Maths Games 2020 Resource Kit 1
Teaching Problem Solving

MATHS GAMES

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, so by Years 5-6 they 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.

The problems in this resource kit are based on questions from Maths Olympiad and Maths Games competitions in previous years. Further questions and solution methods can be found in the APSMO resource books available from www.apsmo.edu.au.

Competition problems can often be solved in many different ways. For this reason, different methods of solution will be suggested for each problem, with particular emphasis on:

1. Guess, Check and Refine

With this strategy, the student makes a reasonable guess of the answer, and then checks the guess against the conditions of the problem. If the first guess is not correct, the student obtains more information that may lead to the answer. Beginners in particular are urged to use "Guess, Check and Refine" often, until they catch the "feel" of solving problems.

2. Draw a Diagram

If a problem is not illustrated, sometimes it is helpful for the student to draw a diagram. A picture may reveal information that may not be obvious just by reading the problem. It is also useful for keeping track of where the student is up to in a multi-step problem.

This resource kit includes:

- **Set Yellow**
  Example problems for which full worked solutions are included.
- **Set Green**
  Problems that are designed to be similar to Set Yellow, but with fewer difficult elements.
- **Extension**
  Problems that are similar in mathematical structure to the corresponding Yellow problems.

How to use these problems

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 may 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 and sophisticated 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.

Set Yellow

1.1) There are 12 people in a boat.
There are eight more men than women in the boat.
How many women are in the boat?

1.2) A starting number is multiplied by 4.
Then 14 is added to the result.
The new number is 6 times the starting number.
What is the starting number?

1.3) A dollar was changed into 16 coins consisting of just 5c coins and 10c coins.
How many coins of each value were in the change?

1.4) In a group of 30 high school students, there are:

- 8 students in the French class, and
- 12 students in the Japanese class.

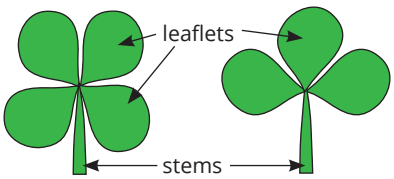
Three of the students attend both classes.
How many students in the group are not in either the French class or the Japanese class?

Set Yellow

1.5) There are 6 piles each containing a different number of counters.
Each pile contains at least one counter.
What is the least possible total number of counters in the 6 piles?

1.6) On a standard circular 12-hour clock, the numerals 12 and 6 are opposite each other.
On the planet Bajor, they use a circular ten-hour clock with the numerals 1 to 10 equally spaced.
What pair of opposite numerals on a Bajorian clock has a sum of 11?

1.7) Sean has a patch of clover growing in his garden.
Some of the stems have 4 leaflets.
All of the other stems have just 3 leaflets.
There are 12 stems and 40 leaflets.
How many of the stems have 4 leaflets?



1.8) I am building a 50-metre-long wire fence along one side of a straight road.
The wires will be attached to posts, which are set into the ground at 5 metre intervals.
To begin with there are no posts along this stretch of road.
How many posts do I need to construct this fence?

Set Green

1.1) There are 12 people in a boat.
There are two more men than women in the boat.
How many women are in the boat?

1.2) A starting number is multiplied by 4.
Then 10 is added to the result.
The new number is 6 times the starting number.
What is the starting number?

1.3) Sally has 8 coins which add to a total value of $1.
She only has 10c coins and 20c coins.
How many of each does she have?

1.4) In a group of 20 high school students, there are:

- 6 students in the French class, and
- 6 students in the Japanese class.

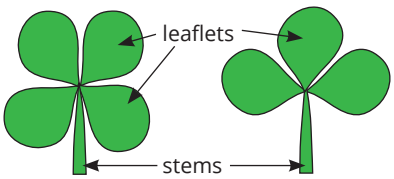
Two of the students attend both classes.
How many students in the group are not in either the French class or the Japanese class?

Set Green

1.5) There are 4 piles each containing a different number of counters.
Each pile contains at least one counter.
What is the least possible total number of counters in the 4 piles?

1.6) On a standard circular 12-hour clock, the numerals 12 and 6 are opposite each other.
On the planet Bahor, they use a circular eight-hour clock with the numerals 1 to 8 equally spaced.
What pair of opposite numerals on a Bahorian clock has a sum of 10?

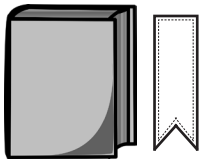
1.7) Sean has a patch of clover growing in his garden.
Some of the stems have 4 leaflets.
All of the other stems have just 3 leaflets.
There are 6 stems and 20 leaflets.
How many of the stems have 4 leaflets?



1.8) I am building a 10-metre-long wire fence along one side of a straight road.
The wires will be attached to posts, which are set into the ground at 1 metre intervals.
To begin with there are no posts along this stretch of road.
How many posts do I need to construct this fence?

Extension

1.1) I spent $22 on a book and a bookmark.
The book cost $20 more than the bookmark.
What was the cost of the book?



1.2) Jon's age is three times Jac's age.
Jill's age is one-third of Jac's age.
Jon is 16 years older than Jill.
How old is Jac?

1.3) A shop owner packages marbles in boxes of two different sizes.
A small box holds 5 marbles and a large box holds 12 marbles.
If the shop owner packaged 99 marbles and used more than 10 boxes, how many boxes of each size did he use?

1.4) There are 12 students in Mr Lee's class.
Today, seven of them brought a sandwich for lunch.
Eight of them brought fruit for recess.
Two of them didn't bring either a sandwich or fruit today.
How many of Mr Lee's students brought both a sandwich and fruit?

