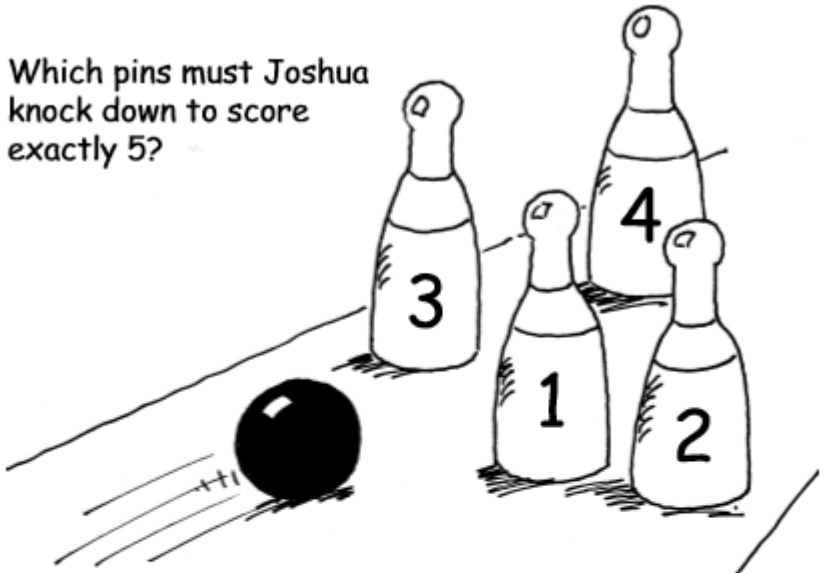
Puzzles and problems for Years 1 and 2

Four-pin bowling

Which pins must Joshua knock down to score exactly 5?



Find 2 different ways:

a. to score 5
b. to score 6
c. to score 7

1

Teaching objectives

Solve mathematical problems or puzzles.
Know addition and subtraction facts up to 10.

Questions and Activities to Develop Reasoning

Always, Sometimes, Never

I can get a higher score with 3 pins than with 2. Is this always true, sometimes true or never true?

Silly Answers

Why is 10 a silly answer if Joshua knocks three pins down?

Continue the Pattern

Joshua knocks two pins down. These are his possible scores:

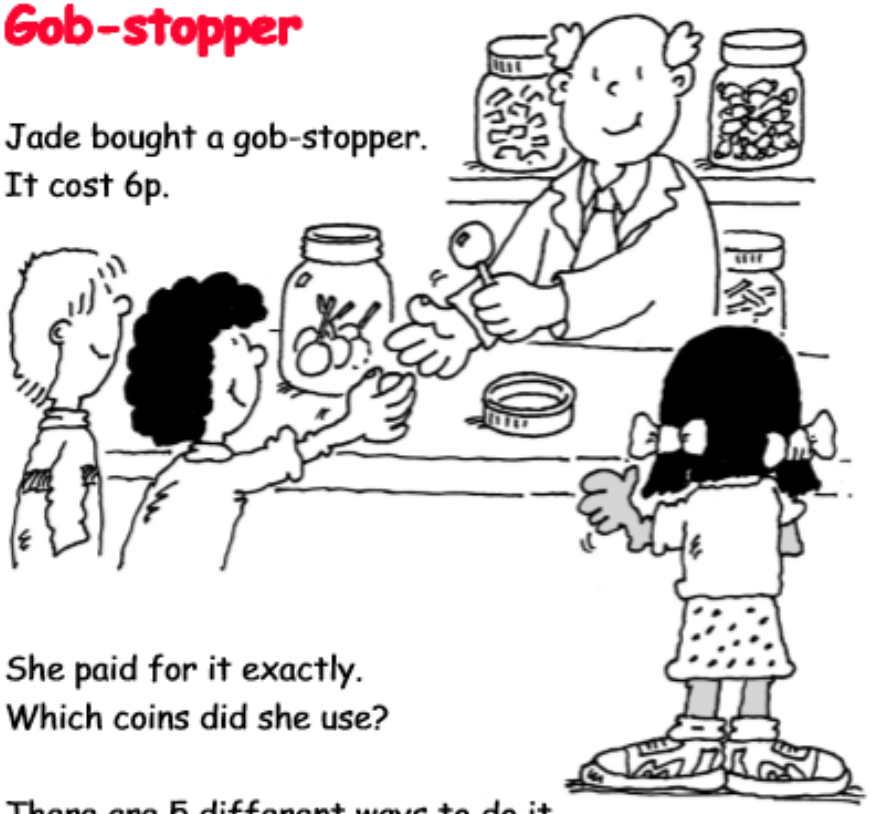
1 + 2 =

1 + 3 =

Is it Possible?

Is it possible for Joshua to score 8 with two pins?

Gob-stopper



Jade bought a gob-stopper.
It cost 6p.

She paid for it exactly.
Which coins did she use?

There are 5 different ways to do it.
Find as many as you can.

What if the gob-stopper cost 7p?

Teaching objectives

Solve mathematical problems or puzzles.
Know addition and subtraction facts up to 10.
Find totals, give change, and work out which coins to pay.

2

Questions and Activities to Develop Reasoning

Is it Possible?

Is it possible to pay for a gob-stopper costing 6p using exactly three coins? What if it cost 7p? 8p?

Which amounts are possible using 3 coins?

What Could it Be?

I pay for a gob-stopper with four coins. The price of the gobstopper is less than 50p? What could it be?

Would you Rather?

Would you rather have the fifty of the lowest denomination of silver coins or 10 of the highest denomination of silver coins?

Another and Another

Give me a set of coins I could use to pay for a gob-stopper costing 25p. And another... And another...

Pick a pair

Choose from these numbers.

1. Pick a pair of numbers.
   Add them together.
   Write the numbers and the answer.

   Pick a different pair of numbers.
   Write the numbers and the answer.

   Keep doing it.
   How many different answers can you get?

2. Now take one number from the other.
   How many different answers can you get now?

3

Teaching objectives

Solve mathematical problems or puzzles.
Know addition and subtraction facts up to 10.

Questions and Activities to Develop Reasoning

Is it possible? 

Is it possible to make a total of 11?

What number could be written in the fifth snowflake to make it possible? Is this the only answer?

Can you Find? 

I have three new numbers and I choose two each time.

Can you find what my three numbers are so that I can make all these totals?

8 12 14

Make up an Example

Make up an example of a set of snowflakes that give five different totals below 15.

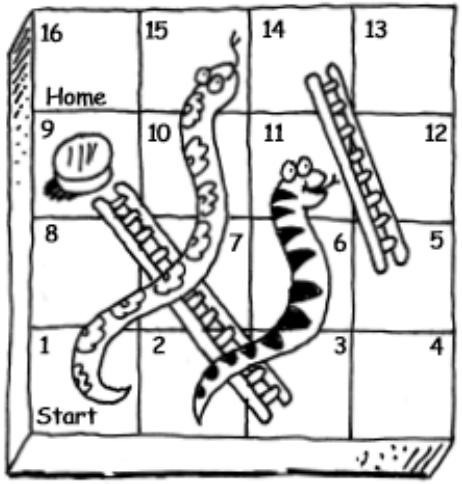
True or False?

I cannot make an even total using four of the numbers below:

3 6 8 5 2

First 4 Maths

Snakes and ladders



Your counter is on 9.

You roll a 1 to 6 dice.
After two moves you land on 16.

Find all the different ways you can do it.

Now think of other questions you could ask.

Teaching objectives

Solve mathematical problems or puzzles.
Count on from any small number.

Questions and Activities to Develop Reasoning

Convince me

I land on 8. Convince me that I cannot reach 16 on my next turn.

True or False?

Is it true or false that I could reach win in just two throws?

Would You Rather?

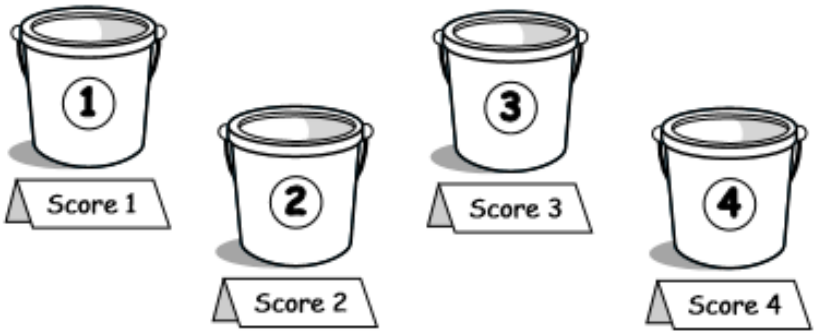
Would you rather start on square 9 and throw a 6 or start on square 8 and throw a 3?

Another and Another

I start on square 10 and reach square 16 on my next two throws. Give me two scores I might throw. And another... And another...

Bean-bag buckets

Dan threw 3 bean-bags.
Each bag went in a bucket.
More than one bag can go in a bucket.



1. What is the highest score Dan can get?
2. Find three ways to score 6.
3. Find three ways to score 9.
4. What other scores can Dan get?

5

Teaching objectives

Solve mathematical problems or puzzles.
Know addition facts up to 10.

Questions and Activities to Develop Reasoning

Silly Answers

Dan takes away the fourth bucket. He throws three bean-bags, which all land in a bucket. I ask him what his total might be. He says it could be 10. This is a silly answer. Why? What else would be a silly answer?

Is it Possible?

This time, Dan has four beanbags to throw into the same four buckets. Is it possible for him to score 9 if they all land in a bucket?

True or False?

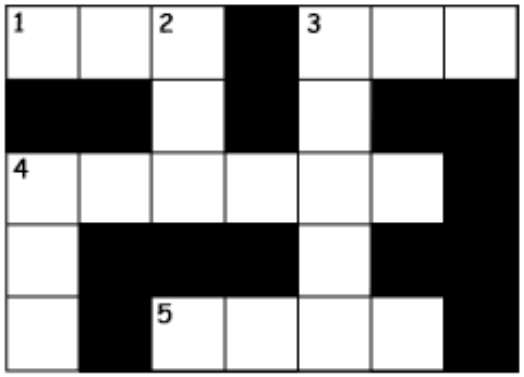
Dan throws all three of his beanbags into the same bucket. His score will definitely be an odd number. True or False?

What Could It Be?

Dan misses with one of his three beanbags but the other two go in. What different scores could he now get?

Crossword

Write the answers to this puzzle in words:
ONE, TWO, THREE, ...



Across

1. 7 – 5

3. 2 + 5 – 1

4. 4 + 4 + 4

5. 13 – 4

Down

2. 3 + 4 – 6

3. 9 – 2

4. 11 – 4 + 3

Teaching objectives

Solve mathematical problems or puzzles.
Use known number facts and place value to add and subtract mentally.
Read and write whole numbers.

Questions and Activities to Develop Reasoning

Spot the Mistake

I decided to write a different calculation for 2 down. It needs to have the same answer. Spot my mistake:

6 + 3 – 7

Write More Statements

Write your own addition and subtraction statement to replace 4 across. It must give the same answer.

Can you replace any other statements with your own to give the same answers?

What Else Do You Know?

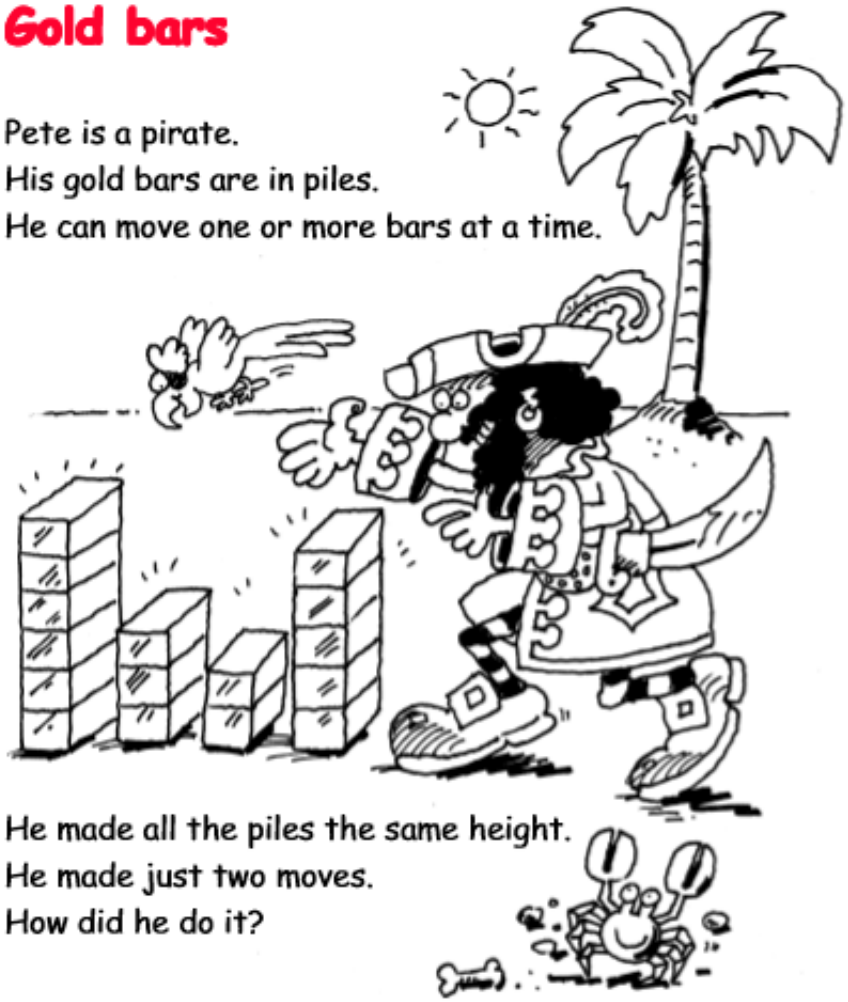
If you know that 11 – 4 + 3 = 10, what else do you know?

Create a Question

Make your own crossword using addition and subtraction facts.

Gold bars

Pete is a pirate.
His gold bars are in piles.
He can move one or more bars at a time.



