Using contexts and models to support mathematical development: resource materials

These activities and examples of students' work support the *Using contexts and models to support mathematical development* article by Frank Eade and Sue Hough of Manchester Metropolitan University available on the QCDA website (www.qcda.gov.uk)

1. Grocer - balance, number lines and algebra
2. Shorts Changed
3. Ratio (and examples of students' work)
4. Pablo's Pizzas
5. Percentages
6. Area and volume 1
7. Algebra (and examples of students' work)
8. Area and volume 2 (and examples of students' work)

Activities 1, 2, 4, 5 and 6 are examples of materials for Foundation Tier GCSE students. They are taken from a text called *Making Sense of Mathematics* currently being trialled by schools working with MMU.

If you intend to try out these activities please make sure you work on them yourself before hand.

Activity 1: The Grocer

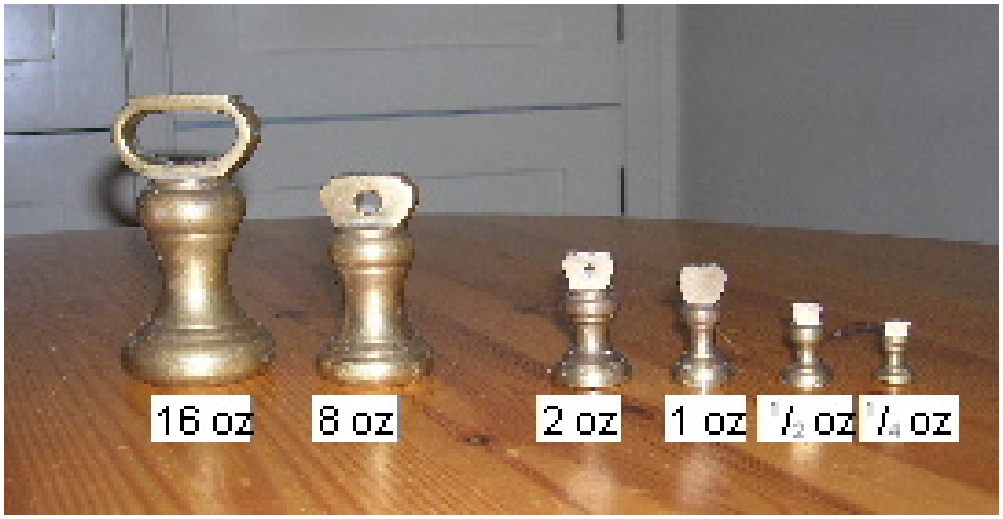
This activity provides two examples of algebra models. The first example looks at balance. Note how it starts with a real balance and gradually the drawings become more abstract. The second example using the number line as a model for solving equations.

Example 1 The grocer

1. Here is a set of weighing scales. There is nothing in the dish and there are no weights on the other side. How can you tell that these scales are balanced?

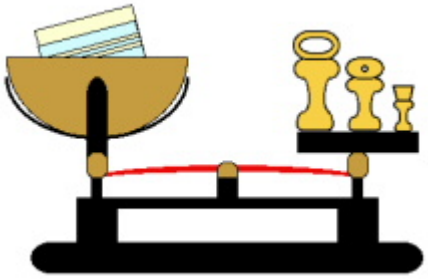
2. a) Look closely at these photographs and describe what you see:

b) How much flour is in the bag?

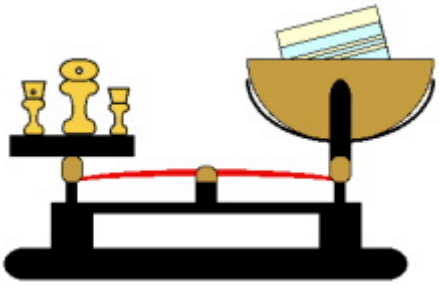


3. Write down a statement about the weight of flour in each of the following pictures

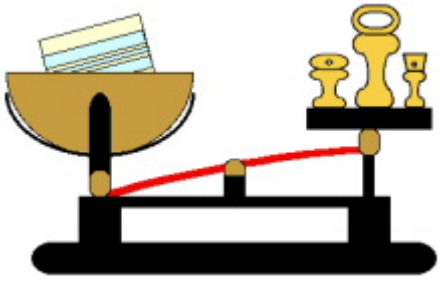
a) 16 8 1



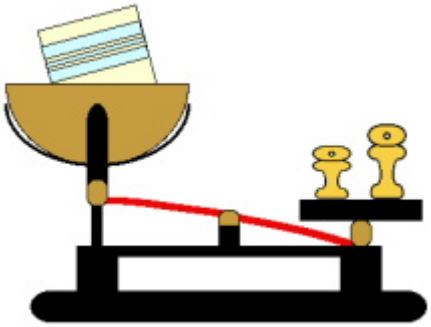
b) 2 8 1



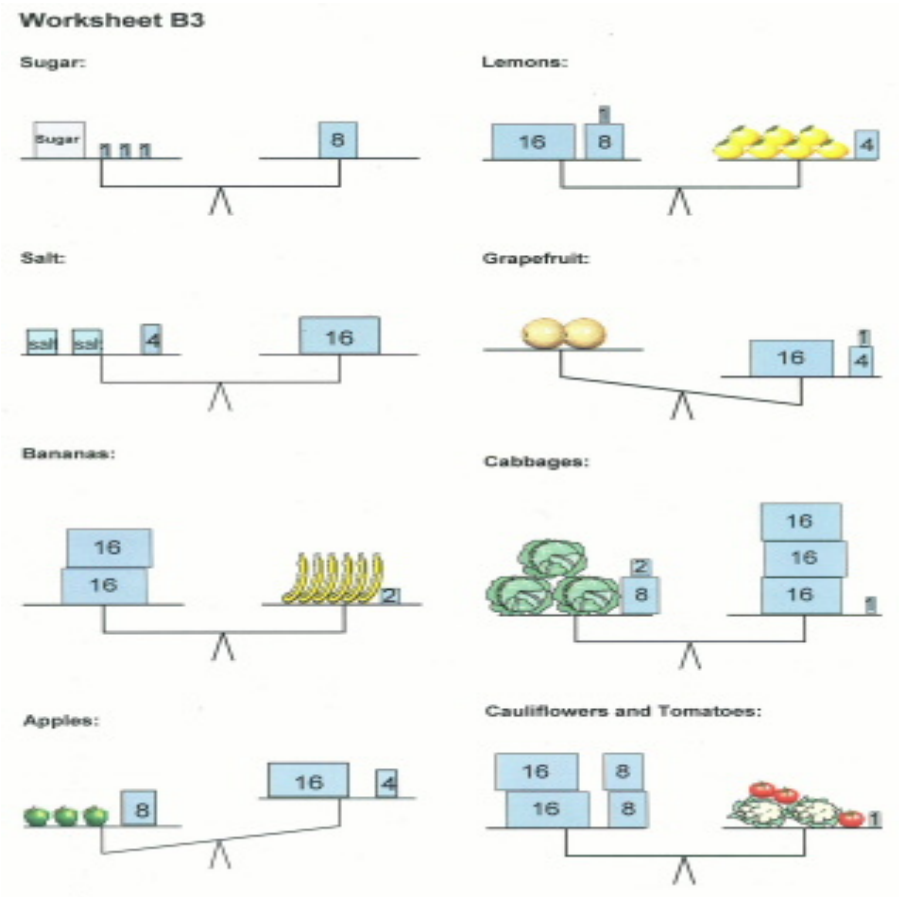
c) 4 16 2



d) 4 8



4. Look at the weighing pictures below. Work out as best you can the weight of each object.



5. For each of the following problems

a. copy out the problem,

b. draw a scales picture,

c. try to find the value of the object.

i. $6R + 15 = 11R + 5$

ii. $12T + 34 = 4T + 38$

iii. $2U + 17 + 3U = 11 + 7U$

iv. $20 = 7V + 6$

v. $17 + 3W + 4 = 6 + 2W + 3 + 5W$

vi. $3f + 12 > f + 24$

vii. $13g + 60 < 6g + 109$

viii. $62 + 29h = 20 + 33h + 18$

ix. $4V – 5 = 7 – 2V$

Example 2: Froggit!!

