

## Task description

Pupils plan quantities they will buy in order to maximise their profit from selling ice creams at a school event.

**Suitability** National Curriculum levels 5 to 6

**Time** 30 minutes to 1 hour

**Resources** Pencil, calculator and paper

## Key Processes involved

- **Representing:** Interpret diagrams and words and select the appropriate information from them.
- **Analysing:** Work logically towards a result, recognising the impact of constraints. Calculate accurately and apply routine algorithms, making estimates and checking calculations.
- **Interpreting and evaluating:** Interpret their calculations in context.
- **Communicating and reflecting:** Show reasoning clearly

## Teacher guidance

Check that pupils fully understand the context, for example by explaining:

- *You are planning to make and sell ice cream cones at the school sports day. You need to calculate the costs to make sure that you don't make a loss.*
- *What points would you think about?*

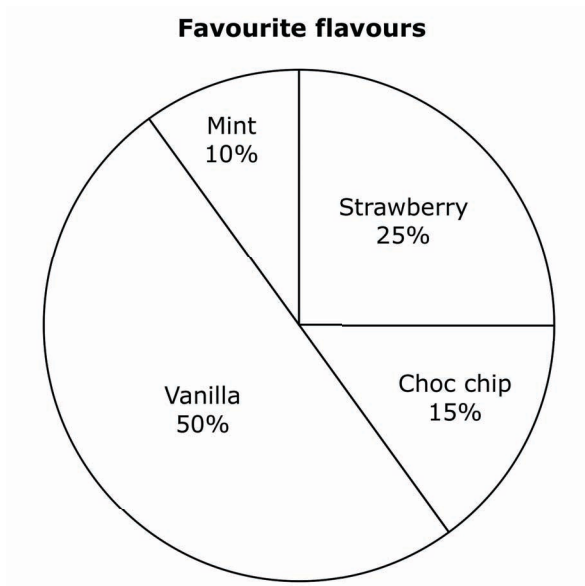
Pupils may tackle this task in different ways, but might be expected to:

- *solve simple problems involving ratio and direct proportion*
- *calculate fractional or percentage parts of quantities and measurements, using a calculator where appropriate*
- *interpret graphs and diagrams, including pie charts, and draw conclusions*

# Ice Cream

You are planning to make and sell ice creams at the school sports day.  
You plan to make 300 ice creams and hope to sell them all.

Before buying the ice cream, you survey 60 people to find out what flavours they like. Here are the results of the survey:



You buy ice cream in 1 litre tubs. Each tub costs £2 and you can fill ten cones from each tub.

Each empty cone costs 5p

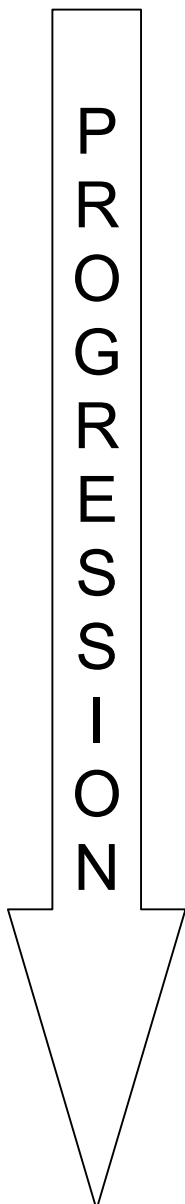
You plan to sell each filled cone for 80p.

Work out the quantities you need to buy and their costs.

If you sell all 300, how much profit do you expect to make on the day?

## Assessment guidance

### Progression in Key Processes



Representing	Analysing	Interpreting and evaluating	Communicating and reflecting
Selection of information from the pie chart	Quality of calculations and reasoning throughout	Interpretation of own calculations to conclude the task	Clarity of method used
Selects minimal information from the pie chart or text.	Performs some calculations to determine quantities and costs  <span style="color: #2980b9;">Pupil A</span>	Interprets calculations to decide quantity of one or more flavours of ice cream to purchase; calculates resulting costs, but with some errors or omissions  <span style="color: #2980b9;">Pupil A</span>	Presents some calculations  <span style="color: #2980b9;">Pupil A</span>
Selects some appropriate information from the pie chart or text  <span style="color: #2980b9;">Pupils A and B</span>	Works logically, performing some calculations to determine quantities and costs  <span style="color: #2980b9;">Pupil B</span>	Interprets calculations to decide quantities of all flavours of ice cream to purchase; calculates resulting costs, but with some errors or omissions  <span style="color: #2980b9;">Pupil B</span>	Presents some calculations clearly  <span style="color: #2980b9;">Pupil B</span>
Selects most of the appropriate information from the pie chart and text  <span style="color: #2980b9;">Pupil C</span>	Works logically, performing calculations to determine quantities, costs and profits  <span style="color: #2980b9;">Pupil C</span>	Interprets calculations to decide quantities of all flavours of ice cream to purchase; calculates resulting profit, but with errors e.g. omits the cost of the cones  <span style="color: #2980b9;">Pupil C</span>	Gives a detailed and reasonably clear explanation of method used  <span style="color: #2980b9;">Pupils C and D</span>
Selects all the appropriate information from the pie chart and text  <span style="color: #2980b9;">Pupil D</span>	Works logically, performing accurate calculations to determine quantities, costs and profits  <span style="color: #2980b9;">Pupil D</span>	Interprets calculations to make correct decisions on quantities of all flavours of ice cream to purchase; calculates correct profit  <span style="color: #2980b9;">Pupil D</span>	Gives a detailed and clear explanation of method used

## Sample responses

### Pupil A

$$60 \times 5 = 300$$

1. 50% of 60 = 30      vanilla

$$30 \times 5 = 150$$

$$\begin{array}{r} 15 \text{ tubs} = £ 30 \\ 150 \text{ cones} = £ 07.50 \\ \hline \text{Total} = £ 37.50 \end{array}$$

$$\begin{array}{r} \text{cost} = £ 37.50 \\ \text{income} = £ 120 \\ \hline \text{total} = £ 82.50 \end{array}$$

### Comments

Pupil A successfully considers the costs of making and selling 150 vanilla ice creams. No further work is shown.

