Reasoning in the classroom

Ice cream sundaes

Support materials for teachers

Year 3

Llywodraeth Cymru
Welsh Government

Year 3 Reasoning in the classroom – Ice cream sundaes

These Year 3 activities require learners to solve a range of problems linked to the theme of ice cream sundaes. The first activity was included in the 2015 National Numeracy Tests (Reasoning). This is followed by two further activities.

Activity 1

Ice cream sundaes

Learners use their knowledge of money to work out the comparative costs of different sundaes.

Includes:

- Teachers' script
- PowerPoint presentation
- Ice cream sundaes questions
- Markscheme

Activity 2

So many sundaes!

They investigate how many different combinations of sundaes there are after introducing a further scoop to the ice cream, and then a chocolate curl.

Includes:

- Explain and question – instructions for teachers
- Whiteboard – Different scoops
- Resource sheet – How many sundaes? 1
- Resource sheet – How many sundaes? 2

Activity 3

Ice cream bingo

Learners work out simple combinations of money to 'buy' the ingredients for ice cream sundaes on a bingo board.

Includes:

- Explain and question – instructions for teachers
- Resource sheet – Ice cream bingo
- Teachers' sheet – Ice cream bingo money

Reasoning skills required

Identify	Communicate	Review
Learners select mathematical skills and apply them to classroom and play activities.	They negotiate appropriate strategies, using mathematical language to explain their ideas and choices.	They review their work, considering alternative approaches and solutions.

Procedural skills

- Money
- Addition/subtraction
- Simple combinations

Numerical language

- Exactly
- More (money)
- Altogether
- Combination

Activity 1

Ice cream sundaes

Activity 1 – Ice cream sundaes

Outline

This Year 3 activity requires learners to consider the cost of different ice cream sundaes, then to find simple combinations of flavours given constraints.

You will need

Teachers' script

PowerPoint presentation

Ice cream sundaes questions
Three pages for each learner, can be printed double-sided

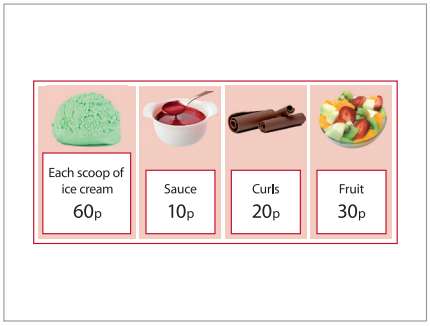
Markscheme

TS

Presentation to be shown to learners before they work on Ice cream sundaes

The text in the right-hand boxes (but not italics) should be read to learners. You can use your own words, or provide additional explanation of contexts, if necessary. However, if you are using this as an assessment item, no help must be given with the numeracy that is to be assessed.

Slide 1		*(Keep this slide on the screen until you are ready to start the presentation.)*
Slide 2		How many of you like ice cream? People have been making ice cream for about two thousand years! That's a long time ago. But back then ice cream was probably made from snow with fruits and juices. I don't suppose it tasted as nice as it does now!
Slide 3		These ice creams were probably invented in America. They're called ice cream sundaes. They're called that because you could only buy them on Sundays! Now you can buy them on any day. What can you see in these ice cream sundaes? *(Discuss, helping learners to become familiar with the words 'ice cream', 'sauce', 'chocolate curls' and 'fruit'.)* What would you choose if you could order your very own ice cream sundae? How many scoops would you order? What else would you order? *(Allow learners time to discuss, as this engages them in the context. However, do not discuss costs.)* My favourite ice cream sundae would have three scoops of ice cream, two lots of fruit and three lots of chocolate curls. Delicious! *(This supports learners in understanding that more than one of each item can be ordered. Again, do not discuss costs.)*

Slide 4		You can make ice cream sundaes at home, but some ice cream shops sell them. But, of course, if you want to buy an ice cream sundae from a shop, you have to pay for it.
Slide 5		These are the prices that one shop charges. You order what you want and they put it all together to make your ice cream sundae. And then they work out the price. Each ball of ice cream is called a scoop. How much is each scoop of ice cream? That's right, 60 pence. You can order one scoop of ice cream, or two scoops, or three scoops, or even more – but of course you have to pay for each scoop. *(Do not discuss costs.)* What else does the shop sell to have with your ice cream? That's right. You can order sauce, curls or fruit. Some people don't want any of these, some order just one thing and some people order more. The more you order, the more it costs! Now you are going to answer some questions about ice cream sundaes. Remember to set out your work clearly so that someone else can understand what you are doing and why. *(If you are using this item for assessment purposes, you may wish to limit the time available, e.g. 15 minutes.)*

