

Having investigated the practical impact of inaccuracy and error I can use my knowledge of tolerance when choosing the required degree of accuracy to make real-life calculations.

MNU 4-01b

I can apply my knowledge and understanding of measure to everyday problems and tasks and appreciate the practical importance of accuracy when making calculations

MNU 4-11a

## Real Life Calculations

The questions in this booklet require a wee bit of rounding and also some common sense (these questions might help you...Should this answer be a whole number? Should I round up or round down here? Is this solution sensible just mathematically or does it fit with how things work in real life?).



1. Cans of Irn Bru come in six-packs. These are then put into boxes with four six-packs per box. To make sure that 284 students in S2 have a can each, how many boxes should be ordered?



2. Logan is hoping to record a music album. The recording studio charges £1550 to record and produce the master copy and it costs £1.25 to make each copy. If he sells each CD for £10, how many will he have to sell to make a profit?

3. Mrs Smith is wanting to buy an iPad for her cat (who is called "Fractions"). Mrs Smith has spotted one on sale for £299. She already has £112 and can afford to save £35 a week. When will she be able to buy the iPad?



4. Using a calculator, Heidi multiplied by 7 when she should have divided by 7 and the display read 7742.

What should the correct answer have been?

5. A chocolate company have a promotion where you can redeem 8 empty wrappers for a free bar! You manage to get your hands on 71 wrappers. How many bars can you get using this deal but with no extra money?



6. A little frog falls down a well 80m deep. If every day it climbed up 11m and every night it dropped back 7m, how many days did it take to reach the top?

7. Lorraine decides to sell the 198 dollars she had left over from a holiday. Comparing rates in a few places, she opts for the highest rate of 1.8 (dollars to the pound) rather than the lowest, of 1.5. Too late, she realises her mistake. How much did she lose out?



8. The following information is collected from a bus company.

	Capacity (excluding driver)	Daily Hire Cost (unlimited mileage)
<b>Double Decker</b>	122 seats	£175
<b>Single Decker</b>	53 seats	£110
<b>Minibus</b>	17 seats	£65

There are 270 people going to Alton Towers.

The organisers are going to fill the largest buses first- so the only spare seats will be on the final bus. Using this system there are a number of possible booking options, a couple of which are shown in the table opposite.

- Copy and complete all possible options, showing how many spare seats would be on the final bus and the total hire cost.
- Which option works out the cheapest?
- Which option wastes fewest seats?

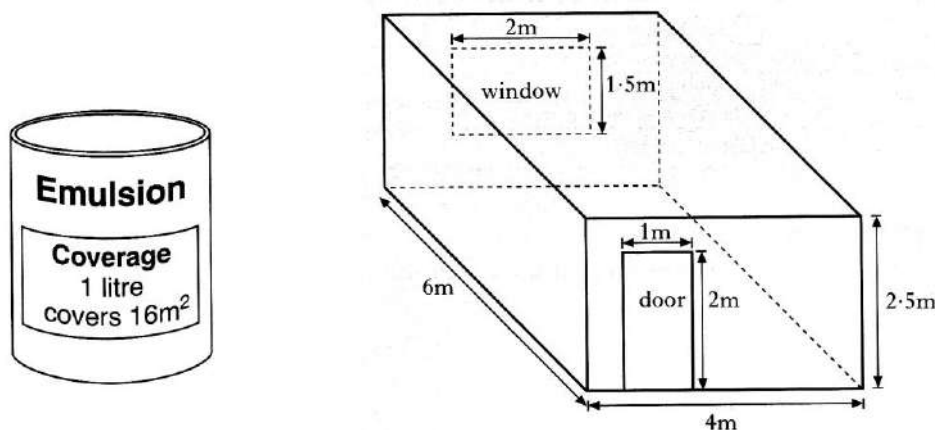
Double Decker	Single Decker	Minibus	Cost	Spare Seats on Final bus
3	0	0	£525	96
2	1	0	£460	27



9. Daisy reads 9 books in the 39-week school year. She wanted to figure out about how long she spent reading each book, so she divided. Daisy got 4 remainder 3 as an answer and is confused about what the 3 represents? How would you help Daisy understand the problem?