Freddie (the frog) and his friends like to play a game which involves getting from one point to another in a number of equal jumps.

So, for example, Freddie covers a distance of 9m in 3 equal jumps.

1. What was the length of each of Freddie's jumps?

Tina isn't as good at the game as Freddie. She makes 4 equal jumps but is still a metre short.

2. How far was each of Tina's jumps?

The smaller frogs now join in as well, but obviously using much shorter distances. The table below shows what happened. We have put Freddie and Tina in the table as well, so you can check your answers to Q 1 & 2.

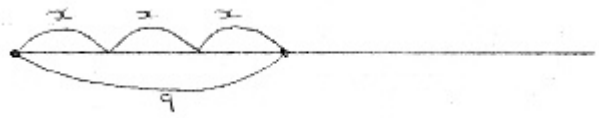
3. Fill in the blank column in the table in each case.

Frog name	Total distance to jump	Number of equal sized jumps	Finishing point	Size of each jump
Freddie	9m	3	Exactly right	3m
Tina	9m	4	1m short	2m
Tommy	30cm	7	2cm short	
Funky	27cm	5	3cm too far	
Tillie		5	2cm too far	10cm

 Steve is a frogologist at the University, and likes to watch the frogs and estimate the distances that they are jumping.

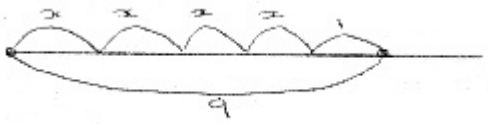
Instead of using a table, Steve writes down his observations and then draws a diagram for each frog.

So, for Freddie he writes down 3x = 9 and then draws



Freddie

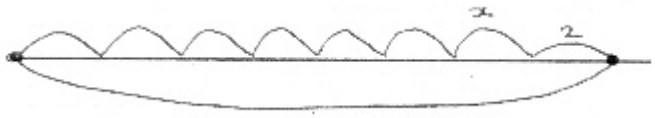
And for Tina, he writes 4x+1=9 and then draws



Tina

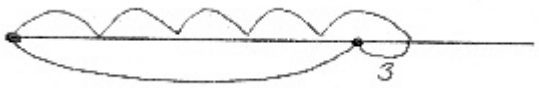
The writing and part of his drawings for Tommy and Funky are shown below. Copy the diagrams, label them, and put on any missing information.

7x+2=30



Tommy

5x-3=27

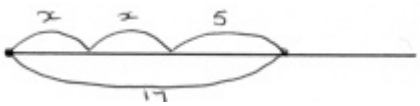


Funky

When Steve gets back to the University, he looks at five drawings that he made last week.

4. For each of these drawings, describe what each frog did, and then write down the size of each equal jump.

a)



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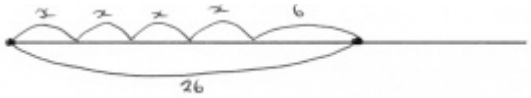
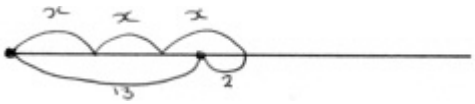


c)



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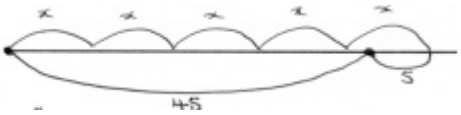
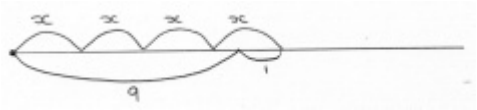


e)



5. Steve also has some where he wrote down what happened, but hasn't yet done the drawings. Make a number line drawing for each of the following

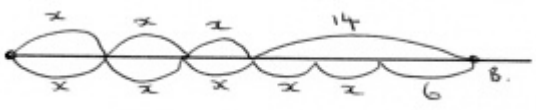
(a). $3x + 2 = 11$

(b). $15 = 4x + 3$

(c). $27 = 5x - 3$

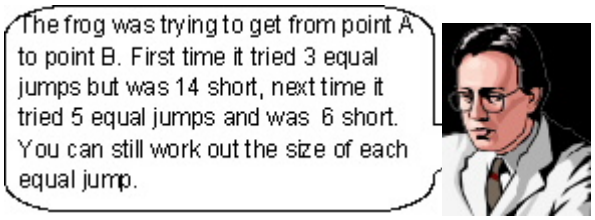
(d). $6x - 4 = 32$

6. While Steve is on holiday, Simon records the jumps for him. Unfortunately, he does it in a different way, and doesn't write down the total distance. Instead he draws the following



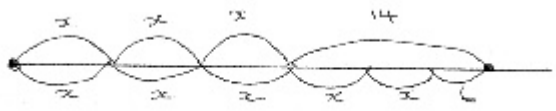
And writes $3x + 14 = 5x + 6$

When Steve asks Simon what the drawing means, he says



Explain carefully how Simon can still work out the size of each equal jump.

7. In school, a teacher uses some of Steve's drawings to play the game 'Say what you can see'



For 3x+14=5x+6

Some ideas from the class were

2x+14=4x+6

3x=3x

2x+6=14

3x+14-6=5x

3x+14-6-5x=0

5x+6-14-2x=x

Discuss the above statements with your class. Write down two more statements that you could make from looking at the number line.

8. Beth was trying to write down some statements for the equation

$4x + 5 = x + 12$

She wrote the following

$4x = 12$

$3x + 5 = 12$

$5x + 5 = 2x + 12$

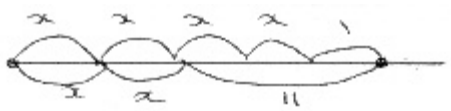
$4x + 5 + 12 = x$

$8x + 10 = 2x + 24$

$4x + 5 - 12 - x = 0$

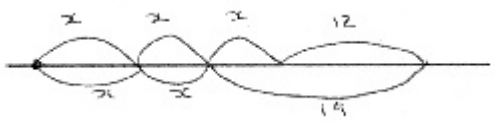
Some of her statements are **correct** and some are **incorrect**. For each statement, say whether it is right or not and give a reason. For the incorrect ones, you might be able to say why she has made the mistake and what the correct answer should be.

9. In each of the following, one statement has been done for you. Copy the drawing into your book and then write down three other statements you could make by looking at the number line.



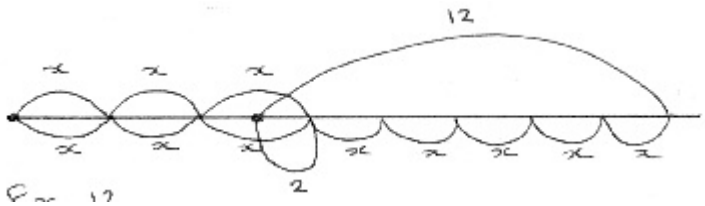
a)

$4x + 1 = 2x + 11$



b)

$3x + 12 - 19 = 2x$



c)

$3x - 2 = 8x - 12$

Activity 2: Shorts Changed

1. Mary went to Prishop and bought 6 pairs of shorts (all the same price, but different colours) and two pairs of jeans (same price and colour).

   She spent £30.

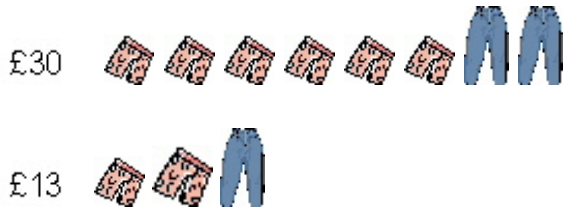
What can you say about the cost of jeans and shorts?

You already have some shorts and a pair of jeans that you have never worn.

As she was about to leave, her mother said,

She insisted that Mary return 2 pairs of shorts and a pair of jeans and she was refunded £13.

The diagram provides a summary of this.



Make sure you see the connection between this diagram and the story above. Can you think of another story?

a) Can you work out how much a pair of shorts costs?

Number of shorts	Number of jeans	Cost (£)
6	2	30
2	1	13

b) Here are two different representations of this situation.

Notebook: Equation: 6S + 2J = 30

2S + 1J = 13

Say to a partner what you think each of these is saying.

c) Use both of these to solve the problem making sure you link this back to the original story.