Each scoop of ice cream
60p

Sauce
10p

Curls
20p

Fruit
30p

1 Alun orders **1 scoop** of ice cream with **sauce**.

He pays £1

How much change does he get?

p change

1m

2 Rhian wants to pay exactly £1.20

She can order

or

she can order

1m

1m

Each scoop of ice cream
60p

Sauce
10p

Curls
20p

Fruit
30p

3 Tim orders **curls** with **3 scoops** of ice cream.

Erin orders **fruit** with **3 scoops** of ice cream.

Erin pays **more** than Tim.

How much more?

Show how you work it out.

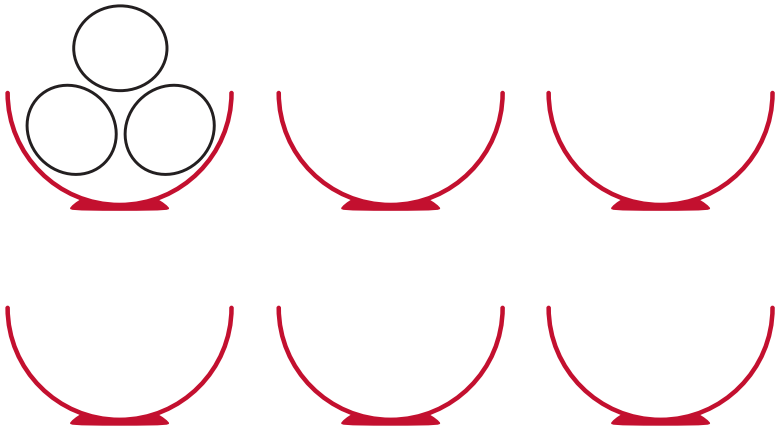
p more

3m

4 On Friday six friends order some scoops.

- Half of them order **3 scoops**.
- **Altogether** they order **13 scoops**.

Draw the number of scoops. One is done for you.

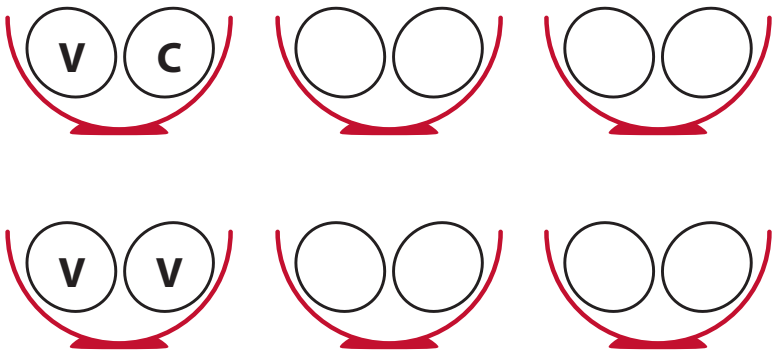


2m

On Saturday each friend orders **2 scoops**.

- No one has the same as anyone else.
- They choose from vanilla (**V**), cherry (**C**) or mint (**M**).

Write what they order. Two are done for you.



2m

Activity 1 – Ice cream sundaes – Markscheme

Q	Marks	Answer
1	1m	**30**p
2i	1m	**2 scoops** Or **1 scoop, sauce, curls** and **fruit** Or Any other combination that makes exactly £1.20, e.g. • 1 scoop of ice cream, 2 sauce, 2 curls • 4 fruit
2ii	1m	Gives a correct combination, different from their answer in 2i Or In both 2i and 2ii, the items to be bought are not stated but the costs imply correct but different combinations, e.g. • In 2i, 60 + 60 In 2ii, 60 + 30 + 20 + 10

Do not accept the same combination, even with different flavours for the ice cream

Activity 1 – Ice cream sundaes – Markscheme (continued)

Q	Marks	Answer
3	3m	Answer **10**p more, with **30** and **20** but no additional numbers (other than 10) Or Answer **10**p more, with both **2.00** (or 200) and **2.10** (or 210) shown Or Answer **10**p more, with **correct costs but no totals** shown, e.g. • 20, 60, 60, 60 30, 60, 60, 60 Answer 10p more
	Or 2m	Both **2.00** (or 200) and **2.10** (or 210) shown Or Answer **10**p more, whatever else may be shown Or Shows **one correct** total cost, **one incorrect** total cost, and their **correct difference**, e.g. • He pays £1.90, she pays £2.10, answer 20p more
	Or 1m	Shows **one** correct total cost