10. Isabel is planning to paint the walls of her room with emulsion paint. The room is in the shape of a cuboid, with the dimensions shown.



- How much paint does Isabel need to paint the walls of her room?
- Paint is only sold in 1 litre and 2.5 litre tins. What will be the minimum cost of painting Isabel's room with emulsion ?



11. Mr Houston is arranging a visit to Murrayfield for parents, teachers and pupils.

The ratio of parents to teachers to pupils **must** be 1:3:15.

- a) 45 pupils want to go to the rugby match. How many teachers must accompany them?
- b) The stadium gives the school 100 tickets for a match. What is the maximum number of pupils who can go to the match?



12. To make "14 carat" gold, you mix copper and pure gold in the ratio 5:7.

A jeweller has 160g of copper and 245 grams of pure gold.

What is the maximum weight of "14 carat gold" that the jeweller can make?



13. A coffee shop blends its own coffee and sells it in one-kilogram tins.

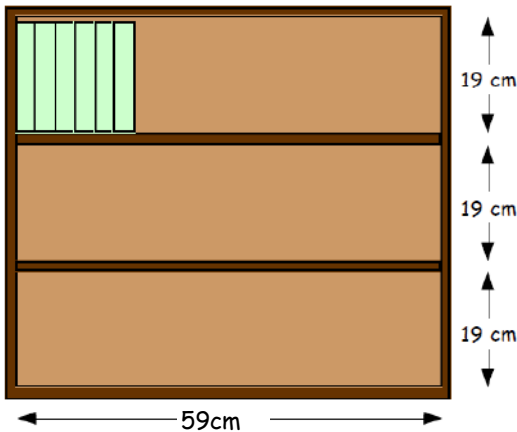
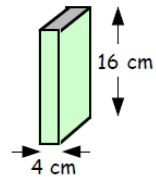
One blend consists of two kinds of coffee, Brazilian and Colombian, in the ratio 2:3.

The shop has 20kg of Brazilian and 25 of Colombian in stock.

What is the **maximum** number of one-kilogram tins of this blend which can be made?

14. The three shelves on a bookcase are 59cm wide and 19cm tall.

Willie has a large collection of encyclopedias. Each volume is 16cm tall and 4cm wide.

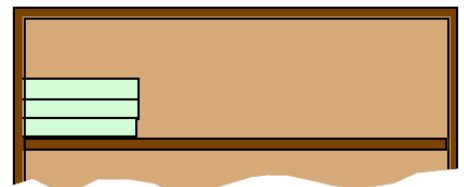


First, Willie stacks books on the top shelf, standing up.

- a) How many books can be stacked along the top shelf?
- b) How many books can the bookshelf hold stacked in this way?

Then Willie decides to stack the books lying flat.

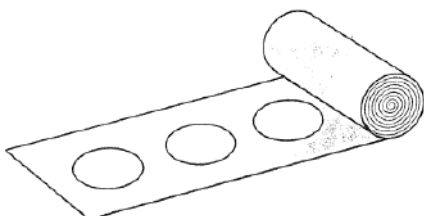
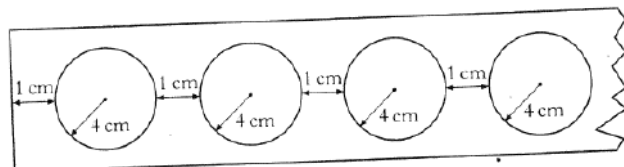
- c) How many bundles can be fitted along the shelf this way?
- d) How many books can be stacked one on top of the other in each bundle on the shelf?
- e) How many books can be fitted on each shelf?
- f) How many books can the bookcase hold stacked in this way?



