White Rose Maths

Spring - Block 2

# Percentages

# Overview

## Small Steps

1. Fractions to percentages
2. Equivalent FDP
3. Order FDP
4. Percentage of an amount (1)
5. Percentage of an amount (2)
6. Percentages – missing values

## NC Objectives

Solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison.

Recall and use equivalences between simple fractions, decimals and percentages including in different contexts.

# Fractions to Percentages

## Notes and Guidance

It is important that children understand that 'percent' means 'out of 100'.
Children will be familiar with converting some common fractions from their work in Year 5
They learn to convert fractions to equivalent fractions where the denominator is 100 in order to find the percentage equivalent.

## Mathematical Talk

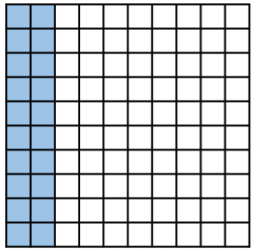
What does the word 'percent' mean?

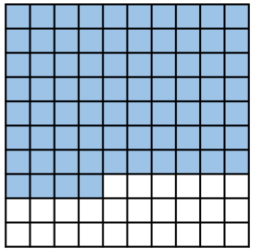
How can you convert tenths to hundredths?

Why is it easy to convert fiftieths to hundredths?
What other fractions are easy to convert to percentages?

## Varied Fluency

- What fraction of each hundred square is shaded? Write the fractions as percentages.





- Complete the table.

| Fraction | Percentage |
|---|---|
| $\frac{1}{2}$ | |
| $\frac{1}{4}$ | |
| $\frac{1}{10}$ | |
| $\frac{1}{5}$ | |

- Fill in the missing numbers.

$\frac{12}{100} = \square\ \%$ $\qquad$ $\frac{\square}{100} = 35\%$

$\frac{12}{50} = \frac{\square}{100} = \square\ \%$ $\qquad$ $\frac{44}{\square} = \frac{22}{100} = 22\%$

# Fractions to Percentages

## Reasoning and Problem Solving

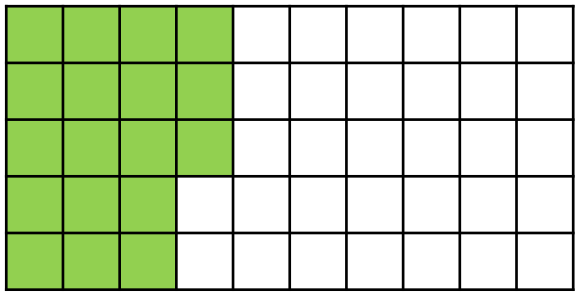
In a Maths test, Tommy answered 62% of the questions correctly.

Rosie answered $\frac{3}{5}$ of the questions correctly.

Who answered more questions correctly?

Explain your answer.

Tommy answered more questions correctly because $\frac{3}{5}$ as a percentage is 60% and this is less than 62%



Amir thinks that 18% of the grid has been shaded.

Dora thinks that 36% of the grid has been shaded.

Who do you agree with?

Explain your reasoning.

Dora is correct because $\frac{18}{50} = \frac{36}{100}$

# Equivalent FDP

## Notes and Guidance

Children use their knowledge of common equivalent fractions and decimals to find the equivalent percentage.

A common misconception is that 0.1 is equivalent to 1%. Diagrams may be useful to support understanding the difference between tenths and hundredths and their equivalent percentages.

## Mathematical Talk

How does converting a decimal to a fraction help us to convert it to a percentage?

How do you convert a percentage to a decimal?

Can you use a hundred square to represent your conversions?

## Varied Fluency

Complete the table.

| Decimal | Fraction | Percentage |
|---|---|---|
| 0.35 | $\frac{35}{100}$ | 35% |
| 0.27 | | |
| 0.6 | | |
| 0.06 | | |

Use <, > or = to complete the statements.

0.36 ◯ 40%

$\frac{7}{10}$ ◯ 0.07

0.4 ◯ 25%

0.4 ◯ $\frac{1}{4}$

Which of these are equivalent to 60%?

$\frac{60}{100}$ | $\frac{6}{100}$ | 0.06 | $\frac{3}{5}$ | $\frac{3}{50}$ | 0.6

# Equivalent FDP

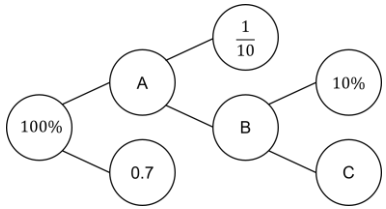
## Reasoning and Problem Solving

Amir says 0.3 is less than 12% because 3 is less than 12

Explain why Amir is wrong.