Efficient method

Works only with the costs of fruit and curls (the cost of ice cream is the same for both)

For 3m, if the totals are shown, they must be correct

The correct total costs are 2.00 (or 200) and 2.10 (or 210)

Activity 1 – Ice cream sundaes – Markscheme (continued)

Q	Marks	Answer
4i	2m	Draws, in any order **3** scoops in **two** bowls, **2** scoops in **one** bowl, **1** scoop in **two** bowls
	Or 1m	Draws **3** scoops in exactly **two** bowls Or Draws at least 1 scoop in each bowl, and a total of **10** scoops

Do not accept 3 scoops drawn in more, or less, than two bowls

4ii	2m	Shows, in any order, all four combinations, i.e. **VM (or MV)** **CM (or MC)** **CC** **MM**
	Or 1m	Shows at least **two** correct combinations

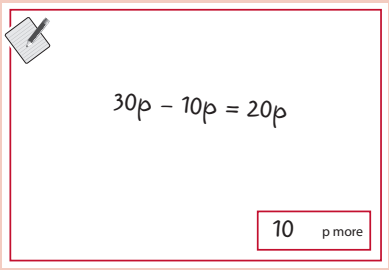
Activity 1 – Ice cream sundaes – Exemplars

Question 2

2 scoops of ~~Ice~~ Ice cream ~~&~~	Correct; **1 mark**
a scoop of ice cream and fruit and three spoons of sauce	Correct; **1 mark** • 1 scoop and fruit and three sauce costs 60p + 30p + 3 × 10p = £1.20
2 Ice creams	Correct; **1 mark**
12 sauce	Correct; **1 mark** • 12 sauce costs 12 × 10p = £1.20 so this response is correct, even if unlikely to be ordered!
All four	Correct; **1 mark** • It is reasonable to assume that 'all four' refers to all four of ice cream, sauce, curls and fruit.
One of each	Repeat; **0 marks** • As this answer is the same as the one given above, no mark can be given.
60p + 10p= 70p + 30p = £1 + 20p = £1.20 ?	Incorrect; **0 marks** • No items are shown.
60p + 60p = £1.20p ?	Correct but different costs in both 2i and 2ii; **1 mark** • This learner consistently shows costs not items. As both show correct but different combinations, for this question part 1 mark can be given.

Activity 1 – Ice cream sundaes – Exemplars (continued)

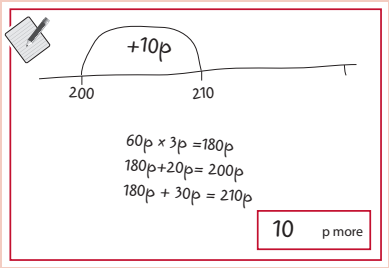
Question 3



10p more, only 30 and 20 shown; **3 marks**

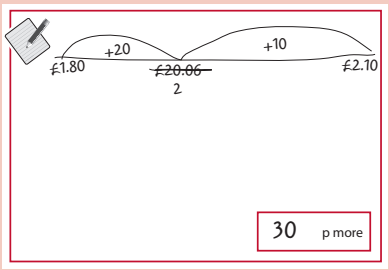
Efficient method

This learner recognises that as the cost of ice cream is the same for both, only the costs of fruit and curls need be considered.



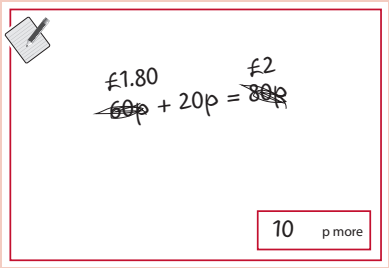
10p more, both 200 and 210 shown; **3 marks**

- Although this method is less efficient than the one above, it is correct. Other than the redundant 'p' in '× 3p', the numerical communication is very clear.