Extension

1.5) A total of fifteen 5c coins are put into four piles so that each pile has a different number of coins.
What is the smallest possible number of coins that could be in the largest pile?

1.6) Adam, Bree, Chloe, Duncan, Elena and Fahim are holding hands in a circle, facing the centre.
Adam is opposite Bree.
Duncan is holding Bree's left hand.
Elena is holding hands with both Adam and Fahim.
Who is holding Chloe's left hand?

1.7) The owner of a bicycle store had some bicycles (two-wheelers) and tricycles (three-wheelers) on display.
Each cycle had two pedals.
The total number of pedals on the cycles was 50.
The total number of wheels on the cycles was 64.
How many tricycles were on display?

1.8) Kim stands in a line of people.
She is the 25th person counting from the front of the line.
She is the 12th person counting from the rear of the line.
How many people are in the line?

Maths Games – Example Problem 1.1

Example Problem 1.1 - Green

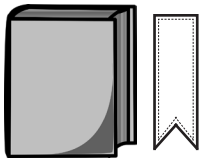
There are 12 people in a boat.
There are two more men than women in the boat.
How many women are in the boat?

Example Problem 1.1 - Yellow

There are 12 people in a boat.
There are eight more men than women in the boat.
How many women are in the boat?

Example Problem 1.1 - Extension

I spent $22 on a book and a bookmark.
The book cost $20 more than the bookmark.
What was the cost of the book?



Maths Games Example Solution 1.1 - Yellow

There are 12 people in a boat. There are 8 more men than women in the boat. How many women are in the boat?

Strategy 1: Guess, Check and Refine

Let's guess a number of women.

How about 4 women?

Approach 1

There are eight more men than women.

With 4 women, that's 4 + 8 = 12 men.

4 women + 12 men = 16 people.

That's too many. The boat has 12 people.

Approach 2

There are 12 people on the boat.

So there are 12 – 4 = 8 men.

That's 8 – 4 = 4 more men than women.

That's not enough. It should be 8 more men.

Let's try 3 women.

If so, there are 3 + 8 = 11 men.

3 women + 11 men = 14 people.

If so, there are 12 – 3 = 9 men,

and 9 – 3 = 6 more men than women.

It's getting closer to our target.

How about 2 women?

If so, there are 2 + 8 = 10 men.

2 women + 10 men = 12 people.

If so, there are 12 – 2 = 10 men,

and 10 – 2 = 8 more men than women.

That matches the question.

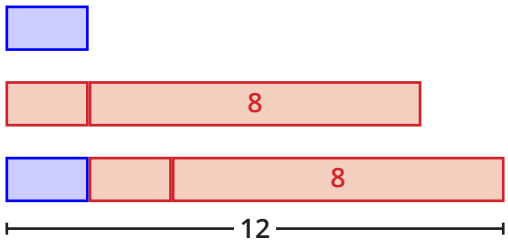
So there must be **2** women on the boat.

Strategy 2: Draw a Diagram (1)

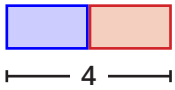
Let's use a bar to represent the number of women.

There are eight more men than women.

There are 12 people in total.



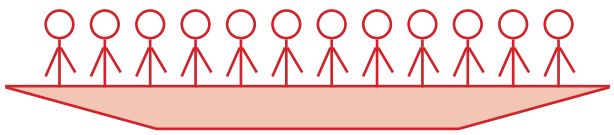
From the diagram, we can see that these two bars together would comprise 12 – 8 = 4 people.



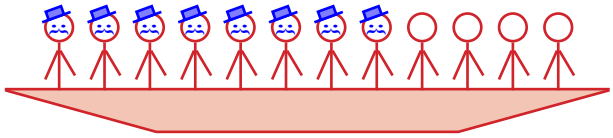
So the number of women must be 4 ÷ 2 = **2**.

Strategy 3: Draw a Diagram (2)

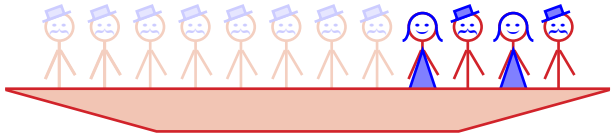
We can draw the boat with 12 people in it.



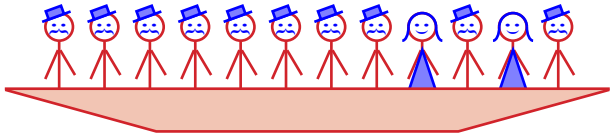
Let's make eight of the people men.



If we took those eight men away, there must be just as many men as there were women.



So there must be **2** women in the boat.



Answers

1.1 - Green: 5

1.1 - Yellow: 2

1.1 - Extension: $21

Maths Games – Example Problem 1.2

Example Problem 1.2 - Green

A starting number is multiplied by 4.
Then 10 is added to the result.
The new number is 6 times the starting number.
What is the starting number?

Example Problem 1.2 - Yellow

A starting number is multiplied by 4.
Then 14 is added to the result.
The new number is 6 times the starting number.
What is the starting number?

Example Problem 1.2 - Extension

Jon's age is three times Jac's age.
Jill's age is one-third of Jac's age.
Jon is 16 years older than Jill.
How old is Jac?

Maths Games Example Solution 1.2 - Yellow

A starting number is multiplied by 4. Then 14 is added to the result. The new number is 6 times the starting number. What is the starting number?