2. Look at the following information:

Poshshop				Basic Store		
Shirt	**Jeans**	**Cost**		**Shirt**	**Jeans**	**Cost**
3	5	£245		6	5	£135
2	3	£150		6	3	£105

a) Tell a story for each of these.

b) Write both of these in equation form.

c) Explain why it is much quicker to work out the cost of a pair of jeans from the Basic Store than from Poshshop. If you are not sure, go back to the story form for each store.

d) Work out the price of a shirt and the price of a pair of jeans from Poshshop.

What are we allowed to do?

3. Suppose $3S + 15J = 60$ ①

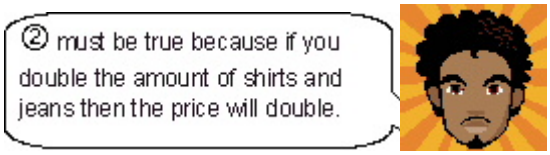
a) What story could this be?

b) Which of the following are also true?

$6S + 30J = 120$ ② $5S + 25J = 100$ ⑦ $1S + 5J = 20$ ③

$3S + 15J + 1 = 61$ ⑧ $4S + 16J = 61$ ④ $60 + 300J = 1200$ ⑨

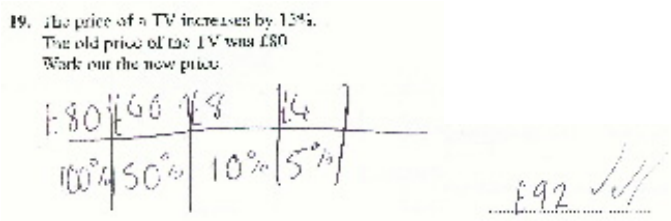
$7S + 35J = 140$ ⑤ $\frac{1}{2}S + 2\frac{1}{2}J = 10$ ⑩ $5S + 21J = 81$ ⑥



c) Summarise what you think you are allowed to do

Activity 3: Ratio

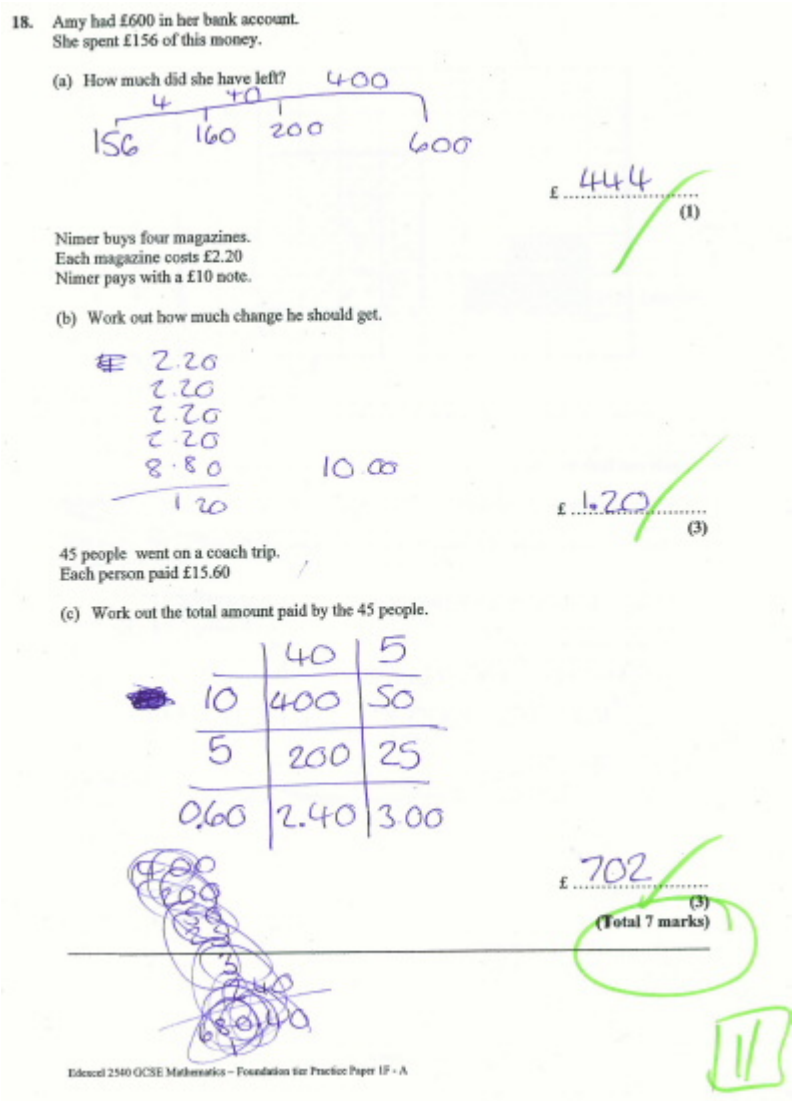
The following examples show different examples of students work. Note the strong use of ratio tables and other models to solve a range of problems.



19. The price of a TV increases by 15%.
The old price of the TV was £80
Work out the new price

£80 | £40 | £8 | £4
100% | 50% | 10% | 5%

£92



18. Amy had £600 in her bank account.
She spent £156 of this money.

(a) How much did she have left?

4 40 400
156 160 200 600

£ 444
(1)

Nimer buys four magazines.
Each magazine costs £2.20
Nimer pays with a £10 note.

(b) Work out how much change he should get.

£ 2.20
2.20
2.20
2.20
8.80

10.00
1.20

£ 1.20
(3)

45 people went on a coach trip.
Each person paid £15.60

(c) Work out the total amount paid by the 45 people.

	40	5
10	400	50
5	200	25
0.60	2.40	3.00

£ 702
(3)
(Total 7 marks)

Edexcel 2540 GCSE Mathematics – Foundation tier Practice Paper 1F - A

22. An English exam has two sections, section A and section B.

Section A is out of 40.
Section B is out of 20.

Nish scored 45 marks for the two sections.

Belinda scored 75% in section A and 60% in section B.

Who scored the higher marks?
Explain your answer.

A 100% | 50 | 75% | = 30 in A
40 | 20 | 30 | 12 + 30 = 42

B 100% | 10% | 20% | 60 = 12 in B
20 | 2 | 4 | 12

Nish scored higher ✓

(Total 4 marks)

22. Andy sells CDs.
He sells each CD for £8.80 plus VAT at 17 $\frac{1}{2}$ %.

He sells 650 CDs.

Work out how much money Andy gets.

100% | 10% | 1% | 1.54
8.80 | 8.8 | 0.088 | 17.5

£ 6721

(Total 4 marks)

Q22 4

5 Work out 28% of 32

Answer 8.96 (2 marks) 2

100% | 1% | 28%
32 | 0.32 | 8.96

0.32 × 28 = 8.96

14/17

Turn over ▶

45 people went on a coach trip.
Each person paid £15.60

(c) Work out the total amount paid by the 45 people.

People | 1 | 10 | 20 | 40 | 5
Paid | 15.60 | 156 | 312 | 624 | 78

50
£5
5

624 + 78

694 + 702

£ 702

(3)
(Total 7 marks)

5 Work out 28% of 32

100%	10%	20%	1%	2%	5%
32	3.2	6.4	0.32	0.64	1.60

$\times 32 \times 5 = 1.60$

Answer 7.96 (2 marks) 1

6.4
1.60
0.64
0.32
7.96

(b) Work out $810 \div 6$

1	10	100	2	5	50	810	150	15
6	60	600	12	30	300		900	90

- take away

Answer 135 (2 marks) 2

21. Ron received his pocket money on Saturday.

He spent $\frac{3}{10}$ of his pocket money on magazines.

He spent $\frac{3}{5}$ of his pocket money on a book.

What fraction of his pocket money did he have left?

1/10

(Total 4 marks)

Activity 4: Pablo's Pizzas

Pablo's Restaurant

Pablo has for many years run a family pizza restaurant in Rome. He is famous for making "Pizza al Taglio", which are huge rectangular pizzas which groups of people share between them.

Menu

Circular Pizza		Rectangular Pizza	
12" (30 cm)	£6	16" (40 cm)	£8
16" (40 cm)	£8	24" (60 cm)	£12
20" (50 cm)	£10	30" (75 cm)	£14

When he moves to the UK and opens his first restaurant, he is told that people are more used to circular pizzas, so he decides to offer both circular and rectangular pizzas on the menu. A section of the menu is shown here.

