

### Problem bank for phase 3

These problems support phase 3 of the multiplicative relationships unit. They have been selected from previous Key Stage 3 test papers. Questions 1–3 are targeted at NC level 5, questions 4–8 at level 6, questions 9 and 10 at level 7 and question 11 at level 8. All questions are taken from the calculator paper. Additional problems can be found on pages 5, 75 and 79 of the Framework's supplement of examples.

#### 1 Paint

You can make different colours of paint by mixing red, blue and yellow in different proportions. For example, you can make green by mixing 1 part blue to 1 part yellow.

- (a) To make purple, you mix 3 parts red to 7 parts blue.

How much of each colour do you need to make 20 litres of purple paint? Give your answer in litres.

. . . . . litres of red and . . . . . litres of blue

- (b) To make orange, you mix 13 parts yellow to 7 parts red.

How much of each colour do you need to make 10 litres of orange paint? Give your answer in litres.

. . . . . litres of yellow and . . . . . litres of red

From 1998 Key Stage 3 Paper 2 question 10

#### 2 Ratios

- (a) Nigel pours 1 carton of apple juice and 3 cartons of orange juice into a big jug.

What is the ratio of apple juice to orange juice in Nigel's jug?

apple juice : orange juice = . . . . . : . . . . .

- (b) Lesley pours 1 carton of apple juice and  $1\frac{1}{2}$  cartons of orange juice into another big jug.

What is the ratio of apple juice to orange juice in Lesley's jug?

apple juice : orange juice = . . . . . : . . . . .

- (c) Tandi pours 1 carton of apple juice and 1 carton of orange juice into another big jug. She wants only half as much apple juice as orange juice in her jug.

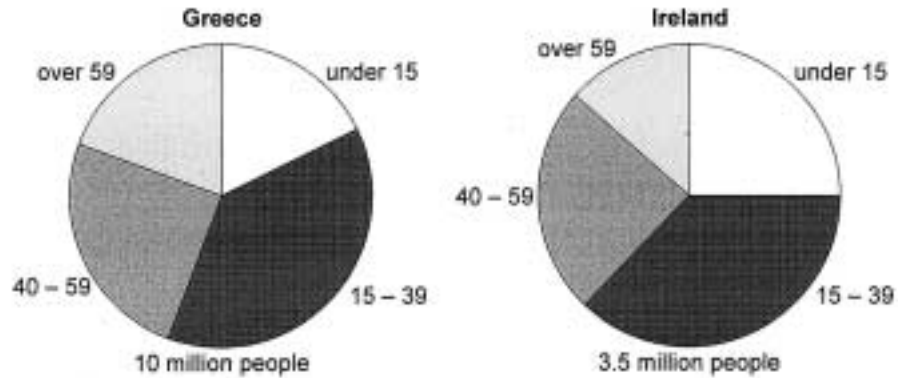
What should Tandi pour into her jug now?

From 1999 Key Stage 3 Paper 2 question 11

### 3 Ages

These pie charts show some information about the ages of people in Greece and in Ireland.

There are about 10 million people in Greece, and there are about 3.5 million people in Ireland.



- Roughly what percentage of people in Greece are aged 40–59?
- There are about 10 million people in Greece. Use your percentage from part (a) to work out roughly how many people in Greece are aged 40–59.
- Dewi says: 'The charts show that there are more people under 15 in Ireland than in Greece.'

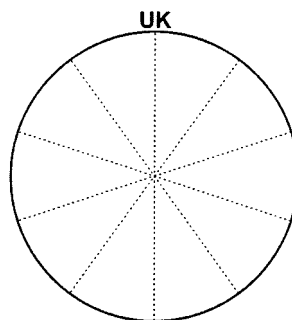
Dewi is wrong. Explain why the charts do not show this.

- There are about 60 million people in the UK.

The table shows roughly what percentage of people in the UK are of different ages.

under 15	15–39	40–59	over 59
20%	35%	25%	20%

Draw a pie chart below to show the information in the table. Label each section of your pie chart clearly with the ages.



60 million people

From 1998 Key Stage 3 Paper 2 question 12

#### 4 Birds

- (a) One morning last summer Ravi carried out a survey of the birds in the school garden. He saw 5 pigeons, 20 crows, 25 seagulls and 45 sparrows.

Complete the line below to show the ratios.

1 : . . . . . : . . . . . : . . . . .

- (b) What percentage of all the birds Ravi saw were sparrows?
- (c) One morning this spring Ravi carried out a second survey. This time he saw:
- the same number of pigeons
  - 25% fewer crows
  - 60% more seagulls
  - two thirds of the number of sparrows

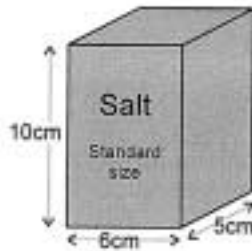
Pigeons : Crows : Seagulls : Sparrows

1 : . . . . . : . . . . . : . . . . .