Strategy 1: Guess, Check and Refine

Let's guess a number - say, 3.

3 × 4 = 12. 12 + 14 = 26.	3 × 6 = 18.

The results are not the same.
The second result is 26 - 18 = 8 less than the first result.
So the starting number must not be 3.

Guess: The starting number is 2.

2 × 4 = 8. 8 + 14 = 22.	2 × 6 = 12.

The difference between the results is now 22 - 12 = 10.
This difference is greater than we had for our first guess.
Since we guessed a smaller number this time, let's try a bigger guess.

Guess: The starting number is 5.

5 × 4 = 20. 20 + 14 = 34.	5 × 6 = 30.

The difference is now 4.
The results are getting closer together.
The second result is still smaller than the first.
Let's try an even bigger guess.

Guess: The starting number is 7.

7 × 4 = 28. 28 + 14 = 42.	7 × 6 = 42.

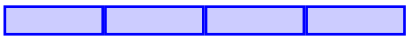
The results match.

It works when we try 7 as the starting number.
So the starting number must be 7.

Strategy 2: Draw a Diagram

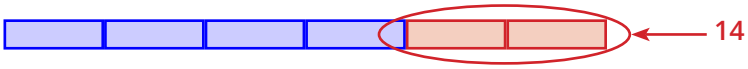
Let's say that the starting number is this big.

It is multiplied by 4, then 14 is added to the result.



The new number is 6 times the starting number.

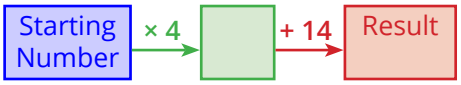
This means that this extra bit must be equal to 14.



So the starting number must be 14 ÷ 2 = 7.

Strategy 3: Reason Logically, Guess, Check and Refine, and Work Backwards

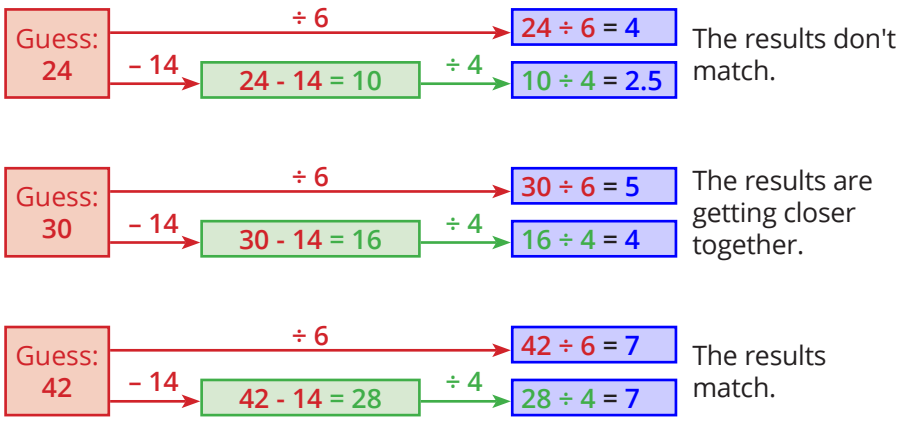
A starting number is multiplied by 4, then 14 is added.



The new number is 6 times the starting number.

So the new number must be a multiple of 6.

We can guess multiples of 6 and work backwards.



So the starting number must be 7.

Answers

1.2 - Green: 5

1.2 - Yellow: 7

1.2 - Extension: 6

Maths Games – Example Problem 1.3

Example Problem 1.3 - Green

Sally has 8 coins which add to a total value of $1.

She only has 10c coins and 20c coins.

How many of each does she have?

Example Problem 1.3 - Yellow

A dollar was changed into 16 coins consisting of 5c coins and 10c coins.

How many coins of each value were in the change?

Example Problem 1.3 - Extension

A shop owner packages marbles in boxes of two different sizes.

A small box holds 5 marbles and a large box holds 12 marbles.

If the shop owner packaged 99 marbles and used more than 10 boxes, how many boxes of each size did he use?

Maths Games Example Solution 1.3 - Yellow

A dollar was changed into 16 coins consisting of just 5c coins and 10c coins.

How many coins of each kind were in the change?

Strategy 1: Guess, Check and Refine (1)

Let's start by guessing that there are three 5c coins.

With three 5c coins, we would have 3 × 5c = 15c in 5c coins.

So there would be $1 – 15c = 85c in 10c coins.

That's not possible. You can't make 85c out of 10c coins.

There must be an even number of 5c coins.

With six 5c coins, we have 6 × 5c = 30c in 5c coins.

So there would be $1 – 30c = 70c in 10c coins.

That would mean there are 70 ÷ 10 = 7 10c coins.

That's 6 + 7 = 13 coins in total.

With twelve 5c coins, we would have 12 × 5c = 60c in 5c coins.

So there would be $1 – 60c = 40c in 10c coins, for a total of 40 ÷ 10 = four 10c coins.

That's 12 + 4 = 16 coins in total.

That matches the question.

So there are **twelve** 5c coins and **four** 10c coins.

Strategy 2: Guess, Check and Refine (2), and Build a Table

If there were three 5c coins, there would be 16 – 3 = 13 10c coins, for a total of 13 × 10 = $1.30 in 10c coins.

Clearly, that's too many 10c coins. Let's try for more 5c coins and fewer 10c coins.

