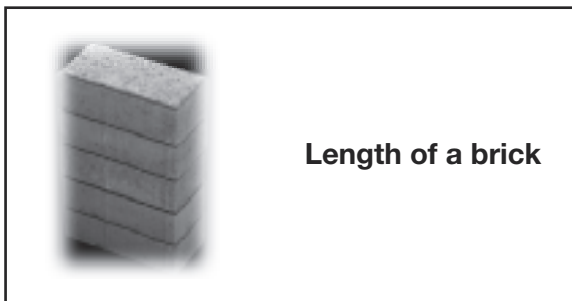
4. Match each of these items to their approximate measurement.



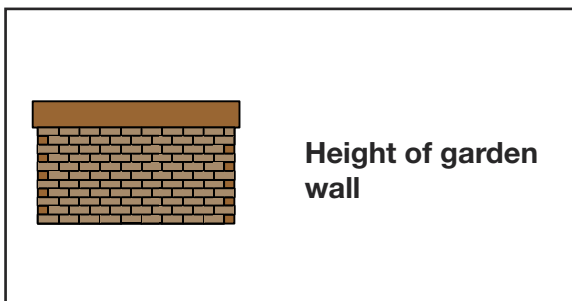
0.8m



1900mm



2250mm



230mm

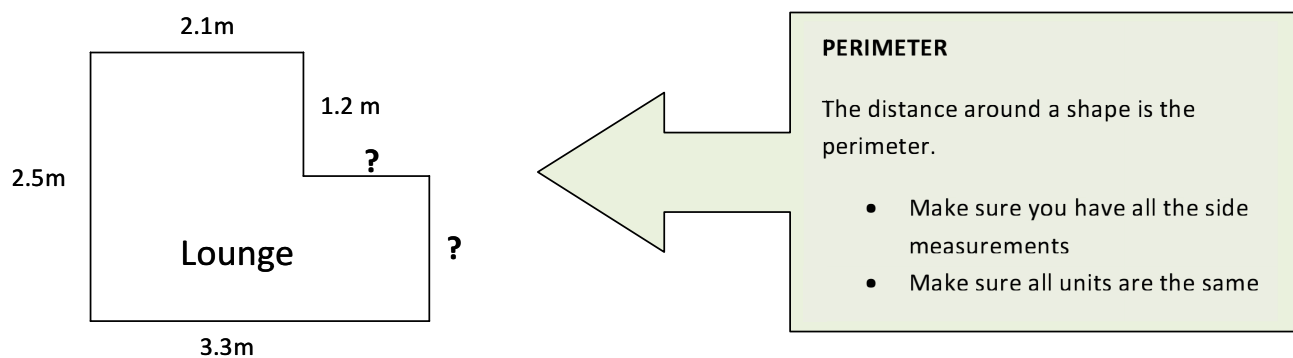


1.2m

# MEASURE, SHAPE & SPACE TASK 6

## PERIMETER

New firm, RJM joinery, has been asked to quote for replacement skirting for a client. He visits the client, takes preliminary measurements and calculates the quantity of skirting needed.



**1. What are the lengths of the two sides where the measurements are missing?**

--

**2. Work out the total amount of skirting needed for the room in millimetres.**

Perimeter:

Total length of skirting required in metres:

Total length of skirting required in millimetres:

# MEASURE, SHAPE & SPACE TASK 6



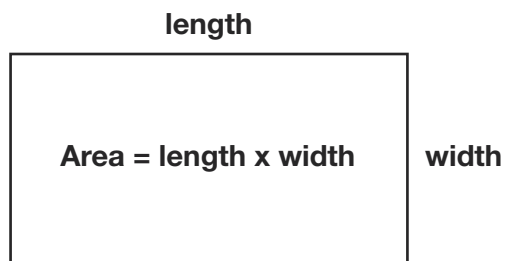
Helen wants to replace the skirting board in her living room. She hasn't taken any measurements yet but remembers that her living room is identical to the dining room she did a couple of months ago except that the living room has a chimney breast on one wall. Helen believes that since the chimney breast cuts down on floor area she will not need any more skirting for the living room than she did for the dining room. She decides to order the same amount she ordered for the dining room.

**3. Use a diagram and/or a calculation in the space below to demonstrate Helen's mistake.**

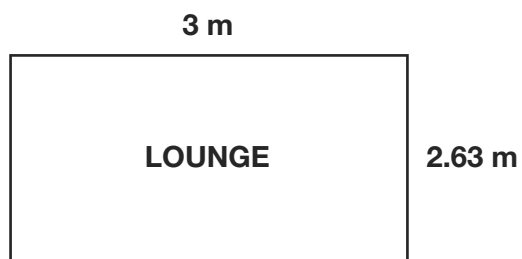
# MEASURE, SHAPE & SPACE TASK 7

## AREA

The client would also like to get an estimate for a wooden floor to be laid in their dining room. In order to calculate the estimate he needs to work out the area of the room. This means taking measurements of the length and width of the room and converting measurements to metres in order to find the area in squared metres.



Plan of room:



**What is the area of the room?**

**The area of the room to be floored is:**

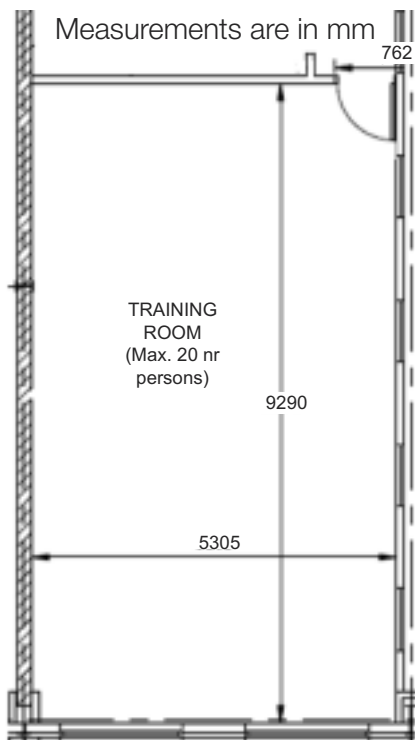
# MEASURE, SHAPE & SPACE TASK 8

## PLANS

Measurements can be taken directly from site plans and used in calculations off site. A site plan is a bird's eye view of a property that is drawn to scale. A site plan can show:

- Property lines
- Outline of existing and proposed buildings and structures
- Distance between buildings
- Distance between buildings and property lines (setbacks)
- Parking lots, indicating parking spaces
- Driveways
- Surrounding streets
- Landscaped areas
- Easements
- Ground sign location

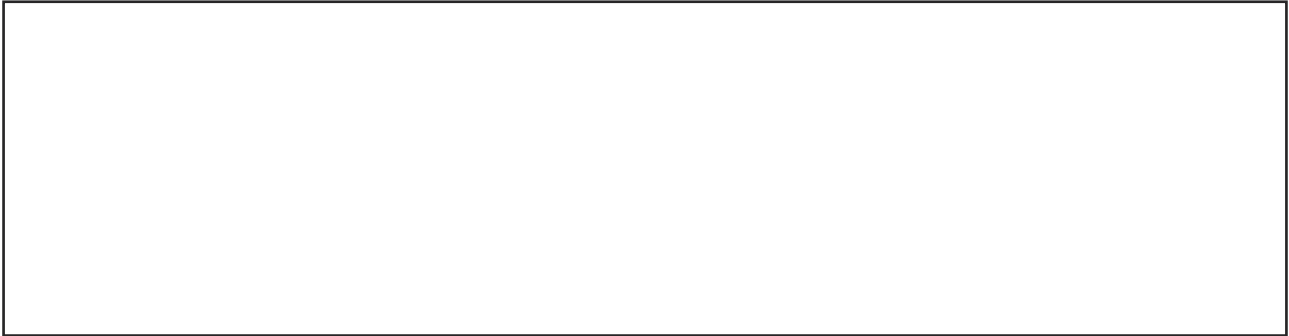
When working from plans you will need to be able to interpret the plans and the measurements on the plans to accurately calculate quantities.



**1. From the upstairs plan what is the perimeter of the room in mm?**

# MEASURE, SHAPE & SPACE TASK 8


**2. What would this be in metres?**



**3. What is the width of the door for the training room?**



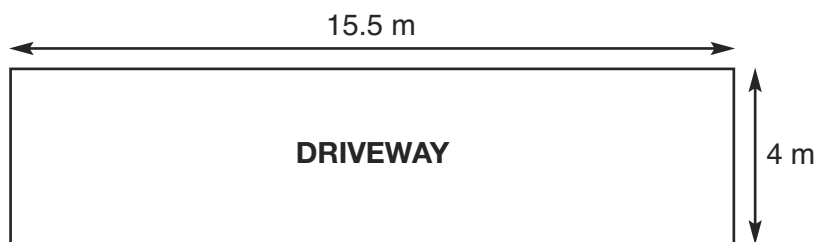
**4. What length of skirting would be needed for the room? (remember to leave out the door)**



# MEASURE, SHAPE & SPACE TASK 9

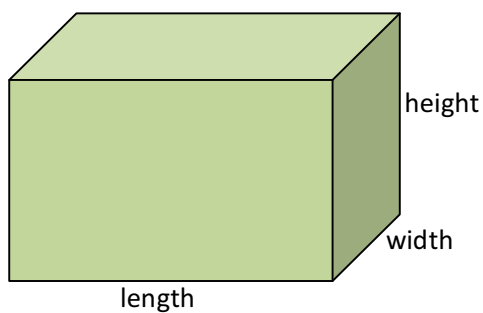
## LAYING A CONCRETE DRIVEWAY

RS Contracts have received an order to lay a concrete driveway for a customer. The dimensions of the driveway have been measured as below:



In order to accurately calculate the quantity of concrete required, RS Contracts need to calculate the volume of concrete required. Follow the steps to complete the calculation.

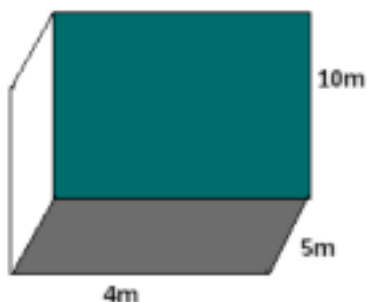
$$\text{Volume} = \text{length} \times \text{width} \times \text{height}$$



To order material such as stones for a path or concrete for a driveway or foundations, you need to calculate the volume. Volumes are normally measured in units cubed such as metres cubed.

# MEASURE, SHAPE & SPACE TASK 9

## EXAMPLE



For this example the volume is  $4 \times 5 \times 10 = 200\text{m}^3$

To determine the volume of concrete needed, RS contracts multiply the length and width of the driveway by the depth of concrete to be laid, in this case 100mm.

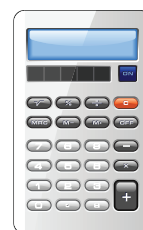
### 1. What volume of concrete will they need to order?

Length of driveway in metres =

Width of driveway in metres =

Depth of concrete in METRES =

Volume of concrete =



### 2. As a general rule: one cubic metre of concrete weighs around 2.5 tonnes. Using this method, how many tonnes of concrete will you need to order?



# MEASURE, SHAPE & SPACE TASK 10

## ERECTING A SHED

A client wants you to erect a garden shed.

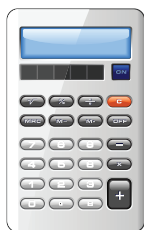
The shed they have chosen is from B & Q and costs £589. Until the end of the week there is an offer of 25% off all garden buildings.

In addition to erecting the shed you will have to build a concrete base. The amount of concrete required for the base will need to be calculated. Follow the steps below to cost the job.



**1. What is 25% as a fraction?**

**2. What does the discount on the shed work out at?**



**3. What is the price of the shed with the 25% discount taken off?**

# MEASURE, SHAPE & SPACE TASK 10

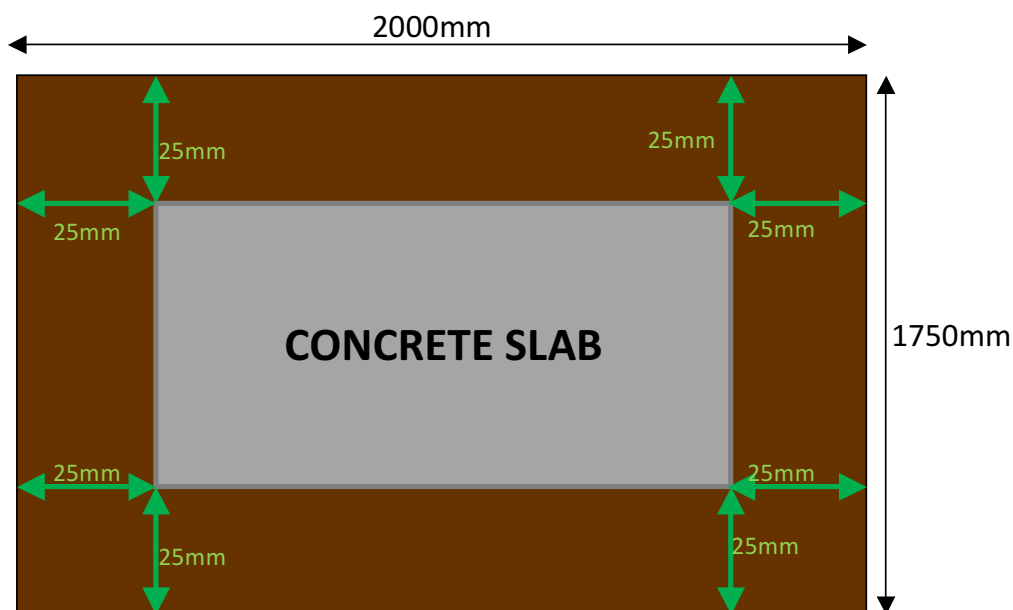
To build a **garden shed** you will need to lay a concrete pad that is 25mm smaller on all sides than the base of the shed, to create an overhang and prevent water accumulating around the timber floor and runners.

The dimensions of the shed are: 2000mm by 1750mm by 3475mm



#### 4. What would the dimensions of the concrete base need to be?

see the diagram below for help



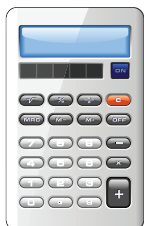
The dimensions of the concrete slab would be:

Length =

Width =

# MEASURE, SHAPE & SPACE TASK 10

5. If the concrete for the slab needs to be 100mm thick, what volume of concrete will be needed in metres cubed?



REMEMBER: **Volume** = *length* × *width* × *height*

length in m =

width in m =

height in m =

Volume =

6. Concrete costs approximately £60 per metre cubed including VAT.  
What will the cost be for the concrete?

7. The labour costs work out at £130 including VAT.  
What is the total costing for the client for the purchase and erection of the shed?

Labour costs:

Cost of shed:

Cost of concrete:

The total costs will be:

# MEASURE, SHAPE & SPACE TASK 11

## BRICK WALL

James is an apprentice and has been asked to build a small garden wall for a family member. This is the first time he has undertaken a project from start to finish. He needs to do a range of calculations for instance the amount of brick, mortar, concrete etc. required to complete the job. The task below will take him through the various stages of each calculation.

Each brick measures:

21.5 cm x 10.25 cm x 6.5 cm

### 1. What are the dimensions of the brick in mm?



The first bricks have been laid as shown above.

### 2. If the thickness of mortar is 10mm. What is length of the wall so far?



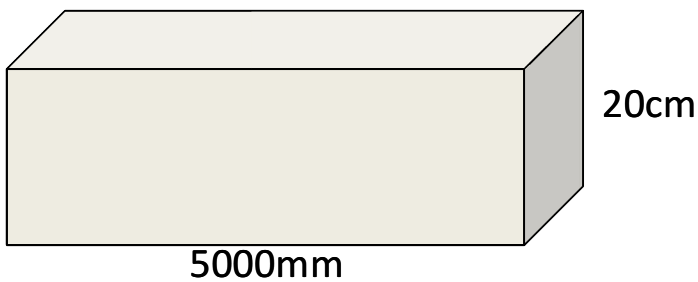
### 3. Mortar is made up from 1 part cement to 4 parts sand. How much sand would be needed to mix with 2 buckets of cement?

1 part cement	to	4 parts sand
2 buckets of cement	to	_____ buckets of sand

# MEASURE, SHAPE & SPACE TASK 11

- 4. When the wall around the garden is completed it will contain 120 bricks.  
Each brick costs 40p. How much will all the bricks required for the wall cost?**

For a small garden wall, a foundation is dug as shown below.



The width of the foundation is twice the width of a brick plus 10mm.

- 5. If a brick is 102.5mm wide, what will the width of the foundation be?**

# MEASURE, SHAPE & SPACE TASK 11

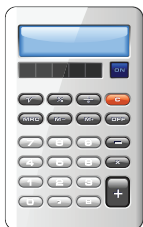
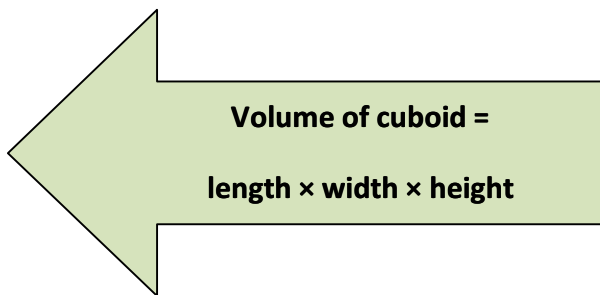
6. What are the dimensions of the foundation in metres?

Length =

Width =

Height =

7. What volume of concrete will you need for the foundation?



Volume of concrete =

m<sup>3</sup>

8. The concrete for the foundation is made up 1 part cement: 3 parts sand : 5 parts 10mm aggregate. If you have 8 buckets of cement, how many buckets of sand and aggregate will you need?