15. Circular tops for yoghurt cartons are cut from a strip of metal foil as shown.

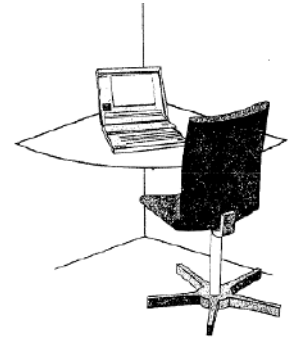
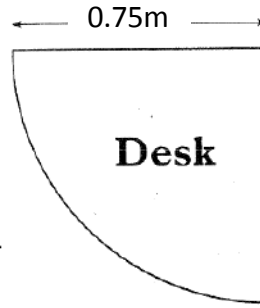
The radius of each top is 4cm.

The gap between each top is 1cm.

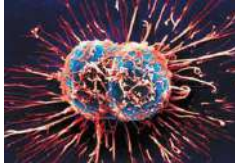


How many tops can be cut from a strip of foil 7metres long?

16. The top of Callum's desk is in the shape of a quarter-circle as shown.



- a) Calculate the area of the top of the desk.
- b) Callum wants to paint the top of his desk. The tin of paint he buys has a coverage of  $1\text{m}^2$ . Using this tin of paint how many times could he paint the top of his desk?

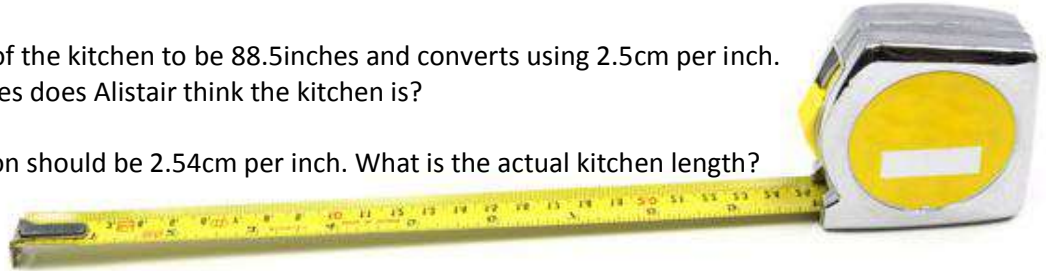


17. A scientist places a cell in a petri dish. The cell splits into two after a day. These two cells split into four cells the next day. The number of cells continues to double daily. The petri dish is full after 30 days. After how many days is the petri dish half full?

18. Chris and his father-in-law Alistair are preparing and measuring a room that Chris hopes to convert into a new kitchen. While Chris tears down some old cabinets, Alistair offers to measure the room so they know what units to buy to fit the space.

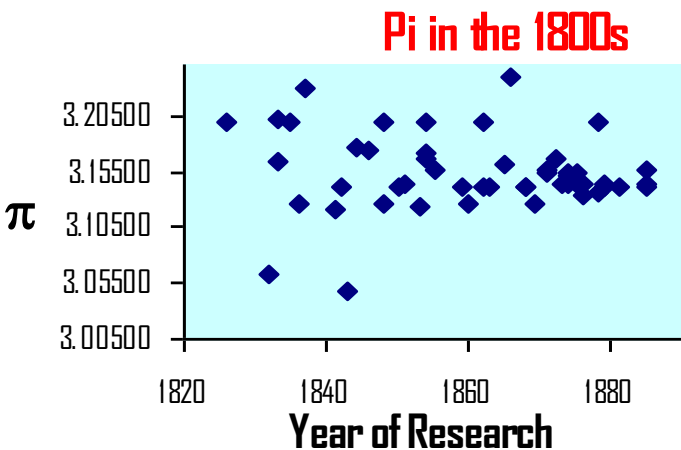
Alistair measures the length of the kitchen to be 88.5 inches and converts using 2.5 cm per inch.