No. 5c coins	3	4	5	6	7	8	9	10	11	12	13	14
No. 10c coins	13	12	11	10	9	8	7	6	5	4	3	2
Total Value	$1.45	$1.40	$1.35	$1.30	$1.25	$1.20	$1.15	$1.10	$1.05	$1.00	95c	90c

The total comes to $1 when there are **12** 5c coins and **4** 10c coins.

Strategy 3: Draw a Diagram (1)

Let's draw **16** coins.

Each coin is worth at least 5c.
In total, that's 16 × 5c = 80c.

If we change one 5c coin to be a 10c coin, the total increases by 5c to 85c.

Let's keep changing 5c coins to 10c coins until we reach $1 in total value.

We can see that there are **twelve** 5c coins and **four** 10c coins.

Strategy 4: Draw a Diagram (2)

Ten 10c coins is worth $1.

We can maintain the same value if we swap a 10c coin for two 5c coins.

Let's keep swapping 10c coins for two 5c coins until we have 16 coins.

With **16** coins, there must be **twelve** 5c coins and **four** 10c coins.

Answers

1.3 - Green: 6 10c coins, 2 20c coins

1.3 - Yellow: 12 5c coins, 4 10c coins

1.3 - Extension:
15 × 5 marbles,
2 × 12 marbles

Maths Games – Example Problem 1.4

Example Problem 1.4 - Green

In a group of 20 high school students, there are:

- 6 students in the French class, and
- 6 students in the Japanese class.

Two of the students attend both classes.

How many students in the group are not in either the French class or the Japanese class?

Example Problem 1.4 - Yellow

In a group of 30 high school students, there are:

- 8 students in the French class, and
- 12 students in the Japanese class.

Three of the students attend both classes.

How many students in the group are not in either the French class or the Japanese class?

Example Problem 1.4 - Extension

There are 12 students in Mr Lee's class.

Today, seven of them brought a sandwich for lunch.

Eight of them brought fruit for recess.

Two of them didn't bring either a sandwich or fruit today.

How many of Mr Lee's students brought both a sandwich and fruit?

Maths Games Example Solution 1.4 - Yellow

In a group of 30 high school students, there are:

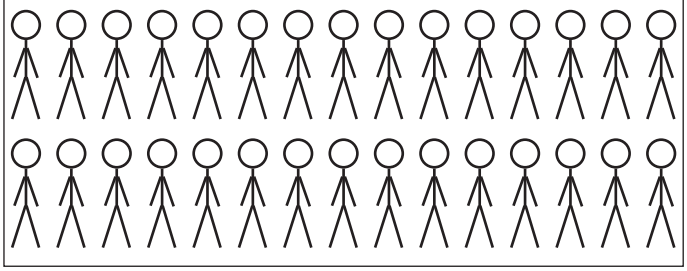
- 8 students in the French class, and
- 12 students in the Japanese class.

Three of the students attend both classes.

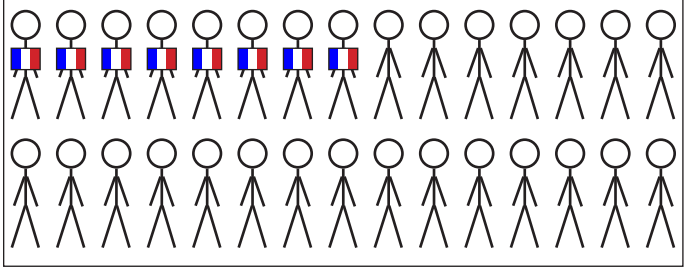
How many students of the group are in neither the French nor the Japanese class?

Strategy 1: Draw a Diagram (1)

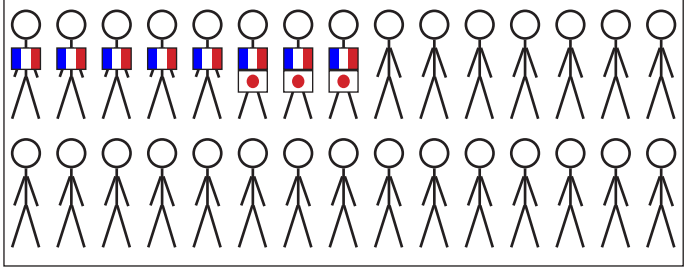
There are 30 high school students in the group.



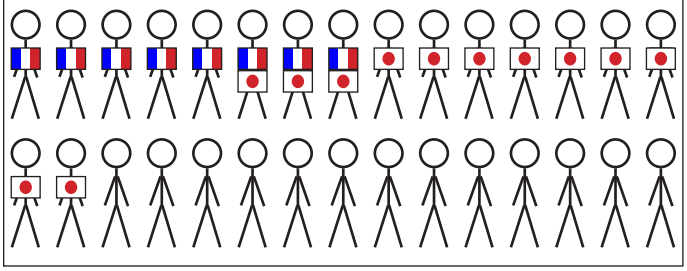
Eight of them are in the French class.



Three of them take both French and Japanese.



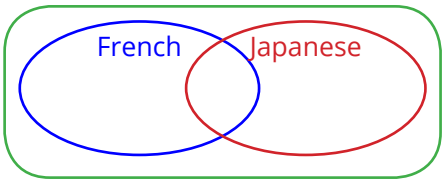
In total, there are twelve in the Japanese class.



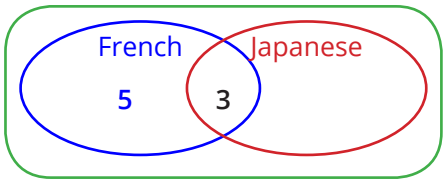
We can see that there are **13** students who are in neither the French class nor the Japanese class.