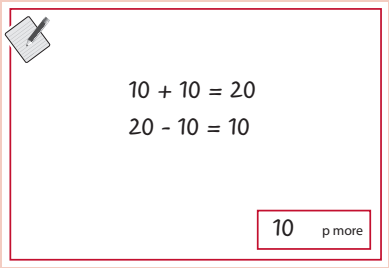
Shows both £2 and £2.10; **2 marks**

- The method is correct, but this learner has given the difference from £1.80 (the cost of 3 scoops) rather than from £2.00



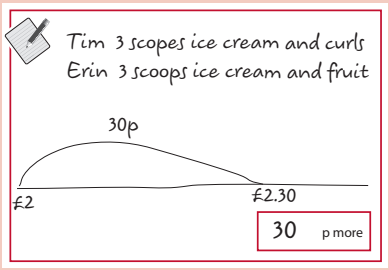
Answer 10p more; **2 marks**

- £2.10 is not shown. However, the answer 10p more scores 2 marks. This learner needs encouragement to show a complete method.



Answer 10p more; **2 marks**

- This learner may be working efficiently, but the cost of 30p is not shown. However, the answer is 10p more.

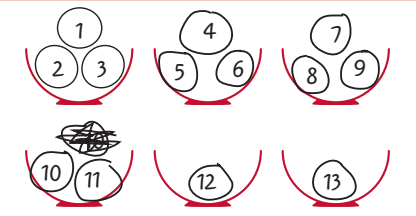
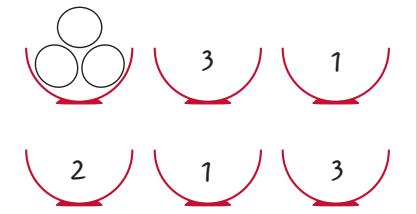
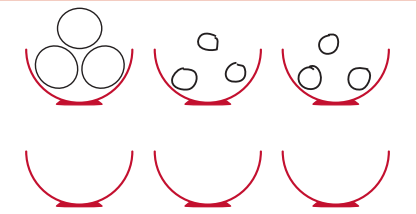
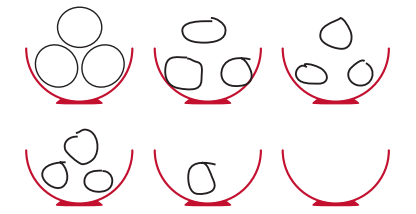
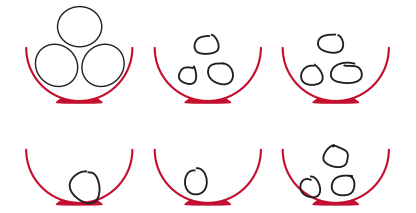


One correct cost, one incorrect, correct difference; **2 marks**

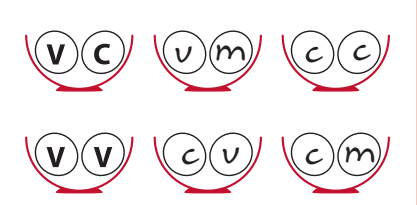
- £2 is correct, £2.30 is incorrect, but the difference of 30p is correct for their costs.

Activity 1 – Ice cream sundaes – Exemplars (continued)

Question 4i

	Correct; **2 marks** • The third scoop in the bottom-left bowl has clearly been crossed out. Numbering the scoops is an effective way to check working.
	Correct; **2 marks** • The use of numbers to show the number of scoops is acceptable.
	3 scoops in exactly two bowls; **1 mark**
	Incorrect; **0 marks** • Although 10 scoops have been drawn, there is not at least one scoop in each bowl.
	Incorrect; **0 marks** • This learner has drawn three, not two, bowls with 3 scoops and 11 scoops are drawn in total.

Question 4ii

	Three correct; **1 mark** • CV is incorrect – it is one of the two already given.

Activity 2

So many sundaes!

Activity 2 – So many sundaes!

or

Outline

This activity builds on the final question within **Activity 1 – Ice cream sundaes** within which learners work out simple combinations of ice cream flavours.

So many sundaes! allows learners to explore the impact of introducing more variables (different ingredients of ice cream sundaes) to the number of choices that are then available. It can be delivered as a practical activity using modelling dough.

You will need

WB **Whiteboard – Different scoops**

R **Resource sheet – How many sundaes? 1**
One for each pair/small group

R **Resource sheet – How many sundaes? 2**
One for each pair/small group

Each pair/small group will need: (optional)

- **four balls of modelling dough – in different colours**
- **paper cups or circles of paper** (representing bowls – at least 12)
- **straws** (cut into three pieces to represent chocolate curls – 12 pieces)

Activity 2 – So many sundaes!