He made all the piles the same height.
He made just two moves.
How did he do it?

7

Teaching objectives

Solve mathematical problems or puzzles.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Convince Me

Convince me that Pete cannot make five piles with the same number of gold bars in each pile.

Would you Rather?

Would you rather have 6 piles with 4 gold bars in each or 3 piles with 7 gold bars in each?

Silly Answers

4 piles of 3 gold bars = ☐ piles of 6 gold bars

Pete says the missing number is 8.

Tell me why Pete's answer is silly.

What would be another silly answer? Why?

Is it Possible?

Is it possible to make 4 equal piles using 30 gold bars?

Ride at the fair

Lucy had a ride at the fair.
Her Mum asked Lucy to pay less than 20p towards it.

Lucy paid exactly three coins towards the ride.
How much did Lucy pay her Mum?

Find different ways to do it.

Teaching objectives

Solve mathematical problems or puzzles.
Find totals, give change, and work out which coins to pay.

Questions and Activities to Develop Reasoning

Is it Possible?

Is it possible to pay for a 15p ride using three different coins?

Would You Rather?

Would you rather go on a ride that costs the same as three 5p coins or a ride that costs the same as ten 2p coins?

What Could It Be?

Lucy paid for a ride with a 20p piece. She was given two coins in her change. What could the ride have cost? Is this the only solution?

Find the Fiction

Four 5p coins make the same total as two 10p coins.

Ten 2p coins make the same total as two 10p coins.

Three 5p coins make the same total as five 2p coins.

Sum up

Choose from these four cards.

Make these totals:

9
10
11
12
13
14
15

What other totals can you make from the cards?

9

Teaching objectives

Solve mathematical problems or puzzles.
Know addition and subtraction facts to at least 10.
Add three small numbers mentally.

Questions and Activities to Develop Reasoning

Another and Another 3 9 6 5

Give me a total I can make using any combination of these cards. And another... And another ...

Agree or Disagree?

I can make a higher total using the first four even numbers than the first four odd numbers. Do you agree or disagree?

Always, Sometimes, Never

Is it always, sometimes or never true that four single digit numbers added together will make a total greater than 10?

Would You Rather?

Would you rather have the highest total from:

three of these cards 5 7 2 8 or three of these cards? 3 9 6 4

Birds' eggs

You may need 19 counters.

Three birds laid some eggs.
Each bird laid an odd number of eggs.
Altogether they laid 19 eggs.

How many eggs did each bird lay?
Find different ways to do it.

Teaching objectives

Solve mathematical problems or puzzles.
Recognise odd and even numbers.
Add three small numbers mentally.

Questions and Activities to Develop Reasoning

Is it possible?

Is it possible for three birds to lay an even number of eggs if one bird lays five eggs?

Always, Sometimes, Never

Is it always true, sometimes true or never true that three birds can lay a multiple of 5 eggs?

Silly Answers

Three birds lay a total of 15 eggs. I asked my friend how many they each laid and she told me they all laid a different multiple of 3. Why is this a silly answer?

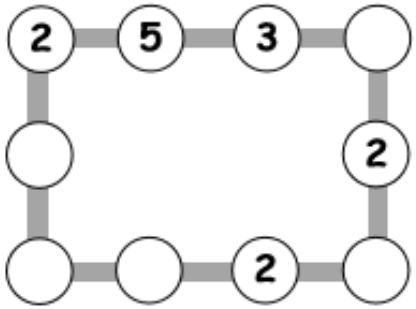
Agree or Disagree?

The three birds each lay an even number of eggs.

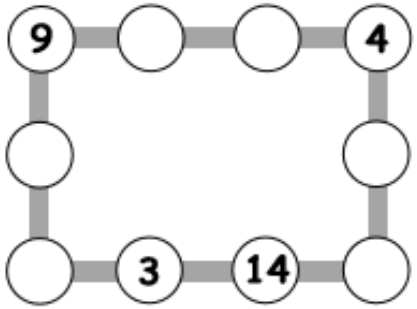
Do you agree or disagree that the three birds can lay an odd number of eggs in total?

Number lines

1. Make each line add up to 16.



2. Make each line add up to 20.



3. Make up your own puzzle like this.
   Ask a friend to do it.

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Teaching objectives

Solve mathematical problems or puzzles.
Know addition and subtraction facts up to 20.
Add three small numbers mentally.

Questions and Activities to Develop Reasoning

Another and Another

Give me 4 numbers that add to make 15. And another... And another ...

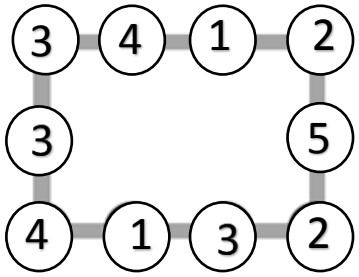
Convince Me

Convince me that I cannot make a total of 13 using three even numbers.

Is It Possible?

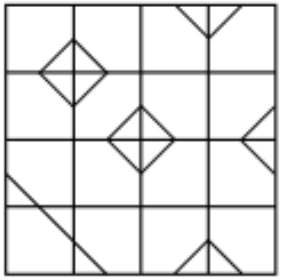
Is it possible to make a total of 18 using four odd numbers?

Spot the Mistake

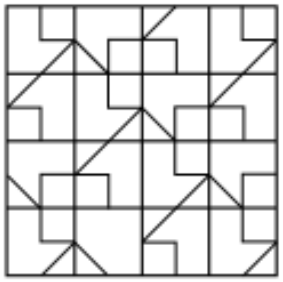


Odd one out

1. Here is a grid of 16 squares.
   One square is different from all the others.
   Mark it on the grid.



2. Now do this one.



Teaching objectives

Solve mathematical problems or puzzles.
Make and describe patterns and pictures.

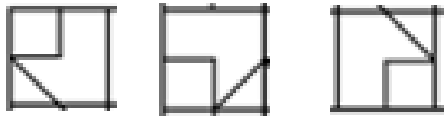
Questions and Activities to Develop Reasoning

What's the Same, What's Different?

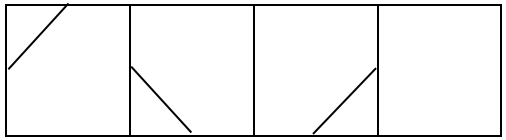
Look at the two grids again. What is the same about them?
And what is different?

Odd One Out

Which of these squares is the odd one out?

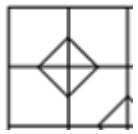


What comes next?



Agree or Disagree?

I could make this pattern symmetrical by addina one more line.



Line of symmetry

You need:
some squared paper,
a red pen, a green pen and a blue pen.

Gopal had six squares: two red, two green, two blue.
He put them in a line.
The squares made a symmetrical pattern.

red	blue	green	green	blue	red

Arrange six squares in a line.
Make two squares red, two green and two blue.
Make the line of squares symmetrical.

How many different lines can you make like this?

13

Teaching objectives
Solve mathematical problems or puzzles.
Begin to recognise line symmetry.
Solve a problem by sorting, classifying and organising information.

Questions and Activities to Develop Reasoning

Always Sometimes Never

Is it always true, sometimes true or never true that you need an even number of squares to make a symmetrical pattern?

Is it Possible?

Is it possible to create a symmetrical pattern using 2 red, 1 blue, 2 green and 1 yellow square?

Agree or Disagree?

If my line starts with a red square, it has to finish with a red square.

What comes next?

blue	green	red	blue	red		

Card sharp

Take ten cards numbered 0 to 9.

1. Pick three cards with a total of 12.
   You can do it in 10 different ways.
   See if you can record them all.

2. Now pick four cards with a total of 12.
   How many different ways can you do it?

3. Can you pick five cards with a total of 12?

Teaching objectives

Solve mathematical problems or puzzles.
Know addition facts to at least 10.
Solve a problem by sorting, classifying and organising information.

Questions and Activities to Develop Reasoning

Convince me

Convince me that it is not possible to make a total of 25 with 3 cards

Is it Possible?

Is it possible to make a total of 3 using 3 cards? What about a total of 4 using 4 cards? 5 using 5 cards? And so on.

Silly Answers

I pick 3 cards and work out the total. What would be a silly answer?

Create a Question

Use the cards to create a question where the answer is 9.

Jack and the beanstalk

Jack climbed the beanstalk.
He always went upwards.

He first did it like this: left, right, left, right.

Find five other ways that Jack can climb the beanstalk.

15

Teaching objectives

Solve mathematical problems or puzzles.
Recognise turns to the left or to the right.
Give instructions for moving along a route.

Questions and Activities to Develop Reasoning

True or False?

Jack can find a way to reach the top with five moves.

Is it possible?

Is it possible for Jack to reach the top in less than four moves?

Convince Me

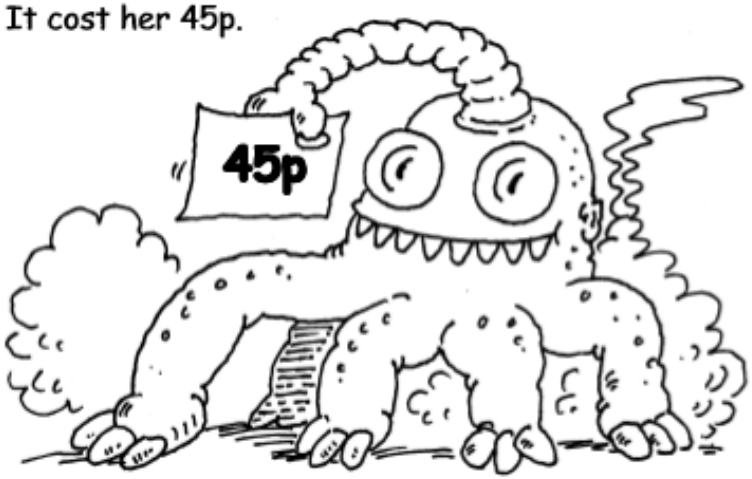
Convince me that Jack cannot reach the top of the beanstalk with less than two left turns.

Spot the Mistake

Jack says he can get to the top without passing the centre in three different ways.

Monster

Alesha bought a monster using only silver coins.
It cost her 45p.



There are nine different ways to pay 45p exactly using only silver coins.
Find as many as you can.

What if the monster cost 50p?
How many different ways are there to pay now?

Teaching objectives

Solve mathematical problems or puzzles.
Find totals.
Work out which coins to pay.

Questions and Activities to Develop Reasoning

True or False?

I can pay 55p for the monster with exactly 4 silver coins.

True or false?

Another and Another

Give me an amount I can pay using exactly three silver coins.
And another... And another ...

Convince Me

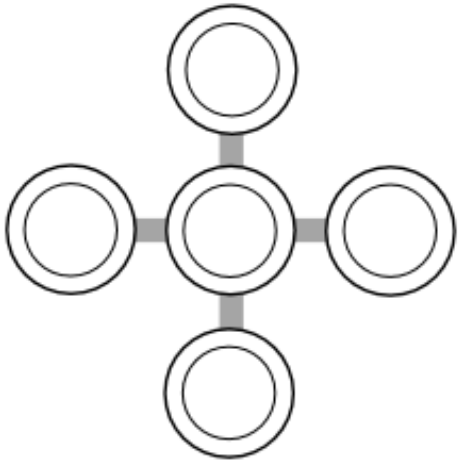
Convince me why I cannot buy a monster for more than £1 using two silver coins.

Silly Answers

Why is 75p a silly answer if I paid with two silver coins?

Cross-road

You need 5 paper plates and 15 counters.
Put the plates in a cross.



Use all 15 counters.
Put a different number on each plate.
Make each line add up to 10.

Do it again.
This time make each line add up to 8.

17

Teaching objectives

Solve mathematical problems or puzzles.
Know addition and subtraction facts up to 10.
Add three small numbers mentally.

Questions and Activities to Develop Reasoning

What Could It Be?

I have a different number of counters which I place on the 5 plates. On the centre plate, I put 6 counters. How many counters could I have on the other plates? Is that the only answer?

Silly Answers

I place 8 counters on the centre plate and ask my friend what the total of each line could be. What would be a silly answer?

Another and Another

How many counters would I have to place to make each line add to 12. Give me another … And another …

Always Sometimes Never

If I place an odd number of counters on the centre plate, I will make an odd total for each line. Is it always true, sometimes true or never true?

Fireworks

Emma had some fireworks.
Some made 3 stars.
Some made 4 stars.

Altogether Emma's fireworks made 19 stars.
How many of them made 3 stars?
Find two different answers.

What if Emma's fireworks made 25 stars?
Find two different answers.

Teaching objectives

Solve mathematical problems or puzzles.
Count on in steps of 3 or 4 from zero, or from any small number.

Questions and Activities to Develop Reasoning

Is it Possible?

Emma uses both types of fireworks. Is it possible for her to make 16 stars?

Another and Another

Emma lights four of her fireworks. Tell me a number of stars that she might see. And another ... And another ...

Would You Rather?

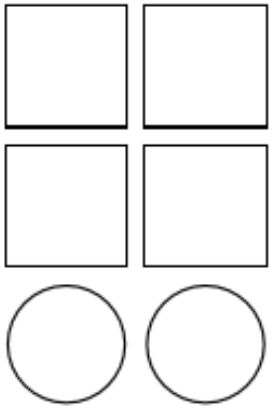
Would you rather have five fireworks that make 3 stars each or 4 fireworks that make 4 stars each?

Always Sometimes Never

Is it always true, sometimes true or never true that Emma makes an even number of stars from three fireworks?

Coloured shapes

What colour is each shape?
Write it on the shape.



Clues

- Red is not next to grey.
- Blue is between white and grey.
- Green is not a square.
- Blue is on the right of pink.

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Teaching objectives

Solve mathematical problems or puzzles.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

What else do you know?

If you know that blue and green are circles, and pink is above blue, what else do you know? What else do you need to know?

Spot the Mistake

White is not a circle. Pink is between grey and red.

