PRIMARY

BOOK C
(Ages 7–8)

CURRICULUM LINKED

Problem-solving in mathematics

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SAMPLE - NOT FOR SALE

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Problem-solving
To use spatial visualisation and logical reasoning to solve problems.

Curriculum links
Second Class
Skills
- Select and apply appropriate strategies for completing a task or solving a problem
- Discuss and record the results of mathematical activities using diagrams and pictures

Algebra
- Recognise patterns

Shape and space
- Combine 2-D shapes

Materials
Square grid paper, blocks or squares in five different colours

Focus
These pages explore possible arrangements of shapes or combinations of coloured squares on a grid in order to determine how a particular outcome can be formed. Spatial as well as logical thinking and organisation are involved as pupils investigate all likely arrangements to ensure the final forms match the given criteria.

Discussion
Page 3
Pupils will need to physically manipulate the shapes in order to see the pattern involved in extending each shape. The first shape replicates the manner in which the larger square was constructed. The triangles require one of the pieces to be flipped in order to make the larger triangle. Encourage pupils to continue the patterns to make the next largest shape.

Page 4
The grids can be organised in a number of ways. However, each different way will have one or two diagonals with four blocks of the same colour. Two grids are provided to enable pupils to explore and try different possible arrangements.

Page 5
This activity builds on and extends the pupils' previous experience of the 4-by-4 grid by extending the grid to 5-by-5 and by introducing an additional colour. Again, the grid can be organised in a number of ways. Pupils should be encouraged to explore and try different possible arrangements.

Possible difficulties
- Not rotating or flipping shapes to eliminate duplicates or to 'grow' a shape
- Inability to visualise the pattern needed to grow a shape
- Not considering both rows and columns

Extension
- Investigate growing other shapes using different numbers of squares or shapes.
- Extend the grid to 6-by-6 and use six different colours.
- Explore other shapes that can be made using four of Shape 1.
- Investigate making these shapes using Shape 3.

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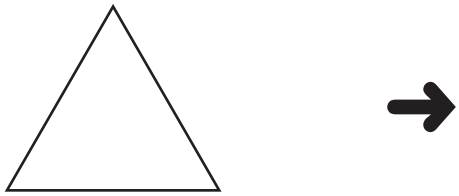
LARGER SHAPES

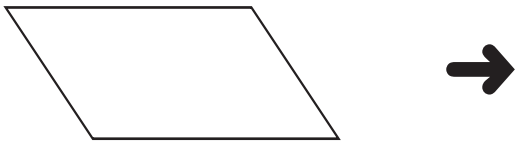
Four squares can make a larger square.

Use four of each of these shapes to make a larger copy of the shape. Draw the new shape you made.

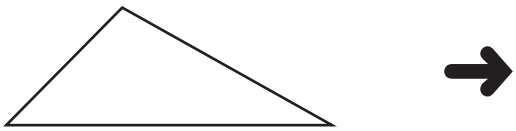
Shape 1



Shape 2



Shape 3



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GRID FUN 1

Take four blocks of four different colours (16 blocks).

Place blocks on the grid so that no row or column has the same colour in it.

What do you notice? _____

Try doing it a different way.

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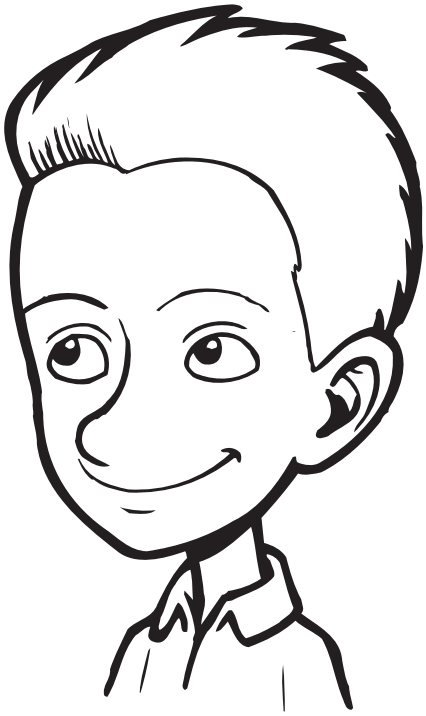
GRID FUN 2

Take five blocks of five different colours (25 blocks).

1. Place the blocks on the grid so that no row or column has the same colour in it.



What do you notice? _____

Try doing it a different way.

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Problem-solving
To use strategic thinking to solve problems.

Curriculum links
Second Class
Skills
- Select and apply appropriate strategies for completing a task or solving a problem
- Understand the mathematical ideas behind the procedures he/she uses

Number
- Solve one-step and two-step problems

Materials
12 counters (1 one colour, 11 another colour)

Focus
This page introduces a more complex problem in which the most difficult step is to try and find a way of understanding the question and what it is asking. Using materials to explore the problem is one way this can be done. Another is to use a diagram to assist in 'thinking backwards' by trying and adjusting possible answers until a solution that matches all of the conditions is found.