Explain

Remind learners of the question within **Activity 1 – Ice cream sundaes** relating to a group of friends choosing different bowls of ice cream, then show on the whiteboard **Different scoops** which repeats the question. Go through the different combinations, making sure learners understand the solutions.

Tell them that they still have three flavours of ice cream but this time they can have three scoops of ice cream in each bowl, rather than two. Each bowl must again be different. How many different sundaes can they make now? *(10 – VVV, CCC, MMM, VVC, VVM, CCV, CCM, MMV, MMC, VCM)* Give each pair/small group a copy of **How many sundaes? 1** and if necessary, the modelling dough, etc. *(they do not need the straws at this stage)*. They can create the sundaes using the modelling dough or they can go straight to writing the different combinations onto the sheet. Make sure they realise that the number of bowls on the sheet is not relevant to the actual number of combinations.

When they have arrived at their answer, ask them to compare their solution with another pair/group and agree between them how many combinations there are. Once everyone has agreed there are 10 combinations, tell learners that the shop has now introduced chocolate curls. So they can choose from the three different ice creams and add in a chocolate curl as well. Explain that each combination can have one chocolate curl or no chocolate curl. Now how many combinations are possible? *(20 – the original 10 without a chocolate curl, and then 10 with a curl)* For learners who need it, give pairs/small groups copies of **How many sundaes? 2** and, if using modelling dough, straws to represent the chocolate curls.

If appropriate, continue by pairs/small groups exploring the number of different sundaes they can make by introducing a fourth flavour *(e.g. lemon)* and allowing two scoops in each bowl *(10)*, or two scoops and a chocolate curl *(20)*.

Question

- For vanilla we write V, and for cherry we write C, and so on. Why don't we write the words out in full? *(Saves time)* Why might this not work so well if we had chocolate as well as cherry? *(Same initial letters)*
- Why is VM the same as MV? *(Both contain vanilla and mint.)*
- For three scoops and no curl: how are you going to find all the different bowls? Do you have a method?
- Did you agree with the other pair/group on the answer? If not, what did you do about it?
- For three scoops and one curl: is there a way of finding the answer 20 without having to make all the bowls? How many bowls are there if you can just have ice cream *(10)*? And if we add a chocolate curl to each of them . . . ? *(There are only two options in relation to the chocolate curls, either they have one or they don't, so 10 bowls without curls and 10 with.)*

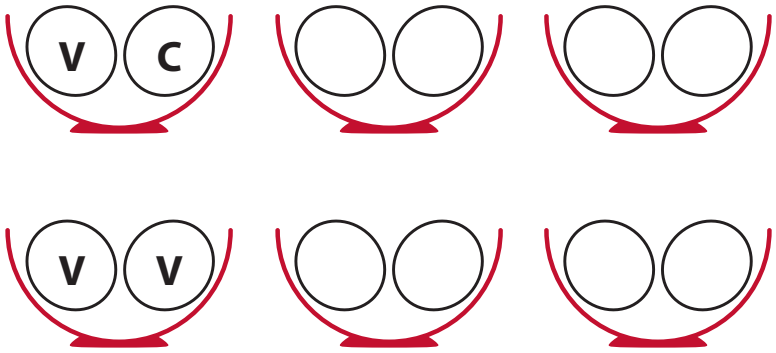
(continued)

- For four flavours: do you have to start from the beginning when you are working out how many different sundaes you can now have? Is there anything you can use from what you have already done?
- With three flavours there are 10 ways of getting three scoops, and with four flavours there are 10 ways of getting two scoops. Do you think there will always be 10 ways even if there are a different number of flavours and/or number of scoops? Why/why not? *(This is a good opportunity to disprove what appears to be a consistent pattern.)*

On Saturday each friend orders **2 scoops**.

- No one has the same as anyone else.
- They choose from vanilla (**V**), cherry (**C**) or mint (**M**).

Write what they order. Two are done for you.