1 part cement : 3 parts sand : 5 parts 10mm aggregate

8 buckets of cement : \_\_\_\_\_ : \_\_\_\_\_

# MEASURE, SHAPE & SPACE TASK 12

## MAPS

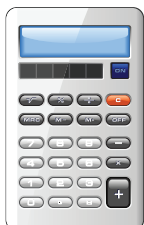
Chris lives in Newry and is a construction engineer for a large local firm. He has to make a visit to three of the company's sites tomorrow. The first site is in Ballycastle and Chris is trying to work out how far away it is. He takes out a map similar to the one you see below and begins to estimate the distance from Newry to Ballycastle.

1. Use a ruler to estimate the distance “as the crow flies” from Newry to Ballycastle if the map has a scale of 1cm to 4.5 miles.



Round the ruler measurement to the nearest cm

Convert this to miles using the scale given above



# MEASURE, SHAPE & SPACE TASK 12

Chris realises this method is not very accurate so he attempts to use a slightly different approach. He breaks the journey into three “as the crow flies” legs.

- Newry to Belfast
- Belfast to Ballymena
- Ballymena to Ballycastle

**2. Use the map again to calculate an improved estimate of the distance from Newry to Ballycastle and show your working in the space below**

**Newry to Belfast:**

Ruler measurement in cm

Circle one option      4.0cm    4.5cm    5.0cm

**Belfast to Ballymena:**

Ruler measurement to nearest cm

Circle one option      3.0cm    3.5cm    4.0cm

**Ballymena to Ballycastle:**

Ruler measurement to nearest cm =

Circle one option      3.0cm    3.5cm    4.0cm

Add up the three measurements:

Total journey in cm =

Total journey in miles =





# MEASURE, SHAPE & SPACE TASK 12

**3. Round your answer above to the nearest 5 miles.**

An internet search on [www.multimap.com](http://www.multimap.com) for this journey gives an answer of 92 miles.

**4. Round this figure to the nearest 5 miles**

The difference in the previous two answers could be described as the error in Chris's method.

**5. What is the error in miles?**

# MEASURE, SHAPE & SPACE TASK 12

**6. Which of the following answers do you feel best describes the percentage error in Chris's method? Don't do any further actual calculations to answer this.**

Error in miles = (answer to question 5)	Correct answer in miles = (answer to question 4)
Circle one option	
10%	33%
50%	100%
Reason:	

After Chris visits the Ballycastle site he has to go to Magherafelt where his company are upgrading the spectator seating at a local rugby ground. From Magherafelt he will travel to a site in Armagh where his company are building a new shopping centre. After that he will go back to Newry.

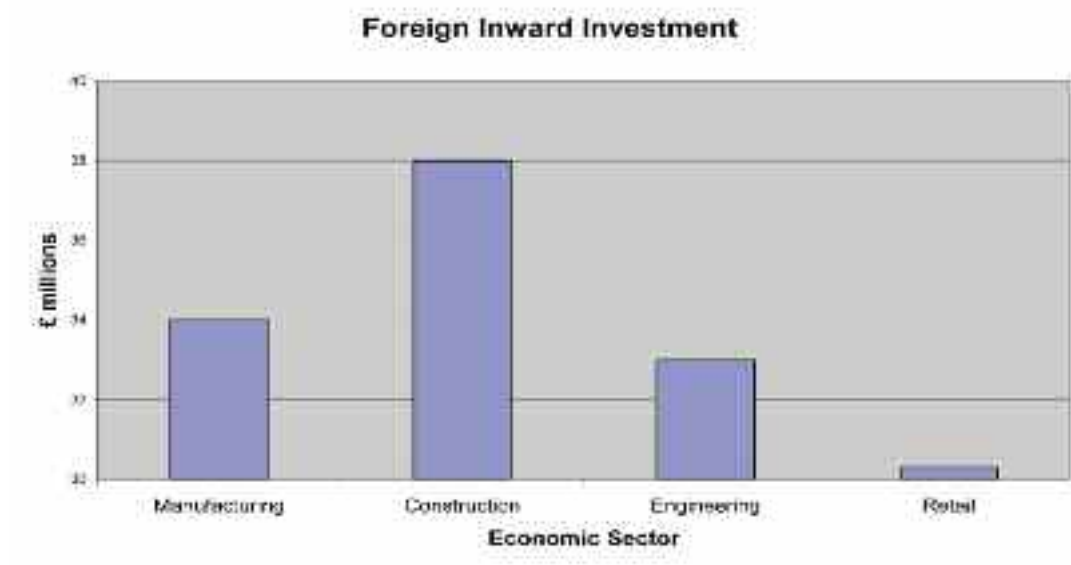
**7. Use the mileage chart below to calculate how far Chris will have travelled altogether by the time he returns home again in the evening.**

	Armagh	Ballycastle	Magherafelt	Newry
Armagh		95	33	19
Ballycastle	95		52	92
Magherafelt	33	52		51
Newry	19	92	51	

Mileage covered in total:
---------------------------

# MEASURE, SHAPE & SPACE TASK 12

He arrives in Ballycastle just as the workers are having a tea break. Bill and Malachy are having a conversation about an article in the newspaper. The article includes the chart shown below.



Bill says Construction has received twice as much investment as manufacturing. Malachy agrees and thinks the retail sector has received very little indeed.

## 8. Comment on these statements in the space below.

Construction received twice as much as Manufacturing:

Retail sector received very little:

# MEASURE, SHAPE & SPACE TASK 12

There is an article in this paper about the rugby ground Chris's company are in the process of upgrading. The article states that the finished stadium is to have a seating capacity of 380,000 people and that 15,000 tonnes of concrete will have been used in the construction of it. According to the article the project was initially tendered at a cost of £18,000,000 but is due to come in over budget by 50% making the final total £18,900,000.

**9. State whether or not you think these statistics are reasonable and if not indicate what may be wrong.**

Capacity of 380,000 people

15000 tonnes of concrete



£18,000,000 increased by 50% gives £18,900,000

# MEASURE, SHAPE & SPACE TASK 13

## RENOVATION

John is going to put down a concrete floor and replace the beams in an old barn behind his house. He takes some measurements with a tape and finds the barn floor is rectangular with dimensions 4.45m by 3.92m.

- 1. Round these values up the nearest metre in order to make the volume calculation easier and allow for some wastage.**

4.45m rounded up is

3.92m rounded up is

A builder has told him the floor needs to be at least 3" deep. John decides to use 4" to ensure he orders enough concrete and also because he knows that 4" comes out at a round number when converted to cm. What is the number he is thinking of?

- 2. First of all use the fact that 1" = 25mm to convert to mm.**

1" = 25mm      so      4" =      mm

- 3. Now convert this answer to cm.**

10mm = 1cm

# MEASURE, SHAPE & SPACE TASK 13

John wants to order the concrete for the builder arriving. After doing the volume calculation he rings up to order 200m<sup>3</sup> of concrete. The person on the phone asks him if he is sure as that is a very large amount of concrete.

## 4. Is John correct? If not show how he went wrong in his calculation?

Remember      Volume = length x width x height

John also wants to use steel for the main beams. The table below gives some information on the price of steel beams according to their strength.

Beam Type	Max. load per metre in tonnes	Price (£)
A	1.2	80
B	1.8	
C	2.4	160
D	3.0	
E	4.8	

## 5. Use the figures given to help fill in the unknown prices. If you need to do some calculations use the space below the table:

# MEASURE, SHAPE & SPACE TASK 13

Cameron is making a batch of mortar for John to finish some work behind the barn. Mixing sand and cement in different ratios helps produce different kinds of mortar.

A very hard mix as might be used for a floor would use 3:1 of sand to cement. A softer mortar mix such as is used for brickwork might use 6:1.

Cameron is making up a mix using the ratio 4:1 sand to cement. He has a 5 kg bag of cement.

**6. How much sand does he need?**

**7. How much mortar mix will this make altogether?**

Later Cameron is asked to make 50kg of mortar mix to the same hardness as the last batch. He wonders if there is a short cut to working out how much sand and cement to use for this batch.

**8. Help give Cameron an answer in the space below.**

# MEASURE, SHAPE & SPACE ANSWERS - TASK 1

## TIME

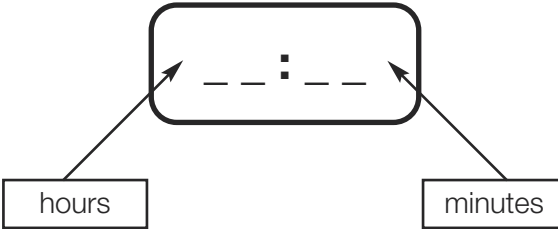

In construction time is money. It is important that you manage time effectively and estimate the time required to complete a job as accurately as possible. It is also important to record time accurately. On 25 September 2009 an accident occurred on a construction site. The contractor was McClure Construction. Jason Shepherd was on scaffolding when he fell. The accident occurred at 13:09. An ambulance was called for and arrived at 14:06.

With 12 hour clock each day is split into two halves, am (before mid day) and pm (after mid day).


**24 hour clock** is used in digital clocks, timers and timetables. The hours are numbered up to 24 instead of using am and pm, starting at 00:00 for midnight.

4 digits are used when writing times in 24 hour clock:

Example:

- Twenty five minutes to two in the morning
- 1:35am is the time as 12 hour clock
- 01:35 is the time as 24 hour clock



- Quarter past four in the afternoon
- 4:15pm
- 16:15

- Add 12 Hours to pm times.
- Subtract 12 Hours to find the pm time.

## Finding the difference between times

Example:

If you start work at 08:15 and stop for lunch at 12:40, how long have you worked for?

- Find the number of minutes to the next hour i.e.  
8:15 to 9:00 => **45 minutes**
- Then find the number of hours and minutes to the final time:  
9:00 to 12:40 => **3 hours and 40 minutes**
- Total the hours and the minutes separately:  
3 hours + 40 minutes + 45 minutes = 3 hours and 85 minutes = **4 hours and 25 minutes**

85 minutes = 60 mins + 25 mins  
= 1 hour and 25 minutes



# MEASURE, SHAPE & SPACE ANSWERS - TASK 1

On 25 September 2009 an accident occurred on a construction site. The contractor was McClure Construction. Jason shepherd was on scaffolding when he fell. The accident occurred at 13:09. An ambulance was called for and arrived at 14:06.

**1. What time did the accident occur in 12 hour clock?**

1:09pm

**2. What time did the ambulance arrive in 12 hour clock?**

2:06pm

**3. How long after the accident did the ambulance arrive?**

From 1:09pm to 2pm would be 51 minutes

From 2pm to 2:06pm would be 6 minutes

This gives a total of  $51 + 6 = 57$  minutes

**4. If the call was placed for the ambulance at 13:51, how long did it take between the ambulance being called and it arriving?**

From 13:51 to 14:00 is 9 minutes

From 14:00 to 14:06 is 6 minutes

This is a total of  $9 + 6 = 15$  minutes

**5. Jason arrived on site that morning at 8:50am. How is this written in 24 hour clock?**

08:50

# MEASURE, SHAPE & SPACE ANSWERS - TASK 1

**6. The site foreman calculates that if Jason arrived on site at 8:50am and the accident occurred at 13:09, then he had been on site:**

$13:09 - 8:50 = 4:59$  i.e. 4 hours 59 minutes.

Has he calculated this correctly? If he has made an error, what mistake did he make and what is the correct length of time?

Jason subtracted the clock times as though they were decimals.

The correct method is:

From 8:50 to 9:00 is 10 minutes

From 9:00 to 13:09 is 4 hours 9 minutes

The total time is 4 hours and 19 minutes

**7. The employees on site that day started and finished at the times shown below:**

EMPLOYEE	START TIME	FINISH TIME
<b>Claire</b>	08:30	Twenty five minutes to five in the afternoon
<b>Sean</b>	Quarter past eight	4:15
<b>Peter</b>	09:05	16:41
<b>Adrian</b>	7:59	Quarter to five in the afternoon
<b>Dean</b>	08:35	16:30

# MEASURE, SHAPE & SPACE ANSWERS - TASK 1

Calculate how long each employee worked that day.

EMPLOYEE	TIME WORKED
<b>Claire</b>	8:30 to 9:00 is 30 minutes 9:00 to 4:35pm is 7 hours and 35 minutes The total is 30 minutes + 7 hours and 35 minutes = 7 hours and 65 minutes = 8 hours and 5 minutes
<b>Sean</b>	8:15 to 9:00 is 45 minutes 9:00 to 4:15pm is 7 hours 15 minutes The total is 45 minutes + 7 hours and 15 minutes = 7 hours and 60 minutes = 8 hours
<b>Peter</b>	9:05 to 10:00 is 55 minutes 10:00 to 16:41 is 6 hours and 41 minutes The total is 55 minutes + 6 hours and 41 minutes = 6 hours and 96 minutes = 7 hours and 36 minutes
<b>Adrian</b>	7:59 to 8:00 is 1 minute 8:00 to 4:45pm is 8 hours and 45 minutes The total is 1 minute + 8 hours and 45 minutes = 8 hours and 46 minutes
<b>Dean</b>	8:35 to 9:00 is 25 minutes 9:00 to 16:30 is 7 hours and 30 minutes The total is 25 minutes + 7 hours and 30 minutes = 7 hours and 55 minutes

**8. Peter had started at 08:05 and agrees to start a quarter of an hour earlier the next day. What time will he start at?**

07:50 or 7:50am or ten minutes to eight in the morning

**9. Dean started work at 08:35. Is this 12 hour or 24 hour clock?**

24 hour clock

# MEASURE, SHAPE & SPACE ANSWERS - TASK 1

- 10. 7 days after the accident Jason is well enough to return to work. What date did he return to work?**

Accident date: 25/09/09

Return to work date: 2/10/09 or 2nd October 2010

- 11. When Jason returns to work he started at 8:05am and worked 7 hours and 50 minutes. What time did he finish?**

8:05 + 7 hours is 15:05

15:05 + 50 minutes is 15:55

Jason finishes at 15:55 or 3:55pm or 5 minutes to four in the afternoon

- 12. Jason gets a lift to work with Sean. The journey from Dungannon takes 85 minutes because of delays on the M1. How long did the journey take in hours and minutes?**

1 hour and 25 minutes

- 13. If Jason and Sean arrive on site at 8:05am, what time did they leave Dungannon? (Remember the journey took 85 minutes).**

8:05 less 1 hour is 7:05

7:05 less 25 minutes is 6:40

They left at 6:40am or 06:40 or twenty minutes to seven in the morning.

# MEASURE, SHAPE & SPACE ANSWERS - TASK 1

14. In order to make it to back to Dungannon for an appointment at quarter to six that evening, what time will Jason need to get the bus from Belfast?.

(Note that timetables sometimes omit the colon)

Belfast, Europa Buscentre - Dungannon - Enniskillen						Goldline Express Service 261									
Monday to Friday															
Belfast, Europa Buscentre	0805	0905	1005	1105	1135	1205	1305	1405	1505	1605	1705	1805	1905	2005	2205
Dungannon, Bus Station	0900	1000	1100	1200		1300	1400	1500	1600	1700	1800	1900	2000	2100	2300
Dungannon, Bus Station	0903	1003	1103	1203		1303	1403	1503	1603	1703	1803	1903	2003	2103	
Enniskillen, Buscentre	1020	1120	1220	1320	1325	1420	1520	1620	1720	1820	1920	2020	2120	2220	
Saturday															
Belfast, Europa Buscentre	0905	1005	1105	1205	1305	1405	1505	1605	1705	1805	2005				
Dungannon, Bus Station	1000	1100	1200	1300	1400	1500	1600		1800	1900	2100				
Dungannon, Bus Station	1003	1103	1203	1303	1403		1603		1903	2103					
Enniskillen, Buscentre	1120	1220	1320	1420	1520		1720	1810		2020	2220				
Sunday															
Notes:	A	A													
Belfast, Europa Buscentre	0945	1305	1445	1605	1745	2005							A — Passengers to/from Belfast are required to change at Dungannon from Service 273		
Dungannon, Bus Station	1040	1400	1540	1700	1840	2100									
Dungannon, Bus Station	1045	1403		1703		2103									
Enniskillen, Buscentre	1200	1520		1820		2220									
Departure times are shown from main Ulsterbus Stations, intermediate timing points show estimated times which are dependent on traffic conditions															

16:05

15. How long did the bus take?

1 hour less 2 minutes that means 58 minutes

# MEASURE, SHAPE & SPACE ANSWERS - TASK 1

**16. How much shorter was the journey home than the journey to work?**

The journey took 85 minutes by car and 58 minutes by bus.  $85 - 58 = 27$  minutes shorter

**17. Claire usually works 8 hours 15 minutes each day. How long does she work over the course of the 5 day working week?**

8 hours  $\times 5 = 40$  hours

15 minutes  $\times 5 = 75$  minutes = 1 hour and 15 minutes

Total = 41 hours and 15 minutes

# MEASURE, SHAPE & SPACE ANSWERS - TASK 2

## MEASURING

Many trades associated with the construction industry rely on accurate measurements being taken. Where inaccuracies occur this may lead to loss in profit, time or even compromise safety on site.

In Northern Ireland we use miles to measure distance on the road. In the rest of Europe, long distances are measured in kilometres.

1 mile is longer than 1 kilometre  
 $1 \text{ km} = 1000\text{m}$

km stands for kilometre  
 m stands for metre

On a tape measure centimetres and millimetres are marked.

$1\text{m} = 100\text{cm} = 1000\text{mm}$   
 m stands for metre  
 cm stands for centimetre  
 mm stands for millimetre



Some rulers are marked in centimetres and millimetres.

$1\text{cm} = 10\text{mm}$

Notice from the ruler that the line is 22mm. This is the same as 2.2cm.