Discussion
Page 7
The problems can be solved in several ways. One is to work backwards from the final position, reasoning that the reverse of each condition must be performed—for example, that Gina finishes in fourth position and must pass three cars and then be passed by seven cars to get back to her original position.

Some pupils may need counters to model the process of cars passing and being passed. Pupils could use the 12 counters, with the single-colour counter representing Gina's car, and the other counters (of a second colour) representing the other 11 cars. Other pupils may prefer to base their solution on a diagram that shows what has happened.

Also, rather than working backwards, some pupils may prefer to work forwards; choosing a position for Gina and working through each of the events in the race. If Gina does not end up in fourth place, an adjustment will need to be made to the original position chosen. In this way, a process of 'try and adjust' can lead to the correct starting position. Note that the positive expression 'try and adjust' is much more helpful than the often used 'guess and check'.

The second problem extends the concept; however, this time the initial position is given and the question is reversed so that pupils are asked for the number of cars that Jordan needs to pass to take the winning position.

Possible difficulties
- Using only the seven cars that Gina passed to determine her starting position
- Using only the three cars that passed Gina to determine her starting position
- Thinking only of the three cars between Jordan's starting position and first place
- Thinking that Jordan needs to pass 10 cars, when being in tenth position means he has to pass nine cars to win

Extension
- Pupils write their own car race problems based on these questions.
- Use a different context rather than racing cars for the stories.

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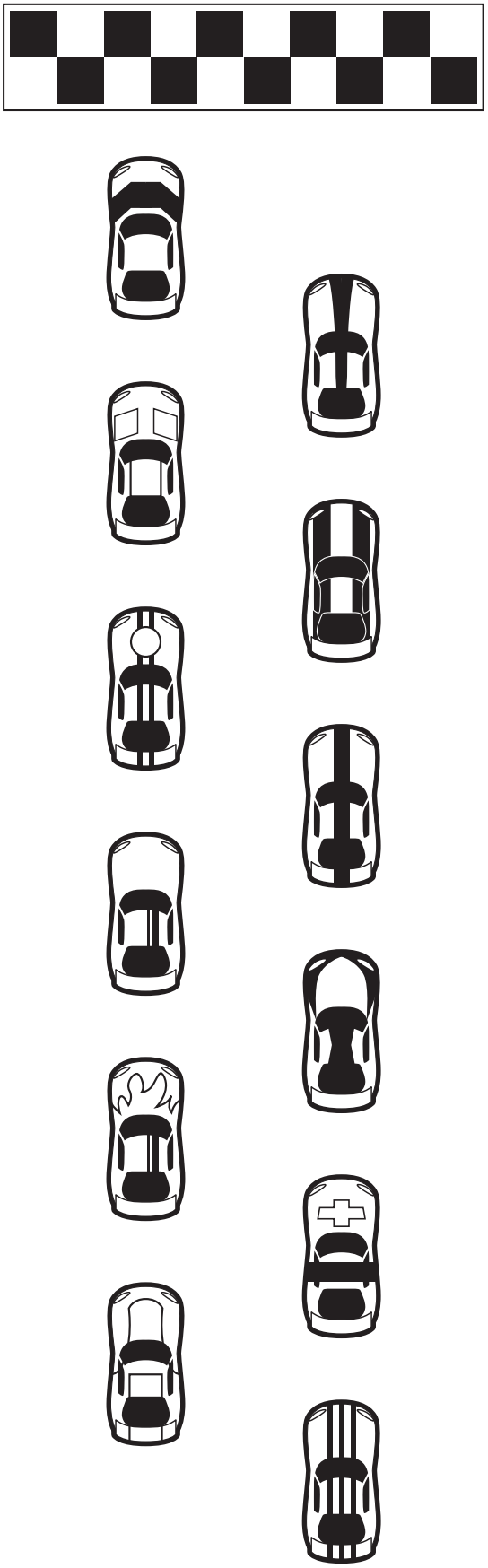
THE BIG RACE

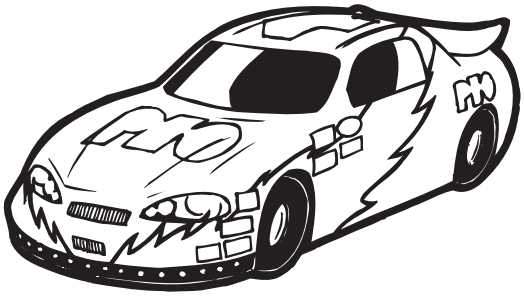
At the start of a car race, the cars line up in their starting positions.



1. Gina is driving one of the 12 cars in the race. During the race, she passes seven cars before being passed by three cars. She finishes the race in fourth place.

   In what position did Gina start the race?

   _____



2. Jordan started in fourth place. During the race, he was passed by six cars.

   How many cars does he need to pass to win the race?

   _____

SAMPLE - NOT FOR SALE

Problem-solving
To read, interpret and analyse information.