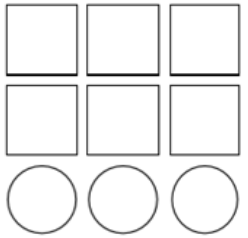
White is not next to a square. Green is to the left of pink.

Convince Me

Blue is a square. Green is on the top row. Grey is a circle. Blue is not on the middle row.

Convince me that blue can never be next to grey.

True or False?



I add some more shapes.

Pink is between blue and green.

Is it true or false that there are three places where pink could be?

Ones and twos

Holly has six numbers, three 1s and three 2s.
She also has lots of + signs, x signs and = signs.

1 2 1 2 1 2

She is trying to make the biggest number possible.
Here are some she tried.

First try	Second try
1 x 2 = 2	1 + 2 + 1 + 2 + 1 + 2 = 9
1 x 2 = 2	
1 x 2 = 2	
2 + 2 + 2 = 6	

Can you beat Holly's score?

What if Holly had three 2s and three 3s?

Teaching objectives

Solve mathematical problems or puzzles.
Use known number facts to add mentally.
Carry out simple multiplication.

Questions and Activities to Develop Reasoning

What Could It Be?

Emma makes a score of 8 using her six numbers. How could she have done it? Is this the only way?

Is it Possible?

Is it possible to make a score less than 6 with Emma's six numbers?

Find the Fiction

Emma can score 8 using only the x signs and all six numbers.

Emma cannot make an odd score with 2s and 1s.

Emma cannot score more than 3 using only her three 1s.

Spot the Mistake

2 x 3 = 6 2 + 3 = 5 2 x 3 x 2 = 12

6 + 5 + 12 = 23

Birthdays

Mum and Paul are talking about birthdays.

They take Paul's age and double it.
Then they add 5.
The answer is 35.
Mum says this is her age.
How old is Paul?

Make up more problems like this.
Try to use some of these words:

double halve add subtract

21

Teaching objectives

Solve mathematical problems or puzzles.
Use known number facts to add mentally.
Carry out simple multiplication.

Questions and Activities to Develop Reasoning

Is it Possible?

They take Pauls' age, add 10 and halve it. This is mum's age. Is this possible?

What Else Do You Know?

When Paul is 15, mum's age is 40. What else do you know?

True or False?

Paul is 10 and his mum is 30. When Paul is 20, his mum will be 60. True or false?

Another and Another

Paul adds 3 to his age and doubles it to get his mum's age, 32.

Give me another set of operations Paul can use to convert his age to his mum's. And another ... And another ...

Christmas tree

Rudolph put four stars on a tree.
He coloured each star either red or yellow.

In how many different ways can Rudolph colour the four stars?

Teaching objectives

Solve mathematical problems or puzzles.
Solve a problem by organising information.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Agree or Disagree?

To have the same number of red and yellow stars, Rudolph needs an even number of stars on the tree. Do you agree or disagree?

Convince Me

Convince me that Rudolph could paint the stars in at least three more ways if he has one extra star.

Silly Answers

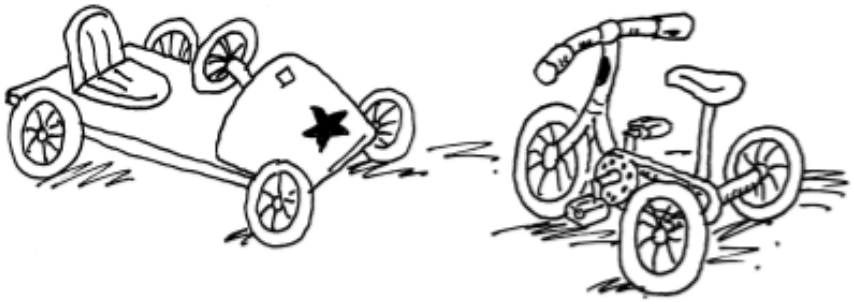
Rudolph still has four stars but now he has three colours. I ask him how many ways he can paint them now. What would be a silly answer?

Is it Possible?

Is it possible for Rudolph to paint five stars with 2 colours in less than 20 different ways?

At the toy shop

The toy shop stocks tricycles and go-carts.
The tricycles have 3 wheels.
The go-carts have 5 wheels.



Suna counted the wheels.
He counted 37 altogether.

How many tricycles are there?
How many go-carts?

Find two ways to do it.

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Teaching objectives

Solve mathematical problems or puzzles.
Recognise multiples of 3 and 5.
Add mentally a pair of two-digit numbers.

Questions and Activities to Develop Reasoning

Silly Answers

Suna counts 12 tricycles and go-carts in total. I ask her how many wheels she can see. She estimates that there are 30 wheels. Why is this a silly answer? What else would be a silly answer?

What Could It Be?

The toy shop has 10 items in stock. How many wheels could there be? Is this the only answer?

Is it Quicker?

Is it quicker to count the wheels on 5 go-carts or 8 tricycles?

Always, Sometimes, Never

Whenever Suna goes into the toy shop, she counts the total wheels. She counts an odd number of wheels. Is this always true, sometimes true or never true?

Ben's numbers

Ben has written a list of different whole numbers.
The digits of each number add up to 5.
None of the digits is zero.

Here is one of Ben's numbers.

23

Ben has written all the numbers he can think of.
How many different numbers are there in his list?

Write all the numbers in order.

Teaching objectives

Solve a given problem by organising and interpreting data in a simple table.
Write whole numbers in figures; know what each digit represents.
Order whole numbers.

Questions and Activities to Develop Reasoning

Always, Sometimes, Never

This time Ben chooses numbers whose digits add to 4. He says that they have to be either all odd or all even.

Is this always true, sometimes true or never true?

Odd One Out

34 53 16

Which is the odd one out?

What's the Rule?

This time, Ben chooses numbers using a different rule for the digits. What is his rule?

97 53 42

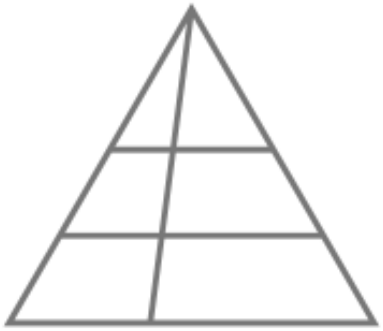
Can you suggest more numbers Ben could use for this rule?

Is it Possible?

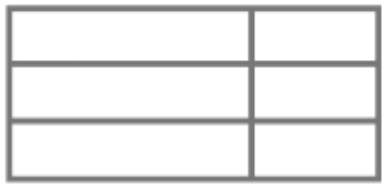
Ben chooses a new number. One of the digits is 0. He adds the digits. Is it possible that the sum of the digits is even?

Spot the shapes 1

1. How many triangles can you count?



2. How many rectangles can you count?



3. Draw your own diagram to count triangles.
   How many can a friend find?
   Can you find more?

25

Teaching objectives

Solve mathematical problems or puzzles.
Visualise 2-D shapes.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Another and Another

Draw me a shape with 8 triangles. And another ... And another ...

True or False?

If I draw four rectangles connected in a row, I can count 10 rectangles in total. True or False?

Always, Sometimes, Never

I draw a pair of triangles connected along one side. I can count 3 triangles. Is this always true, sometimes true or never true?

Is it Possible?

Is it possible to make more than 6 triangles from 3 triangles joined by their sides?

Puzzles and problems for Years 3 and 4

Rows of coins

1. Take five coins: 1p, 2p, 5p, 10p, 20p.
   Put them in a row using these clues.
   The total of the first three coins is 27p.
   The total of the last three coins is 31p.
   The last coin is double the value of the first coin.

2. Take six coins: two 1p, two 2p and two 5p.
   Put them in a row using these clues.
   Between the two 1p coins there is one coin.
   Between the two 2p coins there are two coins.
   Between the two 5p coins there are three coins.

   What if you take two 10p coins as well, and between them are four coins?

Teaching objectives

Solve word problems involving money.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Is it Possible?

I have one each of 1p, 2p, 5p, 10p and 20p. Is it possible to place all five coins in a row so each adjacent pair add to an even amount?

What Could They Be?

I have five coins. 3 of them total 32p. 3 of them total 17p. What could they be? Is this the only answer?

Convince Me

Convince me that I cannot make 63p using less than 4 coins.

Convince me 20p always has to be in the middle of the row.

Would You Rather?

Would you rather have any 3 silver coins or any 50 copper coins?

Roly poly

The dots on opposite faces of a dice add up to 7.

1. Imagine rolling one dice.
   The score is the total number of dots you can see.
   You score 17.
   Which number is face down?
   How did you work out your answer?

2. Imagine rolling two dice.
   The dice do not touch each other.

   The score is the total number of dots you can see.
   Which numbers are face down to score 30?

Teaching objectives

Solve mathematical problems or puzzles.
Add three or four small numbers.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Is it Possible?

Is it possible to score a total of 9 when the 3 is face down?

Is it possible to score more than 10 when the 6 is face down?

Would You Rather?

Would you rather the dice landed with the 6 face down or the 2?

True or False?

I cannot score a total of 11. True or false?

Another and Another

Give me a score I could get if the dice lands with the 4 face down. And another ... And another ...

Dan the detective

1. Dan the detective looked for a number.
   He found a two-digit number less than 50.
   The sum of its digits was 12.
   Their difference was 4.
   What number did Dan find?

2. Dan found a two-digit odd number.
   One of its digits was half the other.
   The number was greater than 50.
   What number did Dan find?

Teaching objectives

Solve a given problem by organising and interpreting data in a simple table.
Write whole numbers in figures; know what each digit represents.

Questions and Activities to Develop Reasoning

What Could It Be?

Dan finds another two-digit number less than 50. The digit sum was a multiple of 3.

What could his number be?

Is It Possible?

Is it possible for Dan's number to be a multiple of 4 if its digit sum and difference are both odd?

Always Sometimes Never

Dan says that the number he finds cannot be an even number if the digit sum is an odd number.

Is this always true, sometimes true or never true?

What Else Do You Know?

What else do you know if Dan tells you that his digit sum is greater than 3?

Spaceship

Some Tripods and Bipods flew from planet Zeno.
There were at least two of each of them.

Tripods have 3 legs.
Bipods have 2 legs.
There were 23 legs altogether.

How many Tripods were there?
How many Bipods?

Find two different answers.

Teaching objectives

Solve mathematical problems or puzzles.
Count on in steps of 2 or 3.
Know multiplication facts for 2 and 3 times tables.

Questions and Activities to Develop Reasoning

Another and Another

Give me a number of legs that I could count if I have twice as many bipods as tripods. And another… And another … What do you notice?

Agree or Disagree?

There can never be the same number of bipod legs as tripod legs. Do you agree or disagree?

Is It Quicker?

Is it quicker to count the legs on 4 bipods and 5 tripods or 6 bipods and 3 tripods?

Always Sometimes Never

If I have the same number of bipods and tripods, I will count an odd number of legs.

Susie the snake

Susie the snake has up to 20 eggs.

She counted her eggs in fours.
She had 3 left over.

She counted them in fives.
She had 4 left over.

How many eggs has Susie got?

30

Teaching objectives

Solve mathematical problems or puzzles.
Know multiplication facts for 4 and 5 times tables.
Find remainders after division.

Questions and Activities to Develop Reasoning

Convince Me

Convince me that Susie cannot have 17 eggs if she has 2 eggs left over when she counts in 4s.

Agree or Disagree?

Susie has 19 eggs. She says that she cannot count her eggs into groups without having any left over. Do you agree or disagree?

Find the Fiction

Susie has 15 eggs. She counts in 4s and has 3 left over.

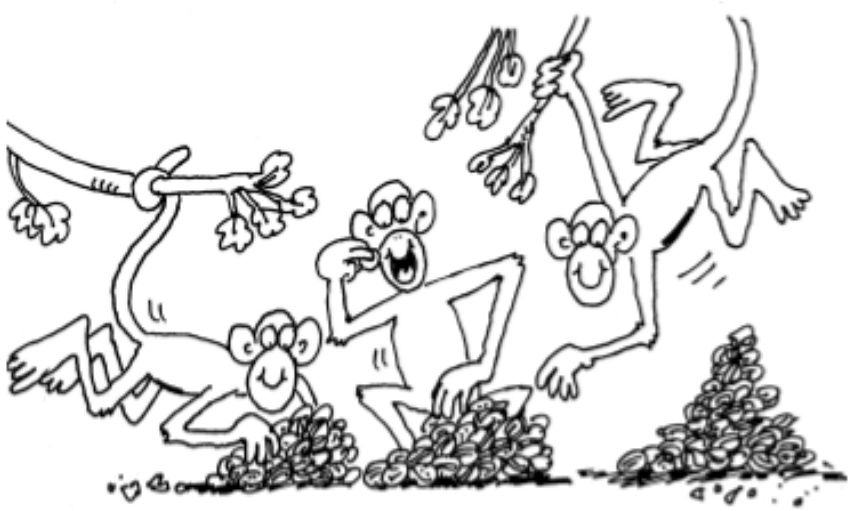
Susie has an odd number of eggs. She will always have some eggs left over if she counts in 4s.

Susie has an even number of eggs. She will never have any left over if she counts in 4s.

Create a Question

Create your own question about the number of eggs that Susie has.

Three monkeys



Three monkeys ate a total of 25 nuts.
Each of them ate a different odd number of nuts.

How many nuts did each of the monkeys eat?
Find as many different ways to do it as you can.

Teaching objectives

Solve mathematical problems or puzzles.
Recognise odd and even numbers.
Add three or four small numbers mentally.

Questions and Activities to Develop Reasoning

What Do You Notice?

Three monkeys ate a different odd number of nuts. How many nuts might there have been in total. Repeat this for four monkeys… Five … And so on…What do you notice?

The Answer is … What was the Question?

The answer is 19 nuts. What was the question?

Is It Possible?

Is it possible for the three monkeys to eat an odd total number of nuts if one of them eats 8 nuts?

Always Sometimes Never

Four monkeys cannot eat an odd total number of nuts.

Is this always true, sometimes true or never true?

Card tricks

Chico's cards are all different.
There is a number from 1 to 8 on each card.