# MEASURE, SHAPE & SPACE ANSWERS - TASK 2

On site you will measure using various instruments. What do each of the devices below measure and what unit will they measure in?

Instrument	Used to measure?	Unit
	Distance	mm / cm / inches
	Distance	mm / m
	Volume / capacity	
	Angle and Distance	Degrees / mm
	Length	mm / inches



# MEASURE, SHAPE & SPACE ANSWERS - TASK 2

Instrument	Used to measure?	Unit
	Temperature	Degrees celsius
	Angle	Degrees
	Distance	Metres

In construction we mainly use **metric units** for measuring. Where have you come across the metric units below at work?

Fill in examples of where you have come across that unit in work.

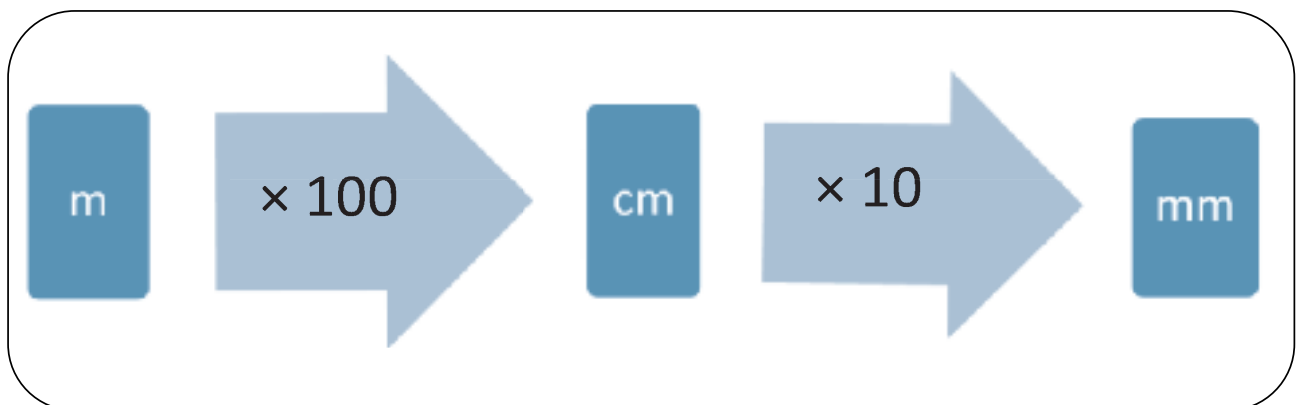
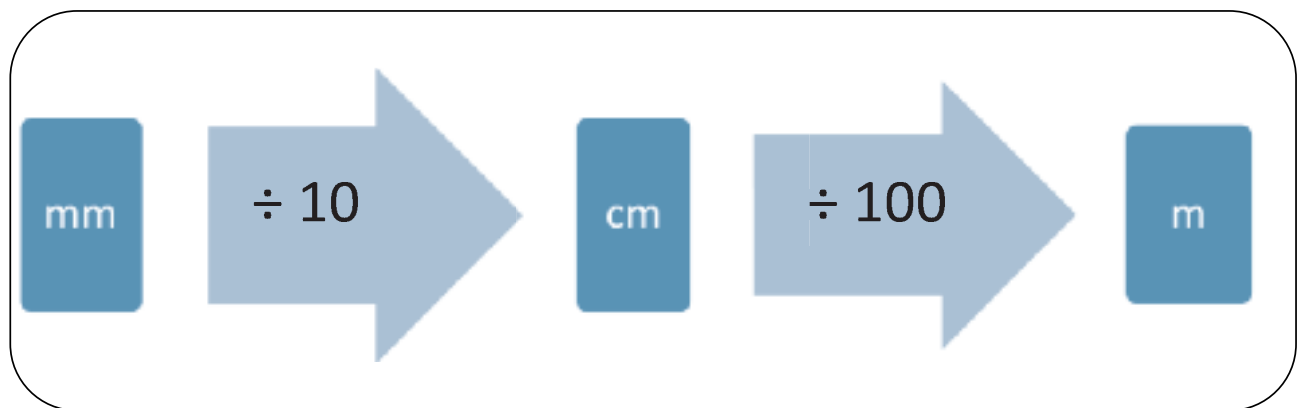
# MEASURE, SHAPE & SPACE ANSWERS - TASK 2

## METRIC UNITS

	ABBREVIATION	FULL NAME	EQUIVALENT	EXAMPLES
MEASUREMENT OF LENGTH	mm	millimetre	10 mm = 1 cm 1 000 mm = 1 m	
	cm	centimetre	100 cm = 1 m	
	m	metre	1 000 m = 1 km	
	km	kilometre	1 000 m = 1 km	
MEASUREMENT OF WEIGHT	g	gram	1000g = 1 kg	
	kg	kilogram	1kg = 1000g	
	t	tonne	1t = 1000kg	
MEASUREMENT OF CAPACITY	ml	millilitre	1l = 1000ml	
	l	litre	1l = 1000ml	

# MEASURE, SHAPE & SPACE ANSWERS - TASK 3

## CONVERTING BETWEEN METRIC UNITS OF MEASURE



### EXAMPLES

700mm = 70cm  
1200mm = 1.2m  
1.3m = 1300mm

$700 \div 10 = 70$   
 $1200 \div 1000 = 1.2$   
 $1.3 \times 1000 = 1300$

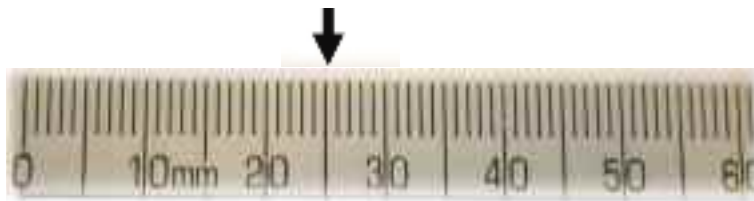
# MEASURE, SHAPE & SPACE ANSWERS - TASK 3

**Rulers and tape measures are marked off in cm**



**1. The arrow is pointing at what measurement? (give your answer in cm and in mm)**

1.1cm = 11mm



**2. The arrow is pointing at what measurement? (give your answer in cm and in mm)**

2.5cm = 25mm



**3. The arrow is pointing at what measurement? (give your answer in cm and in mm)**

0.8cm = 8mm

# MEASURE, SHAPE & SPACE ANSWERS - TASK 3



**4. The arrow is pointing at what measurement? (give your answer in cm and in mm)**

4.3cm = 43mm



**5. The arrow is pointing at what measurement? (give your answer in cm and in mm)**

3.7cm = 37mm

**6. You have to cut skirting to measure 1010mm. If your tape measure is in cm, what length is 1010 mm in cm?**

101cm

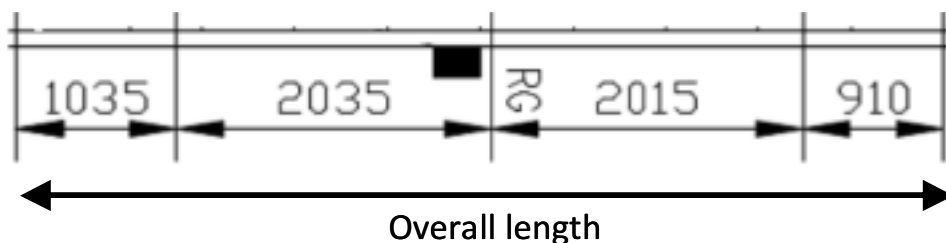
**7. A length of pipe needs to be 1570mm long. What is this length in metres?**

$1570 \div 1000 = 1.57\text{m}$

# MEASURE, SHAPE & SPACE ANSWERS - TASK 4

## SITE PLANS

Karen works for a construction firm and needs to be able to translate the measurements from the plans she has been given to actual lengths on site. This requires her to accurately measure lengths on the drawings and interpret what these lengths mean on the site. Look at the plans below and check your understanding of site plans.



**1. What is the overall length of this section of the site?**

$$1035 + 2035 + 2015 + 910 = 5995\text{mm}$$

**2. What is 2035mm in metres?**

$$2.035\text{m}$$

**3. The architect thinks he has made a mistake and the 2035mm measurement should be 2.35m. Are these two measurements different? If so, what is the difference?**

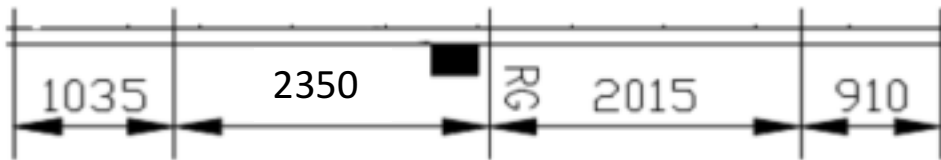
$$2.35 \text{ m} = 2350\text{mm}$$

$$2350 - 2035 = 315\text{mm}$$

the difference is 315mm

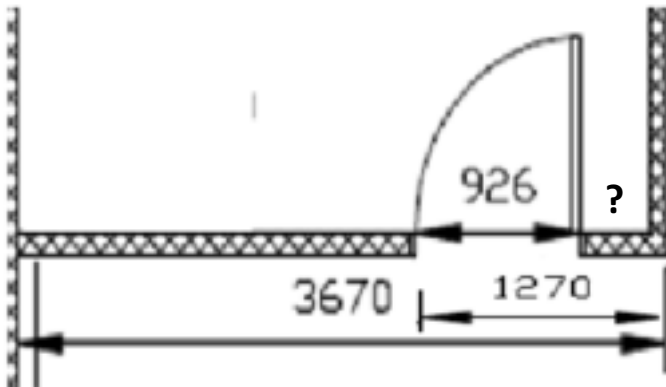
# MEASURE, SHAPE & SPACE ANSWERS - TASK 4

The plan is changed to incorporate the changed measurement.



4. Calculate the overall length now.

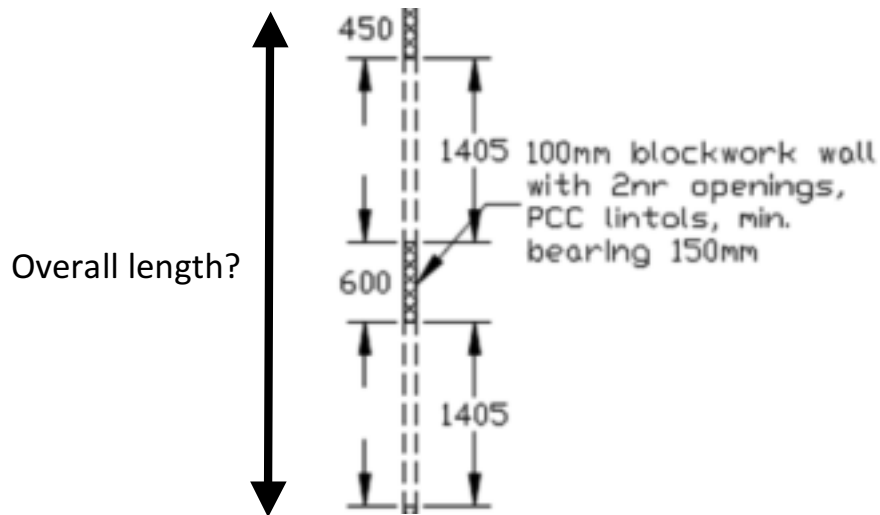
$$1035 + 2350 + 2015 + 910 = 6310\text{mm}$$



5. There is a measurement missing from the plan above. What is the missing measurement?

$$1270 - 926 = 344\text{mm}$$

# MEASURE, SHAPE & SPACE ANSWERS - TASK 4



**6. What is the total overall length shown by the arrow?**

$$450 + 1405 + 600 + 1405 = 3860\text{mm}$$



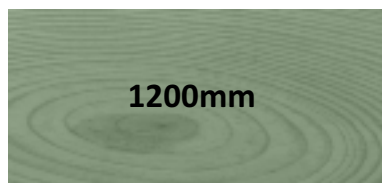
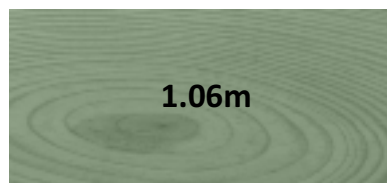
# MEASURE, SHAPE & SPACE ANSWERS -

## TASK 5

### MATERIALS

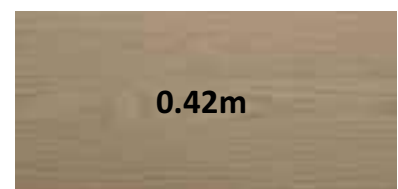
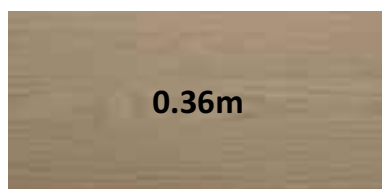
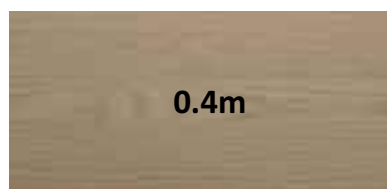
When working with different materials on site you will need to be able to compare quantities accurately. You will come across weights and lengths frequently on site. From the weight of a steel H section which will need to be accurately counterbalanced when using a crane on site, to quantities of stone and other building materials, you will need to be able to work with metric measurements. Lengths of timber, pipe and steel etc need to be accurately known. Measurements may be given in a variety of units and you need to be able to convert from one unit to another. Test your understanding in the questions below.

#### 1. Put these lengths in ascending order.



1.06m      1200mm      130cm

#### 2. Put these lengths in ascending order.



0.36m      0.4m      0.42m

#### 3. Put these weights in order of size.



23.06kg



23.6kg




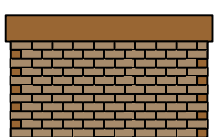



23500g

23.06kg      23500kg      23.6kg

# MEASURE, SHAPE & SPACE ANSWERS - TASK 5

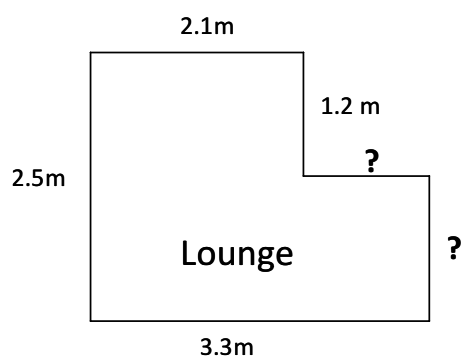
4. Match each of these items to their approximate measurement.

 Height of door	0.8m
 Width of door	1900mm
 Length of a brick	2250mm
 Height of garden wall	230mm
 Height of garage door	1.2m

# MEASURE, SHAPE & SPACE ANSWERS - TASK 6

## PERIMETER

New firm, RJM joinery, has been asked to quote for replacement skirting for a client. He visits the client, takes preliminary measurements and calculates the quantity of skirting needed.



### PERIMETER

The distance around a shape is the perimeter.

- Make sure you have all the side measurements
- Make sure all units are the same

**1. What are the lengths of the two sides where the measurements are missing?**

$$3.3 - 2.1 = 1.2\text{m}$$

$$2.5 - 1.2 = 1.3\text{m}$$

**2. Work out the total amount of skirting needed for the room in millimetres.**

Perimeter:

$$2.1 + 1.2 + 1.2 + 1.3 + 3.3 + 2.5 + 11.6\text{m}$$

Total length of skirting required in metres: 11.6m

Total length of skirting required in millimetres: 11600mm

# MEASURE, SHAPE & SPACE ANSWERS - TASK 6

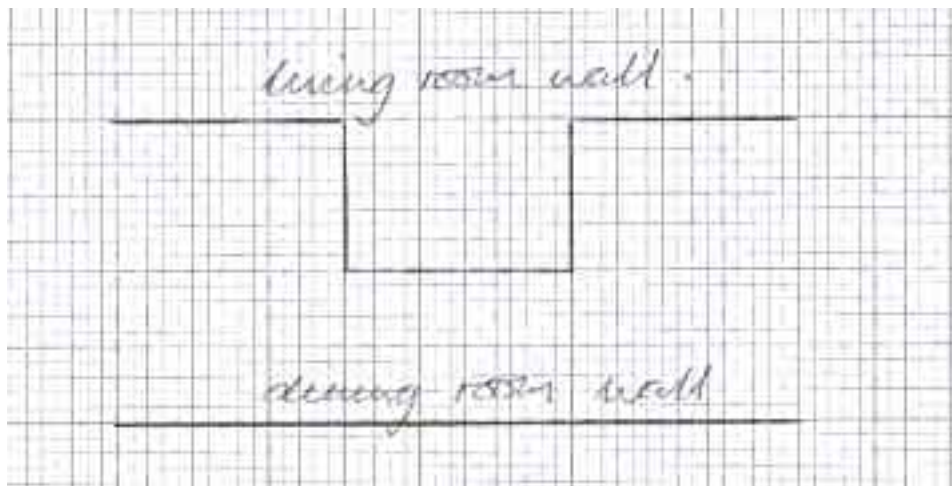


Helen wants to replace the skirting board in her living room. She hasn't taken any measurements yet but remembers that her living room is identical to the dining room she did a couple of months ago except that the living room has a chimney breast on one wall. Helen believes that since the chimney breast cuts down on floor area she will not need any more skirting for the living room than she did for the dining room. She decides to order the same amount she ordered for the dining room.

**3. Use a diagram and/or a calculation in the space below to demonstrate Helen's mistake.**

A reduction in area does not necessarily mean a reduction in perimeter.