Amir is wrong because 0.3 is equivalent to 30%

Complete the part-whole model.
How many different ways can you complete it?




Can you create your own version with different values?

A = 0.3, 30% or $\frac{3}{10}$

B = 0.2, 20%, $\frac{2}{10}$ or $\frac{1}{5}$

C = 0.1, 10% or $\frac{1}{10}$

How many different fractions can you make using the digit cards?

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|

How many of the fractions can you convert into decimals and percentages?

Possible answers:

Children make a range of fractions.

They should be able to convert

$\frac{1}{2}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}$

and $\frac{4}{5}$ into decimals and percentages.

# Order FDP

## Notes and Guidance

Children convert between fractions, decimals and percentages to enable them to order and compare them.

Encourage them to convert each number to the same form so that they can be more easily ordered and compared. Once the children have compared the numbers, they will need to put them back into the original form to answer the question.

## Mathematical Talk

What do you notice about the fractions, decimals or percentages? Can you compare any straight away?

What is the most efficient way to order them?

Do you prefer to convert your numbers to decimals, fractions or percentages? Why?

If you put them in ascending order, what will it look like?
If you put them in descending order, what will it look like?

## Varied Fluency

- Use <, > or = to complete the statements:

60% ◯ 0.6 ◯ $\frac{3}{5}$

0.23 ◯ 24% ◯ $\frac{1}{4}$

37.6% ◯ $\frac{3}{8}$ ◯ 0.27

- Order from smallest to largest:

| | | | | | |
|---|---|---|---|---|---|
| 50% | $\frac{2}{5}$ | 0.45 | $\frac{3}{10}$ | 54% | 0.05 |

- Four friends share a pizza. Whitney eats 35% of the pizza, Teddy eats 0.4 of the pizza, Dora eats 12.5% of the pizza and Alex eats 0.125 of the pizza.

  Write the amount each child eats as a fraction.
  Who eats the most? Who eats the least? Is there any left?

# Order FDP

## Reasoning and Problem Solving

In his first Geography test, Mo scored 38%

In the next test he scored $\frac{16}{40}$

Did Mo improve his score?

Explain your answer.

Mo improved his score.

$\frac{16}{40}$ is equivalent to 40% which is greater than his previous score of 38%

Which month did Eva save the most money?

Estimate your answer using your knowledge of fractions, decimals and percentages.

Explain why you have chosen that month.

In January, Eva saves $\frac{3}{5}$ of her £20 pocket money.

In February, she saves 0.4 of her £10 pocket money.

In March, she saves 45% of her £40 pocket money.

She saved the most money in March.

Estimates:

Over £10 in January because $\frac{3}{5}$ is more than half.

Under £10 in February because she only had £10 to start with and 0.4 is less than half.

Nearly £20 in March because 45% is close to a half.

# Percentage of an Amount (1)

## Notes and Guidance

Children use known fractional equivalences to find percentages of amounts.
Bar models and other visual representations may be useful in supporting this e.g. 25% $= \frac{1}{4}$ so we divide into 4 equal parts.
In this step, we focus on 50%, 25%, 10% and 1% only.

## Mathematical Talk

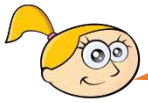
Why do we divide a quantity by 2 in order to find 50%?

How do you calculate 10% of a number mentally?

What's the same and what's different about 10% of 300 and 10% of 30?

## Varied Fluency

Eva says,



50% is equivalent to $\frac{1}{2}$
To find 50% of an amount, I can divide by 2

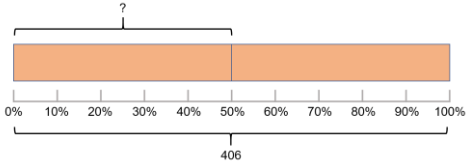
Complete the sentences.

25% is equivalent to $\frac{1}{\square}$ To find 25% of an amount, divide by ___

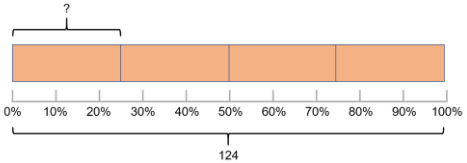
10% is equivalent to $\frac{1}{\square}$ To find 10% of an amount, divide by ___

1% is equivalent to $\frac{1}{\square}$ To find 1% of an amount, divide by ___

Use the bar models to help you complete the calculations.