Vikki and 3 of her friends decide to share a circular 16" (40 cm) Pablo Special between them.

1. What measurement of the pizza is 16" (40 cm)?

2. Draw a sketch of the pizza, and show how Vikki might cut the pizza so that each person gets the same amount.

3. The pizzas cost £8 each. How much should each person pay?

While Vikki is in the restaurant, a party of 24 people arrive and they are seated at 3 tables, with 8 people at each table. At the first table, Ben orders 5 circular 16" (40 cm) Pablo Specials to share between them.

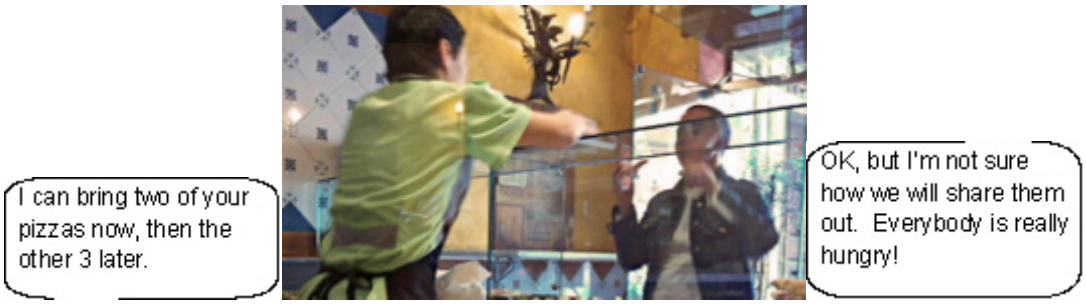
When the five pizzas arrive at Ben's table, immediately there is an argument about how best to cut the pizzas so that each gets the same amount.

4. Draw a sketch of the pizzas and show how they could be cut so that each of the 8 people gets the same amount.

5. Is there more than one way of doing this? Compare your drawings with others in the class. What do you think is the best way to share out the pizzas?

6. Someone at another table asks Ben how much pizza he has got. How would you describe how much pizza Ben has on his plate?

The second table also orders five 16" pizzas between the 8 of them, but after 20 minutes the pizzas still haven't arrived and they are starting to get hungry. The waiter says that some of their pizzas are ready, but they will have to wait for the others.



They decide to share out the 2 pizzas equally, and then share out the other 3 when they arrive.

7. Draw a sketch of the pizzas to show how they will do this.

8. How much does each person get out of the first two pizzas?

9. How much does each person get out of the other 3 pizzas?

The third table of 8 orders 6 16" pizzas between them and when they arrive (all together!) they share them equally. Peter says, "I have ½ of a pizza on my plate and also ¼ of a pizza."

10. Draw a sketch to show how the pizzas are shared out at this table.

11. Peter says, "We each have $^{1}/8$ of a pizza more than the people at the other tables." Is this true? Make a drawing to explain your answer.

A few weeks later, Ben again visits the restaurant, this time with 4 of his friends. First of all they have to decide whether to order circular or rectangular pizzas.

12. Which would you choose? Give a reason for your answer.

They eventually decide to order a 30" (75 cm) rectangular pizza.

13. What measurement on the pizza is 30" (75 cm)?

14. Draw a sketch to show where Ben could slice the pizza so that each of them gets an equal amount.

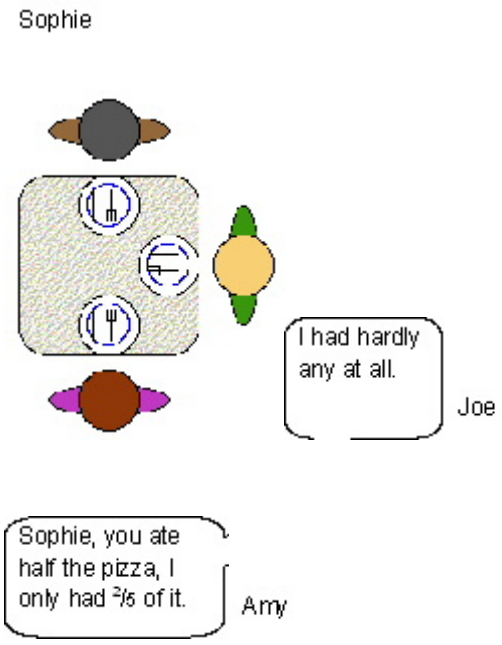
15. What fraction of the pizza does each person get?

16. 30" pizzas cost £14. How much should each person pay for their share?

Sammy the Slicer

Pablo decides to try to help people who can't work out how to share the pizzas equally between them. Sammy works in the restaurant on Saturdays and his job is to slice the pizzas before they arrive at the table. He only does this for rectangular pizzas. But what he enjoys most is listening to the arguments when the bill arrives. One Saturday night was particularly good for this.

On **Table 1** three people here ordered a 40 cm pizza cut into 10 equal pieces. The total cost was £8.



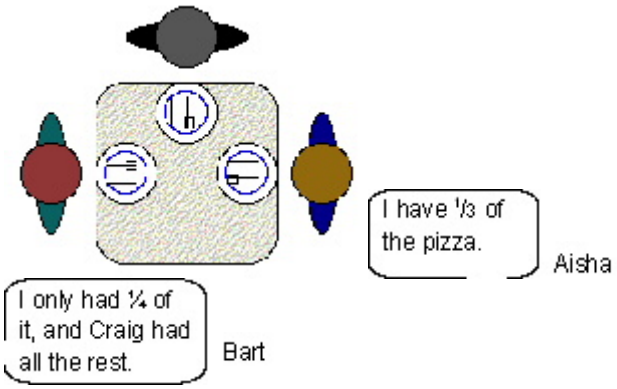
17. How many pieces did Amy eat?

18. How many pieces did Joe eat?

19. How much should each person pay towards the final bill?

The three people on **Table 5** ordered a 60 cm pizza costing £12.

Craig



Sammy couldn't remember how many pieces he had cut this pizza into.

20. How many pieces do you think Sammy had cut this pizza into? Give a reason for your answer.

21. How much of the pizza did Craig have?

22. How much of the pizza did Aisha and Bart have altogether?

23. Aisha paid for herself and for Bart. Craig paid for his own. How much should Aisha and Craig each pay towards the final bill?

At **Table 7**, Dale ate ½ the pizza, Ellen ate ¼ of it and Frankie ate $^1/6$ of it.

24. How many pieces do you think the pizza was sliced into?

25. Was all the pizza eaten? Give a reason for your answer. If some was left over, how much?

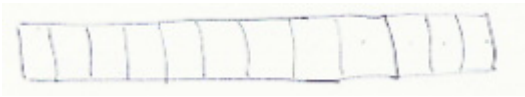
When Sammy gets back to school on Monday, he uses his work at the restaurant to help him with some questions on fractions.

The teacher's question is, **"Work out** $\frac{1}{3} + \frac{1}{4}$ **."**

Sammy thinks of this as someone having $^1/3$ of a pizza, their friend having ¼ of it, and working out how much they have altogether.

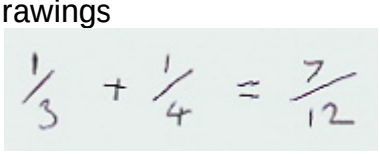

He says, This would be easiest if I'd sliced the pizza into 12 pieces

and he draws



So the person eating 1/3 would get 4 pieces, and the person eating 1/4 would get 3 pieces. So altogether they have eaten 7/12 of the pizza.

And he writes below his drawings



26. Why did Sammy decide to slice the pizza into 12 pieces?

27. Are there any other numbers of slices that he could have chosen?

28. Make a drawing to show what answer he would have got if he had cut the pizza into 24 pieces.

29. Show what Sammy would have drawn and how he would have answered the following questions:

a. $\frac{1}{2} + \frac{1}{6}$

b. $\frac{1}{3} + \frac{2}{5}$

c. $\frac{2}{3} + \frac{1}{4}$

d. $\frac{2}{3} - \frac{1}{4}$

e. $\frac{5}{6} - \frac{1}{3}$

30. Sammy got all the questions correct, but then struggled with the next question, which was

$$\frac{3}{4} + \frac{2}{5}$$

Make a drawing for this question and try to explain why Sammy found it more difficult. What do the you think the answer should be?