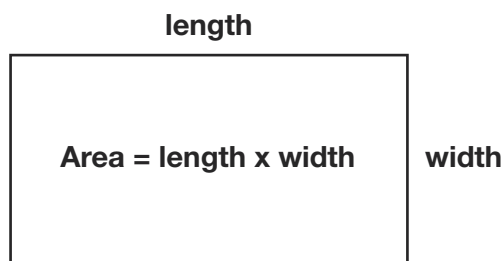
Living room wall with chimney breast is longer than the "same" dining room wall with no chimney breast.



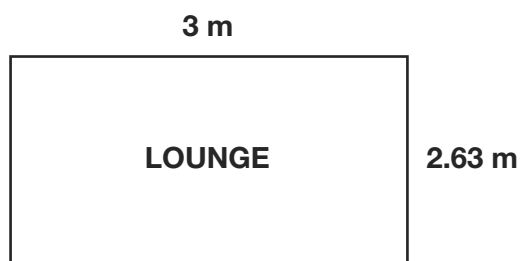
# MEASURE, SHAPE & SPACE ANSWERS - TASK 7

## AREA

The client would also like to get an estimate for a wooden floor to be laid in their dining room. In order to calculate the estimate he needs to work out the area of the room. This means taking measurements of the length and width of the room and converting measurements to metres in order to find the area in squared metres.



Plan of room:



**What is the area of the room?**

$$2.63 \times 3 = 7.89$$

**The area of the room to be floored is:**

$$7.89\text{m}^2$$

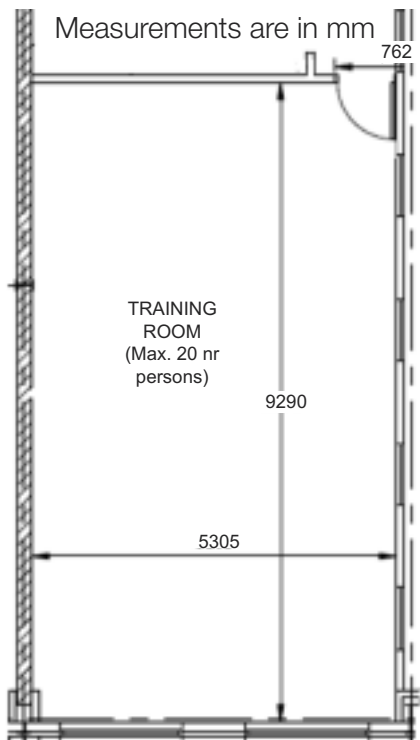
# MEASURE, SHAPE & SPACE ANSWERS - TASK 8

## PLANS

Measurements can be taken directly from site plans and used in calculations off site.  
A site plan is a bird's eye view of a property that is drawn to scale. A site plan can show:

- Property lines
- Outline of existing and proposed buildings and structures
- Distance between buildings
- Distance between buildings and property lines (setbacks)
- Parking lots, indicating parking spaces
- Driveways
- Surrounding streets
- Landscaped areas
- Easements
- Ground sign location

When working from plans you will need to be able to interpret the plans and the measurements on the plans to accurately calculate quantities.



**1. From the upstairs plan what is the perimeter of the room in mm?**

$$9290 + 5305 + 9290 + 5305 = 29190\text{mm}$$

# MEASURE, SHAPE & SPACE ANSWERS - TASK 8

**2. What would this be in metres?**

$$29190 \div 1000 = 29.19\text{m}$$

**3. What is the width of the door for the training room?**

$$762\text{mm}$$

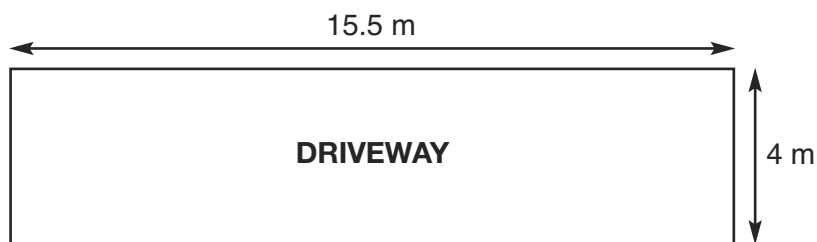
**4. What length of skirting would be needed for the room? (remember to leave out the door)**

$$29190 - 762 = 28428\text{mm}$$

# MEASURE, SHAPE & SPACE ANSWERS - TASK 9

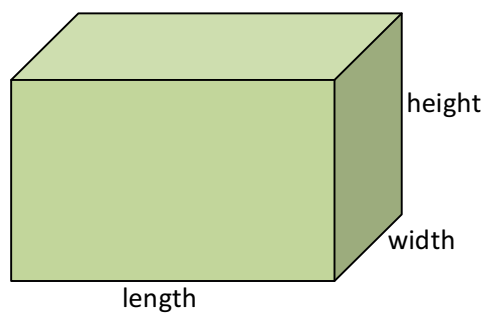
## LAYING A CONCRETE DRIVEWAY

RS Contracts have received an order to lay a concrete driveway for a customer. The dimensions of the driveway have been measured as below:



In order to accurately calculate the quantity of concrete required, RS Contacts need to calculate the volume of concrete required. Follow the steps to complete the calculation.

**Volume** = length × width × height

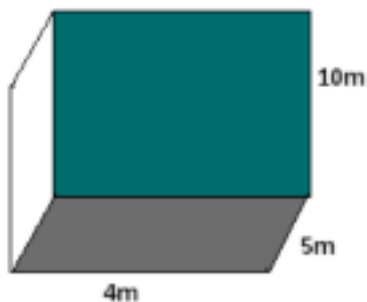


To order material such as stones for a path or concrete for a driveway or foundations, you need to calculate the volume. Volumes are normally measured in units cubed such as metres cubed.



# MEASURE, SHAPE & SPACE ANSWERS - TASK 9

## EXAMPLE



For this example the volume is  $4 \times 5 \times 10 = 200\text{m}^3$

To determine the volume of concrete needed, RS contracts multiply the length and width of the driveway by the depth of concrete to be laid, in this case 100mm.

### 1. What volume of concrete will they need to order?

Length of driveway in metres = 15.5m

Width of driveway in metres = 4m

Depth of concrete in METRES = 0.1m

Volume of concrete =  $15.5 \times 4 \times 0.1 = 6.2\text{m}^2$



### 2. As a general rule: one cubic metre of concrete weighs around 2.5 tonnes. Using this method, how many tonnes of concrete will you need to order?



a. Using your answer to question 1      **$6.2 \times 2.5 = 15.5 = 15.5 \text{ tonnes}$**

# MEASURE, SHAPE & SPACE ANSWERS - TASK 10

## ERECTING A SHED

A client wants you to erect a garden shed.

The shed they have chosen is from B & Q and costs £589. Until the end of the week there is an offer of 25% off all garden buildings.

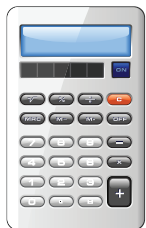
In addition to erecting the shed you will have to build a concrete base. The amount of concrete required for the base will need to be calculated. Follow the steps below to cost the job.



### 1. What is 25% as a fraction?

$\frac{1}{4}$

### 2. What does the discount on the shed work out at?



$$589 \div 4 = 147.25$$

£147.25

### 3. What is the price of the shed with the 25% discount taken off?

$$£ 589.00 - £147.25 = £441.75$$

# MEASURE, SHAPE & SPACE ANSWERS -

## TASK 10

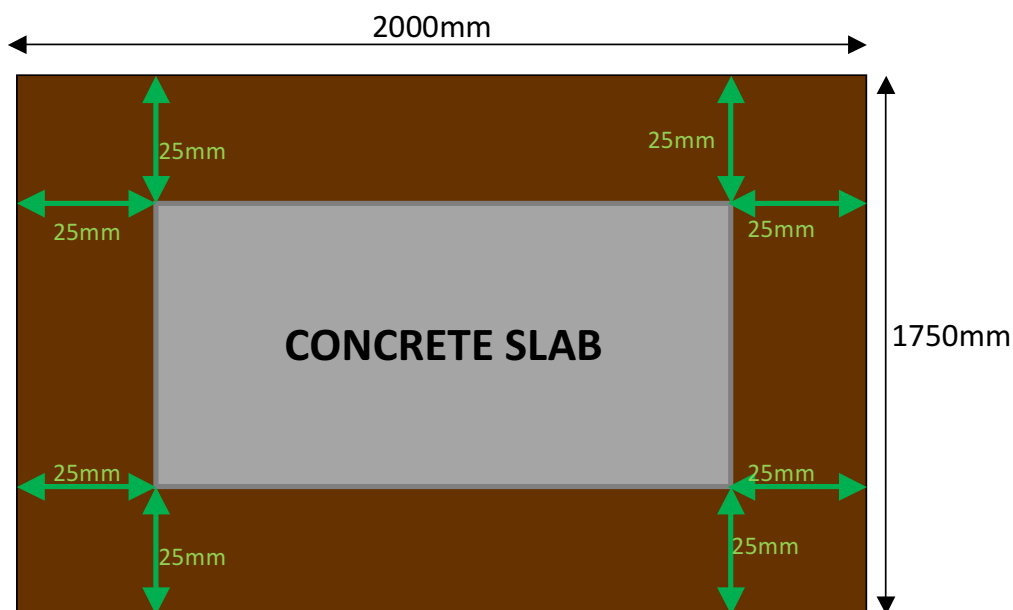
To build a **garden shed** you will need to lay a concrete pad that is 25mm smaller on all sides than the base of the shed, to create an overhang and prevent water accumulating around the timber floor and runners.

The dimensions of the shed are: 2000mm by 1750mm by 3475mm



#### 4. What would the dimensions of the concrete base need to be?

see the diagram below for help



The dimensions of the concrete slab would be:

$$2000 - 50 = 1950\text{mm}$$

$$1750 - 50 = 1700\text{mm}$$

$$\text{LENGTH} = 1950\text{mm}$$

$$\text{WIDTH} = 1700\text{mm}$$

# MEASURE, SHAPE & SPACE ANSWERS - TASK 10

5. If the concrete for the slab needs to be 100mm thick, what volume of concrete will be needed in metres cubed?



REMEMBER: **Volume** = *length* × *width* × *height*

**length in m** = 1.95m

**width in m** = 1.7m

**height in m** = 0.1m

**Volume** =  $1.95 \times 1.7 \times 0.1 = 0.3315\text{m}^3$

6. Concrete costs approximately £60 per metre cubed including VAT.  
What will the cost be for the concrete?

$$£60 \times 0.3315 = £19.89$$

7. The labour costs work out at £130 including VAT.  
What is the total costing for the client for the purchase and erection of the shed?

**Labour costs:** £130

**Cost of shed:** £441.75

**Cost of concrete:** £19.89

Total = £591.64

**The total costs will be:** £591.64

# MEASURE, SHAPE & SPACE ANSWERS -

## TASK 11

### BRICK WALL

James is an apprentice and has been asked to build a small garden wall for a family member. This is the first time he has undertaken a project from start to finish. He needs to do a range of calculations for instance the amount of brick, mortar, concrete etc. required to complete the job. The task below will take him through the various stages of each calculation.

Each brick measures:

21.5 cm x 10.25 cm x 6.5 cm

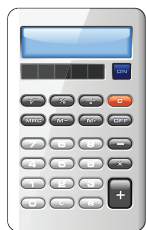
#### 1. What are the dimensions of the brick in mm?

215mm by 102.5mm by 65mm



The first bricks have been laid as shown above.

#### 2. If the thickness of mortar is 10mm. What is length of the wall so far?



$$16 \text{ bricks} \times 215 = 3440\text{mm}$$

$$15 \times 10 = 150\text{mm}$$

$$\text{Total} = 3590\text{mm}$$

#### 3. Mortar is made up from 1 part cement to 4 parts sand.

How much sand would be needed to mix with 2 buckets of cement?

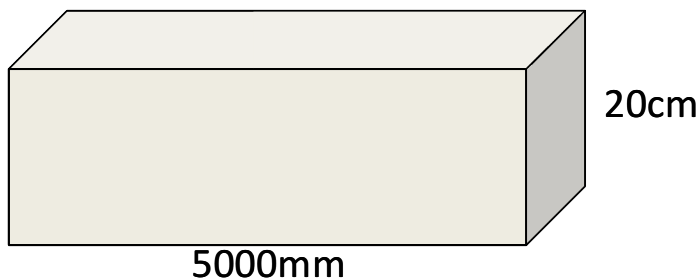
1 part cement	to	4 parts sand
2 buckets of cement	to	8 buckets of sand

# MEASURE, SHAPE & SPACE ANSWERS - TASK 11

- 4. When the wall around the garden is completed it will contain 120 bricks.  
Each brick costs 40p. How much will all the bricks required for the wall cost?**

$$120 \times 40 = 4800\text{p} = \text{£}48$$

For a small garden wall, a foundation is dug as shown below.



The width of the foundation is twice the width of a brick plus 10mm.

- 5. If a brick is 102.5mm wide, what will the width of the foundation be?**

$$102.5 \times 2 = 205\text{mm}$$

$$205 + 10 = 215\text{mm}$$

# MEASURE, SHAPE & SPACE ANSWERS - TASK 11

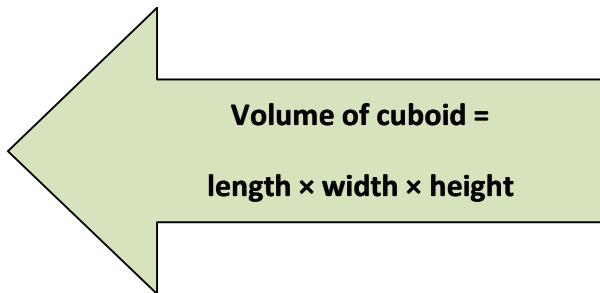
**6. What are the dimensions of the foundation in metres?**

**Length = 5m**

**Width = 0.215m**

**Height = 0.2m**

**7. What volume of concrete will you need for the foundation?**



$$5 \times 0.215 \times 0.2 = 0.215$$

$$\text{Volume of concrete} = 0.215\text{m}^3$$

**8. The concrete for the foundation is made up 1 part cement: 3 parts sand : 5 parts 10mm aggregate. If you have 8 buckets of cement, how many buckets of sand and aggregate will you need?**

1 part cement : 3 parts sand : 5 parts 10mm aggregate

**8 buckets of cement** : 24 buckets : 40 buckets

# MEASURE, SHAPE & SPACE ANSWERS - TASK 12

## MAPS

Chris lives in Newry and is a construction engineer for a large local firm. He has to make a visit to three of the company's sites tomorrow. The first site is in Ballycastle and Chris is trying to work out how far away it is. He takes out a map similar to the one you see below and begins to estimate the distance from Newry to Ballycastle.

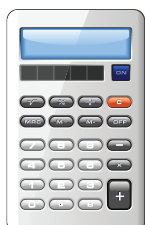
1. Use a ruler to estimate the distance "as the crow flies" from Newry to Ballycastle if the map has a scale of 1cm to 4.5 miles.



**Round the ruler measurement to the nearest cm**

Less than 9.5cm so rounds to 9cm

**Convert this to miles using the scale given above**



$$9 \times 4.5 = 40.5 \text{ miles}$$



# MEASURE, SHAPE & SPACE ANSWERS -

## TASK 12

Chris realises this method is not very accurate so he attempts to use a slightly different approach. He breaks the journey into three “as the crow flies” legs.

- Newry to Belfast
- Belfast to Ballymena
- Ballymena to Ballycastle

**2. Use the map again to calculate an improved estimate of the distance from Newry to Ballycastle and show your working in the space below**

### **Newry to Belfast:**

Ruler measurement in cm

Circle one option      4.0cm      **4.5cm**      5.0cm

### **Belfast to Ballymena:**

Ruler measurement to nearest cm

Circle one option      **3.0cm**      3.5cm      4.0cm

### **Ballymena to Ballycastle:**

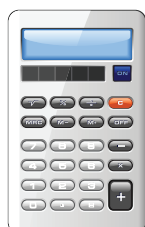
Ruler measurement to nearest cm =

Circle one option      **3.0cm**      3.5cm      4.0cm

Add up the three measurements:

Total journey in cm =  $4.5 + 3.0 + 3.0 = 10.5\text{cm}$

Total journey in miles =  $10.5 \times 4.5 = 47.25\text{ miles}$



# MEASURE, SHAPE & SPACE ANSWERS - TASK 12

## 3. Round your answer above to the nearest 5 miles.

$47.25 = 45$  miles to the nearest 5 miles

An internet search on [www.multimap.com](http://www.multimap.com) for this journey gives an answer of 92 miles.

## 4. Round this figure to the nearest 5 miles

$92 = 90$  miles to the nearest 5 miles

The difference in the previous two answers could be described as the error in Chris's method.

## 5. What is the error in miles?

$90 - 45 = 45$  miles

# MEASURE, SHAPE & SPACE ANSWERS - TASK 12

**6. Which of the following answers do you feel best describes the percentage error in Chris's method? Don't do any further actual calculations to answer this.**

Error in miles = 45

Correct answer in miles = 90

Circle one option

10%

33%

50%

100%

**Reason:**

45 is half of 90 and  $\frac{1}{2} = 50\%$

After Chris visits the Ballycastle site he has to go to Magherafelt where his company are upgrading the spectator seating at a local rugby ground. From Magherafelt he will travel to a site in Armagh where his company are building a new shopping centre. After that he will go back to Newry.

