2022 Maths Explorer – Years 3 & 4
Resource Kit 1
Teaching Problem Solving

Rationale and Syllabus Outcomes

Mathematics is a creative subject requiring abstract thought. Children naturally reason and use creative strategies when they seek patterns and relationships that will enable them to solve challenging unfamiliar problems. The generalisations they make can then be used to solve problems with the same mathematical structure.

Through the process of problem solving and class discussion of the strategies used, children will also develop skills they can use when faced with more unfamiliar problems. Year 3-4 students will be able to:

- Describe and represent mathematical situations in a variety of ways
- Select and apply appropriate problem-solving strategies in undertaking investigations
- Give valid reasons for supporting one possible solution over another.

Different methods of solution will be suggested for each problem, with particular emphasis in each of the five resource kits on selected problem solving strategies.

The problems in the resource kits are based on questions similar to those in the Maths Games competitions, but simplified to meet the needs of students in Years 3 and 4.

Resource Kit 1 focuses on:

Using Concrete Materials

Some of the problems in this kit can be solved by using concrete materials. Concrete materials provide opportunities for students to construct rich understandings of mathematical concepts and promotes the use of mathematical language, reasoning, and problem solving.

Guess, Check and Refine

This involves making a reasonable guess of the answer and checking it against the conditions of the problem. An incorrect guess can provide more information leading to the correct answer.

Draw a Diagram

A diagram may reveal information that is not necessarily obvious just by reading the problem. This provides a visual explanation for the students and aids their understanding of the concept being investigated. It is also useful for keeping track of where the student is up to in a multi-step problem.

How to use these problems

It is recommended that students work in groups of 3 or 4 to solve these problems. By working in groups, students can share and explore ideas and coach and mentor each other to achieve a common goal and develop their individual problem solving skills.

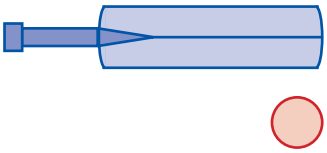
At the start of the lesson, present the problem and ask the students to think about it. Encourage students to try to solve it in any way they like. When the students have had enough time to consider their solutions, ask them to describe or present their methods, taking particular note of different ways of arriving at the same solution.

Each question includes at least one solution method that the majority of students should be able to follow. By participating in lessons that demonstrate achievable problem solving techniques, students will gain increased confidence in their own ability to address unfamiliar problems.

Finally, the consideration of different solution methods is fundamental to the students' development as effective problem solvers. Even when students have solved a problem to their own satisfaction, it is important to expose them to other methods and encourage them to judge whether or not the other methods are more efficient.

Exploring

1.1) Bats and Balls



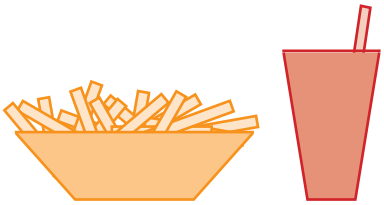
One ball and two bats cost a total of $**7**.

One bat and two balls cost a total of $**5**.

a) What is the cost of one bat and one ball?

b) How much does one ball cost?

1.2) The Meal Deal

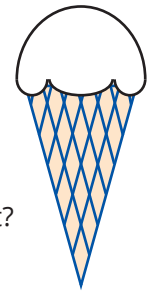


One tray of chips and two drinks cost a total of $**12**.

One drink and two trays of chips cost a total of $**18**.

What is the cost of one tray of chips and one drink?

1.3) The Ice Cream Stand



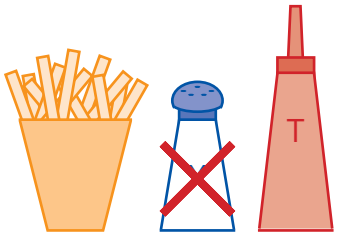
Single ice creams can be purchased in waffle cones or plain cones.

There is a choice of chocolate, strawberry, or peppermint ice cream.

a) How many different choices of ice cream and cone are there?

b) How many choices do we have if each ice cream is topped with either sprinkles or coconut?