Chico has chosen four cards that add up to 20.
What are they?
There are seven different possibilities.
Try to find them all.

What if Chico has three cards that add up to 16?

32

Teaching objectives

Solve mathematical problems or puzzles.
Know addition and subtraction facts up to 20.
Add three or four small numbers mentally.

Questions and Activities to Develop Reasoning

Silly Answers

Chico chooses three cards that add to 18. He tells me that one of them is a 7 and asks me what the other two might be.

What would be a silly answer?

Prove It

Chico says that the difference between the lowest and highest total he can make is 15. Prove it.

Another and Another

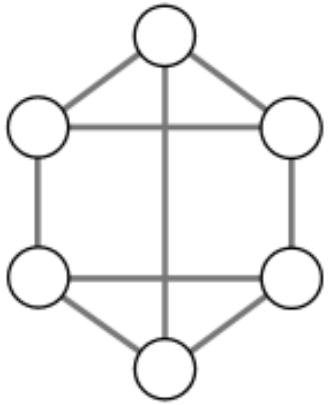
Give me three cards Chico could choose to make a total greater than 10. And another… And another …

Always Sometimes Never

Chico says that he will make a total greater than 15 if one of his numbers is 8. Is this always true, sometimes true or never true?

Neighbours

Use each of the numbers 1 to 6 once.
Write one in each circle.



Numbers next to each other must not be joined.
For example, 3 must not be joined to 2 or 4.

1 2 3 4 5 6

Teaching objectives

Solve mathematical problems or puzzles.
Order numbers 0 to 9.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Create a Question

Create your own question like this using your own diagram.

Agree or Disagree?

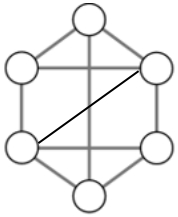
Odd numbers must always be next to other odd numbers.

Do you agree or disagree?

Is It Possible?

Is it possible to place all six numbers

with this extra line?

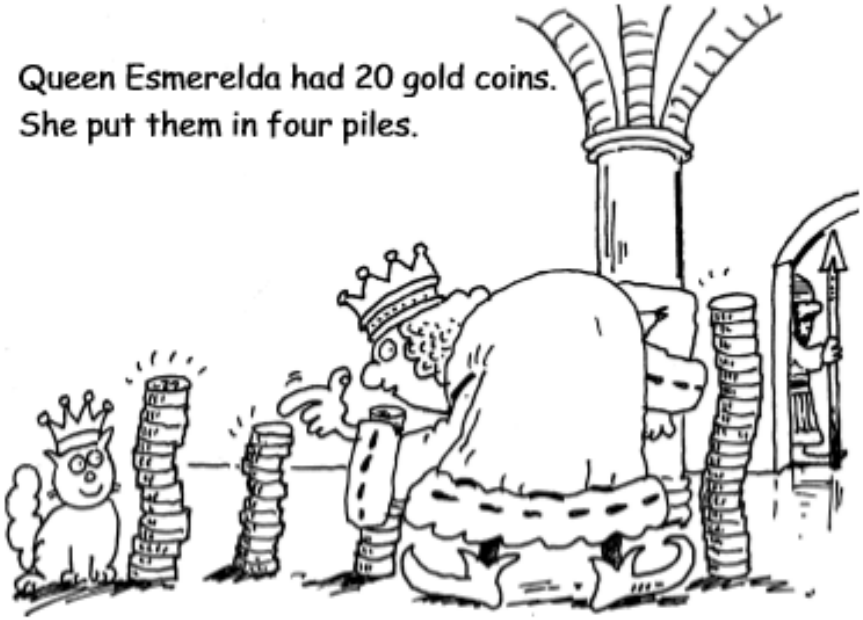


What do you notice?

Which numbers could be joined to the 1? What about the 2? 3? And so on…What do you notice?

Queen Esmerelda's coins

Queen Esmerelda had 20 gold coins.
She put them in four piles.



- The first pile had four more coins than the second.
- The second pile had one less coin than the third.
- The fourth pile had twice as many coins as the second.

How many gold coins did Esmerelda put in each pile?

34

Teaching objectives

Solve mathematical problems or puzzles.
Use vocabulary of comparing and ordering numbers.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Always Sometimes Never

Queen Esmerelda says that she can only make four piles with 3 more in each pile if she has at least 30 gold coins. Is this always, sometimes or never true?

Another and Another

Queen Esmerelda's sister also has four piles of gold coins. She only likes keeping her gold coins in piles of even numbers and each pile must be greater than the pile to its left. Give me a number of gold coins she may have. And another… And another…

Silly Answers

Queen Esmerelda has two piles of coins the same size as each other and another two larger piles the same size as each other. I asked Esmerelda how many gold coins she had. What would be a silly answer to this question?

Create a Question

Create your own question about Esmerelda's gold coins.

Duck ponds

Use 14 ducks each time.

1. Make each pond hold two ducks or five ducks.

2. Make each pond hold twice as many ducks as the one before.

3. Make each pond hold one less duck than the one before.

Teaching objectives

Solve mathematical problems or puzzles.
Know multiplication facts for 2 and 5 times tables.
Add three or four small numbers.

Questions and Activities to Develop Reasoning

Convince Me

Convince me that 14 ducks cannot fill four ponds if there cannot be an odd number of ducks in any one pond and each pond has a different number of ducks.

Another and Another

Draw four ponds that could hold either 2 or 5 ducks. And another four ponds… And another…

What Could It Be?

None of the four ponds hold 2 or 5 ducks. What could they hold?

Odd One Out

Which pond is the odd one out?

Treasure hunt

Jed and Jake are pirates.
Between them they have three precious jewels:
a ruby (R), a diamond (D) and an emerald (E).

Complete the table.
Show what jewels each pirate could have.

Jed	®							
Jake	Ⓔ Ⓓ							

36

Teaching objectives

Solve a given problem by organising and interpreting data in a simple table.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Agree or Disagree?

If instead, they have two of each precious jewel, would there also be twice as many ways that the jewels could be split?

Another and Another

Give me one way the jewels could be shared if there were three pirates and four jewels. And another… And another …

What Else Do You Know?

Jed, Jake and James have four precious jewels. You know that Jake doesn't have a diamond or ruby, Jed doesn't have the ruby or emerald and John has a sapphire and one other stone. What else do you know?

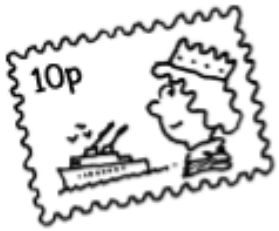
Create a Question

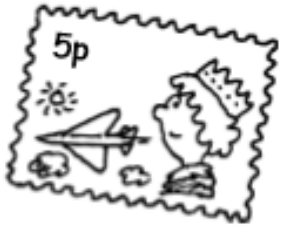
Create your own question about how the pirates could split their jewels.

Stamps

Tilly's parcel cost 55p to post.

She stuck on eight stamps.
Each stamp was either 10p or 5p.





How many of each stamp did Tilly stick on her parcel?

Make up your own puzzle like this.
Ask a friend to do it.

Teaching objectives

Solve mathematical problems or puzzles.
Know multiplication facts for 5 and 10 times tables.

Questions and Activities to Develop Reasoning

Another and Another

Give me a way to pay for a 45p parcel with 10p and 5p stamps. And another… And another …

Possible Answers

Tilly posts another parcel using eight stamps – either 10p or 5p. What did the parcel cost? Find all possible answers.

Silly Answers

Tilly sends another parcel using six stamps – either 10p or 5p. I asked her how much it cost her to post. What would be a silly answer? Explain your reasons.

Find the Fiction

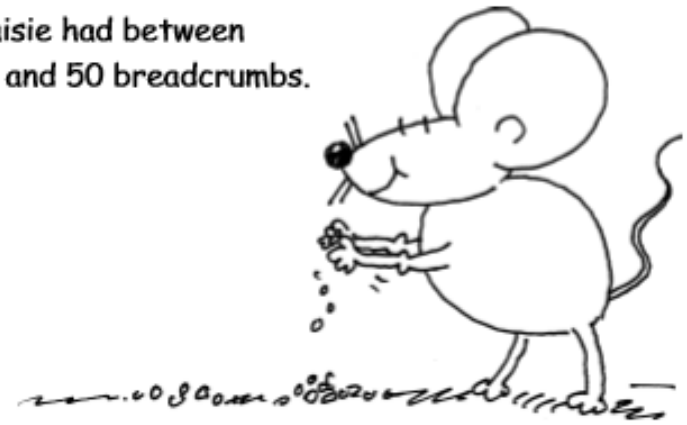
A parcel with four 10p stamps and twice as many 5p stamps would cost 80p.

A parcel with eight 10p stamps would cost twice as much as a parcel with four 5p stamps.

It is not possible to send a parcel for less than 40p with eight stamps.

Maisie the mouse

Maisie had between
30 and 50 breadcrumbs.



She counted the breadcrumbs in fours.
There were 2 left over.

She counted them in fives.
There was 1 left over.

How many breadcrumbs did Maisie have?

38

Teaching objectives

Solve mathematical problems or puzzles.
Know multiplication facts for 4 and 5 times tables.
Find remainders after division.

Questions and Activities to Develop Reasoning

Agree or Disagree?

If Maisie counted the breadcrumbs in threes and had two left over, she cannot have 34 breadcrumbs.

Another and Another

Suggest how many breadcrumbs Maisie might have if she counts in fours and has three left over.

And another ... And another ...

Spot the Mistake

Maisie counts the breadcrumbs in 2s and has 3 left over.

Is it Possible?

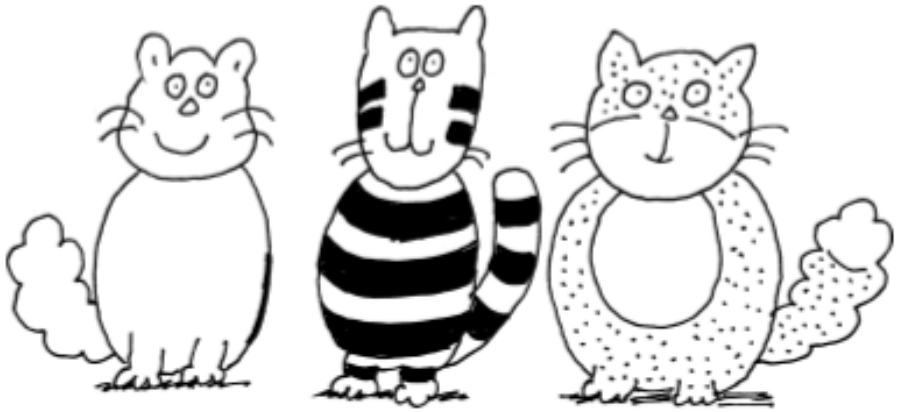
Maisie has between 40 and 60 breadcrumbs. She counts them in 4s and there are none leftover. She counts them in 5s and there are none leftover. Is this possible?

Kieron's cats

Kieron has three cats.
Each is a different weight.

The first and second weigh 7 kg altogether.
The second and third weigh 8 kg altogether.
The first and third weigh 11 kg altogether.

What is the weight of each cat?



Teaching objectives

Solve mathematical problems or puzzles.
Know addition and subtraction facts to 20.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Is it possible?

The two heaviest cats weigh a total of 13kg. The two lightest cats weigh a total of 9kg and there is a difference of 3kg between them. Is it possible for the heaviest cat to be 10kg?

Another and Another

The three cats weigh 18kg altogether. They all weigh at least 2kg and no two cats are the same weight. Give me the three weights they could be. And another… And another …

Peculiar Obvious General

Give me a peculiar, obvious and general set of weights for the three cats if their total weight is 20kg.

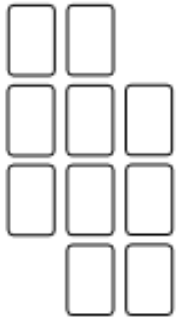
Create a Question

Make up your own question about the weight of the cats.

Next door numbers

Take ten cards numbered 0 to 9.

Arrange the cards like this.



Do it so that no two consecutive numbers are next to each other, horizontally, vertically or diagonally.

There are lots of ways to do it.
How many ways can you find?

40

Teaching objectives

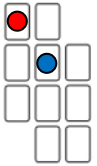
Solve mathematical problems or puzzles.
Order numbers 0 to 9.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Is it Possible?

Is it possible to arrange the cards so that no two odd numbers are next to each other horizontally or vertically?

Agree or Disagree?



It is easier to choose a card to place in
The red position than the blue.
Do you agree or disagree?

Spot the mistake

Spot the mistake in this solution.

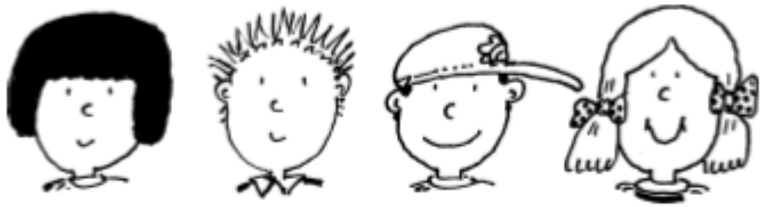
8	5	
6	0	2
3	9	4
	7	1

Always Sometimes Never

Consecutive numbers must have a complete row or column separating them. Is this always, sometimes or never true?

Nick-names

Dawn, Mark, Josh and Tina are friends.



They each have a nick-name.
Their nick-names are Spider, Curly, Ace and Fudgy, but not in that order.

What is the nick-name of each of the friends?

Clues

- Josh plays tennis with Curly and goes swimming with Ace.
- Tina has been on holiday with Curly but travels to school with Fudgy.
- Spider, Curly and Dawn play in the football team.
- Spider sometimes goes to tea with Josh.

Teaching objectives

Solve mathematical problems or puzzles.
Solve a problem by organising information in a table.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Create a Question

Create your own question like this about you and your friends' nicknames.

Odd One Out

Which of the friends is the odd one out and why?

Dawn Mark Josh Tina

What was the Question?