**7. Use the mileage chart below to calculate how far Chris will have travelled altogether by the time he returns home again in the evening.**

	Armagh	Ballycastle	Magherafelt	Newry
Armagh		95	33	19
Ballycastle	95		52	92
Magherafelt	33	52		51
Newry	19	92	51	

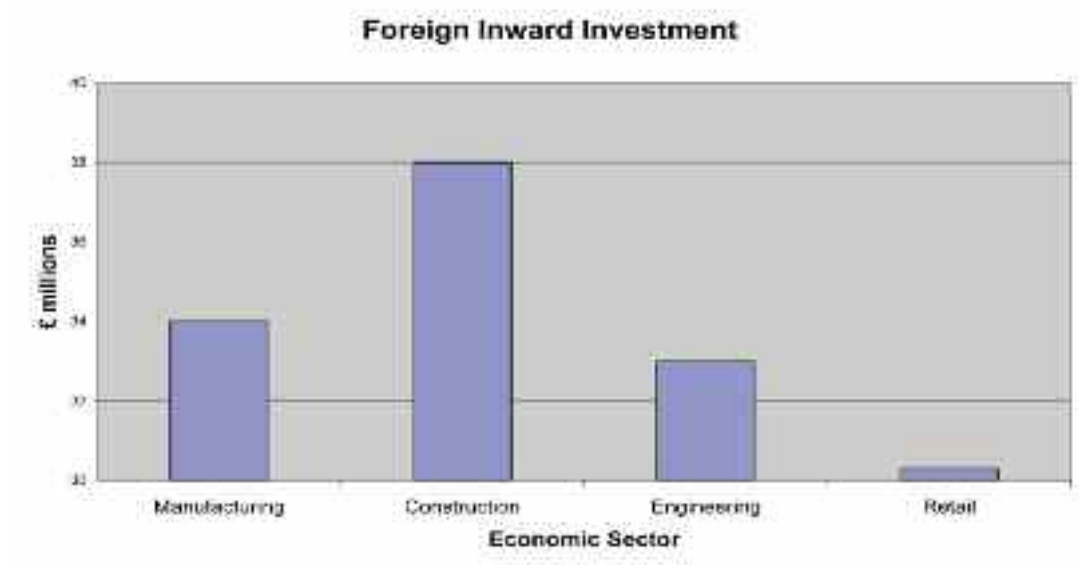
**Mileage covered in total:**

$92 + 52 + 33 + 19 = 196$  miles

# MEASURE, SHAPE & SPACE ANSWERS -

## TASK 12

He arrives in Ballycastle just as the workers are having a tea break. Bill and Malachy are having a conversation about an article in the newspaper. The article includes the chart shown below.



Bill says Construction has received twice as much investment as manufacturing. Malachy agrees and thinks the retail sector has received very little indeed.

### 8. Comment on these statements in the space below.

**Construction received twice as much as manufacturing:**

Construction bar is twice as long as Manufacturing hence Bill's error as the axis does not start at 0.

**Retail sector received very little:**

Relative to other bars the Retail bar looks insignificant. However in reality over £30 million has been invested in that sector but the axis not starting at 0 is misleading at a glance

# MEASURE, SHAPE & SPACE ANSWERS -

## TASK 12

There is an article in this paper about the rugby ground Chris's company are in the process of upgrading. The article states that the finished stadium is to have a seating capacity of 380,000 people and that 15,000 tonnes of concrete will have been used in the construction of it. According to the article the project was initially tendered at a cost of £18,000,000 but is due to come in over budget by 50% making the final total £18,900,000.

**9. State whether or not you think these statistics are reasonable and if not indicate what may be wrong.**

Capacity of 380,000 people

Too large by a factor of 10. 38,000 is a much more realistic figure.

15,000 tonnes of concrete

Reasonable



£18,000,000 increased by 50% gives £18,900,000

Miscalculation: 50% of 18,000,000 is £9,000,000 and not £900,000 giving £27,000,000 instead of £18,900,000

# MEASURE, SHAPE & SPACE ANSWERS -

## TASK 13

### RENOVATION

John is going to put down a concrete floor and replace the beams in an old barn behind his house. He takes some measurements with a tape and finds the barn floor is rectangular with dimensions 4.45m by 3.92m.

- 1. Round these values up the nearest metre in order to make the volume calculation easier and allow for some wastage.**

4.45m rounded up is                      5m

3.92m rounded up is                      4m

A builder has told him the floor needs to be at least 3" deep. John decides to use 4" to ensure he orders enough concrete and also because he knows that 4" comes out at a round number when converted to cm. What is the number he is thinking of?

- 2. First of all use the fact that 1" = 25mm to convert to mm.**

1" = 25mm      so      4" =      4" =  $4 \times 25 = 100\text{mm}$

- 3. Now convert this answer to cm.**

10mm = 1cm

100mm = 10cm

# MEASURE, SHAPE & SPACE ANSWERS -

## TASK 13

John wants to order the concrete for the builder arriving. After doing the volume calculation he rings up to order 200m<sup>3</sup> of concrete. The person on the phone asks him if he is sure as that is a very large amount of concrete.

### 4. Is John correct? If not show how he went wrong in his calculation?

Remember     Volume = length x width x height

No he is not correct. John calculated =  $5 \times 4 \times 10 = 200$  because he forgot to change 10cm to 0.1m before doing his calculation. He should have got 2m<sup>3</sup>.

John also wants to use steel for the main beams. The table below gives some information on the price of steel beams according to their strength.

Beam Type	Max. load per metre in tonnes	Price (£)
A	1.2	80
B	1.8	120
C	2.4	160
D	3.0	200
E	4.8	320

### 5. Use the figures given to help fill in the unknown prices. If you need to do some calculations use the space below the table:

# MEASURE, SHAPE & SPACE ANSWERS -

## TASK 13

Cameron is making a batch of mortar for John to finish some work behind the barn. Mixing sand and cement in different ratios helps produce different kinds of mortar.

A very hard mix as might be used for a floor would use 3:1 of sand to cement. A softer mortar mix such as is used for brickwork might use 6:1.

Cameron is making up a mix using the ratio 4:1 sand to cement. He has a 5 kg bag of cement.

### 6. How much sand does he need?

He needs  $4 \times 5 = 20\text{kg}$  of sand.

### 7. How much mortar mix will this make altogether?

$5 + 20 = 25\text{kg}$

Later Cameron is asked to make 50kg of mortar mix to the same hardness as the last batch. He wonders if there is a short cut to working out how much sand and cement to use for this batch.

### 8. Help give Cameron an answer in the space below.

By direct proportion                      if 25 kg needs 20kg of sand and 5kg of cement  
   then 50 kg needs 40kg of sand and 10kg of cement





# Handling Data

## Tasks and Answers

This section mainly addresses the curriculum area specified, although to allow a more realistic setting for each task, some elements from other curriculum areas may also be mentioned.



# HANDLING DATA TASK 1

## THE CONSTRUCTION INDUSTRY

Statistics in the construction sector allow changes and trends to be analysed. They give a perspective of trends in the construction industry in the Northern Ireland and allow some international comparisons. It also helps to determine initiatives that may influence the future.

Statistics can be used by insurance companies to set premiums.

For businesses, statistics allow them to forward plan by looking at current trends.

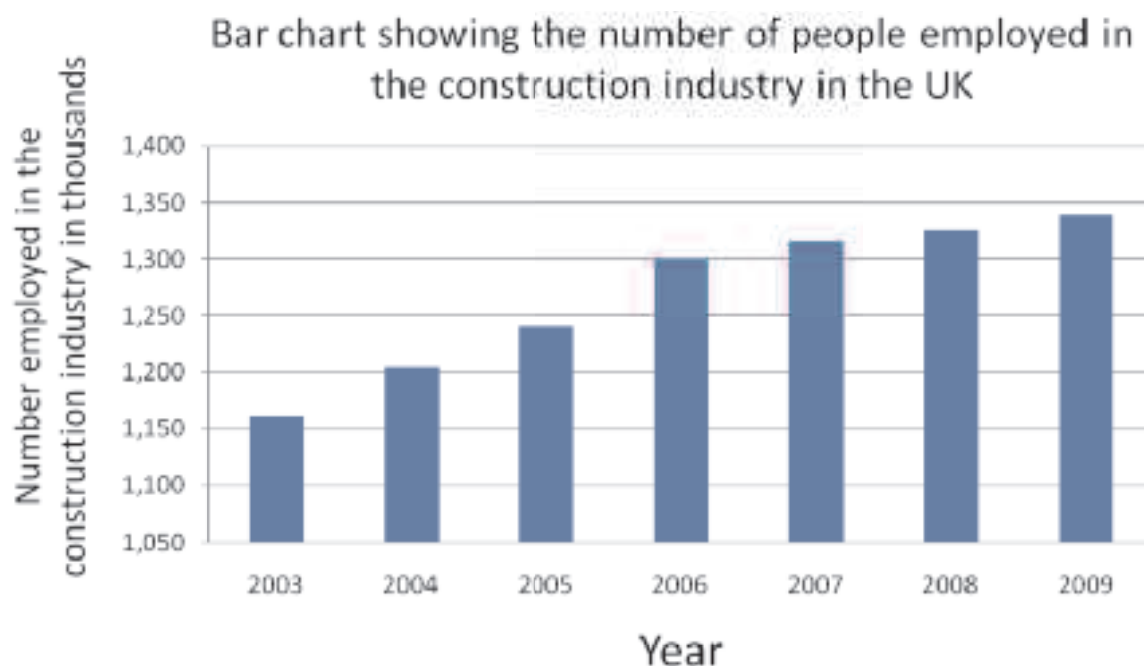
## BAR CHARTS

Remember that bar charts are one way of displaying information.

When you draw a bar chart, you need to decide what it is you want your chart to illustrate. Then you need to consider

1. What will the title be?
2. How many bars will you need?
3. What scale will you need for the other axis?
4. Draw and label the two axes.
5. Draw the bars.

Look at the bar chart below taken from <http://www.statistics.gov.uk>



# HANDLING DATA TASK 1

## Section 1

Look at the information in the chart on the construction industry from the source material. Decide whether these statements are true or false.

1. The bar chart shows how many people were employed in the construction industry in Northern Ireland from 2003 to 2009.

True / False

2. One thousand three hundred people were employed in the construction industry in 2006.

True / False

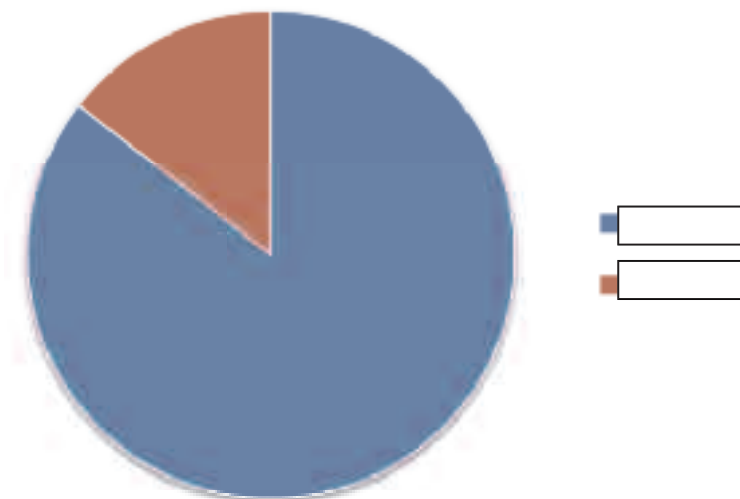
3. The biggest increase in the number of people employed in the construction industry was seen between 2005 and 2006.

True / False

## PIE CHARTS

**Pie charts** are useful to compare different parts of a whole amount. Pie charts are circles divided into segments, where each segment represents a fraction of the total amount.

The pie chart below shows the proportion of males and females employed in the construction sector in the UK in 2009.



# HANDLING DATA TASK 1

## Section 2

Look at the information in the pie chart.

- What labels should go on the right hand side? Write your answer on the chart.

Decide whether these statements are true or false.

- There are more males than females employed in the construction sector in 2009.

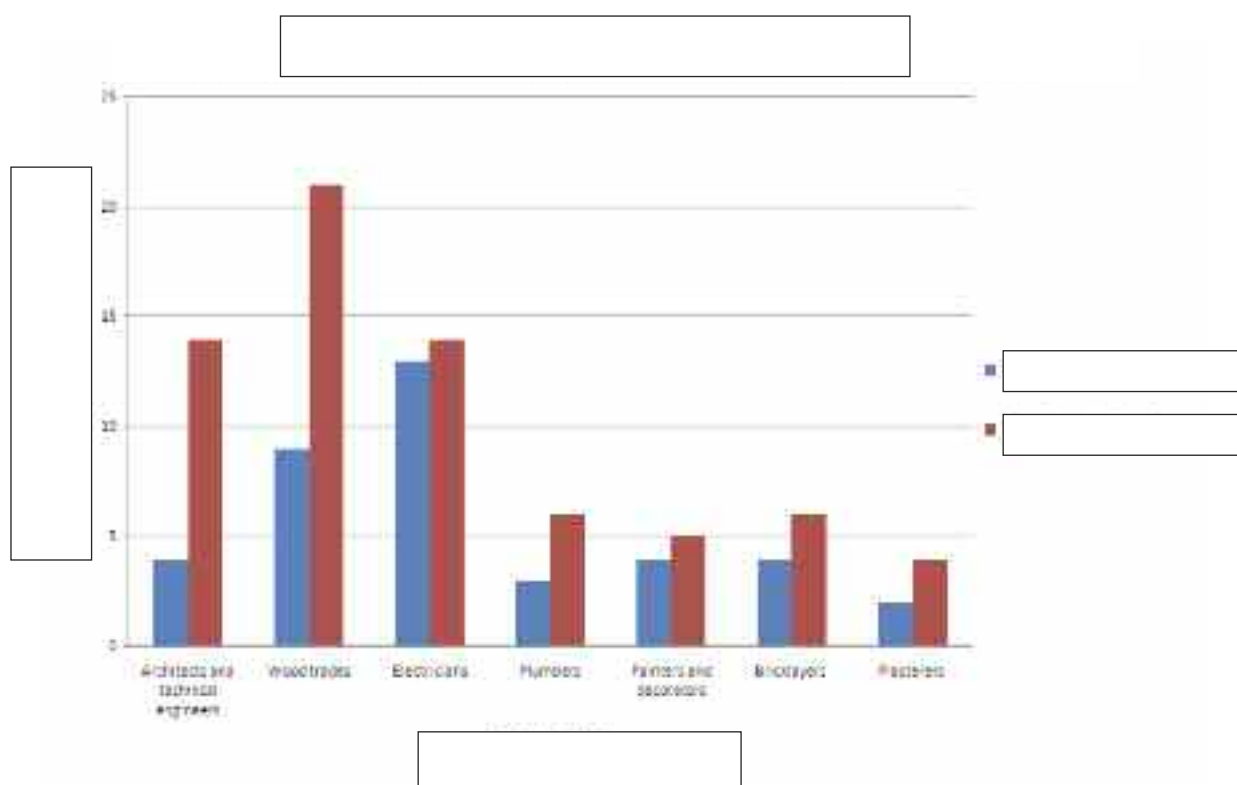
True / False

- About one quarter of the total people employed in the construction industry is female.

True / False

## COMPARISON BAR CHART

The **Comparison bar chart** is used when we want to represent two sets of data on the same chart. We can put the bars side by side or we may put the bars of one set of data on top of the bars of the other set of data.



# HANDLING DATA TASK 1

## Section 3

When the comparison bar chart was drawn the labels were missing. They are below. Can you write in where they should be on the chart?

Number employed in the construction industry in the UK in thousands

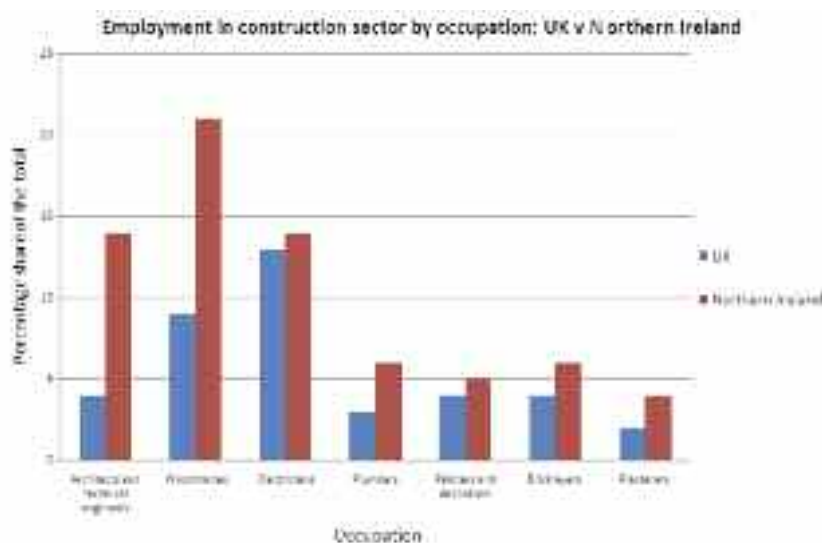
Males

Females

Year

Chart showing the numbers of males and females employed in the construction industry.

Did your chart look like this?



Look at the information in the comparison bar chart. Decide whether these statements are true or false.

- The percentage of people employed in the construction sector as plumbers is greater in the UK than in Northern Ireland.

True / False

- The percentage of people employed in the construction sector as architects / technical engineers is greater in Northern Ireland than in the UK.

True / False

- The percentage of people employed in the construction sector as electricians is approximately the same in both regions.