31. Make up a story from the pizza restaurant for

$$1\frac{3}{4} + 1\frac{2}{3}$$

32. Work out the answer to

$$1\frac{3}{4} + 1\frac{2}{3}$$

Additional Pizza Questions

These questions are all to do with the rectangular pizzas (Pizza al Taglio) sold at Pablo's restaurant.

1. Four friends share a 40 cm rectangular pizza.

   a) Make a drawing to show how they would slice the pizza so that each gets the same amount

   b) What is the size of each piece?

   c) What fraction of the pizza does each person get?

   d) If the pizzas cost £8, how much should each person pay?

2. Six friends share a 30" pizza and ask for it to be cut into 12 equal slices

   a) Make a drawing to show how the pizza was sliced

   b) Heather eats ¼ of the pizza. How many slices does she eat?

   c) Sally eats 2 slices. What fraction of the pizza does she eat?

   d) After Heather and Sally have had their slices, what fraction of the pizza is left?

3. Richard, Chris and Tariq sat at Table 4 and ordered a 60 cm pizza to share between them. Richard ate $^{1}/3$ of the pizza, Chris ¼ and Tariq had ½ of it.

   a) Make a drawing to show how many slices you think the pizza was cut into. Show how much Richard, Chris and Tariq ate.

   b) Did they eat all the pizza between them? Use your drawing to explain your answer.

   c) How much pizza was left over after the three of them had finished eating?

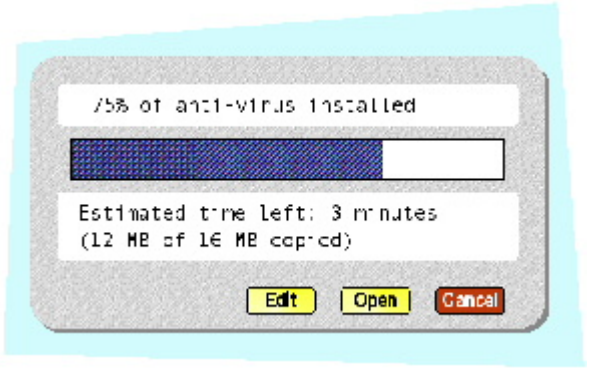
4. Azim and Chris are at Table 7. Azim says “I’m so full, I’ve eaten $^{2}/3$ of a whole pizza”. Chris says “ I feel OK, I only had $^{2}/5$ of it”

Sammy hears this conversation and thinks one of them has made a mistake. Make a drawing to show why Sammy thinks this.

Activity 5: Percentages

Downloading Programs

Demi has won £2000 in a caption competition to explain why she likes to start the day with Rice'o'Pops. With some of the money she decides to buy a new computer. When she gets it home she begins to install some software onto it. She starts with some anti virus software. After a few minutes this is what is on her screen:



1. a) What information is there in this window?

   b) How long has Demi left to wait?

   c) How long has she been waiting so far?

2. Demi has got younger brothers and sisters so she decides to install Barracuda Web Filter. The instructions say that the software takes 10 minutes to install and the program is 40 megabytes in size.

   a) Draw the window that will be showing after 5 minutes.

   b) Draw the window that will be showing after 2.5 minutes.

   c) Draw the window that will be showing after 1 minute.

3. Demi now starts to install Microsoft Word 2007.

This program only tells you what percentage has already been installed. After 3 minutes she looks at the window. The program has so far only installed 10%. She decides to phone her friend, Rene, but wonders how long she will have to wait.

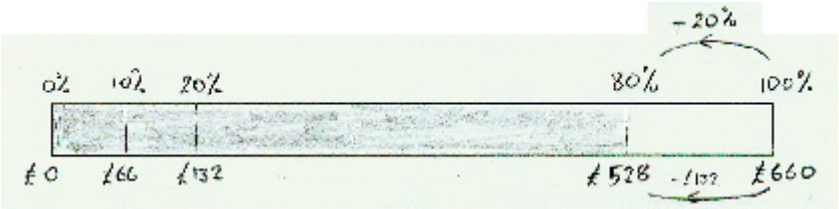
a) How long does this program take to install?

b) How much longer will it take before it is 100% installed?

4. Over the rest of the day, Demi installs other programs onto her new computer. On worksheet B1 there are six bars for each of the six programs that she installs. For each program work out the total installation time.

5. Demi bought her computer from Computers R Us, a new shop that guarantees to be the cheapest. If you can buy the same computer from another shop cheaper, Computers R Us will give you your money back.

Demi paid £525 for her computer. She decides to check on the internet to see if she can find her computer cheaper somewhere else.



She finds that some shops are having a sale. At PC Universe she sees her computer in the 20% off sale. Its normal price was £660. She decides to work out the sale price to see if it is cheaper. This is what she does:

a) Explain in detail Demi's method for calculating the sale price. In what order did she fill in the numbers on the bar?

b) Is the price at PC Universe more or less than at Computers R Us?

6. Next she sees the same computer in PC Solutions. The price is £620, but they have got a 15% off sale.

a) Draw a bar and try to use Demi's method to work out the sale price of the computer.

b) How much more is the price at PC Solutions than at Computers R Us?

7. Demi goes on to check out lots of the sale prices for her computer at different shops. On worksheet B2, work out the sale price at each of the shops.

8. At Computers Unlimited, she notices that there is 9% off in the sale. Her computer's normal price here was £580. Again, she decides to work out the sale price to see if it is cheaper. This is what she does:

a) Explain in detail Demi's method for calculating the sale price. In what order did she fill in the numbers on the bar? (Demi used a calculator for this one)

b) Is the price at Computers Unlimited more or less than at Computers R Us?

Now do Worksheet B3.

Going To The Bank

Demi decides to put £1200 of the money that she won into a savings account. At the BarcWest bank they pay 4% interest per year in a normal account and 5% interest per year in a special account. However, in the special account she is not allowed to withdraw any of her money until the end of the year. Demi decides to work out the interest she will get in each account and then decide which account would be best.

9. a) Work out how much money she will have in the normal account after the interest is paid at the end of the year. You could use a bar like this to help you.

b) Work out how much money she will have in the special account after the interest is paid at the end of the year.

c) How much more interest does she get from the special account?

d) Which of the two accounts would you pick?

Explain your answer.

10. Demi goes home and looks at the on-line bank accounts. Work out how much money she will have in her account after one year of investing £1200 in each of the following banks:

a) E-save account: 6% interest

b) PC Bank: 5.5% interest

c) Big Saver account: 6.5% interest.

Test Results

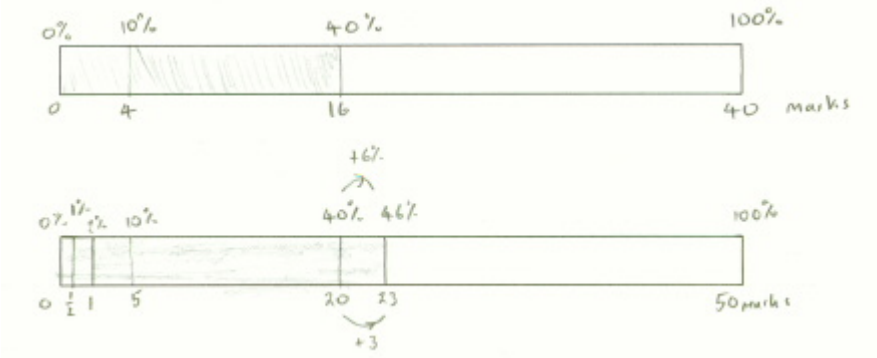
Demi is convinced that by going on revision websites, her new computer is helping her to improve her test marks.

11. Name some websites that she might be using to improve her results.

Before she had her computer she got 16 out of 40 in a science test. Her most recent mark in science is 23 out of 50.

12. In which test do you think she got the better mark? Explain your answer.

Rene shows Demi how to compare these marks using a Percentage Bar. This is what she drew:



13. a) Use Rene's bars to explain which test Demi got the better mark in.

b) Demi now sees a quicker way of getting to 46% for science.