The answer is "Curly".

What was the question?

Spot the mistake (based on the original clues)

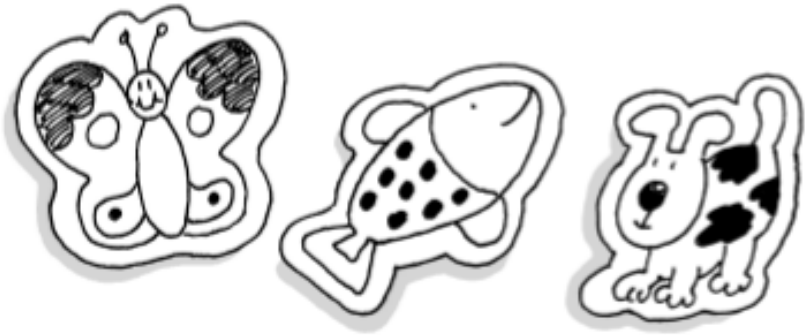
Curly and Josh like to go to the cinema on a Wednesday.

Tina and Spider have been neighbours for 10 years.

Dawn is good friends with Spider and Fudgy.

Stickers

The twins collected some animal stickers.
They each had the same total number.



Winston had 3 full sheets and 4 loose stickers.
Wendy had 2 full sheets and 12 loose stickers.

Every full sheet has the same number of stickers.
How many stickers are there in a full sheet?

Teaching objectives

Solve mathematical problems or puzzles.
Know multiplication facts.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Another and Another

What if the stickers come in sheets of 6? Give me a number of stickers that Winston could have. And another… And another…

Is It Possible?

The twins' friend Wayne has some sheets with 9 stickers on and 3 loose stickers. Is it possible for Winston to have 56 stickers? Explain why.

Would You Rather?

Stickers are sold in sheets of 7.

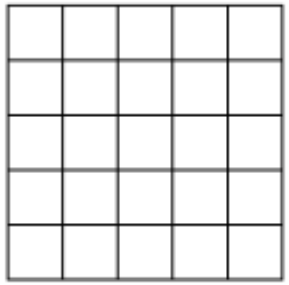
Would you rather have 5 full sheets and 8 loose stickers or 4 full sheets and 15 loose stickers?

What was the question?

The answer is "There are 12 stickers on each page." What was the question?

Odds and evens

You need 13 counters or coins.



Draw a 5 by 5 grid.
Put counters on it.
You can put only one counter in each space.

1. Place 13 counters.
   Get an **odd** number of them in each row and column and the two main diagonals.

2. Place 10 counters.
   Get an **even** number of them in each row and column and the two main diagonals.

Teaching objectives
Solve mathematical problems or puzzles.
Recognise odd and even numbers.
Explain methods and reasoning.

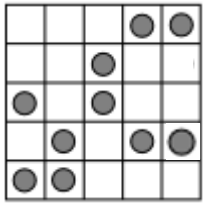
Questions and Activities to Develop Reasoning

Is It Possible?

Is it possible to place more than 13 counters on the grid and still keep an odd number in each row and column?

Spot the Mistake

Spot the mistake in this arrangement of counters. Where should the incorrect counter have been placed?



Create a Question

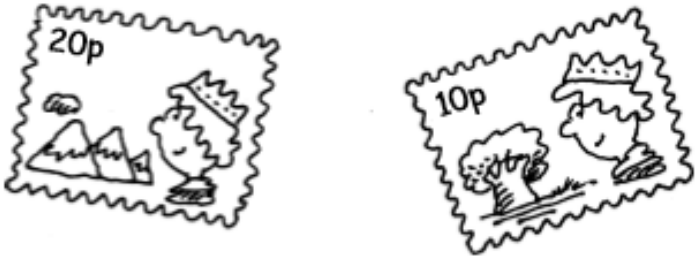
Create your own question involving placing counters on a grid like this.

Convince Me

Convince me that an odd number of counters is needed to make an odd number in each row, column and main diagonal.

More stamps

Rosie spent £2 on 10p and 20p stamps.



She bought three times as many
10p stamps as 20p stamps.

How many of each stamp did she buy?

44

Teaching objectives

Solve mathematical problems or puzzles.
Begin to use ideas of simple ratio and proportion.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

What Could It Be?

The next day, Rosie bought twice as many 20p stamps as 10p stamps. She spent less than £5. What could she have spent? Is that the only answer? Find all possible solutions.

True or False?

Rosie says that she will not be able to buy exactly seven stamps if she spends £1. Is this true or false?

Spot the Mistake

Rosie works out the cost of buying four 20p stamps and twice as many 10p stamps but she doesn't have enough money. This is her calculation:

20p x 4 = 80p 10p x 2 = 20p 80p + 20p = £1

Where did she go wrong?

Convince Me

Convince me that it is possible for Rosie to pay any multiple of 10p if she buys a combination of 10p and/or 20p stamps.

Sandcastles

Lisa went on holiday.

In 5 days she made 80 sandcastles.
Each day she made 4 fewer castles than the day before.
How many castles did she make each day?

Lisa went on making 4 fewer castles each day.
How many castles did she make altogether?

Teaching objectives
Solve mathematical problems or puzzles.
Add two-digit numbers.

Questions and Activities to Develop Reasoning

Is It Possible?

On her next holiday, Lisa makes 20 sandcastles the first day and then each day after that she makes 4 more than the day before. Is it possible for Lisa to make 62 sandcastles if she follows this pattern?

Agree or Disagree?

Lisa says that she will never make an odd number of sandcastles if she makes 14 sandcastles the first day and each day after that, she makes 6 more.

Always Sometimes Never

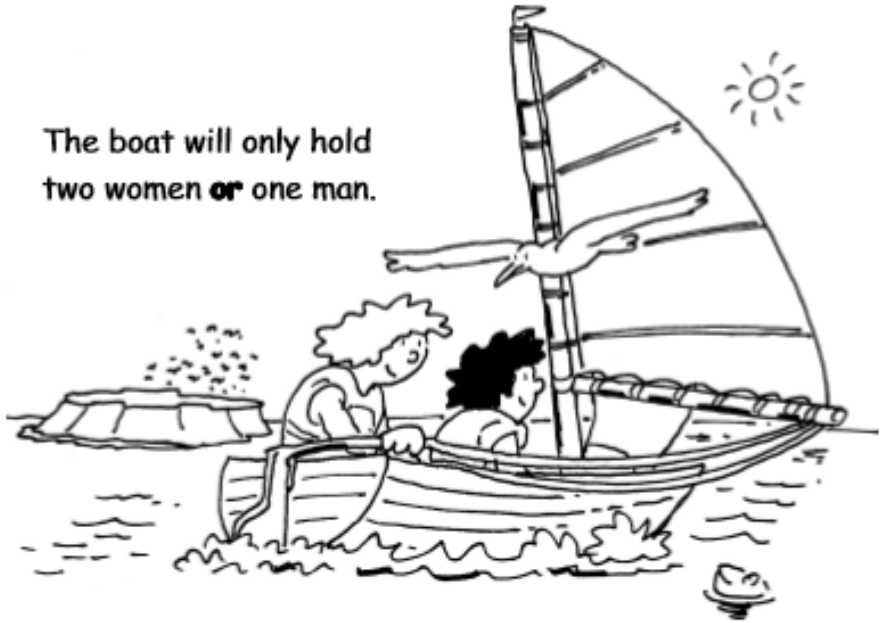
Lisa makes 40 sandcastles one day and makes 3 less than the day before each day after that. The number she makes must be a multiple of 3. Is this always, sometimes or never true?

Peculiar Obvious General

Lisa asks how many sandcastles she could make if she makes 5 more each day after making 12 on the first day. Give Lisa a peculiar, obvious and general answer to her question.

Sail away

Two men and two women want to sail to an island.



The boat will only hold two women **or** one man.

How can all four of them get to the island?

46

Teaching objectives

Solve mathematical problems or puzzles.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Is It Possible?

Is it possible for three men and two women to get to the island in less than ten crossings?

Agree or Disagree?

Two men cannot reach the island without at least one woman.

Do you agree or disagree?

Convince Me

Convince me that four women can reach the island in less crossings than two men and two women.

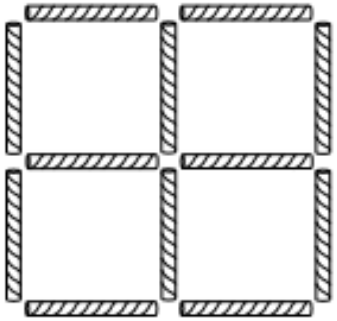
Always Sometimes Never

For every man that crosses to the island, at least one woman is needed. Is this always, sometimes or never true?

Straw squares

You need 20 straws all the same length.

There are 12 straws in this pattern of 5 squares.



Take 20 straws.
Arrange them to make as many squares as you can.
Don't bend or break the straws!

How many squares did you make?

Teaching objectives

Solve mathematical problems or puzzles.
Visualise 2-D shapes.

Questions and Activities to Develop Reasoning

Agree or Disagree?

You will always need an even number of straws to make a pattern of squares

Do you agree or disagree?

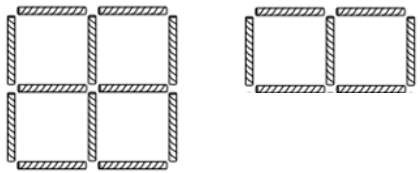
Convince Me

Convince me that I will need at least 25 straws to make a pattern of 6 squares.

Always Sometimes Never

Every time I add 3 straws, one more square is formed. Is this always, sometimes or never true?

What's the Same, What's Different?

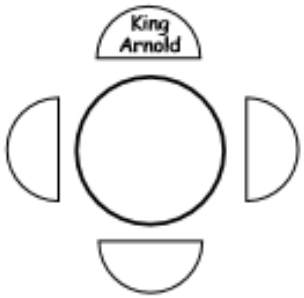


King Arnold

King Arnold sits at a Round Table.

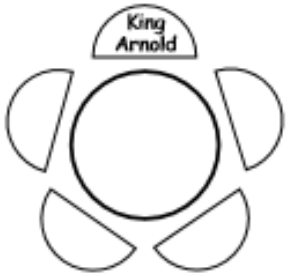
There are 3 empty seats.

In how many different ways can 3 knights sit in them?



What if there are 4 empty seats?

In how many different ways can 4 knights sit in them?



Teaching objectives

Solve mathematical problems or puzzles.
Solve a problem by organising information.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Top Tips

Can you give your top tips for finding the number of different ways for any number of knights to sit?

What's the Same, What's Different

What's the same and what's different about the different ways the knights can sit in 3 empty seats compared to 4 empty seats?

Is It Possible?

Is it possible for King Arnold to sit next to 5 different pairs of knights if there are 5 empty seats?

Agree or Disagree?

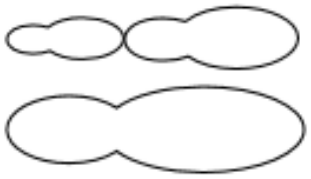
King Arnold says that he wants a different arrangement of knights for every day of the year. He thinks he will only need 6 knights to do this. Do you agree or disagree?

Footsteps in the snow

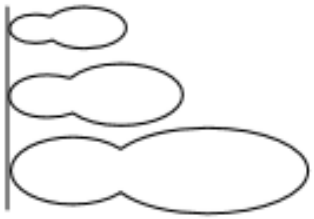
Little has size 2 boots.

Middle has size 3 boots.
They are one and a half times the length of Little's boots.

Big has size 5 boots.
A little boot and a middle boot are the same length as a big boot.



They start with the heels of their boots on the same line.



They each walk heel to toe.

When will all three heels be in line again?

Teaching objectives

Solve mathematical problems or puzzles.
Recognise multiples of 2, 3 and 5.

Questions and Activities to Develop Reasoning

Always, Sometimes, Never

Is it always true, sometimes true or never true that Little will take more than twice as many steps as Big to reach the same point?

Convince Me

Convince me that when Big has taken 10 steps, Middle will have taken more than 16 to reach the same point.

What Else do you Know?

If you know that they stop walking when Middle has taken 20 steps, what else do you know?

Find the Fiction

If Big takes 3 steps, Middle takes 5 to reach the same point.

If Middle takes 3 steps, Little takes 2 to reach the same point.

If Little takes 10 steps, Big takes 2 to reach the same point.

Ski lift

On a ski lift the chairs are equally spaced.
They are numbered in order from 1.

Kelly went skiing.
She got in chair 10 to go to the top of the slopes.

Exactly half way to the top, she passed chair 100 on its way down.

How many chairs are there on the ski lift?

Make up more problems like this.

50

Teaching objectives

Solve mathematical problems or puzzles.
Solve a problem by organising information.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Agree or disagree?

Kelly gets on a different ski lift and sits on chair 20. If there are 150 chairs on this ski lift, she says she will pass chair 95 at the half way point. Do you agree or disagree?

Another and Another

On another ski lift, Kelly sits on chair 6. At the half way point, Kelly passes chair 60. Give me a chair number that Kelly will pass on her way to the top. And another… And another.

What was the Question?

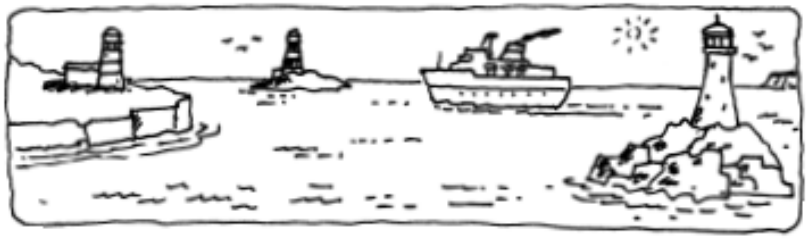
The answer is "chair 80". What was the question?

Top Tips

Give your top tips for finding the chair that Kelly would pass when she is a quarter of the way up.

Lighthouses

On the coast there are three lighthouses.



The first light shines for 3 seconds, then is off for 3 seconds.

The second light shines for 4 seconds, then is off for 4 seconds.