True / False

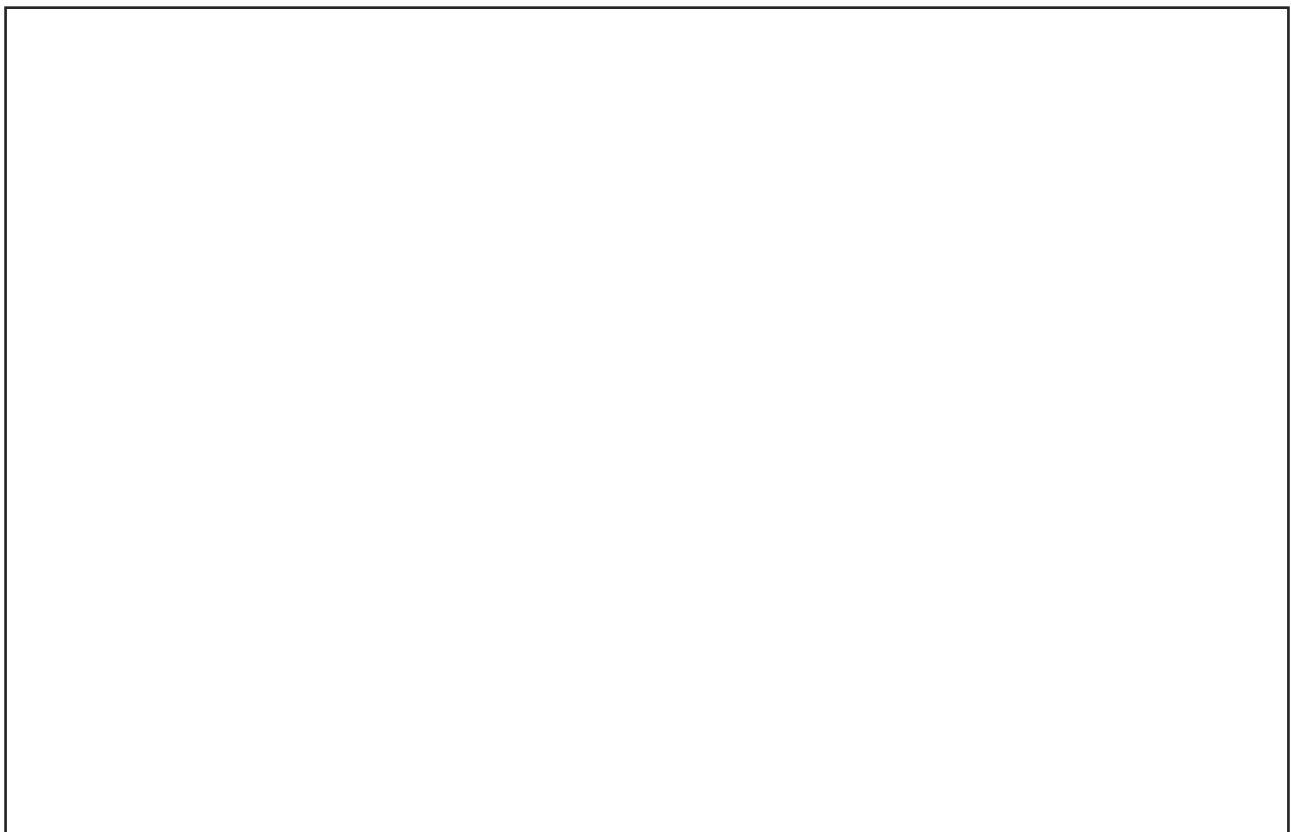
# HANDLING DATA TASK 2

## THE WORKFORCE

It is important for a company to monitor the makeup of their workforce both those directly employed by the company and also any subcontracted staff. This allows them to identify areas where there may be a high turnover of staff or where it has been difficult to get suitable qualified employees. Where there is a skill shortage companies need to forward plan. This may mean diversifying the skills of current employees to meet the shortage in the longer term.

Managers	15
Engineers	8
Drivers	15
Road Operatives	42
Quarry Operatives	13
Other	27

### 1. Display this information on a Bar chart.



# HANDLING DATA TASK 2

The average is a typical value. In the next section when we talk about average we are talking about mean. There are other types of average but we want to look at mean. It is easy to calculate: Just add up all the numbers, then divide by how many numbers there are.

$$\text{Mean} = \frac{\text{Total}}{\text{Number of values}}$$

**The engineers worked the following hours last month:**

181	203	217	184
179	221	233	165
194	0		

**2. What is the mean number of hours worked last month by the engineers?**

Total hours worked by all 10 engineers =

Mean number of hours worked = Total hours worked ÷ number of engineers

**3. What is the range of hours worked last month by the engineers?**

## HANDLING DATA TASK 2

- 4. A new engineer joined the company this month and she worked 204 hours. What is the mean number of hours worked this month by the engineers if the others worked the same number of hours as in the previous month?**

Total hours worked by all 11 engineers =

Mean number of hours worked = Total hours worked  $\div$  number of engineers

- 5. What is this figure rounded to the nearest hour?**

- 6. How has the arrival of the new employee affected the mean number of hours worked?**

- 7. How has the range of hours worked been affected?**



# HANDLING DATA TASK 3

## AVERAGE AND RANGE

Averages look at what we mean when we think of the "typical" value in a collection of data. The concept is extremely important and we encounter it frequently in construction, because we regularly work with numerical quantities. For example, the average number of bricks needed for a wall with particular dimensions or before accepting a job, you might want to know what a typical salary is for someone in that position. The concept of "typical" or "average" is an important one in the construction sector.

### Mean

The **average** is a typical value. In this section when we talk about average we are talking about **mean**. There are other types of average but we want to look at mean.

It is easy to calculate: Just **add up** all the numbers, then **divide by how many** numbers there are.

$$\text{Mean} = \frac{\text{Total}}{\text{Number of values}}$$

### Example

The lengths of off cuts of wood in a workshop are:

400mm                      200mm                      150mm                      330mm

To find the average (mean) length of wood we:

$$\text{Total} = 400 + 200 + 150 + 330 = 1080\text{mm}$$

**Number of values** = 4

$$\text{Mean} = \frac{1080}{4} = 270\text{mm length}$$

*Check your answer is correct by doing the reverse calculation.  $270 \times 4 = 1080$*

**1. Four site operatives earn £6.50 an hour and the site foreman earns £15 an hour. What is the mean wage?**

# HANDLING DATA TASK 3

**2. Does this wage represent the salaries that those on the site earn i.e. is it a typical value?**

**3. The ages of students on a joinery course are shown below.  
What is the average (mean age)?**

16      17      19      17      18      16      30

**4. Employees at a builder's yard are paid the hourly wages listed below. What is the mean hourly wages?**

£5.15, £8.95, £5.75, £5.50, £5.25, £5.40.

# HANDLING DATA TASK 3

## Range

The range is the difference between the highest and lowest values in a set of numbers. It tells you how spread out the values are.

To find it, **subtract the lowest number in the set of numbers from the highest.**

Range = highest value – lowest value

## Example

The ages of students on a joinery course are shown below. What is the range in ages?

16    17    19    17    18    16    23    30










Range = highest value – lowest value

Range = 30 – 16 = **14 years**

# HANDLING DATA TASK 3

5. The prices for a tape measure are shown below. Find the price range?

You are Here: [Home](#) > [Search for "Tape Measures"](#) > Comparison

Product Comparison				
<p>You have selected these products to compare.</p> <p>To remove a product click the  icon.</p> <p><a href="#">Print this Page</a></p> <p><a href="#">Back to Search Results</a></p>	<a href="#">Enlarge Image</a> 	<a href="#">Enlarge Image</a> 	<a href="#">Enlarge Image</a> 	<a href="#">Enlarge Image</a> 
				
	<a href="#">Stanley FatMax XL Tape Measure 5m (16ft)</a>	<a href="#">Stanley Power Rule 10m/33ft</a>	<a href="#">Forge Steel Long Steel Tape 30m x 13mm</a>	<a href="#">Stanley FatMax XL Tape Measure 10m</a>
	<a href="#">Add to Trolley</a>	<a href="#">Add to Trolley</a>	<a href="#">Add to Trolley</a>	<a href="#">Add to Trolley</a>
<b>Quote</b>	53060	24359	87666	29041
<b>Price (Inc. VAT)</b>	£19.84	£17.79	£9.99	£25.65
<b>Brand</b>	FATMAX XL	Stanley	Forge Steel	FATMAX XL
<b>Model No.</b>		0-33-443		
<b>Description:</b>	5m (16ft): Blade armour protection on first 6" for resistance to breakage on susceptible areas. 32mm wide blade for easy reading. Blade hook grabs on top or bottom for versatility.	Highly accurate, professional Tape Measure. Metric and imperial. Spring return mechanism and 3 rivet "tru-zero" hook for accurate readings.	30m x 13mm. Tape coated with acrylic polymers. Easy-to-read, bold black numbers.	10m (33'): Blade armour protection on first 6". 32mm wide blade for easy reading. Blade hook grabs on top or bottom.

# HANDLING DATA TASK 3

**6. Employees at a builder's yard are paid the hourly wages listed below. What is the range of these hourly wages?**

£7.50, £9.25, £8.75, £9.50, £7.25, £8.50.

**7. The hours worked on site for 5 employees are shown below. What is the range of hours worked and what is the mean number of hours worked.**

36    32    40    39    38

# HANDLING DATA TASK 3

A building contractor employs 10 construction tradespersons on a full-time basis. All skilled construction trade employees are paid the same basic annual salary of £25,250. As managing director he pays himself an annual salary of £99,500. He is looking to take on another full-time bricklayer and advertises in the jobs section of a trade publication. The advertisement claims that the average salary in the company is £32,000.

## 8. Is this claim correct?



Total salary bill for company for 10 tradespersons and the managing director

=

Mean salary = Total salary  $\div$  11

=

## 9. Is this advertisement fair? If not why not?

# HANDLING DATA TASK 4

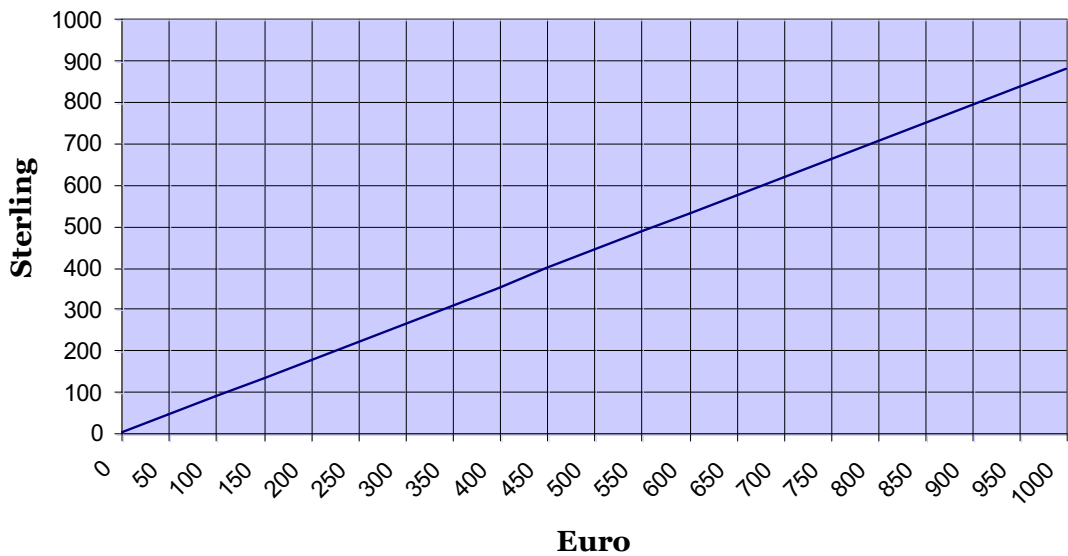
## BUILDING TRADE

The following table shows the volume of sales revenue (£000's) last year for five building supplies businesses chosen at random in Northern Ireland, Republic of Ireland and England.

Northern Ireland (£)	Republic of Ireland (€)	England (£)
356	203	215
413	645	6305
167	909	451
48	396	87
192	302	0
Total	Total	Total

1. Use the conversion graph below to convert the figure for Republic of Ireland from € to £ so a comparison can be made.

Currency Conversion (Euro v Sterling)

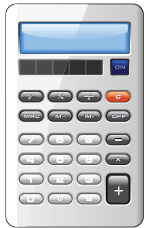


2. Did you convert each value individually or did you use an alternative method?

3. Now complete the table above so the totals are in £.

# HANDLING DATA TASK 4

## 4. Calculate the mean revenue for building supplies businesses in the separate regions.



### Northern Ireland

Total revenue =

Mean = Total revenue  $\div$  5 =

What does the displayed by your calculator mean in terms of money?

### Republic of Ireland

Total revenue =

Mean = Total revenue  $\div$  5 =

What does the displayed by your calculator mean in terms of money?

### England

Total revenue =

Mean = Total revenue  $\div$  ? =

What does the displayed by your calculator mean in terms of money?



# HANDLING DATA TASK 4

- 5. Determine an all-Ireland national average (mean) and compare it to the figure you already have for England.**

**All-Ireland**

Total revenue =

Mean = Total revenue  $\div$  ?

Compare:







- 6. Which region had the largest range in revenues last year according to the data in the table above?**

If you are able to answer this without having to do any calculations please explain why:

# HANDLING DATA TASK 5

## CONSTRUCTION MACHINERY

On site you will encounter a wide range of plant machinery from dozers to excavators to loaders and lorries. Each has a specific function on site and that function will determine the design and specification of the vehicle. Below are cards showing a range of plant machinery and their dimensions. Compare the vehicles and look at the weight, lengths and power of each. The cards can be used to play a game of trumps later.

<p><b>LARGE DOZER</b></p> <p>A</p>  <p>Engine power- 259 kW  <b>Max. Operating Weight</b> - 38,488 kg  <b>Overall length</b> - 5.6m  <b>Fuel tank</b> – 643 litres</p>	<p><b>TRACKED EXCAVATOR</b></p> <p>B</p>  <p>Engine power - 124kW  <b>Max. Operating Weight</b> - 20,003 kg  <b>Overall length</b> - 8.37m (Transport length)  <b>Fuel tank</b> – 253 litres</p>
<p><b>SKID STEER LOADERS</b></p> <p>C</p>  <p>Engine power - 52kW  <b>Max. Operating Weight</b> – 2,650 kg  <b>Overall length</b> - 3.27m  <b>Fuel tank</b> – 80 litres</p>	<p><b>MEDIUM DOZER</b></p> <p>D</p>  <p>Engine power - 93kW  <b>Max. Operating Weight</b> – 13,460kg  <b>Overall length</b> - 4.7m  <b>Fuel tank</b> – 295 litres</p>
<p><b>WHEELED LOADER</b></p> <p>E</p>  <p>Engine power – 180kW  <b>Max. Operating Weight</b> – 25,400kg  <b>Overall length</b> - 8.1m  <b>Fuel tank</b> – 210 litres</p>	<p><b>MOBILE CRANE</b></p> <p>F</p>  <p>Engine power – 205kW  <b>Max. Operating Weight</b> – 29,000kg  <b>Overall length</b> - 10.5m (transport position)  <b>Fuel tank</b> – 300 litres</p>

# HANDLING DATA TASK 5

## DUMP TRUCK

G



**Engine power** – 246 kW  
**Max. Operating Weight** – 53,140kg  
**Overall length** - 6.9 m  
**Fuel tank** – 410 litres

## VIBRATING ROLLER

H



**Engine power** – 100 kW  
**Max. Operating Weight** – 11,550kg  
**Overall length** - 4.5 m  
**Fuel tank** – 200 litres

## ROLLER

I



**Engine power** – 97 kW  
**Max. Operating Weight** – 11,300kg  
**Overall length** - 5.4 m  
**Fuel tank** – 300 litres

## BACKHOE LOADER

J



**Engine power** – 74.2kW  
**Max. Operating Weight** – 8,660kg  
**Overall length** - 5.9 m  
**Fuel tank** – 160 litres

# HANDLING DATA TASK 5

Using the cards for construction machinery, answer the questions below.

## 1. What is the range of engine powers in the vehicles?

--

## 2. Round each of the lengths to the nearest metre.

VEHICLE	LENGTH ROUNDED to nearest metre	VEHICLE	LENGTH ROUNDED to nearest metre
A. Bulldozer		F. Mobile Crane	
B. Tracked Excavator		G. Dump Truck	
C. Skid steer Loaders		H. Vibrating Roller	
D. Medium Dozer		I. Roller	
E. Wheeled Loader		J. Backhoe Loader	

## 3. For the two dozers (A) and (D), what is the average (mean) engine power?

--

## 4. What is the range in lengths of the construction vehicles?

--

# HANDLING DATA TASK 5

5. Work out the order of the cards based on the actual overall length of each vehicle. You don't need to write out the name of each vehicle, simply use the letters on each card A to J.

Vehicles - smallest to largest overall lengths	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

6. What is the range in lengths of the construction vehicles?

--

7. What is the range in sizes of the fuel tanks?

--

8. What is the operating weight of the mobile crane in tonnes?

--

# HANDLING DATA TASK 6

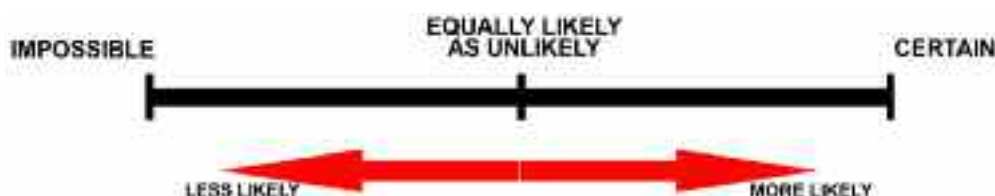
## CHANCES ARE

Probability is an area of mathematics used to measure uncertainty. In life the outcome of many events is not predictable but it is possible to get an idea of how likely some things are to happen. Being able to tell how likely something is to happen is very important in construction especially when it comes to health and safety. Insurance companies base their premiums directly on probabilities.

A scale is used to represent probability with “impossible” at one end and “certain” at the other. All other outcomes can be placed somewhere on the scale between these two extremes. Things that are unlikely are placed near the impossible end whilst things likely to happen are placed near the certain end. We can use common sense to place some outcomes on the scale....