From 1995 Key Stage 3 Paper 2 question 13

#### 5 Salt

- (a) What is the volume of this standard size box of salt?



- (b) What is the volume of this special offer box of salt, which is 20% bigger?



- (c) The standard size box contains enough salt to fill up 10 salt pots.  
How many salt pots may be filled up from the special offer box of salt?

From 1996 Key Stage 3 Paper 2 question 12

## 6 Population

Emlyn is doing a project on world population. He has found some data about the population of the regions of the world in 1950 and 1990.

Regions of the world	Population (in millions) in 1950	Population (in millions) in 1990
Africa	222	642
Asia	1 558	3 402
Europe	393	498
Latin America	166	448
North America	166	276
Oceania	13	26
World	2 518	5 292

- (a) In 1950, what percentage of the world's population lived in Asia? Show each step in your working.
- (b) In 1990, for every person who lived in North America how many people lived in Asia? Show your working.
- (c) For every person who lived in Africa in 1950 how many people lived in Africa in 1990? Show your working.
- (d) Emlyn thinks that from 1950 to 1990 the population of Oceania went up by 100%.

Is Emlyn right? Tick the correct box.

Yes       No       Cannot tell

Explain your answer.

From 1996 Key Stage 3 Paper 2 question 10

## 7 Continents

The table shows the land area of each of the world's continents.

Continent	Land area (in 1 000 km <sup>2</sup> )
Africa	30 264
Antarctica	13 209
Asia	44 250
Europe	9 907
North America	24 398
Oceania	8 534
South America	17 793
World	148 355

- (a) Which continent is approximately 12% of the world's land area?
- (b) What percentage of the world's land area is Antarctica? Show your working.
- (c) About 30% of the world's area is land. The rest is water. The amount of land in the world is about 150 million km<sup>2</sup>.

Work out the approximate total area (land and water) of the world. Show your working.

From 1998 Key Stage 3 Paper 2 question 2

### 8 Currency

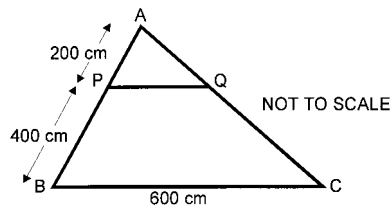
- (a) Use £1 = 9.60 francs to work out how much 45p is in francs. Show your working.
- (b) Use 240 pesetas = £1 to work out how much 408 pesetas is in pounds. Show your working.
- (c) Use £1 = 9.60 francs and £1 = 240 pesetas to work out how much 1 franc is in pesetas. Show your working.

From 1999 Key Stage 3 Paper 2 question 6

### 9 Roof frames

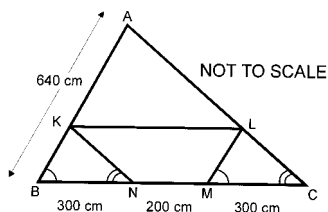
Timpkins Builders make wooden frames for roofs on new houses.

In the diagram of the wooden frame shown below, PQ is parallel to BC.



- (a) Calculate length PQ using similar triangles. Show your working.

In the diagram of the wooden frame shown below, angle ABC = angle LMC, and angle ACB = angle KNB.



- (b) Calculate length LM using similar triangles. Show your working.

From 1995 Key Stage 3 Paper 2 question 9

### 10 Pupils

The table shows some information about pupils in a school.

	Left-handed	Right-handed
Girls	32	180
Boys	28	168

There are 408 pupils in the school.

- (a) What percentage of the pupils are boys? Show your working.
- (b) What is the ratio of left-handed pupils to right-handed pupils?  
Write your ratio in the form 1 : . . . . .  
Show your working.
- (c) One pupil is chosen at random from the whole school.  
What is the probability that the pupil chosen is a girl who is right-handed?

From 1997 Key Stage 3 Paper 2 question 14

**11 Births**

Look at the table:

	1961	1994
England	17.6	
Wales	17	12.2

- (a) In England, from 1961 to 1994, the birth rate fell by 26.1%. What was the birth rate in England in 1994?  
Show your working.
- (b) In Wales, the birth rate also fell. Calculate the percentage fall from 1961 to 1994.  
Show your working.
- (c) From 1961 to 1994, the birth rates in Scotland and Northern Ireland fell by the same amount.

The percentage fall in Scotland was greater than the percentage fall in Northern Ireland.

Put a tick by the statement below which is true.

In 1961, the birth rate in Scotland was higher than the birth rate in Northern Ireland. . . . .

In 1961, the birth rate in Scotland was the same as the birth rate in Northern Ireland. . . . .

In 1961, the birth rate in Scotland was lower than the birth rate in Northern Ireland. . . . .

From the information given, you cannot tell whether Scotland or Northern Ireland had the higher birth rate in 1961. . . . .

From 1998 Key Stage 3 Paper 2 question 9