Strategy 2: Draw a Diagram (2)

We can draw this scenario as a Venn diagram.



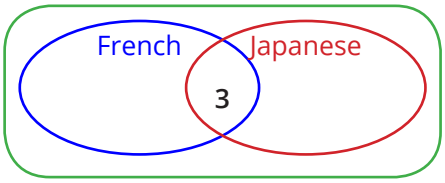
There are two classes.



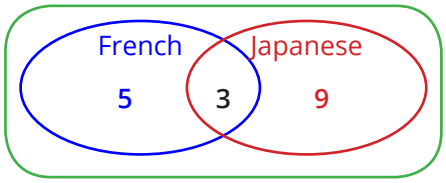
There are **8** students in the French class. So there must be **8 – 3 = 5** students who only take French.

This means that there are **5** + **9** + **3** = **17** students in the group who take at least one language class.

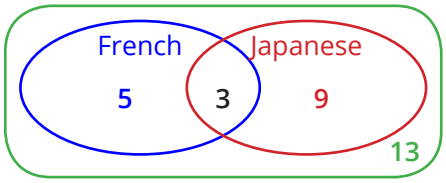
With **30** students in total, there must be **30 - 17 = 13** students who are in neither of the language classes.



Three of the students are in both classes.



There are **12** in the Japanese class. So there must be **12 – 3 = 9** students who only take Japanese.



Answers

1.4 - Green: 10

1.4 - Yellow: 13

1.4 - Extension: 5

Maths Games – Example Problem 1.5

Example Problem 1.5 - Green

There are 4 piles each containing a different number of counters.
Each pile contains at least one counter.
What is the least possible total number of counters in the 4 piles?

Example Problem 1.5 - Yellow

There are 6 piles each containing a different number of counters.
Each pile contains at least one counter.
What is the least possible total number of counters in the 6 piles?

Example Problem 1.5 - Extension

A total of fifteen 5c coins are put into four piles so that each pile has a different number of coins.
What is the smallest possible number of coins that could be in the largest pile?

Maths Games Example Solution 1.5 - Yellow

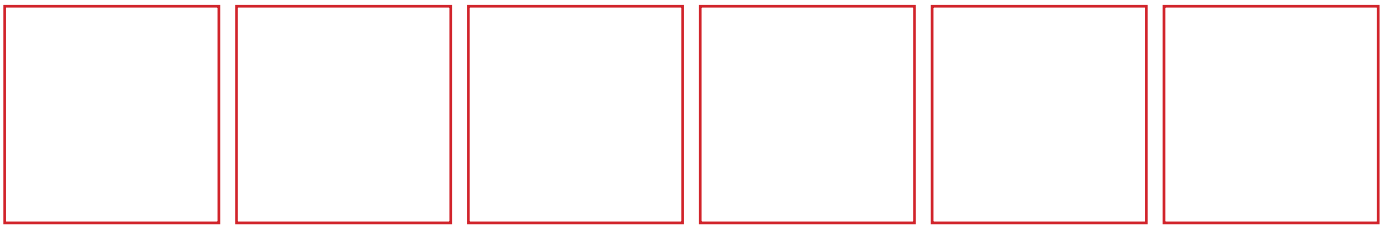
Each of 6 piles contains a different number of counters.

Each pile contains at least one counter.

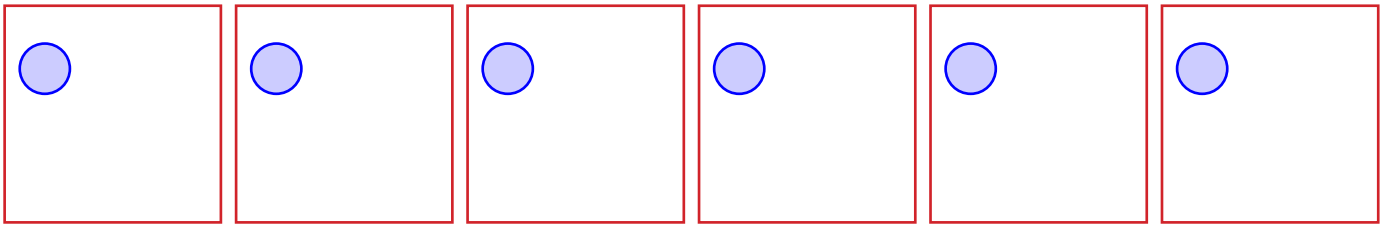
What is the least possible total number of counters in the 6 piles?

Strategy: Draw a Diagram

Let's make six boxes, one for each pile.

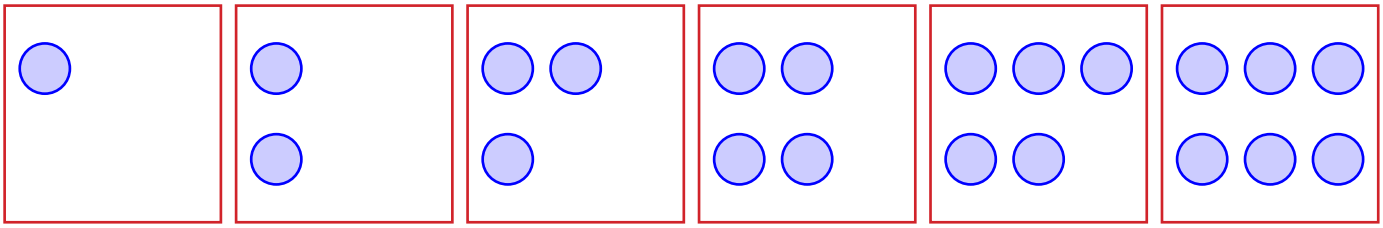


Each pile contains at least one counter.