### 1. For example, place the following outcomes on the probability scale below

- A. Someone chosen at random from a construction trade is a man
- B. Someone who follows all safety guidelines has an accident
- C. A mortar mixture will harden if someone forgot to add cement
- D. A warm but poorly insulated building will lose heat on a cold day
- E. Someone chosen at random from the community is a woman



Sometimes we cannot just tell from common sense how likely an outcome is or whether one outcome is more likely than another. In order to tell if some outcomes are more likely than others we need to represent probabilities using fractions. The top of the fraction is the number of favourable outcomes and the bottom of the fraction is the number of possible outcomes.

$$\text{Probability} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

# HANDLING DATA TASK 6

**2. Complete the following table to help you practice working with different kinds of fractions and then you can try to answer some probability questions.**

Fraction	Decimal	Percentage	Outcome description
0			Impossible
	0.1		
		25%	Unlikely
1/2			Just as likely as not to happen
	0.75		
		90%	Very likely
1			

Use the definition of probability given above to determine how probable the following events are to happen.

**3. McAteer and Bushe, a local construction company, have purchased 4 brand new lorries. Only one of them has air-conditioning for the cab. If a driver chooses a lorry to drive at random what is the probability it will have air-conditioning.**

**4. What is the probability it won't have air-conditioning?**

# HANDLING DATA TASK 6

**5. If you have not already done so express your answers to the latter two questions in percentage form.**

**6. What do you notice about the answers when you add them together?**

**7. The probability of a lorry breaking down in service is 0.05. Use what you have learned in the previous question to determine the probability that a lorry will not break down in service.**

**8. Write down a rule to help you find the probability of something not happening if you already know the probability of it happening.**



# HANDLING DATA TASK 7

## HEALTH AND SAFETY

As mentioned in the previous task, one important use of probability in the construction sector is linked to the management of health and safety. You can now try to apply what you have learned above to the following scenario:

A Safety at Work study (figures not official) has been carried out for the construction industry. It has been determined there is a 1% chance an operative (18-65 years old) will have an accident whilst driving machinery.

- 1. What is the probability that an operative will not have an accident whilst driving machinery?**

- 2. If 1% of the 30000 operatives working in Northern Ireland have an accident when using machinery, how many would that be?**



# HANDLING DATA TASK 7

The study also looked at safety of pneumatic drills and found that there is a 1 in 50 (that's 2%) chance an operative will have an accident whilst using one.

**3. Which of the activities appears to be more accident prone, driving machinery or using a pneumatic drill?**

Of the 30000 operatives referred to above, 1500 of them are over 50 years old.

**4. What is the probability that an operative is over 50?**

There are ten different tasks given to operatives in one company. Five involve driving machines, two involve using pneumatic drills and three involve the use of hand tools.

**5. What is the probability an operative will be given a task involving a hand tool?**

# HANDLING DATA TASK 7

**6. What is the probability that the operative will NOT be given a task involving a hand tool?**

**7. What is the probability that the operative will be given a task involving use of a pneumatic drill?**

# HANDLING DATA ANSWERS - TASK 1

## THE CONSTRUCTION INDUSTRY - ANSWERS

Statistics in the construction sector allow changes and trends to be analysed. They give a perspective of trends in the construction industry in the Northern Ireland and allow some international comparisons. It also helps to determine initiatives that may influence the future.

Statistics can be used by insurance companies to set premiums.

For businesses, statistics allow them to forward plan by looking at current trends.

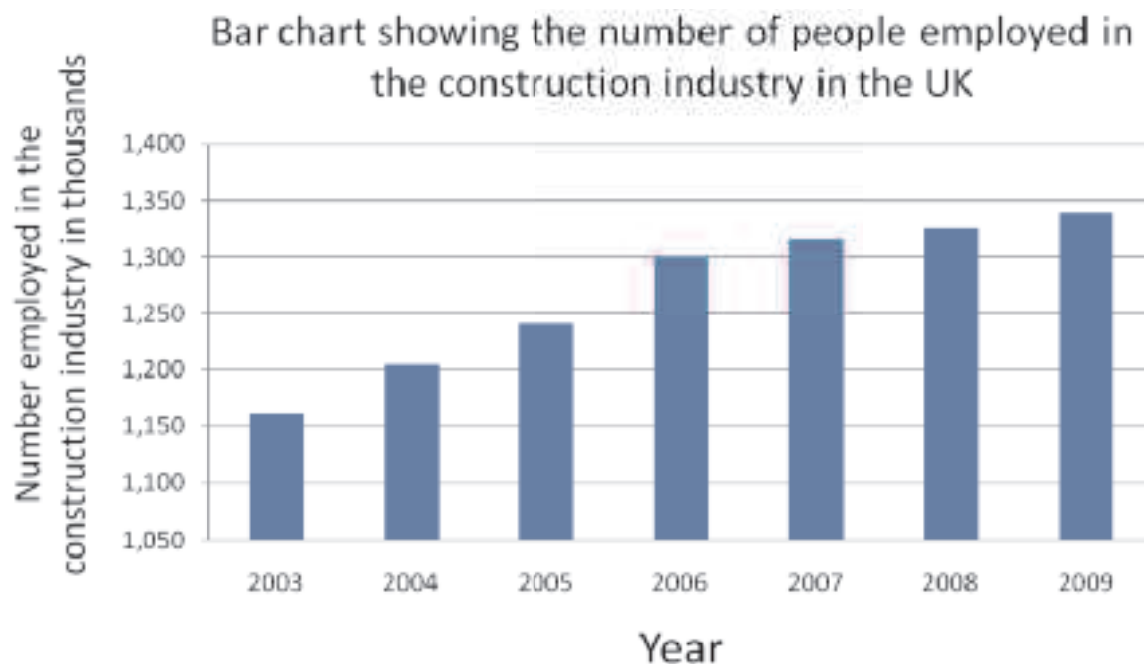
### BAR CHARTS

Remember that bar charts are one way of displaying information.

When you draw a bar chart, you need to decide what it is you want your chart to illustrate. Then you need to consider

1. What will the title be?
2. How many bars will you need?
3. What scale will you need for the other axis?
4. Draw and label the two axes.
5. Draw the bars.

Look at the bar chart below taken from <http://www.statistics.gov.uk>



# HANDLING DATA ANSWERS - TASK 1

## THE CONSTRUCTION INDUSTRY - ANSWERS

### Section 1

Look at the information in the chart on the construction industry from the source material. Decide whether these statements are true or false.

1. The bar chart shows how many people were employed in the construction industry in Northern Ireland from 2003 to 2009.

True / ☒ False

2. One thousand three hundred people were employed in the construction industry in 2006.

True / ☒ False

3. The biggest increase in the number of people employed in the construction industry was seen between 2005 and 2006.

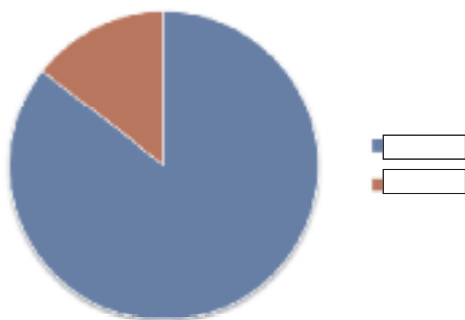
☒ True / False

# HANDLING DATA ANSWERS - TASK 1

## PIE CHARTS

**Pie charts** are useful to compare different parts of a whole amount. Pie charts are circles divided into segments, where each segment represents a fraction of the total amount.

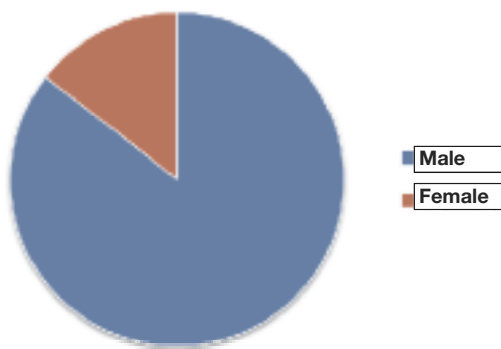
The pie chart below shows the proportion of males and females employed in the construction sector in the UK in 2009.



### Section 2

Look at the information in the pie chart.

1. What labels should go on the right hand side? Write your answer on the chart.



Decide whether these statements are true or false.

2. There are more males than females employed in the construction sector in 2009.

True / **False**

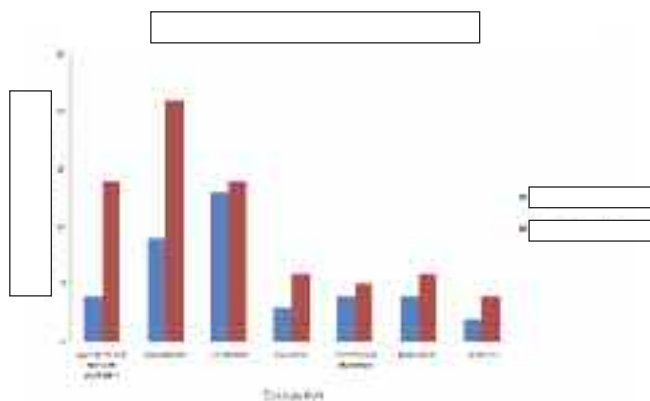
3. About one quarter of the total people employed in the construction industry is female.

True / **False**

# HANDLING DATA ANSWERS - TASK 1

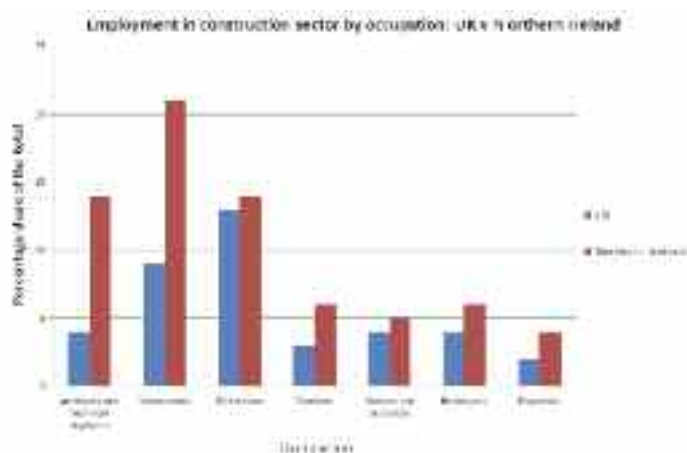
## COMPARISON BAR CHART

The **Comparison bar chart** is used when we want to represent two sets of data on the same chart. We can put the bars side by side or we may put the bars of one set of data on top of the bars of the other set of data.



### Section 3

When the comparison bar chart was drawn the labels were missing. They are below. Can you write in where they should be on the chart?



Number employed in the construction industry in the UK in thousands

Males

Females

Year

Chart showing the numbers of males and females employed in the construction industry.



Did your chart look like this?

Look at the information in the comparison bar chart. Decide whether these statements are true or false.

- The percentage of people employed in the construction sector as plumbers is greater in the UK than in Northern Ireland.

True / **False**

- The percentage of people employed in the construction sector as architects / technical engineers is greater in Northern Ireland than in the UK.

**True** / False

- The percentage of people employed in the construction sector as electricians is approximately the same in both regions.

**True** / False

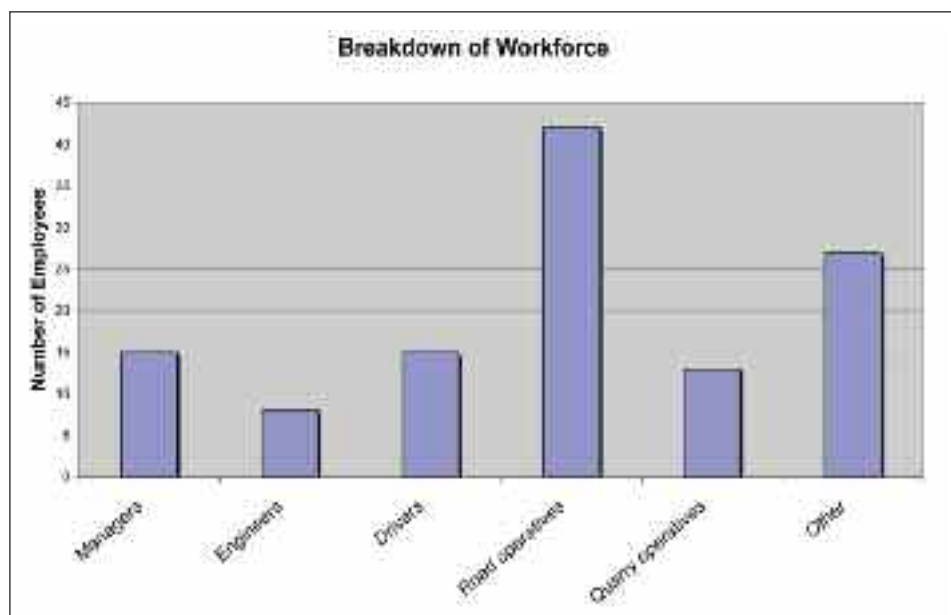
# HANDLING DATA ANSWERS - TASK 2

## THE WORKFORCE - ANSWERS

It is important for a company to monitor the makeup of their workforce both those directly employed by the company and also any subcontracted staff. This allows them to identify areas where there may be a high turnover of staff or where it has been difficult to get suitable qualified employees. Where there is a skill shortage companies need to forward plan. This may mean diversifying the skills of current employees to meet the shortage in the longer term.

Managers	15
Engineers	8
Drivers	15
Road Operatives	42
Quarry Operatives	13
Other	27

### 1. Display this information on a Bar chart.





# HANDLING DATA ANSWERS - TASK 2

The average is a typical value. In the next section when we talk about average we are talking about mean. There are other types of average but we want to look at mean. It is easy to calculate: Just add up all the numbers, then divide by how many numbers there are.

$$\text{Mean} = \frac{\text{Total}}{\text{Number of values}}$$

**The engineers worked the following hours last month:**

181	203	217	184
179	221	233	165
194	0		

**2. What is the mean number of hours worked last month by the engineers?**

**Total hours worked by all 10 engineers =**

$$181 + 203 + 217 + 184 + 179 + 221 + 233 + 165 + 194 + 0 = 1777 \text{ hrs}$$

**Mean number of hours worked = Total hours worked ÷ number of engineers**

$$177 \div 10 = 177.7 \text{ hrs (178 hrs)}$$

**3. What is the range of hours worked last month by the engineers?**

$$233 - 0 = 233 \text{ hrs}$$

# HANDLING DATA ANSWERS - TASK 2

4. A new engineer joined the company this month and she worked 204 hours. What is the mean number of hours worked this month by the engineers if the others worked the same number of hours as in the previous month?

**Total hours worked by all 11 engineers =**

$$1777 + 204 = 1981$$

**Mean number of hours worked = Total hours worked  $\div$  number of engineers =**

$$1981 \div 11 = 180.0909091 \text{ (calculator display)}$$

5. What is this figure rounded to the nearest hour?

180 hrs

6. How has the arrival of the new employee affected the mean number of hours worked?

It has increased

7. How has the range of hours worked been affected?

unaffected

# HANDLING DATA ANSWERS - TASK 3

## AVERAGE AND RANGE - ANSWERS

Averages look at what we mean when we think of the "typical" value in a collection of data. The concept is extremely important and we encounter it frequently in construction, because we regularly work with numerical quantities. For example, the average number of bricks needed for a wall with particular dimensions or before accepting a job, you might want to know what a typical salary is for someone in that position. The concept of "typical" or "average" is an important one in the construction sector.

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It is easy to calculate: Just **add up** all the numbers, then **divide by how many** numbers there are.

$$\text{Mean} = \frac{\text{Total}}{\text{Number of values}}$$

### Example

The lengths of off cuts of wood in a workshop are:

400mm                      200mm                      150mm                      330mm

To find the average (mean) length of wood we:

$$\text{Total} = 400 + 200 + 150 + 330 = 1080\text{mm}$$

**Number of values** = 4

$$\text{Mean} = \frac{1080}{4} = 270\text{mm length}$$

*Check your answer is correct by doing the reverse calculation.  $270 \times 4 = 1080$*

**1. Four site operatives earn £6.50 an hour and the site foreman earns £15 an hour. What is the mean wage?**

$$£6.50 + £6.50 + £6.50 + £6.50 + £15 = £41$$

$$£41 \div 5 = £ 8.20$$

# HANDLING DATA ANSWERS - TASK 3

**2. Does this wage represent the salaries that those on the site earn i.e. is it a typical value?**

£8.20 is more than the rate most of the employees on site earn

**3. The ages of students on a joinery course are shown below.  
What is the average (mean age)?**

16    17    19    17    18    16    30

$$16 + 17 + 19 + 17 + 18 + 16 + 30 = 133$$

$$133 \div 7 = 19$$

Mean age 19

**4. Employees at a builder's yard are paid the hourly wages listed below. What is the mean hourly wages?**

£5.15, £8.95, £5.75, £5.50, £5.25, £5.40.

$$£5.15 + £8.95 + £5.75 + £5.50 + £5.25 + £5.40 = £36$$

$$£36 \div 6 = £6$$

# HANDLING DATA ANSWERS - TASK 3

## Range

The range is the difference between the highest and lowest values in a set of numbers. It tells you how spread out the values are.

To find it, **subtract the lowest number in the set of numbers from the highest.**

Range = highest value – lowest value

## Example

The ages of students on a joinery course are shown below. What is the range in ages?