The third light shines for 5 seconds, then is off for 5 seconds.

All three lights have just come on together.

When is the first time that all three lights will be off?

When is the next time that all three lights will come on at the same moment?

Teaching objectives

Solve mathematical problems or puzzles.
Recognise multiples of 6, 8 and 10.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Another and Another

After how many seconds would the second and third lights both be shining? And another…? And another…?

Prove It

The first and second lights will both be shining after 20 seconds. Prove it.

Convince Me

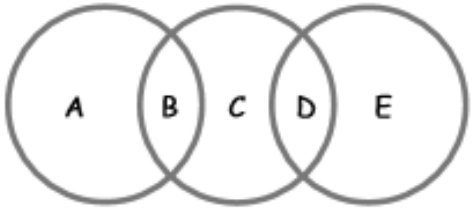
Only one of the lights is shining after 36 seconds. Convince me that it cannot be the first light.

Peculiar Obvious General

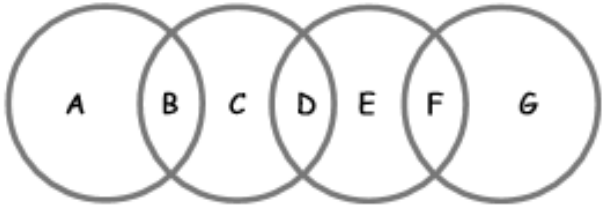
The lighthouse keeper asks one of the fishermen for a time when the first light would be off. What would be a peculiar, obvious and general answer?

Circle sums

1. Use each of the digits 1 to 5 once.
   Replace each letter by one of the digits.
   Make the total in each circle the same.



2. Now use each of the digits 1 to 7 once.
   Make the total in each circle the same.



3. What if you used five circles and the digits 1 to 9?

Teaching objectives

Solve mathematical problems or puzzles.
Add several single digits.
Know addition and subtraction facts to 20.

Questions and Activities to Develop Reasoning

Convince Me

Convince me that the largest numbers must always be in the outermost sections.

Is It Possible?

Is it possible to complete the three circle sum with the numbers 0, 2, 4, 6, 8?

What's the Same, What's Different?

What is the same and what is different about your two circle sum solutions?

Agree or Disagree?

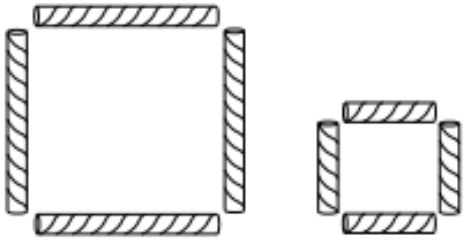
Consecutive numbers cannot be placed next to each other. Do you agree or disagree?

Puzzles and problems for Years 5 and 6

Square it up

You need six drinking straws each the same length.
Cut two of them in half.
You now have eight straws, four long and four short.

You can make 2 squares
from the eight straws.



Arrange your eight straws to make 3 squares, all the same size.

53

Teaching objectives
Solve mathematical problems or puzzles.
Visualise 2-D shapes.

Questions and Activities to Develop Reasoning

True or False?

I cannot make a set of squares using an odd number of straws without having any straws left over

Another and Another

Give me a number of squares the same size that I can make from twelve long straws. And another… And another …

What was the Question?

The answer is "2 small squares and 2 large squares." What was the question?

Find the Fiction

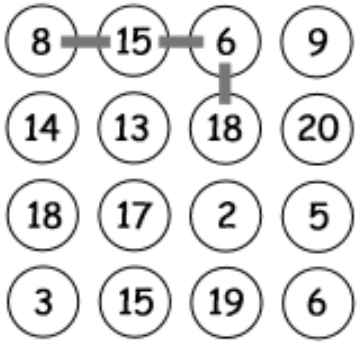
I can make 6 squares the same size using eight long and eight short straws

I can make 6 squares the same size using 8 long straws

I can make 3 squares the same size using 3 long straws and 3 short straws

Joins

Join any four numbers.
Find their total.
Joins can go up, down or sideways, but not diagonally.
The score shown is 8 + 15 + 6 + 18 = 47.



Find the highest possible score.
Find the lowest possible score.

Try joining five numbers.
Now try joining five numbers using only diagonal joins.

Teaching objectives
Solve mathematical problems or puzzles.
Add and subtract two-digit numbers mentally.

Questions and Activities to Develop Reasoning

Is it Possible?

If I start from 3, is it possible to make a total higher than 65 by joining 5 numbers?

Another and Another

Give me a total I can make by joining only prime numbers.
And another… And another…

Would You Rather?

Would you rather have the highest total you can make by joining four numbers including 3, or by joining four numbers including 20?

Silly Answers

Give me a silly answer to this question:

What is the highest total I can make joining four numbers including 14?

Money bags

Ram divided 15 pennies among four small bags.

He could then pay any sum of money from 1p to 15p, without opening any bag.

How many pennies did Ram put in each bag?

55

Teaching objectives

Solve mathematical problems or puzzles.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Convince me

Ram has a fifth bag with another sum of money. The highest total he can now make is 25p. Convince me that he can make any amount up to 25p

Odd One Out

Which is the odd one out of the bags of money Ram has?

What could it be?

The highest total that can be made from four different bags is 20p. What could be the amounts in the bags?

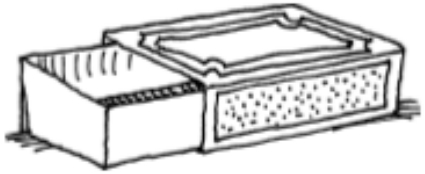
Is it still possible to make every possible amount up to 20p?

Agree or Disagree?

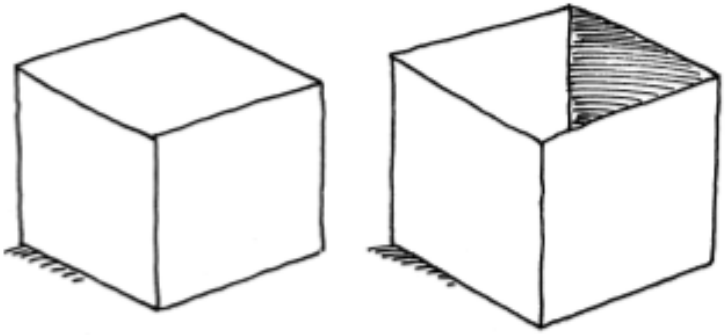
Do you agree or disagree that as long as one bag contains 1p, any total can be made?

A perfect match

1. A matchbox tray slides into its outer cover.
   In how many different ways can you do this?



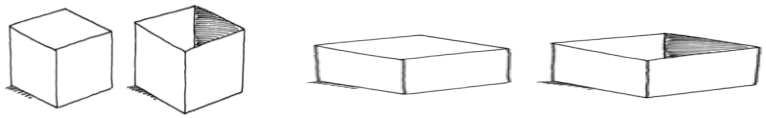
2. Imagine a cube and an open box just large enough to hold it.
   In how many different ways can you fit the cube into the box?



Teaching objectives
Solve mathematical problems or puzzles.
Visualise 3-D shapes.

Questions and Activities to Develop Reasoning

What's the Same, What's different?

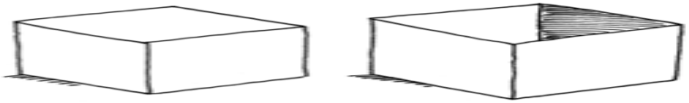


Create a Question

Create a question of your own using a triangular prism.

True or False?

There are half as many ways to fit a cuboid into an open box as there are a cube



What do you notice?

How many different ways can you fit a triangular based pyramid into a box the same shape?

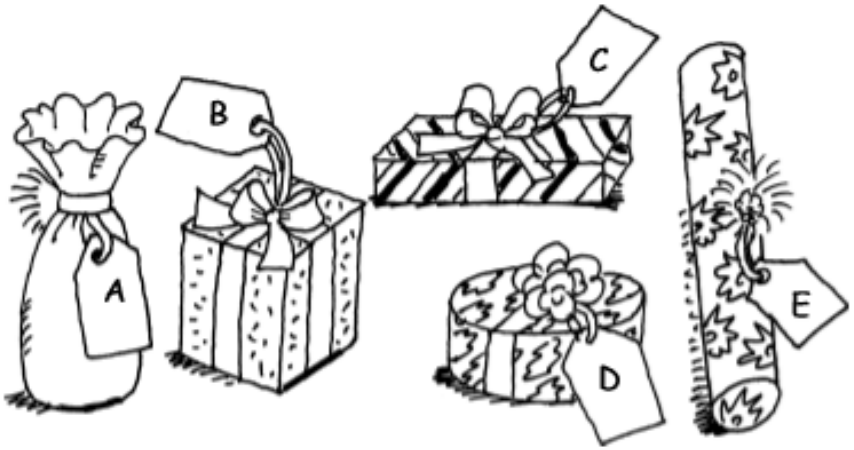
What about a square based pyramid?

What do you notice?

Write more statements about pyramids.

Presents

Gurmit paid £21 for five presents.



For A and B he paid a total of £6.
For B and C he paid a total of £10.
For C and D he paid a total of £7.
For D and E he paid a total of £9.

How much did Gurmit pay for each present?

57

Teaching objectives
Solve a given problem by organising information.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Create a Question

Make up your own question like this one for somebody else to solve.

Silly Answers

Give me a silly answer that Gurmit might have paid for C. Why is this a silly answer?

Peculiar, Obvious, General

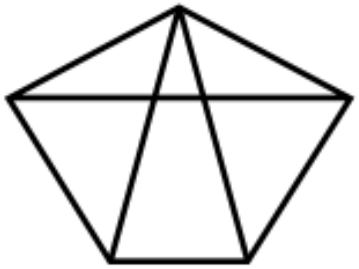
Five different presents have a total cost of £30. Give me a peculiar, obvious and general amount Gurmit could have paid for them.

What could it be?

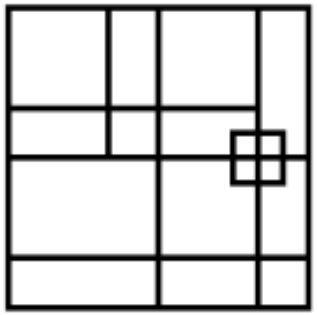
Gurmit buys another five presents. He pays £5 for one of them. The amount he pays for each of the others differs by £3. What could he have paid? Is this the only answer?

Spot the shapes 2

1. How many triangles can you count?



2. How many squares can you count?



3. Draw your own diagram to count triangles.
   Don't use too many lines!
   How many triangles can a friend find?
   Can you find more?

Teaching objectives
Solve mathematical problems or puzzles.
Visualise 2-D shapes.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Is it possible?

Is it possible to draw a shape which contains exactly 2 triangles using only 5 straight lines?

Top Tips

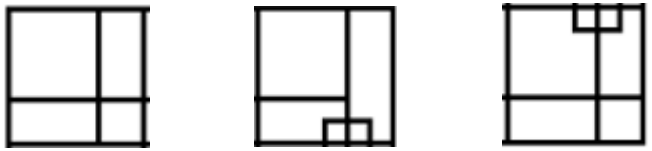
What would be your top tips for counting squares in a diagram like this?

Possible Answers

How many triangles can you make using 10 straight lines?
What is the most number of triangles you can make?

Odd One Out

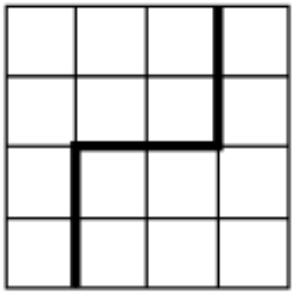
Which is the odd one out of these three parts of the square diagram?



Four by four

You need some squared paper.

This 4 by 4 grid is divided into two identical parts.
Each part has the same area and the same shape.



Find five more ways of dividing the grid into two identical parts by drawing along the lines of the grid.
Rotations and reflections do not count as different!

Explore ways of dividing a 4 by 4 grid into two parts with equal areas but different shapes.

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Teaching objectives
Solve mathematical problems or puzzles.
Visualise 2-D shapes.
Find fractions of shapes.

Questions and Activities to Develop Reasoning

What do You Notice?

Is it possible to divide the 5 by 5 grid into two identical parts? What about a 6 x 6 grid? 7 x 7 ? What do you notice?

Is it Possible?

Is it possible to divide a 4x4 grid into three identical parts? What size grid must I draw to be able to divide it into three identical parts?

Convince Me

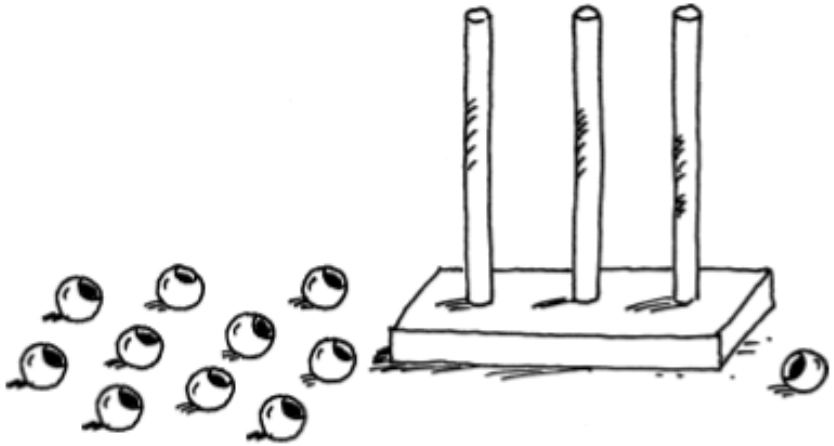
Convince me that there is more than one way to divide this 4 x 4 grid into four identical parts.

Always Sometimes Never

Is it always, sometimes or never true that an even number of squares will divide into 4 equal parts?

Three digits

Imagine you have 25 beads.
You have to make a three-digit number on an abacus.
You must use all 25 beads for each number you make.



How many different three-digit numbers can you make?
Write them in order.