- a) How many centimetres does Alistair think the kitchen is?
- b) The precise conversion should be 2.54 cm per inch. What is the actual kitchen length?



19. Various writers throughout the 19<sup>th</sup> Century confidently reposted that they'd found the true and exact value of  $\pi$ . Unfortunately, they didn't all give the same answer... In 1977, Mathematician Underwood Dudley recorded 50 of these published values (to 5 d.p.) for the constant that we know with great accuracy (thanks to the power of modern computers) is about 3.14159265358979323846...

Year	Estimate	Year	Estimate	Year	Estimate	Year	Estimate	Year	Estimate
1826	3.20000	1844	3.17778	1855	3.15532	1869	3.12500	1876	3.14283
1832	3.06250	1846	3.17480	1859	3.14159	1871	3.15470	1876	3.13397
1833	3.20222	1848	3.20000	1860	3.12500	1871	3.15544	1878	3.20000
1833	3.16483	1848	3.12500	1862	3.14214	1872	3.16667	1878	3.13514
1835	3.20000	1850	3.14159	1862	3.20000	1873	3.14286	1879	3.14286
1836	3.12500	1851	3.14286	1863	3.14063	1874	3.15208	1879	3.14158
1837	3.23077	1853	3.12381	1865	3.16049	1874	3.14270	1881	3.14159
1841	3.12019	1854	3.16667	1866	3.24000	1874	3.15300	1885	3.14187
1842	3.14162	1854	3.17124	1868	3.14214	1875	3.14270	1885	3.14286
1843	3.04862	1854	3.20000	1868	3.14159	1875	3.15333	1885	3.15625



Using the table above, find:

- a) the lowest estimate for  $\pi$
  - b) the highest estimate for  $\pi$
  - c) the range of estimates for  $\pi$
  - d) which year(s) gave the best estimate for  $\pi$
  - e) which year(s) gave the worst estimate for  $\pi$
  - f) the percentage error for the worst estimate.
- Hint: use  $\frac{\text{error}}{\text{actual value}} \times 100$

## ANSWERS

1. 12 boxes
2. 178 CDs
3. 6 weeks
4. 158
5. 64 of the wrappers would give **8** free bars. You could eat all 8 and that would give you **1** free bar. Eat this and use the 7 leftover bars to get **1** more free bar. So the answer is **10** free bars!
6. The frog ends up 4m higher after each day and night so after 18 full days it will be 72m up. During the day there are only 8m to climb- he will make it on day 19!
7. £22
8. a) see table below  
 b) 2 double deckers and 1 single decker is cheapest (£460)  
 c) 16 minibuses wastes fewest seats (2)

3	0	0	£525	96
2	1	0	£460	27
2	0	2	£480	8
1	3	0	£505	11
1	2	3	£590	9
1	1	6	£675	7
0	6	0	£660	48
0	5	1	£615	12
0	4	4	£700	10
0	3	7	£785	8
0	2	10	£870	6
0	1	13	£955	4
0	0	16	£1,040	2

9. It's a remainder of 3 when divided by 9. That's three ninths (or one third). So she spent four and a third weeks on each book.
10. a) 2.8125L      b) £19.25
11. a) 9 teachers    b) 75 pupils
12. 384g
13. 40 one kilo tins
14. a) 14    b) 42    c) 3    d) 4    e) 12    f) 36
15. 77
16. a)  $0.44\text{m}^2$       b) 2 times
17. 29 days
18. a) 221.25cm    b) 224.79cm
19.
  - a) 1843: 3.04862
  - b) 1866: 3.24000
  - c)  $3.24000 - 3.04862 = 0.19138$
  - d) 1850, 1859, 1868, 1881 (all correct to 5 d.p.)
  - e) 1866 is the worst
  - f)  $(3.24000 - 3.14159) / 3.14159 * 100 = 3.13\%$  error