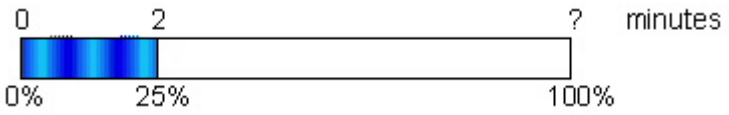
Can you see a quick way? What is it?

14. Use the bars on Worksheet B4 to work out if Demi has improved in all her lessons.

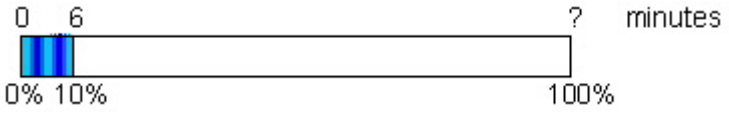
Worksheet B1

For each program work out the total installation time:

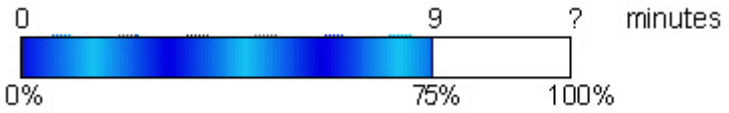
1)



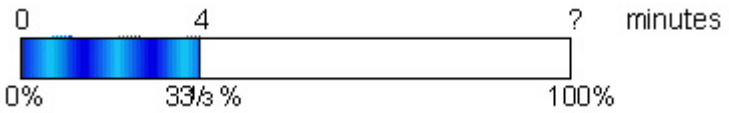
2)



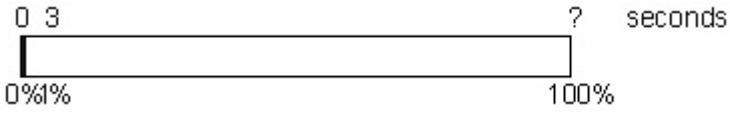
3)



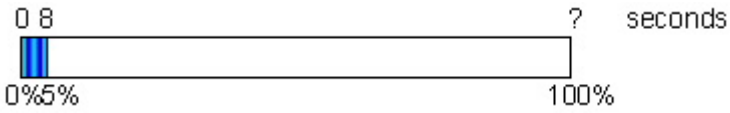
4)



5)



6)



Worksheet B2

For each shop work out the sale price:

1) Normal Price = £600. Reduced by 10% in the sale.

100% = 10% = 90% =

2) Normal Price = £590. Reduced by 10% in the sale.

3) Normal Price = £640. Reduced by 15% in the sale.

4) Normal Price = £560. Reduced by 5% in the sale.

5) Normal Price = £700. Reduced by 25% in the sale.

Worksheet B3

For each shop work out the sale price:

1) Normal Price = £600. Reduced by 9% in the sale.

100%= 10%= 1% = 9%= 91%=

2) Normal Price = £600. Reduced by 8% in the sale.

3) Normal Price = £700. Reduced by 22% in the sale.

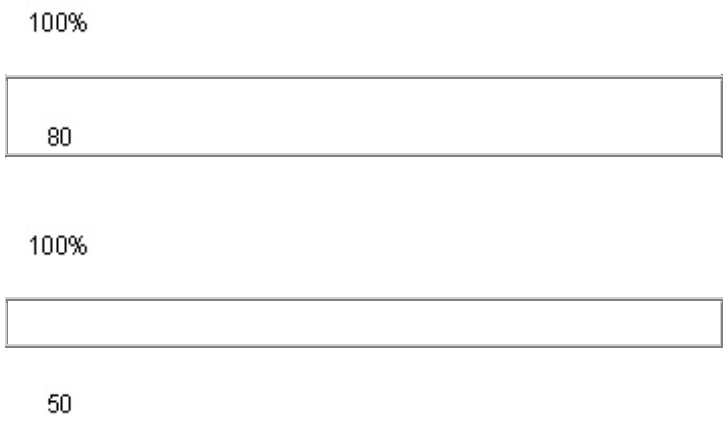
4) Normal Price = £540. Reduced by 2% in the sale.

5) Normal Price = £650. Reduced by 14% in the sale.

Worksheet B4

For each test work out the percentage mark:

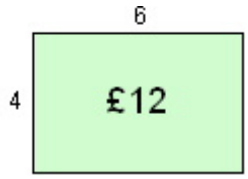
1) History: Last year's test mark 20 out of 80. This year's test mark 15 out of 50.



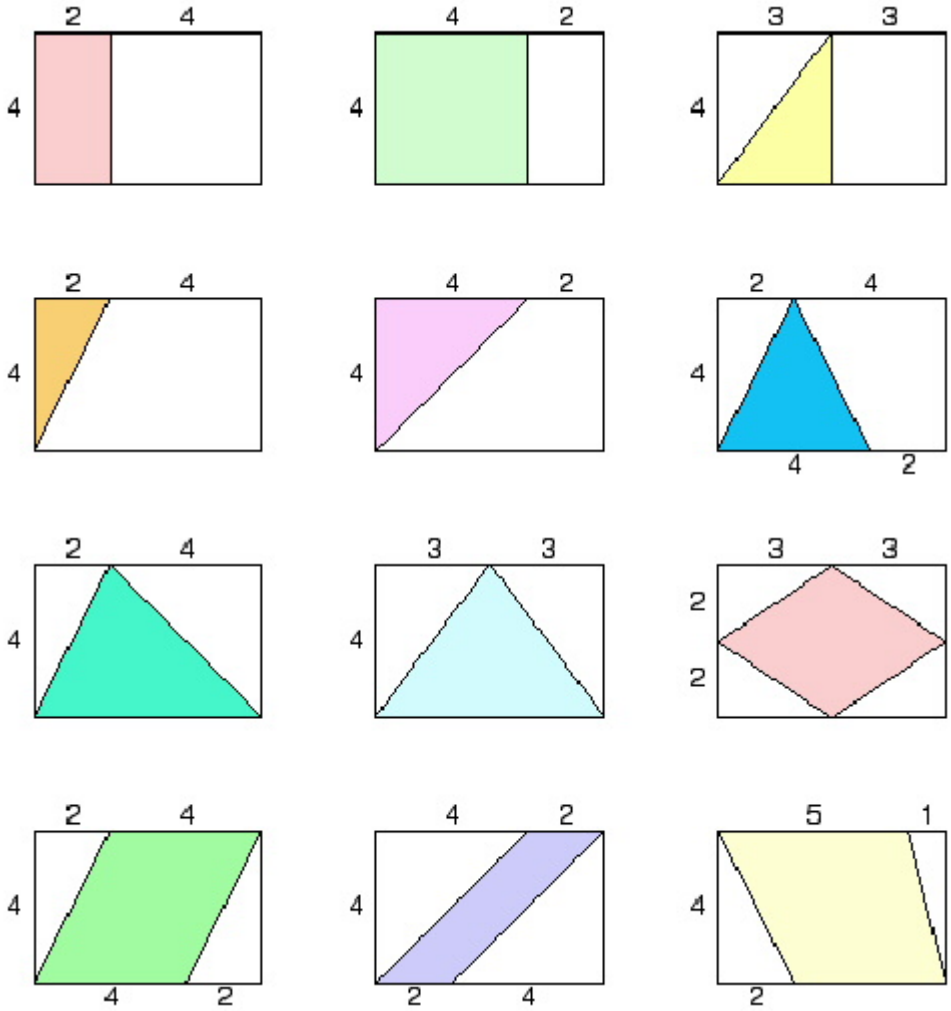
2) Maths: Last year's test mark 24 out of 60. This year's test mark 50 out of 80.

3) English: Last year's test mark 14 out of 24. This year's test mark 36 out of 60.