16    17    19    17    18    16    30










Range = highest value – lowest value

Range = 30 – 16 = **14 years**

# HANDLING DATA ANSWERS - TASK 3

5. The prices for a tape measure are shown below. Find the price range?

You are Here: [Home](#) > [Search for 'Tape Measures'](#) > Comparison

Product Comparison				
<p>You have selected these products to compare.</p> <p>To remove a product click the  icon.</p> <p><a href="#">Print this Page</a></p> <p><a href="#">Back to Search Results</a></p>	<p><a href="#">Enlarge Image</a> </p>  <p><a href="#">Stanley FatMax XL Tape Measure 5m (16ft)</a></p> <p><a href="#">Add to Trolley</a></p>	<p><a href="#">Enlarge Image</a> </p>  <p><a href="#">Stanley Power Rule 10m (33ft)</a></p> <p><a href="#">Add to Trolley</a></p>	<p><a href="#">Enlarge Image</a> </p>  <p><a href="#">Forge Steel Long Steel Tape 30m x 13mm</a></p> <p><a href="#">Add to Trolley</a></p>	<p><a href="#">Enlarge Image</a> </p>  <p><a href="#">Stanley FatMax XL Tape Measure 10m</a></p> <p><a href="#">Add to Trolley</a></p>
<b>Quote</b>	53050	24359	87866	29041
<b>Price (Inc. VAT)</b>	£18.84	£17.79	£9.99	£25.65
<b>Brand</b>	FATMAX XL	Stanley	Forge Steel	FATMAX XL
<b>Model No.</b>		0-33-443		
<b>Description</b>	5m (16ft): Blade armour protection on first 6" for resistance to breakage on susceptible areas. 32mm wide blade for easy reading. Blade hook grabs on top or bottom for versatility.	Highly accurate, professional Tape Measure. Metric and imperial. Spring return mechanism and 3 rivet 'true-zero' hook for accurate readings.	30m x 13mm Tape coated with acrylic polymers. Easy-to-read bold black numbers.	10m (33ft): Blade armour protection on first 6". 32mm wide blade for easy reading. Blade hook grabs on top or bottom.

$$£25.65 - £9.99 = £15.66$$

# HANDLING DATA ANSWERS - TASK 3

**6. Employees at a builder's yard are paid the hourly wages listed below. What is the range of these hourly wages?**

£7.50, £9.25, £8.75, £9.50, £7.25, £8.50.

$$£ 9.50 - £7.25 = £2.25$$

**7. The hours worked on site for 5 employees are shown below. What is the range of hours worked and what is the mean number of hours worked.**

36      32      40      39      38

$$36 + 32 + 40 + 39 + 38 = 185$$

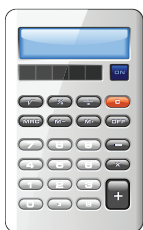
$$185 \div 5 = 37 \text{ hours}$$

$$\text{Range} = 40 - 32 = 8 \text{ hours}$$

# HANDLING DATA ANSWERS - TASK 3

A building contractor employs 10 construction tradespersons on a full-time basis. All skilled construction trade employees are paid the same basic annual salary of £25,250. As managing director he pays himself an annual salary of £99,500. He is looking to take on another full-time bricklayer and advertises in the jobs section of a trade publication. The advertisement claims that the average salary in the company is £32, 000.

## 8. Is this claim correct?



**Total salary bill for company for 10 tradespersons and the managing director**

$$10 \times 25,250 = 252,500$$

$$99,500 + 252,500 = £352,000$$

**Mean salary = Total salary  $\div$  11 =**

$$£352,000 \div 11 = £32,000$$

The claim is correct.

## 9. Is this advertisement fair? If not why not?

No it is not fair. The large director's salary enhances the mean. The advert should not have used to directors salary in a calculation of the mean salary for the tradespersons.



# HANDLING DATA ANSWERS - TASK 4

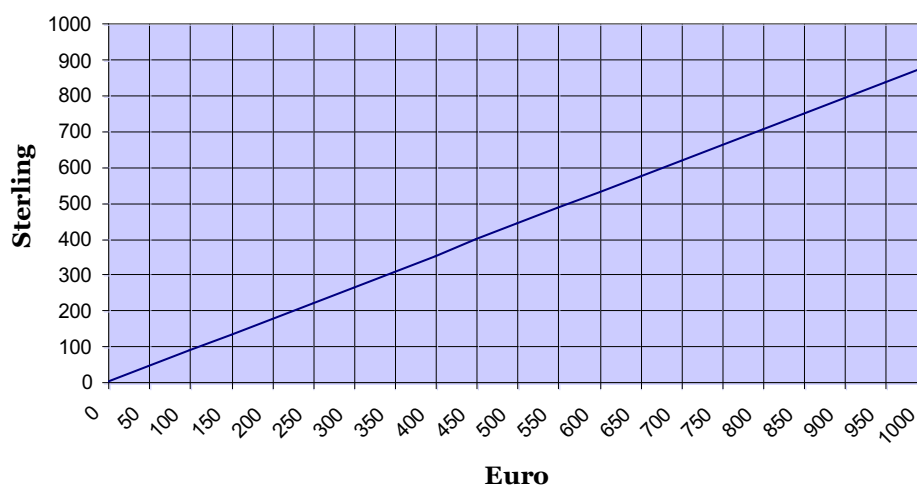
## BUILDING TRADE - ANSWERS

The following table shows the volume of sales revenue (£000's) last year for five building supplies businesses chosen at random in Northern Ireland, Republic of Ireland and England.

Northern Ireland (£)		Republic of Ireland (€)		England (£)
	356		179	215
	413		568	6305
	167		800	451
	48		348	87
	192		266	0
Total	1176	Total	£2161 €2455	Total 7058

1. Use the conversion graph below to convert the figure for Republic of Ireland from € to £ so a comparison can be made.

**Currency Conversion (Euro v Sterling)**



2. Did you convert each value individually or did you use an alternative method?

Note: on account of the scale of graph answers are necessarily approximate as estimation is required.

Alternative method is to first total Euro in table to get €2455.

Approximate this as €2400 because  $2400 = 3 \times 800$  and €800 to £700 is a very straightforward conversion on the graph as it lies on a grid point.

Then by direct proportion  $3 \times 700 = £2100$ . This compares quite well with the 'exact' amount of £2161

# HANDLING DATA ANSWERS - TASK 4

**3. Now complete the table above so the totals are in £.**

**4. Calculate the mean revenue for building supplies businesses in the separate regions.**



## Northern Ireland

Total revenue = 1176

Mean = Total revenue  $\div$  5 =  $1176 \div 5 = 235.2$

What does the displayed by your calculator mean in terms of money?

It means 235.2 thousands of pounds. This is £235,200

## Republic of Ireland

Total revenue = 2161

Mean = Total revenue  $\div$  5 =  $2161 \div 5 = 432.2$

What does the displayed by your calculator mean in terms of money?

£432,200

## England

Total revenue = 7058

Mean = Total revenue  $\div$  ? =  $7058 \div 5 = 1411.6$

What does the displayed by your calculator mean in terms of money?

£1,411,600

# HANDLING DATA ANSWERS - TASK 4

**5. Determine an all-Ireland national average (mean) and compare it to the figure you already have for England.**

## All-Ireland

Total revenue =  $1176 + 2161 = 3337$

Mean = Total revenue  $\div$  ? =  $3337 \div 10 = 333.7$

Compare:

All-Ireland	£333,700
England	£1,411,600, approximately 4 times as large

**6. Which region had the largest range in revenues last year according to the data in the table above?**

If you are able to answer this without having to do any calculations please explain why:

England, quite easy to see as England had one company whose revenue was much larger than any other company in the table (£6,305,000) and another company whose revenue was £0.

# HANDLING DATA ANSWERS - TASK 5

## CONSTRUCTION MACHINERY

On site you will encounter a wide range of plant machinery from dozers to excavators to loaders and lorries. Each has a specific function on site and that function will determine the design and specification of the vehicle. Below are cards showing a range of plant machinery and their dimensions. Compare the vehicles and look at the weight, lengths and power of each. The cards can be used to play a game of trumps later.

### LARGE DOZER

A



**Engine power**- 259 kW  
**Max. Operating Weight** - 38,488 kg  
**Overall length** - 5.6m  
**Fuel tank** – 643 litres

### TRACKED EXCAVATOR

B



**Engine power** - 124kW  
**Max. Operating Weight** - 20,003 kg  
**Overall length** - 8.37m (Transport length)  
**Fuel tank** – 253 litres

### SKID STEER LOADERS

C



**Engine power** - 52kW  
**Max. Operating Weight** – 2,650 kg  
**Overall length** - 3.27m  
**Fuel tank** – 80 litres

### MEDIUM DOZER

D



**Engine power** - 93kW  
**Max. Operating Weight** – 13,460kg  
**Overall length** - 4.7m  
**Fuel tank** – 295 litres

### WHEELED LOADER

E



**Engine power** – 180kW  
**Max. Operating Weight** – 25,400kg  
**Overall length** - 8.1m  
**Fuel tank** – 210 litres

### MOBILE CRANE

F



**Engine power** – 205kW  
**Max. Operating Weight** – 29,000kg  
**Overall length** - 10.5m (transport position)  
**Fuel tank** – 300 litres

# HANDLING DATA ANSWERS - TASK 5

## DUMP TRUCK

G



**Engine power** – 246 kW  
**Max. Operating Weight** – 53,140kg  
**Overall length** - 6.9 m  
**Fuel tank** – 410 litres

## VIBRATING ROLLER

H



**Engine power** – 100 kW  
**Max. Operating Weight** – 11,550kg  
**Overall length** - 4.5 m  
**Fuel tank** – 200 litres

## ROLLER

I



**Engine power** – 97 kW  
**Max. Operating Weight** – 11,300kg  
**Overall length** - 5.4 m  
**Fuel tank** – 300 litres

## BACKHOE LOADER

J



**Engine power** – 74.2kW  
**Max. Operating Weight** – 8,660kg  
**Overall length** - 5.9 m  
**Fuel tank** – 160 litres

# HANDLING DATA ANSWERS - TASK 5

Using the cards for construction machinery, answer the questions below.

## 1. What is the range of engine powers in the vehicles?

$$259 - 52 = 207\text{kw}$$

## 2. Round each of the lengths to the nearest metre.

VEHICLE	LENGTH ROUNDED to nearest metre	VEHICLE	LENGTH ROUNDED to nearest metre
A. Bulldozer	6m	F. Mobile Crane	11m
B. Tracked Excavator	8m	G. Dump Truck	7m
C. Skid steer Loaders	3m	H. Vibrating Roller	5m
D. Medium Dozer	5m	I. Roller	5m
E. Wheeled Loader	8m	J. Backhoe Loader	6m

## 3. For the two dozers (A) and (D), what is the average (mean) engine power?

$$259 + 93 = 352$$

$$352 \div 2 = 176 \text{ kw}$$

## 4. What is the range in lengths of the construction vehicles?

$$53,140 - 2650 = 50,490\text{kg}$$

# HANDLING DATA ANSWERS - TASK 5

5. Work out the order of the cards based on the actual overall length of each vehicle. You don't need to write out the name of each vehicle, simply use the letters on each card A to J.

Vehicles - smallest to largest overall lengths	
1	C
2	H
3	D
4	I
5	A
6	J
7	G
8	E
9	B
10	F

6. What is the range in lengths of the construction vehicles?

$$10.5 - 3.27 = 7.23\text{m}$$

7. What is the range in sizes of the fuel tanks?

$$643 - 80 = 563 \text{ litres}$$

8. What is the operating weight of the mobile crane in tonnes?

$$29,000 \div 1000 = 29 \text{ tonnes}$$

# HANDLING DATA ANSWERS - TASK 6

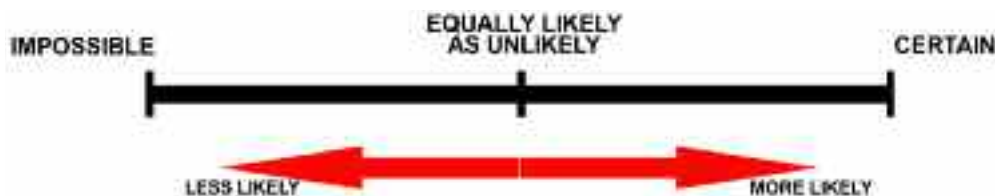
## CHANCES ARE - ANSWERS

Probability is an area of mathematics used to measure uncertainty. In life the outcome of many events is not predictable but it is possible to get an idea of how likely some things are to happen. Being able to tell how likely something is to happen is very important in construction especially when it comes to health and safety. Insurance companies base their premiums directly on probabilities.

A scale is used to represent probability with “impossible” at one end and “certain” at the other. All other outcomes can be placed somewhere on the scale between these two extremes. Things that are unlikely are placed near the impossible end whilst things likely to happen are placed near the certain end. We can use common sense to place some outcomes on the scale....

### 1. For example, place the following outcomes on the probability scale below

- A. Someone chosen at random from a construction trade is a man
- B. Someone who follows all safety guidelines has an accident
- C. A mortar mixture will harden if someone forgot to add cement
- D. A warm but poorly insulated building will lose heat on a cold day
- E. Someone chosen at random from the community is a woman



- A. Very likely so very near the certain end.
- B. Unlikely but not impossible, quite near impossible end.
- C. Impossible.
- D. Certain.
- E. Equally likely as unlikely so in the middle of the scale.



# HANDLING DATA ANSWERS - TASK 6

Sometimes we cannot just tell from common sense how likely an outcome is or whether one outcome is more likely than another. In order to tell if some outcomes are more likely than others we need to represent probabilities using fractions. The top of the fraction is the number of favourable outcomes and the bottom of the fraction is the number of possible outcomes.

$$\text{Probability} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

**2. Complete the following table to help you practice working with different kinds of fractions and then you can try to answer some probability questions.**

Fraction	Decimal	Percentage	Outcome description
0	0	0	Impossible
<b>1/10</b>	0.1	10	<b>Very unlikely</b>
<b>1/4</b>	<b>0.25</b>	25	Unlikely
1/2	<b>0.5</b>	<b>50</b>	Just as likely as not to happen
<b>3/4</b>	0.75	<b>75</b>	<b>Likely</b>
<b>9/10</b>	<b>0.9</b>	90	Very likely
1	<b>1</b>	<b>100</b>	<b>Certain</b>

Use the definition of probability given above to determine how probable the following events are to happen.

**3. McAteer and Bushe, a local construction company, have purchased 4 brand new lorries. Only one of them has air-conditioning for the cab. If a driver chooses a lorry to drive at random what is the probability it will have air-conditioning.**

1/4

**4. What is the probability it won't have air-conditioning?**

3/4

# HANDLING DATA ANSWERS - TASK 6

**5. If you have not already done so express your answers to the latter two questions in percentage form.**

25% and 75%

**6. What do you notice about the answers when you add them together?**

They add to 100%

**7. The probability of a lorry breaking down in service is 0.05. Use what you have learned in the previous question to determine the probability that a lorry will not break down in service.**

$0.1 = 10\%$

$10\% + 90\% = 100\%$

So required probability is 90%

**8. Write down a rule to help you find the probability of something not happening if you already know the probability of it happening.**

Probability of happening + probability of not happening = 100%

# HANDLING DATA ANSWERS - TASK 7

## HEALTH AND SAFETY

As mentioned in the previous task, one important use of probability in the construction sector is linked to the management of health and safety. You can now try to apply what you have learned above to the following scenario:

A Safety at Work study has been carried out for the construction industry in another EU country. It has been determined there is a 1% chance an operative (18-65 years old) will have an accident whilst driving machinery.

**1. What is the probability that an operative will not have an accident whilst driving machinery?**

$$100 - 1 = 99\%$$

or

$$1 - 0.01 = 0.99$$

**2. If 1% of the 30000 operatives working in Northern Ireland have an accident when using machinery, how many would that be?**



$$30000 \div 100 = 300$$

# HANDLING DATA ANSWERS - TASK 7

The study also looked at safety of pneumatic drills and found that there is a 1 in 50 (that's 2%) chance an operative will have an accident whilst using one.

### 3. Which of the activities appears to be more accident prone, driving machinery or using a pneumatic drill?

2% is more than 1% so

Pneumatic drill is more accident prone

Of the 30000 operatives referred to above, 1500 of them are over 50 years old.

### 4. What is the probability that an operative is over 50?

$1500/30000 = 15/300 = 1/20$  (because  $20 \times 15 = 300$ )

or  $15/300 = 5/100 = 1/20$

or  $15/300 = 3/60 = 1/20$

There are ten different tasks given to operatives in one company. Five involve driving machines, two involve using pneumatic drills and three involve the use of hand tools.

### 5. What is the probability an operative will be given a task involving a hand tool?

3/10

# HANDLING DATA ANSWERS - TASK 7

**6. What is the probability that the operative will NOT be given a task involving a hand tool?**

7/10

**7. What is the probability that the operative will be given a task involving use of a pneumatic drill?**

$2/10 = 1/5$



# Useful Websites



**There are many useful websites you can use to help you practice your skills.**

**<http://rwp.qia.oxi.net/embeddedlearning/>**

This site contains *Skills for Life* Materials for Embedded Learning aiming to help you improve the literacy, language or numeracy skills you need for work. There are some interactive materials set in everyday contexts and giving practice in some of the literacy and numeracy skills developed in the paper-based materials.

**<http://www.bbc.co.uk/skillswise/>**

This website has factsheets, worksheets and interactive quizzes to help you practice your numeracy skills.

**[http://www.bgfl.org/bgfl/custom/resources\\_ftp/client\\_ftp/ks2/maths/3d/index.htm](http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/3d/index.htm)**

Link takes you to a site where you can practice your skills in recognising and working with 2D and 3D shapes.

**<http://www.counton.org/>**

This site has numeracy activities at a variety of levels. There are interactive activities letting you practice your skills as you play.

**<http://www.oswego.org/ocsd-web/games/Mathmagician/mathsmulti.html>**

This link takes you to a game to help you practice your tables.