Prompts for main activities in phase 3

Choose one problem: discuss alternative strategies for solving the problem; change the numbers in the problem (e.g. make them more difficult) and consider how the methods can be adapted; ask different or supplementary questions from the same context.

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

Consider possible strategies for part (a). A similar approach can be taken to part (b).

Strategy 1: Mental scaling method

3 litres of red paint plus 7 litres of blue paint makes 10 litres of purple.

Double up for 20 litres.

For which kinds of numbers does this strategy lend itself?

This is the most likely method to come from pupils.

red	blue	purple
3	7	10

Put this table on the board and have the pupils complete the entries.

How does this help us to calculate for 5 litres of purple?

How does this help us to calculate for 13 litres of purple?

How does this help us to calculate for 3.85 litres of purple?

How does it help if the components of red and blue change – for example, 3 parts red and 8 parts blue?

Could I use this strategy to see quickly the percentage of any mix that is made up of red paint?

Other strategies may start to emerge.

Strategy 2: Unitary method

Initial stage to calculate what is required for one unit of the mix.

Ask: What calculation takes me from 10 purple to 1 purple?

purple	red	blue
10	3	7
1	$3 \div 10$	$7 \div 10$
20	$(3 \div 10) \times 20$	$(7 \div 10 \times 20$

How does this help us to calculate for 5 litres of purple?

How does this help us to calculate for 13 litres of purple?

How does this help us to calculate for 3.85 litres of purple?

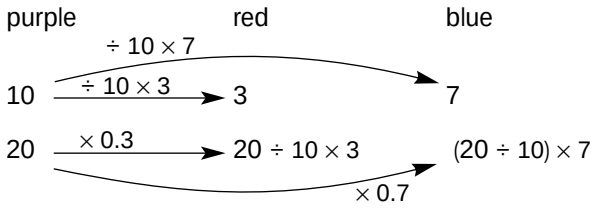
How does it help if the components of red and blue change – for example, 3 parts red and 8 parts blue?

Could I use this strategy to see quickly the percentage of any mix that is made up of red paint?

Strategy 3: Scale factor method

Finding the proportion of the mix made up by each component part – that is, the factor by which the total is multiplied to calculate each part.

Ask: What calculation takes me from 10 purple to 3 red? What is this as a single multiplier?



How does this help us to calculate for 5 litres of purple?

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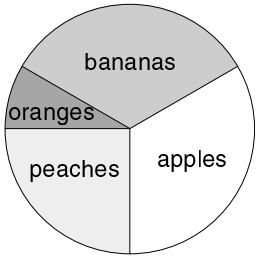
How does this help us to calculate for 3.85 litres of purple?

How does it help if the components of red and blue change – for example, 3 parts red and 8 parts blue?

Could I use this strategy to see quickly the percentage of any mix that is made up of red paint?

Choose a small set of problems: concentrate on extracting and organising the data (e.g. putting into tabular form) before deciding on possible methods of solution, rather than working the problems through to an answer.

- There is 20% orange juice in every litre of a fruit drink. How much orange juice is there in 2.5 litres of fruit drink? How much fruit drink can be made from 1 litre of orange juice?
- This chart shows the income that a market stall-holder got last week from selling different kinds of fruit.



  The stall-holder got £350 from selling bananas. Estimate how much she got from selling oranges.
- 6 out of every 300 paper clips produced by a machine are rejected. What is this as a percentage?
- Rena put £150 in her savings account. After one year, her interest was £12. John put £110 in his savings account. After one year, his interest was £12. Who had the better rate of interest, Rena or John? Explain you answer.

From page 75 of the Supplement of examples in the *Framework for teaching mathematics: Years 7, 8 and 9*

Translate the data from each question into a useful form.

Orange juice

20% or 0.2	every 1 litre
20% or 0.2	2.5 litres

What calculation do we perform to find 20% of anything? Roughly how big will the answer be?

Market stall

Bananas	£350	$^1/_3$
Apples		$^1/_3$
Peaches		$^1/_4$
Oranges	?	?

Will the answer be more than £350? Do we need oranges as a fraction of the whole or as a fraction of bananas?

Paper clips

Produced	300	100
Rejected	6	?

What relationship is it useful to identify here?

300 ÷ 3 = 100

Savings

Rena	£150	£12
John	£110	£12

Draw out gut reaction justified with key words.

(a) The label on yoghurt A shows this information.

How many grams of protein does 100 g of yoghurt provide?

Show your working.

Yoghurt A **125 g**	
Each 125 g provides	
Energy	430 kJ
Protein	4.5 g
Carbohydrate	11.1 g
Fat	4.5 g

(b) The label on yoghurt B shows different information.

A boy eats the same amount of yoghurt A and yoghurt B.

Which yoghurt provides him with more carbohydrate?

Show your working.

Yoghurt B **150 g**	
Each 150 g provides	
Energy	339 kJ
Protein	6.6 g
Carbohydrate	13.1 g
Fat	0.2 g

From 2001 Key Stage 3 Paper 2 question 11

Translate the data from each question into a useful form.

Part (a)

Yoghurt A	125 g	1 g	25 g	100 g
Protein	4.5 g	?	?	?

Which of the entries is useful to calculate?

Part (b)

Yoghurt A	125 g	1 g	25 g	100 g	150 g
Carbohydrates	11.1 g	?	?	?	?
Yoghurt B	150 g	1 g	25 g	100 g	150 g
Carbohydrates	13.1 g	?	?	?	?

Which of the entries is useful to calculate?

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.

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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