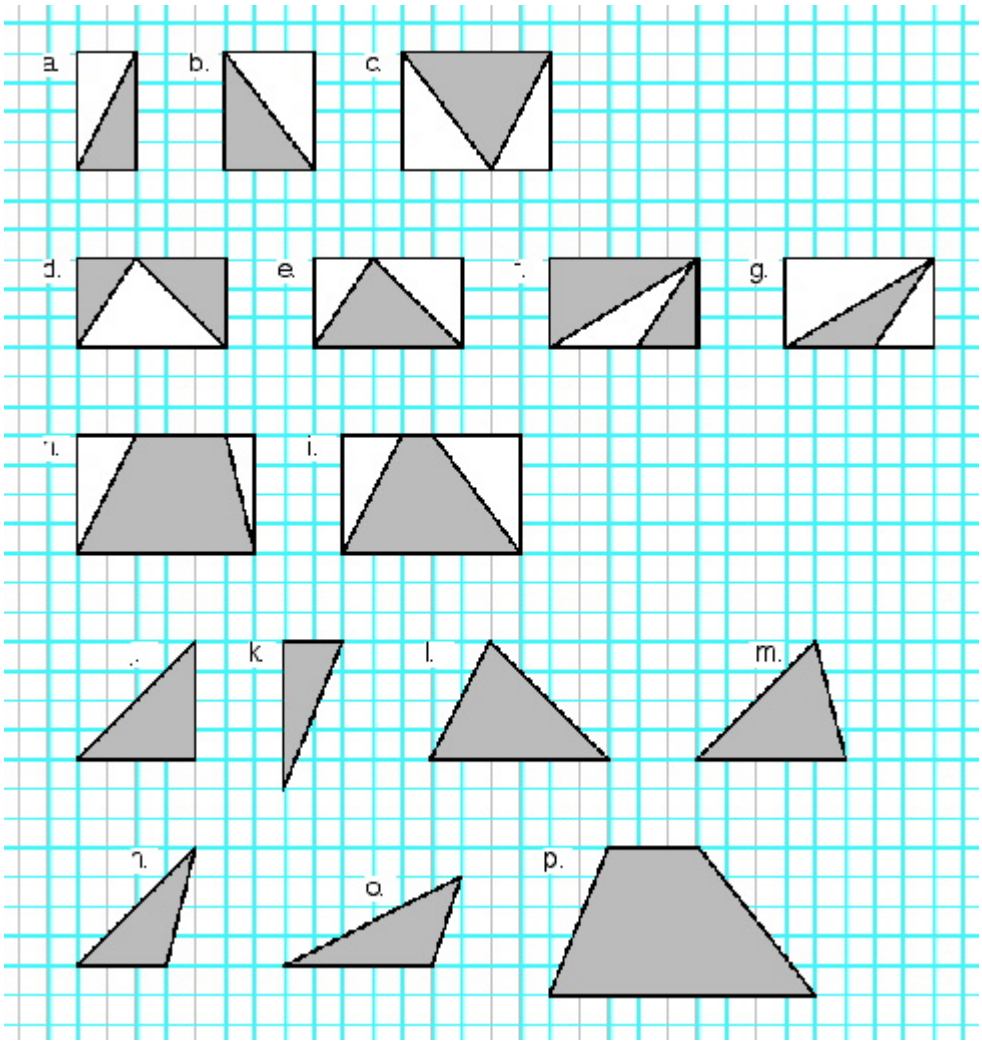
Activity 6: Area and Volume A



1. Work out the cost of each piece of coloured glass.



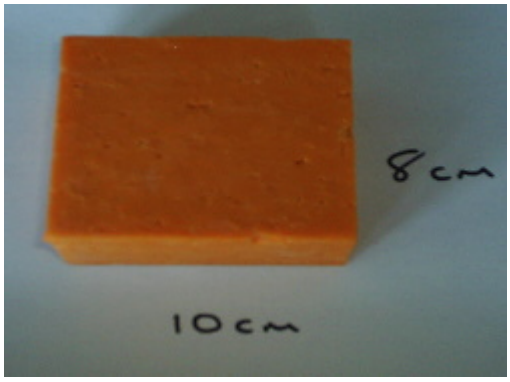
2. Find the area in square units of each of the shaded pieces.



At the Cheese counter

Mariam serves on the cheese counter on a Saturday. One of her jobs is to cut and pack cheese cubes (these are 1 cm cubes).

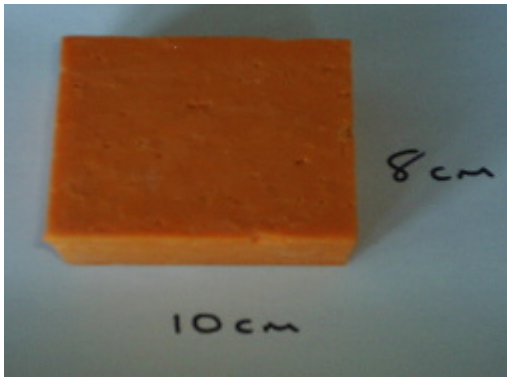
1 Mariam begins with the block of cheese shown here and wants to cut it into 1 cm cubes. The block is 4 cm high.



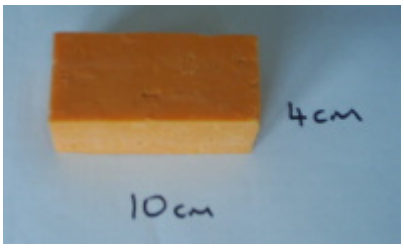
Make a drawing to show how Mariam would cut it into 1 cm cubes, and then write down the volume of the block.

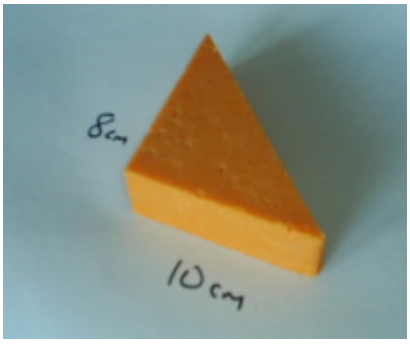
2 Mariam also has to cut, pack, and price various cuts of cheese.

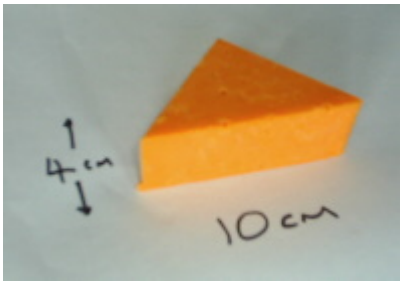
She begins with a new block of cheese which is a cuboid measuring 10 cm x 8 cm x 4cm. This is shown here. This piece is priced at £2.40.



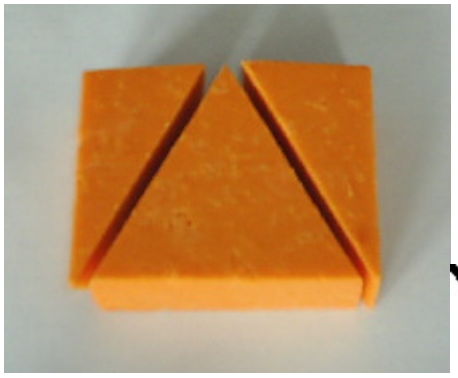
Below are some of the pieces she cuts; for each one, write down the price that you think Mariam should charge. The height of each piece is still 4cm.

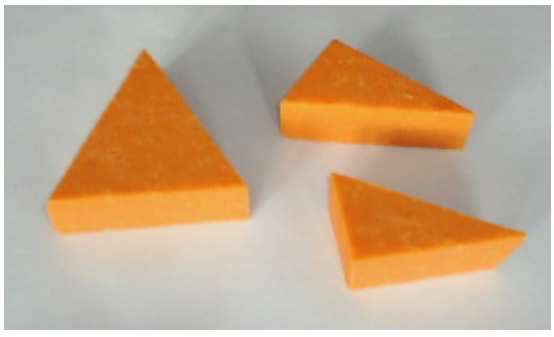






Mariam also cuts some pieces as follows.





3. She puts a price of £1.20 onto the larger piece, and £0.60 onto each of the smaller pieces. Is Mariam right to do this? Use a drawing to help your explanation.

4. What is the general name for each of the shapes in question 28? Look back in your Maths dictionary if you need to.

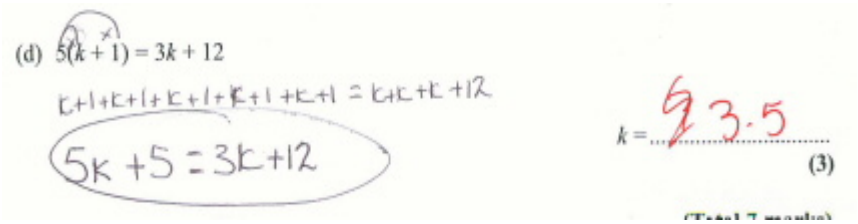
5. In question 1 you worked out the volume of the original block of cheese to be 320 cm^3. What are the volumes of the pieces of cheese shown in question 2?