Each pile contains a different number of counters.

Since we want the least possible total, we won't put on any more than we have to, to make them all different.



To find the total, we need to add them all together: 1 + 2 + 3 + 4 + 5 + 6.

Method 1

We can just add them in order:

1 + 2 = 3

3 + 3 = 6

6 + 4 = 10

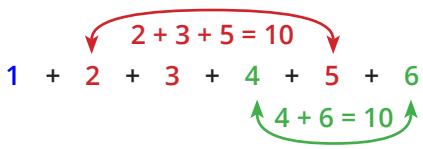
10 + 5 = 15

15 + 6 = 21

```
 1
 2
 3
 4
 5
+6
---
21
```

Method 2

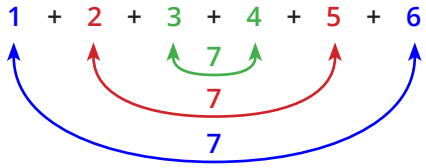
We can group the numbers into **10**s to make them easier to add:



The total is 1 + 10 + 10 = 21.

Method 3

We can group the numbers into equal-sized groups:



The total is equal to 7 + 7 + 7 = 21.

Therefore, the least possible total number of counters is **21**.

Answers

1.5 - Green: 10

1.5 - Yellow: 21

1.5 - Extension: 6

Maths Games – Example Problem 1.6

Example Problem 1.6 - Green

On a standard circular 12-hour clock, the numerals 12 and 6 are opposite each other.
On the planet Bahor, they use a circular eight-hour clock with the numerals 1 to 8 equally spaced.
What pair of opposite numerals on a Bahorian clock has a sum of 10?

Example Problem 1.6 - Yellow

On a standard circular 12-hour clock, the numerals 12 and 6 are opposite each other.
On the planet Bajor, they use a circular ten-hour clock with the numerals 1 to 10 equally spaced.
What pair of opposite numerals on a Bajorian clock has a sum of 11?

Example Problem 1.6 - Extension

Adam, Bree, Chloe, Duncan, Elena and Fahim are holding hands in a circle, facing the centre.
Adam is opposite Bree.
Duncan is holding Bree's left hand.
Elena is holding hands with both Adam and Fahim.
Who is holding Chloe's left hand?

Maths Games Example Problem 1.6 - Solution

On a standard circular 12-hour clock, the numerals 12 and 6 are opposite each other.

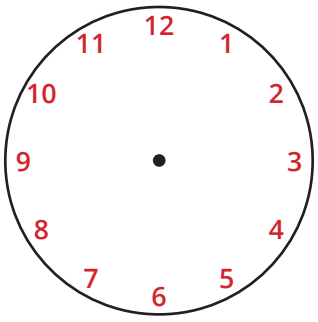
On the planet Bajor, they use a circular ten-hour clock with the numerals 1 to 10 equally spaced.

What pair of opposite numerals on a Bajorian clock has a sum of 11?

Strategy 1: Draw a Diagram

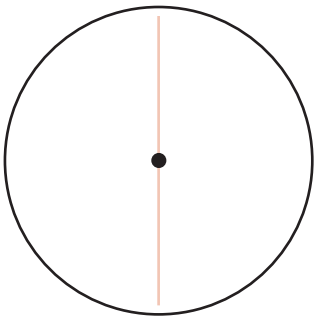
This is a standard circular 12-hour clock.

The numerals 12 and 6 are opposite each other.



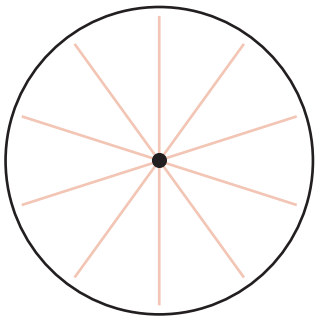
We need to divide the Bajorian clock face into **10** equal sectors.

Since **10 = 2 × 5**, let's begin by dividing the clock face into **2** equal parts (halves).

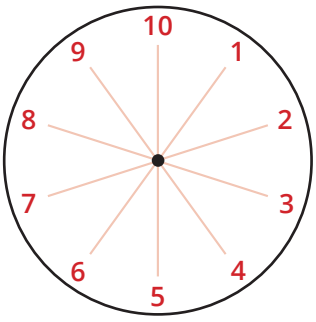


We now need to divide each half into five sectors.

We can think of each of these portions as being a bit smaller than one-eighth.



We can now fill in the numbers from 1 to 10, equally spaced around the clock face.



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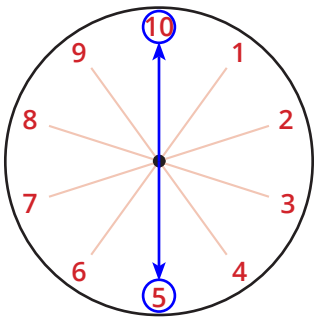
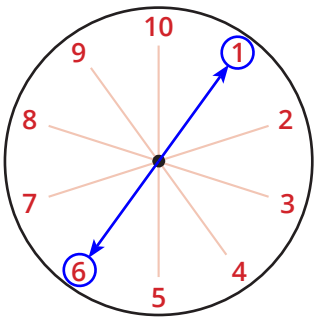
10 is opposite 5.