Curriculum links
Second Class
Skills
- Select and apply appropriate strategies for completing a task or solving a problem
- Understand the mathematical ideas behind the procedures he/she uses
- Devise and use mental strategies and procedures for carrying out mathematical tasks

Number
- Explore, identify and record place value
- Solve one-step and two-step problems

Materials
Some pupils may need counters or number expanders.

Focus
These pages explore relationships among numbers and then use this analysis to find a number that matches specific criteria. This process encourages pupils to disregard numbers that are not possible rather than simply looking for ones that are likely to work. When placing the numbers in the problem situations, pupils need to read the stories carefully in order to work out what number goes where.

Discussion
Page 9
Some pupils will use the listed information to discard numbers until only the correct number remains, while other pupils may prefer to try each number in turn against all of the criteria until they find a number that answers all conditions. The criteria listed allow numbers to be selected as well as ruled out; for example, 'less than 76 tens' rules out 763, 776 and 795.

Some pupils may work down the list of conditions, while others may read all the conditions and then decide where to start. This concept has been extended by having pupils think of their own number and write specific criteria for others to identify it.

Page 10
These problems require pupils to read and interpret the problem situations and then arrange the numbers that are provided so that the resulting stories make sense. The numbers are not listed in the order in which they are used in the stories. This concept has been extended by having pupils think of their own stories/problems and include the numbers to solve the problems.

Page 11
Careful analysis of each problem is needed to take into consideration the use of a number of mathematics terms; for example: twice, half, 'in three years time'. Some problems require pupils to start with the age listed at the end of the problem and then 'backtrack' in order to find a solution. If needed, materials such as counters can be used to assist.

Possible difficulties
- Selecting a number that matches only the first criterion
- Not matching the number against all criteria
- Not considering terms such as 'twice' and 'half'

Extension
- Pupils think of a number and make up criteria to match it, then give it to other pupils to solve.
- Pupils can be encouraged to come up with mathematical criteria of their own rather than using just the same criteria listed.

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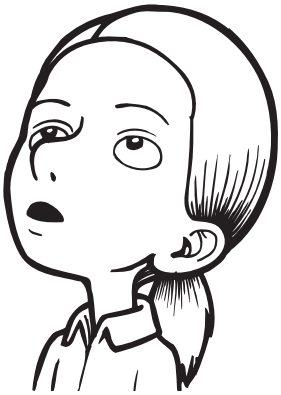
WHAT'S MY NUMBER?

My number ...

763	776	729	757	739	795

- is between 69 tens and 79 tens
- is more than 73 tens
- has 7 in the hundreds place
- does not have 3 in the ones place
- is less than 76 tens
- has a digit larger than 8 in the ones place.



1. My number is _____.

My number ...

356	563	653	536	635	365

- is between 30 tens and 60 tens
- is less than 57 tens
- uses the digits 3, 5, 6
- does not have 3 in the hundreds place
- has a digit larger than 5 in the ones place.

2. My number is _____.

3. Make up your own number puzzle and give it to a friend to solve.

My number is ...

_____ _____

_____ _____

_____ _____

SAMPLE - NOT FOR SALE

MISSING NUMBERS

Some numbers have been left out of the stories below. Put in the numbers so the stories make sense.

4	43	8	5	10

1. Jake's mother drives to work. She leaves at _____o'clock in the morning. She stops work at _____o'clock and collects Jake from after-school care. They arrive home at about _____ o'clock. She is _____years old. Jake is _____years old.

6	7	10	12	1

Joseph, Jacob and Jonathan are brothers. Joseph is older than Jonathan. Jonathan is older than Jacob. Jonathan is in 4th Class at school.

2. Record the age and class of each boy.

	Joseph	Jacob	Jonathan
Age			
Class			4

3. Write your own 'missing numbers' story and give it to a friend to solve.

_____

_____

_____

_____

_____

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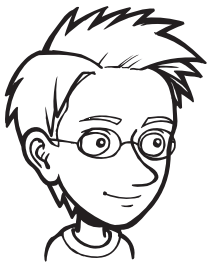
WHAT'S MY AGE?

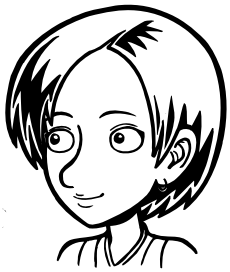
1. 'My sister is twice my age. She will be 15 next year.

   'How old am I?' _____



2. 'I am five years younger than my brother. I will be 12 next year.

   'How old is he?' _____



3. 'My cousin is three times my age. She was 14 last year.

   'How old am I?' _____

4. 'My older brother will be 16 in four years time. I am half his age.

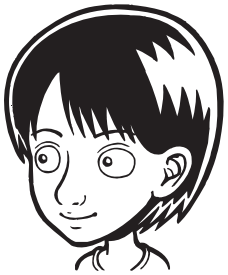
   'How old am I now?'_____

5. 'My cousin is twice my age. She was 11 last year.

   'How old am I?' _____

6. 'I will be nine in three years time. My sister is twice my age.

   'How old is she?' _____



7. 'My little sister is six. I will be twice her age in three years time.

   'How old am I now?' _____

SAMPLE - NOT FOR SALE