Teaching objectives
Solve mathematical problems or puzzles.
Know what each digit represents.
Order a set of whole numbers.

Questions and Activities to Develop Reasoning

Prove it

What is the largest 3 digit number you can make using 18 beads? What is the smallest? Prove it

Who am I?

I use 21 beads to make another 3 digit number on my abacus. The hundreds digit is 3 times the size of the units digit. What could the number be?

Spot the Mistake

I make some numbers on my abacus using the same beads each time. These are the numbers I made:

348 195 277 807 736

Spot the mistake.

Silly Answers

What would be a silly number to make with 16 beads? Why?

Make five numbers

Take ten cards numbered 0 to 9.

Each time use all ten cards.

Arrange the cards to make:

a. five numbers that are multiples of 3

b. five numbers that are multiples of 7

c. five prime numbers

Make up more problems to use all ten cards to make five special numbers.

Teaching objectives

Solve mathematical problems or puzzles.
Know 3 and 7 times tables.
Recognise prime numbers.

Questions and Activities to Develop Reasoning

(no need to use all ten cards now)

Is it Quicker?

Is it quicker to list all the multiples of 3 up to 20 or all the multiples of 4 up to 30?

Agree or Disagree?

Do you agree or disagree that the first three multiples of 4 have a greater sum than the first three multiples of 5?

Create a Question

Create a question where the answer is:

64 28 24 and 12

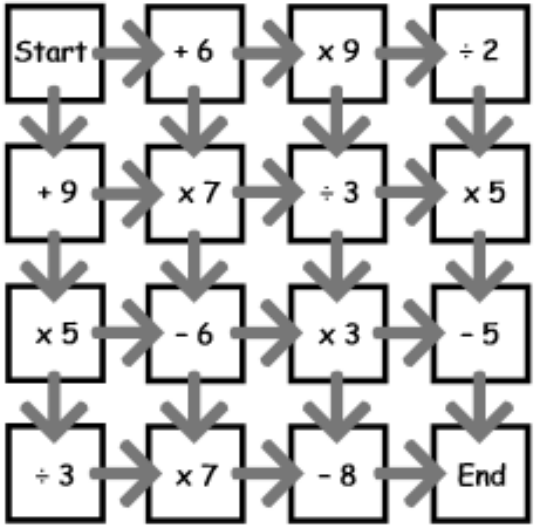
What Could it Be?

I am thinking of a number greater than 20 which is not a multiple of 3, 4 or 7. What could it be?

Maze

Start with zero.

Find a route from 'Start' to 'End' that totals 100 exactly.



Which route has the highest total?

Which has the lowest total?

Now try some different starting numbers.

Teaching objectives

Solve mathematical problems or puzzles.
Add and subtract two-digit numbers mentally.
Multiply and divide by single-digit numbers.

Questions and Activities to Develop Reasoning

Another and Another... ☐ x ☐ + ☐ = 100

Give me a set of numbers that would make this calculation correct. And another... And another ...

What Could It Be?

I add two numbers and multiply them by a single digit to make 100. What could my two numbers be?

Is It Possible?

I have the following numbers and operations.

5 15 4 3 + x ÷

Is it possible to make 100?

Continue the Pattern

1 x 5 + 3 = 8

2 x 5 + 3 = 13

3 x 5 + 3 = ? ...

Jack's book

The pages of Jack's book are numbered from 1.

The page numbers have a total of 555 digits.

How many pages has the book?

How many of the digits are a 5?

Teaching objectives

Solve mathematical problems or puzzles.
Know what each digit represents.

Questions and Activities to Develop Reasoning

Is It Possible?

Is it possible for Jack's book to have pages with the same number of the digits 1 and 5?

Silly Answers

Jack has another book with 100 pages. I asked him how many pages have the digit 0 on them. He said "less than 10." Why is this a silly answer?

Can you give me another silly answer?

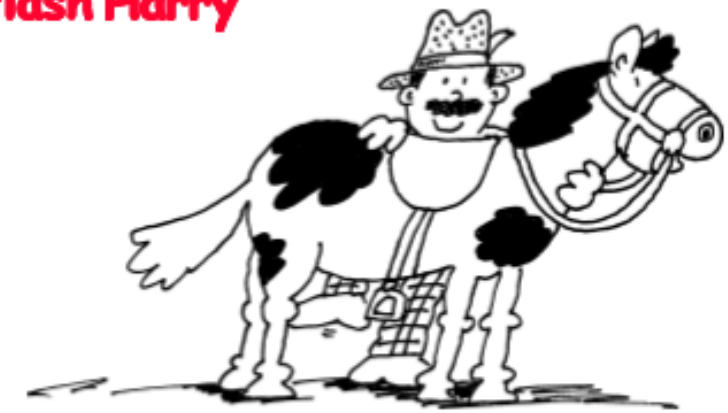
What Could It Be?

Jack says he has another book with 15 of each of the digits 3 and 4 on its pages. How many pages could it have? Is this the only answer?

What's the Same, What's Different?

Jack has two books. One has 25 pages, one has 30. What is the same and what is different about the digits on the pages of each book?

Flash Harry



In April Flash Harry bought a saddle for £100.
In May he sold it for £200.

In June he was sorry he had sold it.
So he bought it back for £300.

In July he got tired of it.
So he sold it for £400.

Overall, did Flash Harry make or lose money?
How much did he make or lose?

Teaching objectives
Solve mathematical problems or puzzles.
Use negative numbers.

Questions and Activities to Develop Reasoning

True or False?

If Flash Harry continues this pattern of buying and selling for another five months, he will make a profit.

Is it Possible?

Is it possible for Flash Harry to make a profit of £600 before the end of the year?

Create a Question

Flash Harry makes a profit of £500.

Continue the story of Flash Harry to show how he did it.

Find the Fiction

If Flash Harry continues buying and selling his saddle in the same way, which of these statements is the fiction?

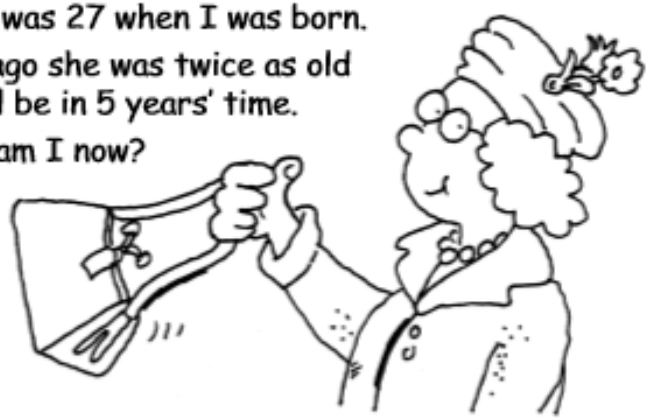
- After 3 more months, Flash Harry is in profit.
- By December, he will have made £900
- He has doubled his money by July.

Age old problems

1. My age this year is a multiple of 8.
   Next year it will be a multiple of 7.
   How old am I?

2. Last year my age was a square number.
   Next year it will be a cube number.
   How old am I?
   How long must I wait until my age is both a square number and a cube?

3. My Mum was 27 when I was born.
   8 years ago she was twice as old as I shall be in 5 years' time.
   How old am I now?



65

Teaching objectives

Solve mathematical problems or puzzles.
Know multiplication facts to 10 x 10.
Recognise square and cube numbers.

Questions and Activities to Develop Reasoning

Create a question

Make up your own question like this if my age now is 15.

Another and Another ...

Give me an age which is a multiple of both 3 and 4. And another... And another ...

Is it Possible?

Is it possible for my age now to be a multiple of 9 and my age next year to be a multiple of 8?

Convince Me

Convince me that if my age now is a multiple of 6, my age next year can never be a multiple of 3.

Zids and Zods

Zids have 4 spots.
Zods have 9 spots.

Altogether some Zids and Zods have 48 spots.
How many Zids are there?
How many Zods?

What if Zids have 5 spots, Zods have 7 spots, and there are 140 spots altogether?
Find as many solutions as you can.

Teaching objectives
Solve mathematical problems or puzzles.
Know multiplication facts to 10 x 10.
Add two-digit numbers mentally.

Questions and Activities to Develop Reasoning

Is it Possible?

Is it possible for some Zids (4 spots) and Zods (9 spots) to have a total of 65 spots?

Would you Rather?

The number of spots shows how intelligent Zids and Zods are.

Would you rather have 8 six-spotted Zods or 5 nine – spotted Zods?

Silly Answers

How many spots in total are there on 5 Zids (4 spots) and 6 Zods (9 spots). What would be a silly answer?

What Could It Be?

I am looking at some Zids and Zods with a total of 50 spots. How many of each could there be and how many spots would be on each? Is this the only answer?

Franco's fast food

This is what food costs at Franco's café.

1 curry and 1 tea cost £4.
2 curries and 2 puddings cost £9.
1 pudding and 2 teas cost £2.

What do you have to pay in total for
1 curry, 1 pudding and 1 tea?
What does each item cost on its own?

Teaching objectives
Solve mathematical problems or puzzles.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

True or False?

If a sandwich and 2 cakes cost £1.50, a sandwich and 4 cakes must cost £3. True or false?

Silly Answers

A jacket potato and a fizzy drink costs £3.50. What would be a silly answer to the question:

What is the cost of a jacket potato and 2 fizzy drinks?

What Else Do You Know?

If you know 2 curries and 1 fizzy drink cost £6, what else do you know? What don't you know?

What Could It Be?

burger £1.80 chips £1.20 chicken nuggets £1.50

milkshake £1.10 water 80p juice 90p

I buy three items from Franco's Fast Food. I pay £3.60

What could they be? Is this the only answer?

Albert Square

36 people live in the eight houses in Albert Square.
Each house has a different number of people living in it.
Each line of three houses has 15 people living in it.
How many people live in each house?

Teaching objectives

Solve mathematical problems or puzzles.
Add several small numbers mentally.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Silly Answers

14 people is a silly answer for the number of people living in one house. Why? What else would be a silly answer?

Convince Me

What is the greatest number of people that can live in a corner house? Convince me of your reasons.

Create a Question

Create a question like this for a friend to solve.

Top Tips

What would be your top tips for somebody else to help them to solve this problem?

Coins on the table

Anna put some 10p coins on the table.
One half of them were tails up.

Anna turned over two of the coins, and then one third of them were tails up.

How many coins did Anna put on the table?

Teaching objectives
Solve mathematical problems or puzzles.
Understand simple fractions.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Is It Possible?

Is it possible for Anna to have started with 26 coins if one third of them were tails up?

True or False?

Half of Anna's coins were heads up. She turns over a quarter of the remaining coins to make them heads also. Now three quarters of the coins are heads up. True or False?

Would You Rather?

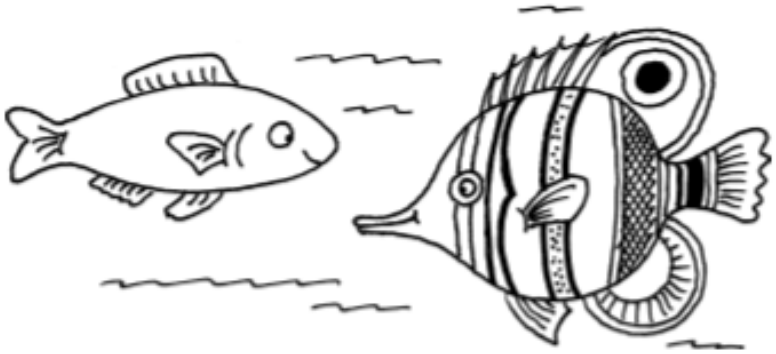
Anna makes up a game. The player with the most coins with heads up wins. Would you rather have 3 more than one quarter of 28 coins or 2 more than one third of 24 coins?

Peculiar Obvious and General

Anna has 30 coins and 12 of them are tails up. Give me a peculiar, obvious and general statement about the fraction that are heads.

A bit fishy

A goldfish costs £1.80.
An angel fish costs £1.40.



Nasreen paid exactly £20 for some fish.
How many of each kind did she buy?

Teaching objectives
Solve problems involving ratio and proportion.
Choose and use efficient calculation strategies to solve a problem.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Silly Answers

On another visit to the pet shop, Nasreen paid £17.80. When I asked her how many goldfish she had bought, she said "about 10". Why was this a silly answer?

What would be another silly answer?

What Could It Be?

Nasreen bought another 5 goldfish and some more angel fish. She spent less than £20. How many angel fish could she have bought?

Another and Another

Give me an amount Nasreen could have paid if she bought 3 fish in total. And another… And another…

Spot the Mistake

Nasreen paid £14.60 for some goldfish and £15.40 for some angelfish. She paid £28.80 in total. Spot the mistake.

Pet shop

1. Jim bought a cat and dog for £60 each.
   Later he sold them.
   He made a profit of 20% on the dog.
   He made a loss of 20% on the cat.
   How much did he get altogether when he sold the cat and dog?

2. Jim bought another cat and dog.
   He sold them for £60 each.
   He made a profit of 20% on the dog.
   He made a loss of 20% on the cat.
   Did he make a profit or loss on the whole deal?

71

Teaching objectives

Solve mathematical problems or puzzles.
Find simple percentages.

Questions and Activities to Develop Reasoning

True or False?

If Jim buys a dog for £50 and sells it for £60, he has made a 10% profit.

What was the question?

The answer is "Jim made a 30% loss."

What was the question?

Convince me

Jim pays £40 each for another cat and dog. He makes a 15% loss on the cat. Convince me that Jim needs to see the cat for £51 if he is to make a £5 profit on the whole deal.

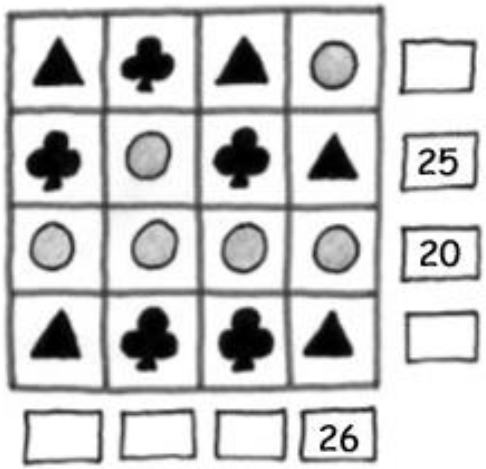
Agree or Disagree?