Activity 7: Algebra

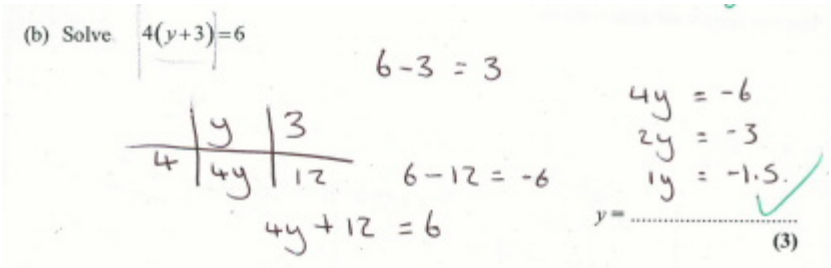
The following examples show the different approaches students take to solving a simple algebraic problem.

Note the use of the number line as a model for solving equations, the grid method for expanding brackets, the use of the scales to solve a formal problem and a student writing down a longer version of the equation in order to make sense of it. Finally note one student using a straight forward formal approach.

In the first example the student writes out the expanded version of the bracket in order to make sense of the equation before now finding a correct solution.

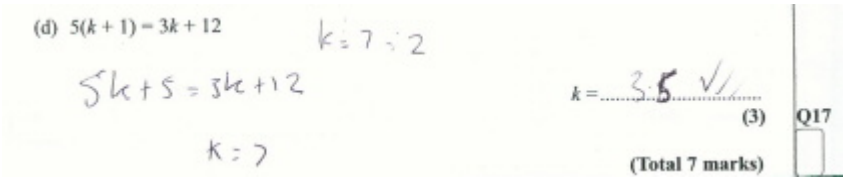


The second example demonstrates a use of the grid method for expanding brackets. It is clear that this student must have experienced the grid method for more than an introductory period.

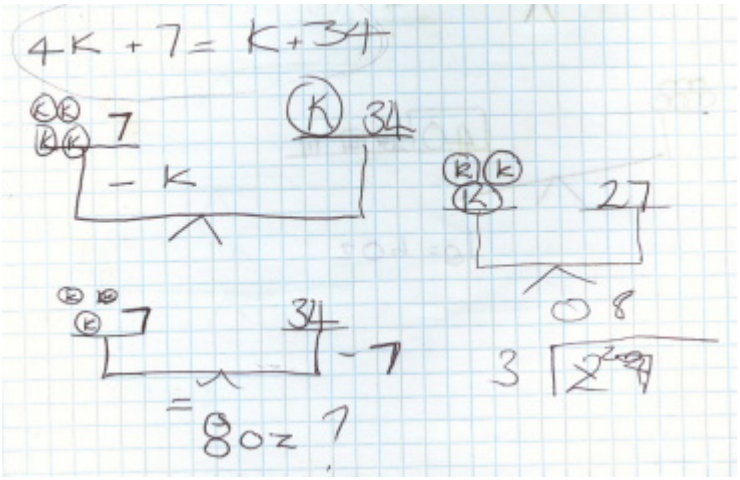


The third example demonstrates an effective use of the number line to represent the equation and also as a means of solving it.

The fourth example is of a student from the same class as example 1. This student however, no longer needs a preformal representation of brackets in order to arrive at a solution.



The final example is of a student representing a formal equation in an informal/ contextual setting before arriving at a solution. Although the solution is incorrect the approach is clear and the student would receive appropriate method marks.

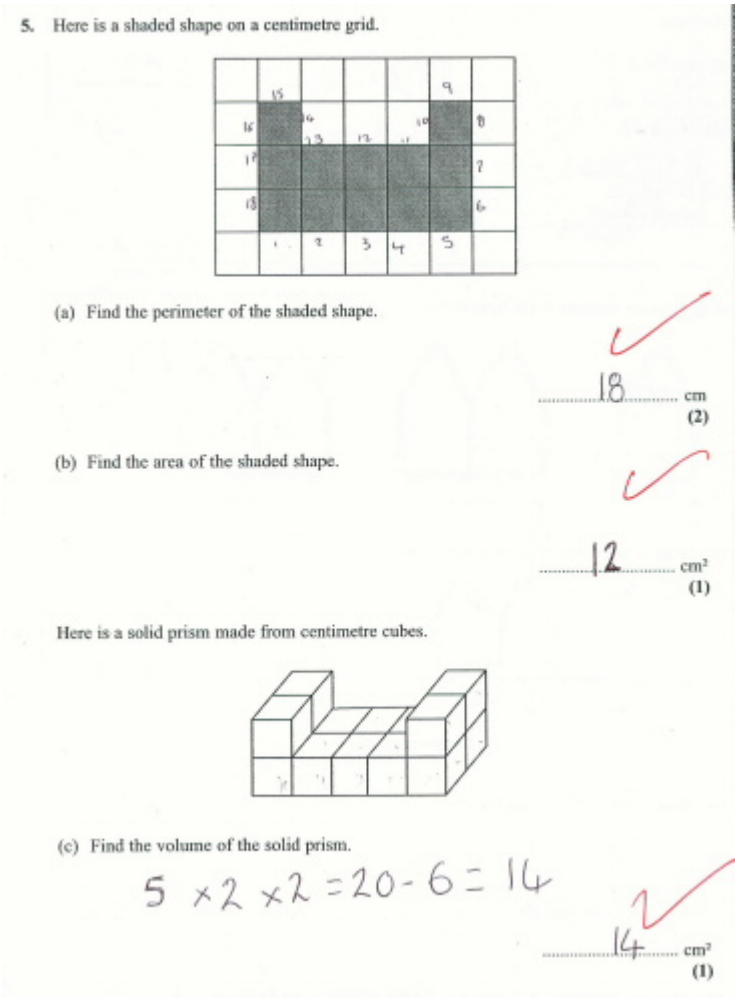


Activity 8: Area and Volume B

The following are examples of students work

Note for question 5c a student calculates the volume of a cuboid and subtracts 6. This is very unusual.

In question 29 one student calculates the volume of a cuboid and halves the answer and the other student when asked what she had done explained that she imagined slicing the prism in half to form a cuboid of half the length.



5. Here is a shaded shape on a centimetre grid.

(a) Find the perimeter of the shaded shape.

18 cm
(2)

(b) Find the area of the shaded shape.

12 cm²
(1)

Here is a solid prism made from centimetre cubes.

(c) Find the volume of the solid prism.

5 × 2 × 2 = 20 - 6 = 14

14 cm²
(1)

24. The cuboid has a volume of 150 cm³.

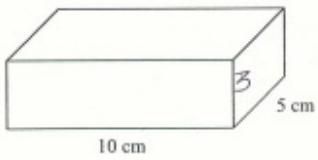


Diagram **NOT** accurately drawn

The length is 10 cm.
The width is 5 cm.

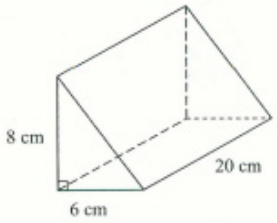
Work out the height of the cuboid.

10 x 5 = 50cm x 3 = 150

3 ✓ cm

29.

Diagram **NOT** accurately drawn



The diagram shows a solid prism.
The cross-section of the solid prism is a triangle with a base of 6 cm and a height of 8 cm.
The length of the solid prism is 20 cm.

Work out the volume of the solid prism.

6 x 8 x 20 = 960
960 ÷ 2 = 480

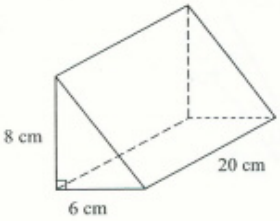
✓

480 ✓ cm³

(Total 2 marks)

29.

Diagram **NOT** accurately drawn



The diagram shows a solid prism.
The cross-section of the solid prism is a triangle with a base of 6 cm and a height of 8 cm.
The length of the solid prism is 20 cm.

Work out the volume of the solid prism.

6 x 8 = 48 x 10 = 480

✓✓

480 cm³