### Probing questions and feedback

- *Have you enough ice creams for 300 people?*
- *What else is needed?*
- *What about the other flavours?*

## Pupil B

Ice Cream

50% = Vanilla = 30 people  
 25% = Strawberry = 15 people  
 15% = chocolate chip = 9 people  
 10% = mint = 6 people

Vanilla = ~~3~~ 15 tubs  
 Strawberry = ~~5~~ 10 tubs  
 Choc chip = ~~1~~ 5 tubs = 5  
 mint = ~~1~~ 5 tubs = 5

300 ice creams

35 tubs altogether

 $35 \times 2 = £70$ 

£70 for the tubs

 $5p \times 300 = 150$ 

$$\begin{array}{r} 15 \\ + 10 \\ + 5 \\ + 5 \\ \hline 35 \\ 1 \end{array}$$

## Comments

Pupil B considers buying and selling the four different flavours of ice cream. The numbers of tubs for vanilla and chocolate chip are correct, but it is not clear how he reached the numbers as there is no link in his reasoning. He also got the wrong numbers of tubs for strawberry and mint, further raising the question of whether he knew what he was doing.

## Probing questions and feedback

- How did you calculate the numbers of tubs – show your working!
- You have calculated that you need to purchase 35 tubs of ice cream. How many ice cream cones will this make?
- You have calculated the total cost of the ice cream and the tubs. How do you find the profit?

## Pupil C

$$\begin{aligned} 1) \text{ Vanilla} &= 300 \div 2 = 150 \\ \text{Cost: } \pounds 30.00 &= 150 \text{ ice creams of vanilla} \\ \text{Quantities: } 15 \text{ tubs} &= 150 \div 10 = 15 = \text{number of tubs} \\ &= 15 \times 2 = \pounds 30 = \text{cost of tubs} \end{aligned}$$

$$\begin{aligned} 2. \text{ Strawberry} &= 250 = 300 \div 4 = 75 \\ \text{cost: } \pounds 16 &= 75 \text{ ice creams of strawberry} \\ \text{quantities: } 8 \text{ tubs} &= 75 \div 10 = 7.5 = 8 = \text{number of tubs} \\ &= 8 \times 2 = \pounds 16 \end{aligned}$$

$$\begin{aligned} 3. \text{ choc chip} &= 150 = \cancel{300} \div 2 = 45 \\ \text{cost: } \pounds 10 &= 45 \text{ ice creams of choc chip} \\ \text{quantities: } 5 \text{ tubs} &= 45 \div 10 = 4.5 = 5 \text{ tubs of choc chip} \\ &= 5 \times 2 = \pounds 10 \end{aligned}$$

$$\begin{aligned} 4. \text{ Mint} &= 100 = 300 \div 3 = 30 \\ \text{Cost: } \pounds 6 &= 30 \text{ ice creams of mint} \\ \text{Quantities: } 3 \text{ tubs} &= 30 \div 10 = 3 \text{ tubs of mint.} \\ &= 3 \times 2 = \pounds 6 \end{aligned}$$

$$\begin{aligned} 2. \text{ } \cancel{\pounds} V + S + C + M &= \pounds 62 = \text{total cost} \\ 150 + 75 + 45 + 30 &= 300 \text{ ice creams} = \pounds 110 \\ \text{Profit} &= \pounds 178.00 \end{aligned}$$

## Comments

Pupil C correctly considers buying and selling all four flavours of ice cream. He rounds up both fractional calculations, so that everyone is likely to be satisfied, but he will have some ice cream left over. He forgets to include the cost of buying the cones, so his overall profit is not correct.

## Probing questions and feedback

- Did you think about how many cones can be made using the total number of tubs you suggest buying?
- Can you reduce this number, to reduce waste?
- What about the cost of the cones?
- What would be your revised figure for the profit?

## Pupil D

ICE CREAM

1) 150 ice creams = vanilla  
 75 ice creams = strawberry  
 45 = choc chip  
 30 = mint

ten cones = 1 tub  
 1 tub = £2  
 (1 cone empty) = 5p

Choc ice cream = £12.25  
 Strawberry ice cream = £19.75

150 cones = 150 x 5 = £750  
 150 ÷ 10 = 15. 15 tubs = £30.

Vanilla ice cream = £37.50  
 Mint ice cream = £7.50

2 x 3 = £6  
 5 x 30 = £1.50  
 2 x 5 = £10  
 5 x 45 = £22.5

2) choc + straw + van + mint = } 2 x 8 = £16  
 £77 } 5 x 75 = £3.75

80p x 300 = £240.000 = £240  
 £240 - £77 = £163 = £163 profit

£163 profit

## Comments

Pupil D correctly considers buying and selling all four flavours of ice cream, including the cost of the cones. He rounds up the number of tubs needed for strawberry and choc chip which means that everyone is likely to be satisfied, but he will have some ice cream left over. His work is clear but it could be explained more carefully.

## Probing questions and feedback

- How much ice cream will you have left over at the end of the day?
- Show this answer to a neighbour and see if he can follow your explanation.
- Can you make the reasoning any clearer?