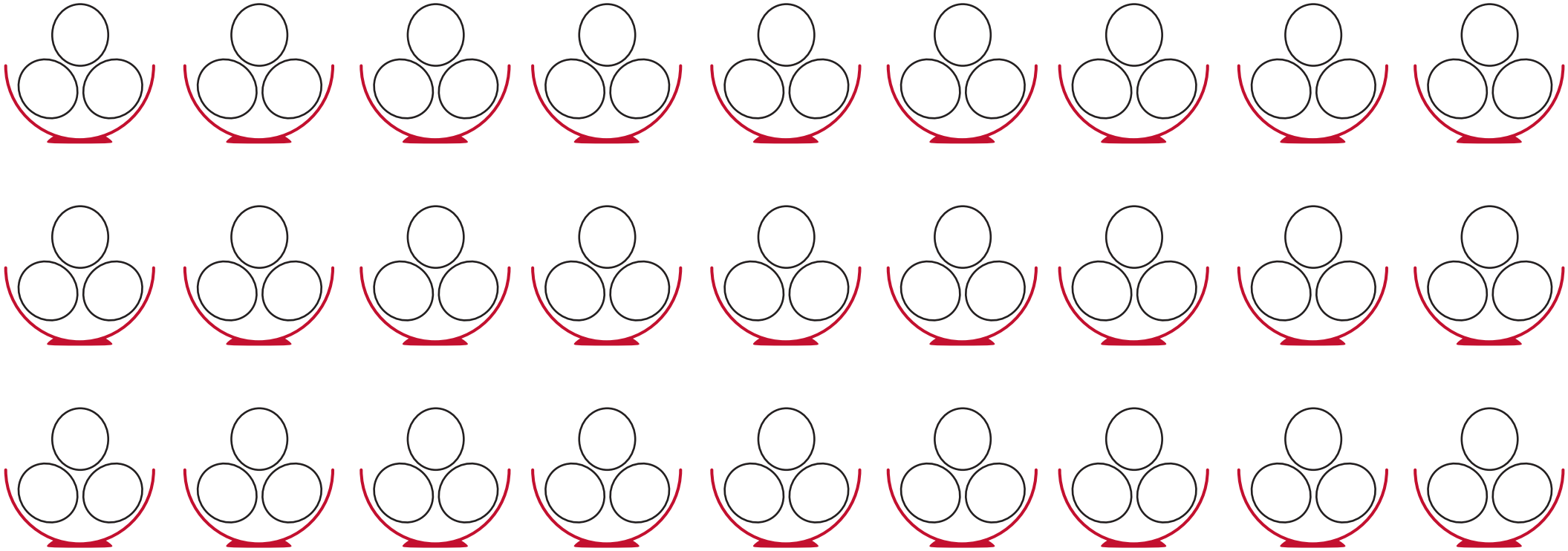


3 scoops in each bowl

3 different flavours

How many bowls can you make?

Each bowl must be different.



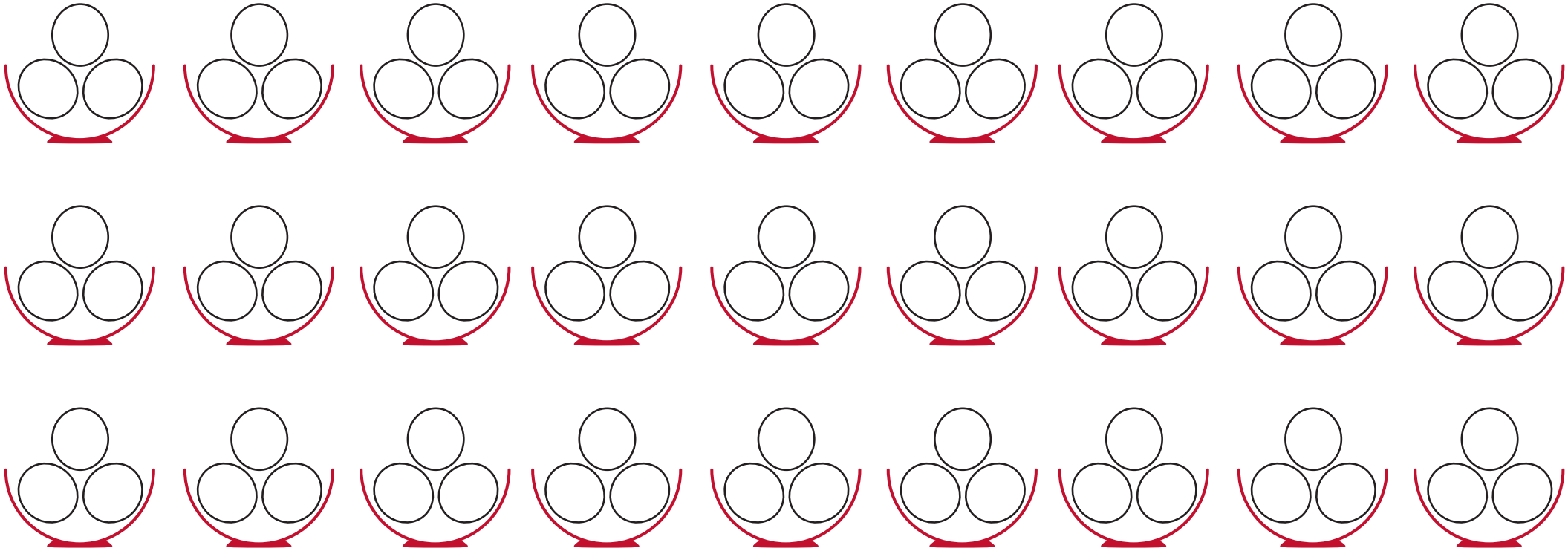
We can make ☐ different ice cream sundaes.