10 + 5 = 15.

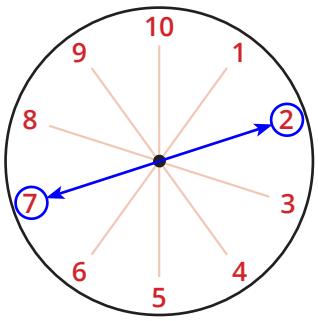


1 is opposite 6.

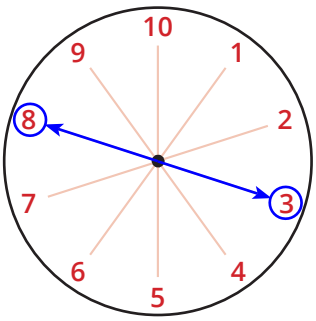
1 + 6 = 7.



2 + 7 = 9.



3 + 8 = 11.



So **3 and 8** have a sum of 11.

Strategy 2: Reason Logically, then Guess, Check and Refine

With **10** numerals equally spaced, the difference between each pair of opposite numerals will be **10 ÷ 2 = 5**.

Let's use this idea to work out the pairs of opposite numerals.

Numeral	1	2	3	4	5
Opposite Numeral	1 + 5 = 6	2 + 5 = 7	3 + 5 = 8	4 + 5 = 9	5 + 5 = 10
Sum of Numeral Pair	1 + 6 = 7	2 + 7 = 9	3 + 8 = 11	4 + 9 = 13	5 + 10 = 15

So the pair of opposite numerals with a sum of 11 is **3 and 8**.

Answers

1.6 - Green: 3 and 7

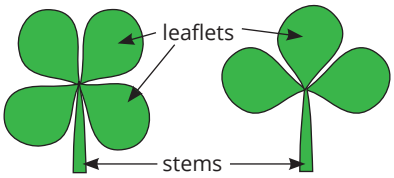
1.6 - Yellow: 3 and 8

1.6 - Extension: Adam

Maths Games – Example Problem 1.7

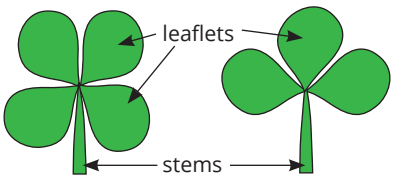
Example Problem 1.7 - Green

Sean has a patch of clover growing in his garden.
Some of the stems have 4 leaflets.
All of the other stems have just 3 leaflets.
There are 6 stems and 20 leaflets.
How many of the stems have 4 leaflets?



Example Problem 1.7 - Yellow

Sean has a patch of clover growing in his garden.
Some of the stems have 4 leaflets.
All of the other stems have just 3 leaflets.
There are 12 stems and 40 leaflets.
How many of the stems have 4 leaflets?



Example Problem 1.7 - Extension

The owner of a bicycle store had some bicycles (two-wheelers) and tricycles (three-wheelers) on display.
Each cycle had two pedals.
The total number of pedals on the cycles was 50.
The total number of wheels on the cycles was 64.
How many tricycles were on display?

Maths Games Example Solution 1.7 - Yellow

Sean has a patch of clover growing in his garden.

Some of the stems have 4 leaflets. All of the other stems have just 3 leaflets.

There are 12 stems and 40 leaflets.

How many of the stems have 4 leaflets?

Strategy 1: Guess, Check and Refine

Let's guess there are **6** four-leaf clovers.

So the other **12 – 6 = 6** would be three-leaf clovers.

No. of leaflets on 4-leaf clovers: **6 × 4 = 24**

No. of leaflets on 3-leaf clovers: **6 × 3 = 18**

Total number of leaflets: **24 + 18 = 42**

We are supposed to have **40** leaflets.

42 is too many.

Let's try changing a 4-leaf clover into a 3-leaf clover.

Let's guess there are **5** four-leaf clovers.

So the other **12 – 5 = 7** would be three-leaf clovers.

No. of leaflets on 4-leaf clovers: **5 × 4 = 20**

No. of leaflets on 3-leaf clovers: **7 × 3 = 21**

Total number of leaflets: **20 + 21 = 41**

41 is still too many.

Let's try changing one more 4-leaf clover into a 3-leaf clover.

Let's guess there are **4** four-leaf clovers.

So the other **12 – 4 = 8** would be three-leaf clovers.

No. of leaflets on 4-leaf clovers: **4 × 4 = 16**

No. of leaflets on 3-leaf clovers: **8 × 3 = 24**

Total number of leaflets: **16 + 24 = 40**

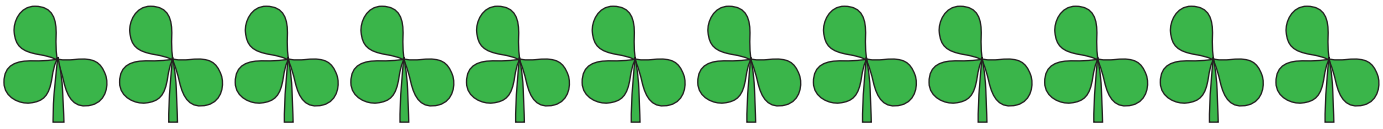
That matches our number of leaflets.

So **4** of the stems have **4** leaflets.

Strategy 2: Draw a Diagram

We have **12** stems.