1.4) Hot Chip Stand



a) Chips can be bought in either a cup or a tray.
They can be sprinkled with plain salt, or be salt free.
They can be topped with tomato sauce, or be without sauce.
How many choices of chips are there?

b) Chips can be bought in either a cup or a tray.
They can be sprinkled with plain salt, chicken salt or be salt free.
They can be topped with tomato sauce, BBQ sauce, chilli sauce, or be without sauce.
How many choices of chips are there?

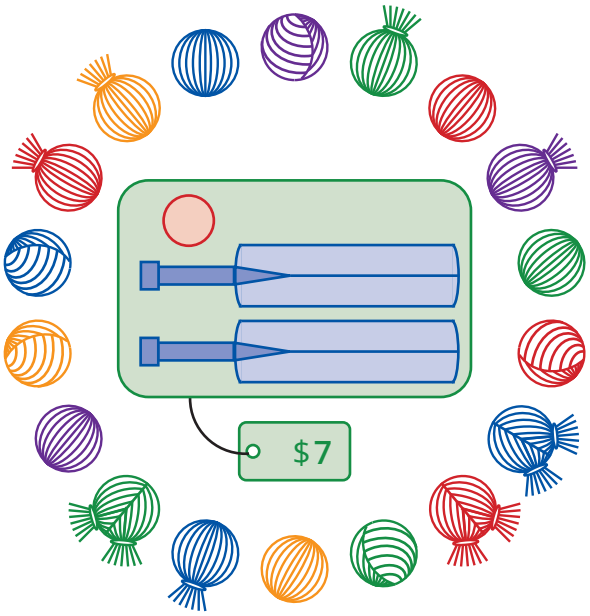
Maths Explorer Example Solution 1.1: Bats and Balls

One ball and two bats cost a total of $7. One bat and two balls cost a total of $5.

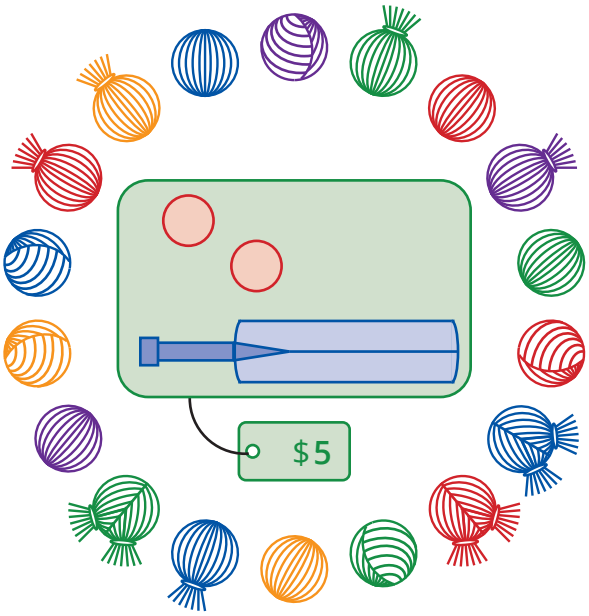
a) What is the cost of one bat and one ball?

Strategy: Use Concrete Materials

One ball and two bats cost a total of $7.

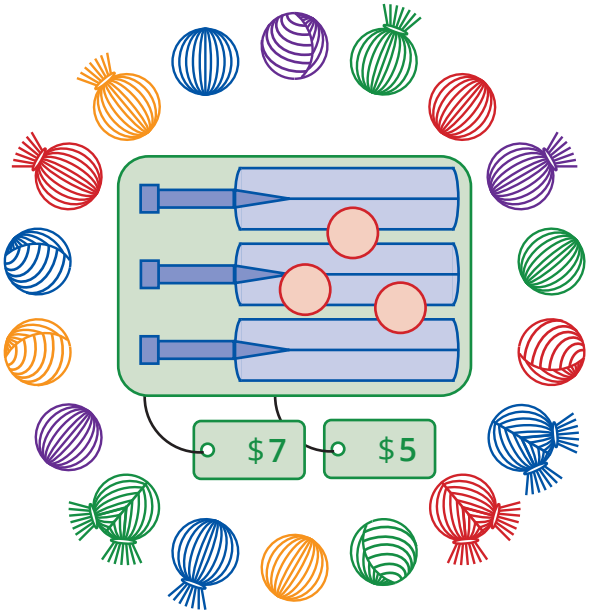


One bat and two balls cost a total of $5.