Jim makes a loss of 40% on another cat and a 50% profit on the dog. No matter what he paid, Jim has made a 10% profit overall. Do you agree or disagree?

Shape puzzle

Each shape stands for a number.

The numbers shown are the totals of the line of four numbers in the row or column.



Find the remaining totals.

Teaching objectives

Solve mathematical problems or puzzles.
Use a symbol to stand for an unknown number.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Another and Another 

Give me a set of numbers the shapes could represent if they totalled 24. And another ... And another... What if they totalled 2.4?

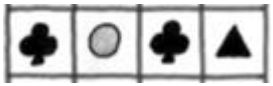
Silly Answers 

What would be a silly answer for the total of this row?

What could it be? 

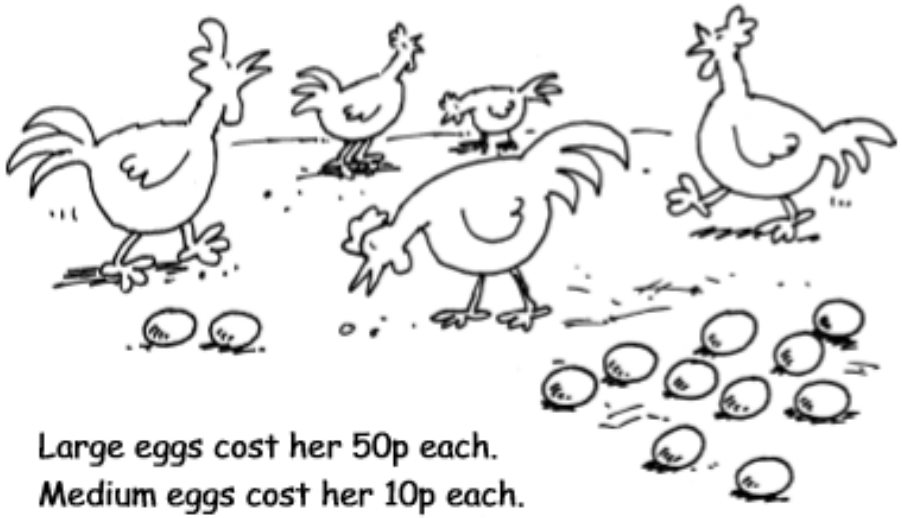
The triangle represents a square number less than 30. If the total of all four symbols is 62, what could the club represent?

Spot the Mistake

 = 28  = 15

Eggs

Mrs Choy spent exactly £10 on 100 eggs for her shop.



Large eggs cost her 50p each.
Medium eggs cost her 10p each.
Small eggs cost her 5p each.

For two of the sizes, she bought the same number of eggs.
How many of each size did she buy?

73

Teaching objectives
Solve problems involving ratio and proportion.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

What Could It Be?

A week later, Mrs Choy bought another 50 eggs for £5. She buys a different number of each size. How many of each size might she have bought? Is this the only answer?

Convince Me

Convince me that Mrs Choy cannot have paid £2 for 30 small eggs in any of the farms she visits.

Another and Another

A week later, she visits a different farm where the eggs are priced differently. She pays £20 for the large eggs, £20 for the medium eggs and £20 for the small eggs.

Give me a number of eggs she may have bought and their cost. And another … And another …

Create a Question

Create a question of your own about Mrs Choy's eggs.

Anyone for tennis?

Two boys and two girls can play tennis.

Ali said: 'I will only play if Holly plays.'
Holly said: 'I won't play if Ben is playing.'
Ben said: 'I won't play if Luke or Laura plays.'
Luke said: 'I will only play if Zoe plays.'
Zoe said: 'I don't mind who I play with.'

Which two boys and which two girls play tennis?

Teaching objectives
Solve a problem by extracting and interpreting data.
Explain methods and reasoning.

Questions and Activities to Develop Reasoning

Top Tips

What would be your top tips for somebody trying to solve this problem?

What else Do You Know?

If you know that the children will not play with another child who shares a letter in their name, what else do you know?

Create a Question

Create your own question like this one for a similar situation.

True or False?

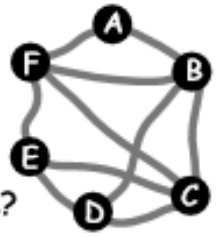
Luke and Laura cannot play together.

Holly has to play for Ali and Zoe to take part.

If Luke plays, Ben will not play.

Bus routes

Six towns are connected by bus routes.
The bus goes from A back to A.
It visits each of the other towns once.
How many different bus routes are there?



This table shows the bus fare for each direct route.
B to A costs the same as A to B, and so on.

A to B	B to C	C to D	D to E	E to F	F to A	B to D	B to F	C to E	C to F
£4	£3	£4	£4	£3	£4	£5	£3	£2	£2

Which round trip from A to A is the cheapest?

75

Teaching objectives

Solve a problem by extracting and interpreting data.
Add several numbers mentally.

Questions and Activities to Develop Reasoning

Is It Possible?

If I start at A, is it possible to visit B, D and F for less than £15?

Another and Another

Give me a route that starts at D and includes exactly 3 other towns. And another… And another …

Find the Fiction

It is cheaper to travel from B to E than from A to E

I cannot travel from D to A without visiting at least two other towns.

I cannot travel from C to A for less than £7

Odd One Out

Which is the odd one out of the six towns? Explain your reasons. Can you think of a reason for each of the towns being the odd one out?

Slick Jim

Slick Jim won the lottery.

He spent two thirds of his winnings on a very posh house.

He spent two thirds of what he had left on a luxury yacht.

Then he spent two thirds of what he had left on a hot air balloon.

He spent his last £20000 on a flashy car.

How much did Slick Jim win on the lottery?

Teaching objectives

Solve a problem by organising information.
Find fractions of quantities.
Understand the relationship between multiplication and division.

Questions and Activities to Develop Reasoning

Prove It

Prove that the house cost three times the yacht.

Would You Rather?

Would you rather have Jim's winnings if he actually spent three fifths of his winnings on a very posh house, three fifths of what he had left on a luxury yacht, three fifths of what he had left on a hot air balloon and his last £20000 on a flashy car?

Create a Question

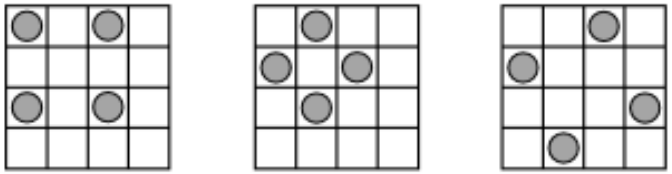
Create your own question like this about what Slick Jim spends his winnings on.

What Else Do You Know?

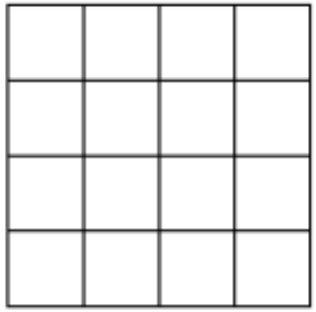
If you know that Slick Jim spends 3/5 of his winnings and has £36 000 left, what else do you know?

All square

On each of these grids, the counters lie at the four corners of a square.



What is the greatest number of counters you can place on this grid without four of them lying at the corners of a square?



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Teaching objectives

Solve a problem by organising information.
Visualise 2-D shapes.

Questions and Activities to Develop Reasoning

Another and Another

Place four counters on the grid to make a rectangle. And another… And another… How many different rectangles can you draw?

Is it Possible?

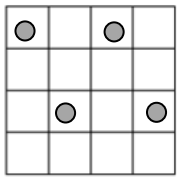
Is it possible to make a kite using four counters on this grid?

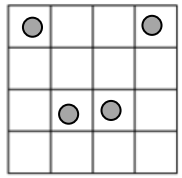
Odd One Out

Make a triangle using three counters on the grid. Do this again for two different triangles. Which is the odd one out?

What's the Same, What's Different?

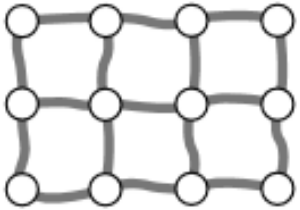
Look at the shapes made from the counters:





Sleigh ride

In Snow Town, 3 rows of 4 igloos are linked by 17 sleigh paths.
Each path is 10 metres long.



When Santa visits, he likes to go along each path at least once.
His route can start and end at any igloo.
How long is the shortest route Santa can take?

What if there are 4 rows of 5 igloos?

Teaching objectives
Solve a problem by organising information.
Visualise 2-D shapes.

Questions and Activities to Develop Reasoning

Is it Possible?

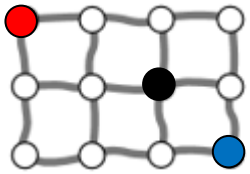
Santa's reindeer refuses to travel more than 10m in one direction without changing direction. Is it possible for Santa to visit every igloo now?

Convince Me

Santa needs to speed up and decides not to go along every path. Convince me that Santa will not be able to visit every igloo in less than 110 m.

Another and Another

Santa is at the red igloo marked below. He needs to get to the blue igloo urgently. Find one route he could take. And another … And another…



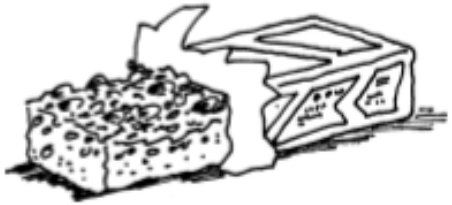
True or False?

Santa starts at the black igloo marked above. His reindeer will not make any left turns. Santa says that he will not be able to visit every igloo now. Is this true or false? Try for different starting points.

Spendthrift

Choc bars cost 26p each.

Fruit bars cost 18p each.



Anil spent exactly £5 on a mixture of choc bars and fruit bars.

How many of each did he buy?

79

Teaching objectives

Solve mathematical problems or puzzles.
Choose and use efficient calculation strategies to solve a problem.
Add sums of money.

Questions and Activities to Develop Reasoning

Convince Me

Convince me that Anil cannot buy more than 10 fruit bars with his £5 if he has already bought 15 choc bars.

Silly Answers

Anil bought 20 fruit bars. He spent £5. I ask Anil how many choc bars he bought. What would be a silly answer?

Another and Another

Anil buys twice as many choc bars as fruit bars. How much could he have spent? Give me another answer… And another… What do you notice?

What Could It Be?

In another shop, choc bars and fruit bars are priced differently. I buy one of each for 52p. What could their prices be? Is that the only answer?

There is a difference of 10p between them. What price are the two bars? Is that the only answer? Convince me.

Cola in the bath

A can of cola holds 33 centilitres.

If you had a bath in cola – don't try it! –
approximately how many cans of cola would you need?
Hint: 1 cubic centimetre is the same as 1 millilitre.

Teaching objectives

Solve mathematical problems or puzzles.
Estimate lengths and convert units of capacity.
Develop calculator skills and use a calculator effectively.

Questions and Activities to Develop Reasoning

Convince Me

Convince me that I would need more than 30 cans of cola to fill a 10 litre bucket.

Would You Rather?

Would you rather have 10 baths full of cola or 150 buckets of cola?

True or False?

It would take more cans of cola to fill 20 kitchen sinks than it would to fill a bath.

Write More Statements

Write more statements about the number of cans of cola needed to fill different numbers of containers.

Millennium

At what time of what day of what year will it be:

a. 2000 seconds
b. 2000 minutes
c. 2000 hours
d. 2000 days
e. 2000 weeks

after the start of the year 2000?

81

Teaching objectives

Solve mathematical problems or puzzles.
Convert smaller to larger units of time.
Develop calculator skills and use a calculator effectively.

Questions and Activities to Develop Reasoning

Convince Me

Convince me that 2000 seconds is less than 200 minutes.

Agree or Disagree?

Do you agree or disagree that there are more than 10000 minutes in a week?

What Else Do You Know?

If you know that there are 60 seconds in a minute, what else do you know?

Find the Fiction

There are more than 4000 minutes in 3 days

There are more than 2000 seconds in half an hour

There are more than 1000 hours in 6 weeks

People in the crowd

Estimate how many people there are in the crowd.

Teaching objectives

Solve mathematical problems or puzzles.
Count larger collections by grouping.
Give a sensible estimate.

Questions and Activities to Develop Reasoning

Agree or Disagree?

Do you agree or disagree that there are more blades of grass in a square metre than there are children in our school?

Another and Another

Give me a situation in real life where I would count more than 1000 of something. And another… And another…

Is It Possible?

Is it possible to fit a million people into an Olympic size swimming pool?

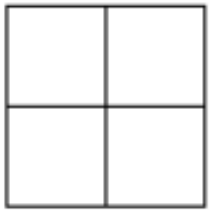
Spot the Mistake

To find how many pieces of work I have marked in my teaching career, I would multiply the number of years I have taught for by the number of days in the school year by the number of lessons I have taught. What have I missed?

Make 200

1 2 3 4 5 6 7 8 9

Choose four of these digits.
Each one must be different.
Put one digit in each box.



This makes two 2-digit numbers reading across and two 2-digit numbers reading down.
Add up all four of the numbers.

In this example the total is 100.

12 + 47 + 14 + 27 = 100

1	2
4	7

How many different ways of making 200 can you find?

Teaching objectives
Solve mathematical problems or puzzles.
Know what each digit represents.
Add several two-digit numbers.

Questions and Activities to Develop Reasoning

Agree or Disagree?

To make 200, the digit in the top left box cannot be a 9.

Do you agree or disagree?

Possible Answers

What are the possible answers you can make using only prime digits?

Would You Rather?

Would you rather have the highest total using only odd digits or the highest total using only even digits?

Silly Answers

What would be a silly answer for the number in the top left box if you were trying to make 100? What about 300?