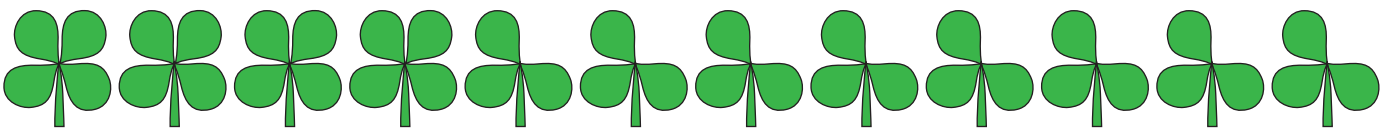
Each stem has at least **3** leaflets.



So far, we have drawn **12 × 3 = 36** leaflets.

There are **40** leaflets in total. So we have **40 – 36 = 4** leaflets remaining.

Let's add the **4** remaining leaflets on to some of the clovers to turn them into four-leaf clovers.



So **4** of the stems have 4 leaflets.

Answers

1.7 - Green: 2

1.7 - Yellow: 4

1.7 - Extension: 14

Maths Games – Example Problem 1.8

Example Problem 1.8 - Green

I am building a 10-metre-long wire fence along one side of a straight road.
The wires will be attached to posts, which are set into the ground at 1 metre intervals.
To begin with there are no posts along this stretch of road.
How many posts do I need to construct this fence?

Example Problem 1.8 - Yellow

I am building a 50-metre-long wire fence along one side of a straight road.
The wires will be attached to posts, which are set into the ground at 5 metre intervals.
To begin with there are no posts along this stretch of road.
How many posts do I need to construct this fence?

Example Problem 1.8 - Extension

Kim stands in a line of people.
She is the 25th person counting from the front of the line.
She is the 12th person counting from the rear of the line.
How many people are in the line?

Maths Games Example Solution 1.8 - Yellow

I am building a 50-metre-long wire fence along one side of a straight road.

The wires will be attached to posts, which are set into the ground at 5 metre intervals.

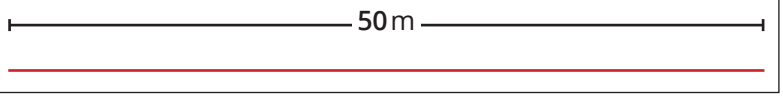
To begin with there are no posts along this stretch of road.

How many posts do I need to construct this fence?

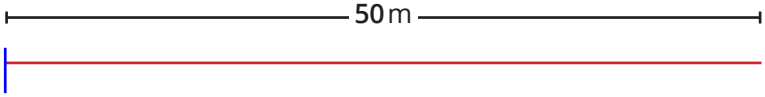
Strategy 1: Draw a Diagram

Let's draw a picture of the fence.

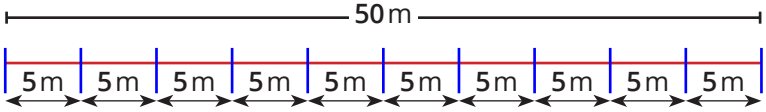
The fence is **50** metres long.



It will need a post to hold up one end,



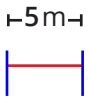
and then there's a post every **5** metres.



So **11** posts are needed to construct the fence.

Strategy 2: Solve a Simpler Related Problem, and Find a Pattern

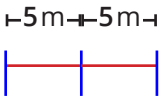
Suppose the fence was only **5** metres long.



Then **2** posts will be needed to construct the fence.

Length of fence	5					
No. of posts	2					

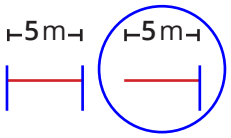
If the fence was **10** metres long,



3 posts will be needed to construct the fence.

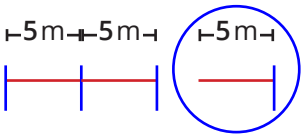
Length of fence	5	10				
No. of posts	2	3				

To turn the **5** metre fence into a **10** metre fence,



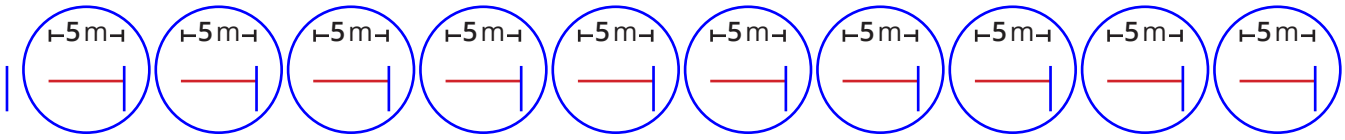
we added 5 metres of wire and 1 post, for a total of 3 posts.

To make the fence another **5** metres longer,



we need to add another 5 metres of wire and 1 more post, for a total of 4 posts.

If we think of each section of fence as though it includes 5 metres of wire and 1 post, then we can build the whole fence by putting down one post, and then adding sections to make it long enough.



For a **50** metre fence, we'll need **50 ÷ 5 = 10** sections, with one post in each section.

So there will need to be **1 + 10 = 11** posts.

Answers

1.8 - Green: 11

1.8 - Yellow: 11

1.8 - Extension: 36

Answers

Set Green

1.1	5
1.2	5
1.3	6 10c coins, 2 20c coins
1.4	10
1.5	10
1.6	3 and 7
1.7	2
1.8	11

Set Yellow

1.1	2
1.2	7
1.3	12 5c coins, 4 10c coins
1.4	13
1.5	21
1.6	3 and 8
1.7	4
1.8	11

Extension

1.1	$21
1.2	6
1.3	15 × 5 marbles, 2 × 12 marbles
1.4	5
1.5	*6*
1.6	Adam
1.7	14
1.8	36