I wonder how much it might cost, if we wanted to buy a different number of bats and balls.

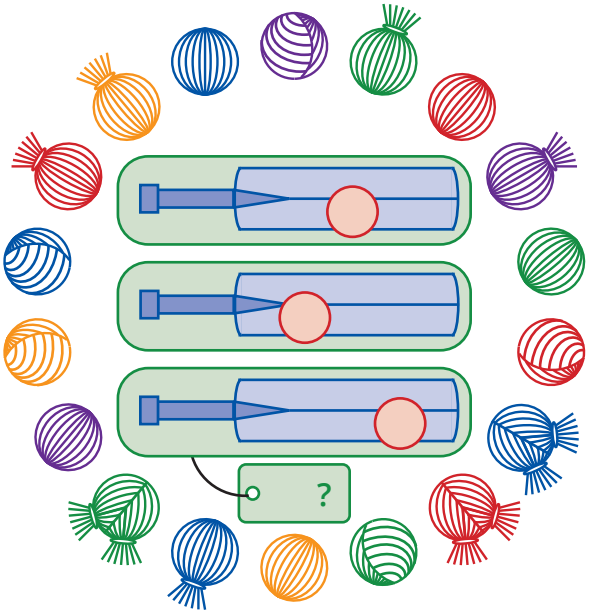
How much might it cost to buy one of each set?



For one of each set, we would pay $7 + $5 = $12.

We would pay $12 for 3 bats, and 3 balls.

I wonder how much it costs to buy 1 bat and 1 ball.



Turn and talk to your neighbour.

How might we work this out?

It costs $12 for 3 bats, and 3 balls.

We can divide this package into 3 equal sets, each containing 1 bat and 1 ball.

We know, from our multiplication tables, that 3 × 4 = 12. This makes sense because 4 + 4 + 4 = 12.

So, a set containing 1 bat and 1 ball would cost **$4**. We can check this: 3 × $4 = $4 + $4 + $4 = $12.

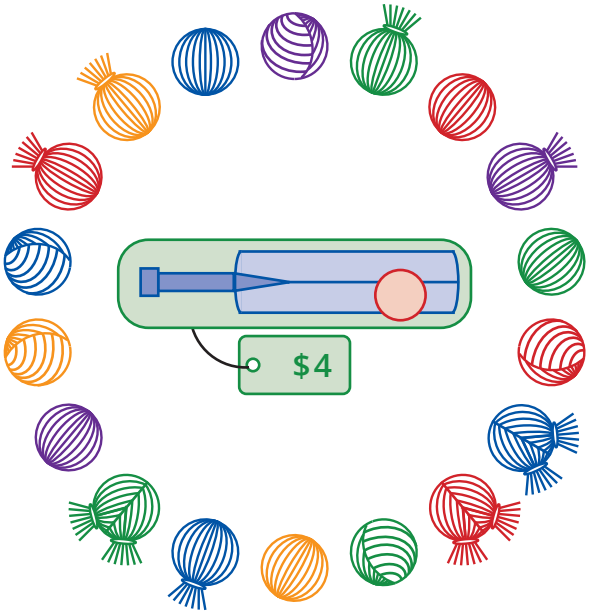
Maths Explorer Example Solution 1.1: Bats and Balls

One ball and two bats cost a total of $7. One bat and two balls cost a total of $5.