Chocolate curl . . .

Or no chocolate curl

3 scoops in each bowl

3 different flavours



We can make ☐ different ice cream sundaes.

Activity 3

Ice cream bingo

Activity 3 – Ice cream bingo

Outline

In this Year 3 activity, learners continue the theme of buying ice creams through the game of bingo. They take decisions on how to 'spend' amounts of money, thus covering items on their game board, then explore the implications of their choices.

Ice cream bingo requires adult oversight to check learners' calculations, so might be better played with two pairs/small groups at one time.

60p

You will need

Resource sheet – Ice cream bingo
(Laminated, so they can be reused)
One board for each pair/small group

Teachers' sheet – Ice cream bingo money
One set, cut into cards

Pens
Washable/erasable pens
(Learners write on the bingo board, then delete for further games.)

Or

Adhesive paper shapes
(Learners stick a shape to a number to cover it, then remove for further games.)

Activity 3 – Ice cream bingo

Explain

Give each pair/small group a copy of **Ice cream bingo** and a washable pen *(they need to delete their writing after the first game)* or adhesive shapes. Remind them of the context of **Activity 1 – Ice cream sundaes** in which they worked out what children could buy to make their sundaes.

Read out an amount of money from one of the **Ice cream bingo money** cards. Learners then decide between them how to 'spend' that amount of money by choosing one item or more from their bingo card. *(For example, if you call 60p, they could choose to buy one ice cream, or two lots of fruit, or three chocolate curls, etc.)* When they buy an item, they cross it out or put a sticker on their board.

Ensure they understand that they must 'spend' all the money that is called *(so, for example, if you call 50p they cannot buy just one sauce).*

As in the game of bingo, the first objective is to be the first pair/group to 'buy' a line *(either horizontal or vertical). (Make sure they don't think they have to complete one line before 'buying' items elsewhere on the board – a common misconception. And remember to check their calculations as you go.)*

When they have a complete line, they call 'Bingo'. Discuss what the other pair/small group chose to buy and what that might mean in terms of completing their card *(learners need to grasp that there are lots of ways they could choose to spend their money, especially at the start of the activity. Use the questions below to support their understanding that they need to try to avoid having only 10p items left, or alternatively, only the highest cost item – ice cream).*

The game then resumes with each group aiming to be the first to complete their card. At the end of the game, discuss, using the questions below as a guide, then repeat so they can, if they choose, adopt a different strategy.

Question

- What did you decide to buy with the first amount of money *(e.g. 70p)*? What could you have bought? *(Any combination of items amounting to 70p)* Why did you choose what you did? Do you think you made the right choice? Why/why not?
- Is the best way to win to buy as many of the low-cost items as you can at the beginning of the game? Why/why not? *(If you are left with just higher-cost items you are likely to restrict your options. Having the 10p's and 20p's gives more options to 'spend' the money on the card.)*
- If I called out 25p, how do I know that nobody would be able to go? *(Ends in a 5, and all the prices are multiples of 10p)*
- What happened towards the end of the game? What were you left with on your board? Did that help you to complete your board, or make it harder? Why/how?
- Now you have played the game, what would you change about the choices you made? Why?

 60p	 10p	 20p	 30p	 10p
 20p	 60p	 30p	 10p	 20p
 10p	 20p	 10p	 30p	 60p
 10p	 30p	 20p	 60p	 30p
 30p	 60p	 60p	 20p	 10p

70p	50p	40p	60p	80p
£1	20p	50p	30p	30p
90p	70p	50p	10p	20p
40p	60p	20p	10p	30p
60p	10p	30p	20p	60p

If more cards are needed, reuse ones from the pack.