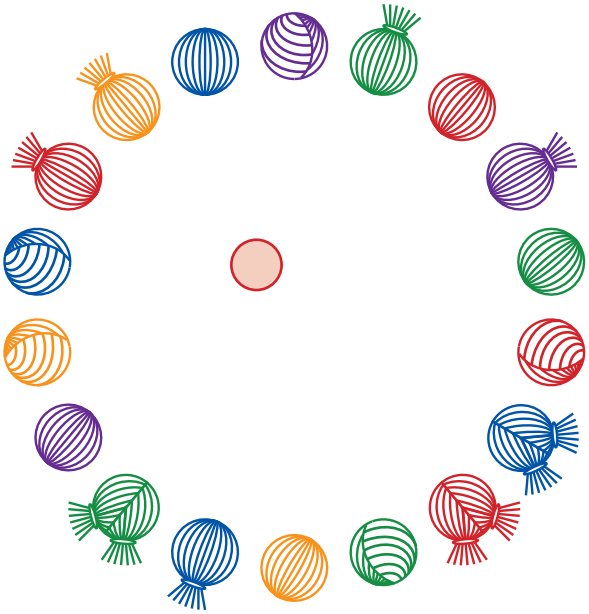
a) What is the cost of one bat and one ball? **$4**.

b) How much does one ball cost?

We've worked out that one bat and one ball costs **$4**.

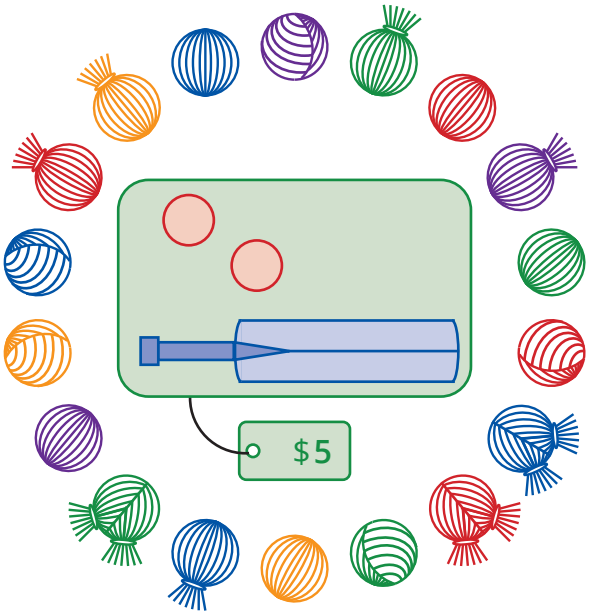


I wonder how much it costs to buy just **1** ball.

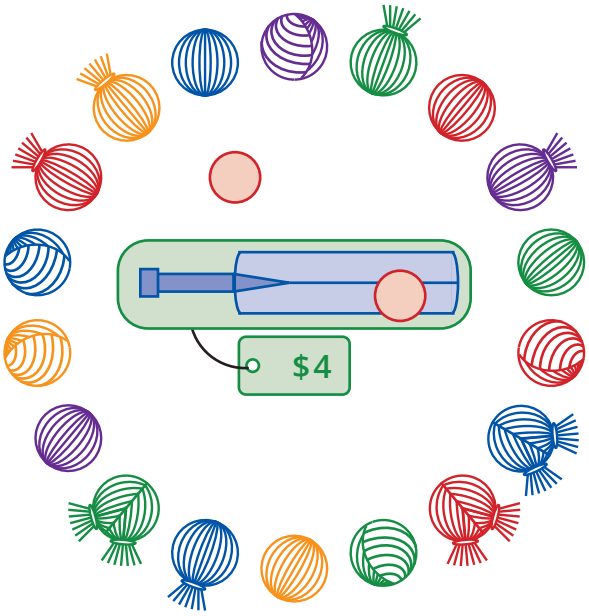


Do we have any more information? What else do we know?

Remember how **1** bat and **2** balls cost a total of $**5**?



How much would this set cost if we took out **1** ball?



It costs $**5** for **1** bat and **2** balls, and it costs $4 for 1 bat and 1 ball.

This means that a single ball must cost $**5** – $4 = **$1**.

Let's check: If a single ball costs $1, then a single bat must cost $4 – $1 = $3.

One ball and two bats cost a total of $1 + $3 + $3 = $**7**.

One bat and two balls cost a total of $3 + $1 + $1 = $**5**.

That matches the question.