50% of 406 =




25% of 124 =

Find:

| | | | |
|---|---|---|---|
| 50% of 300 | 25% of 300 | 10% of 300 | 1% of 300 |
| 50% of 30 | 25% of 30 | 10% of 30 | 1% of 30 |
| 50% of 60 | 25% of 60 | 10% of 60 | 1% of 60 |

# Percentage of an Amount (1)

## Reasoning and Problem Solving

Mo says,

To find 10% you divide by 10, so to find 50% you divide by 50

Do you agree? Explain why.

Possible answer:

Mo is wrong because 50% is equivalent to a half so to find 50% you divide by 2

Eva says to find 1% of a number, you divide by 100
Whitney says to find 1% of a number, you divide by 10 and then by 10 again.

Who do you agree with?
Explain your answer.

They are both correct.
Whitney has divided by 100 in two smaller steps.

Complete the missing numbers.

50% of 40 = ___% of 80

___% of 40 = 1% of 400

10% of 500 = ___% of 100

25

10

50

# Percentage of an Amount (2)

## Notes and Guidance

Children build on the last step by finding multiples of 10% and other known percentages.
They explore different methods of finding certain percentages e.g. Finding 20% by dividing by 10 and multiplying by 2 or by dividing by 5. They also explore finding 5% by finding half of 10%. Using these methods, children build up to find percentages such as 35%.

## Mathematical Talk

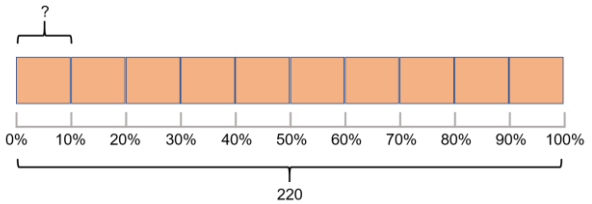
Is dividing by 10 and multiplying by 5 the most efficient way to find 50%? Explain why.

Is dividing by 10 and multiplying by 9 the most efficient way to find 90%? Explain why.

How many ways can you think of to calculate 60% of a number?

## Varied Fluency

- Mo uses a bar model to find 30% of 220




10% of 220 = 22 , so 30% of 220 = 3 × 22 = 66

Use Mo's method to calculate:

40% of 220  20% of 110  30% of 440  90% of 460

- To find 5% of a number, divide by 10 and then divide by 2
Use this method to work out:
(a) 5% of 140  (b) 5% of 260  (c) 5% of 1 m 80 cm

How else could we work out 5%?

- Calculate:

15% of 60 m  35% of 300 g  65% of £20

# Percentage of an Amount (2)

## Reasoning and Problem Solving

Four children in a class were asked to find 20% of an amount, this is what they did:

Whitney: I divided by 5 because 20% is the same as one fifth

Amir: I found one percent by dividing by 100, then I multiplied my answer by 20

Alex: I did 10% add 10%

Jack: I found ten percent by dividing by 10, then I multiplied my answer by 2

Who do you think has the most efficient method? Explain why.

Who do you think will end up getting the answer incorrect?

All methods are acceptable ways of finding 20% Children may have different answers because they may find different methods easier. Discussion could be had around whether or not their preferred method is always the most efficient.

How many ways can you find 45% of 60?

Use similar strategies to find 60% of 45

What do you notice?

Does this always happen?
Can you find more examples?

Possible methods include:

10% × 4 + 5%

25% + 20%

25% + 10%+ 10%

50% – 5%

To find 60% of 45

10% × 6

50% + 10%

10% × 3

Children will notice that 45% of 60 = 60% of 45

This always happens.

# Percentages – Missing Values

## Notes and Guidance

Children use their understanding of percentages to find the missing whole or a missing percentage when the other values are given. They may find it useful to draw a bar model to help them see the relationship between the given percentage or amount and the whole.

It is important that children see that there may be more than one way to solve a problem and that some methods are more efficient than others.

## Mathematical Talk

If we know a percentage, can we work out the whole?

If we know the whole and the amount, can we find what percentage has been calculated?

What diagrams could help you visualise this problem?
Is there more than one way to solve the problem?

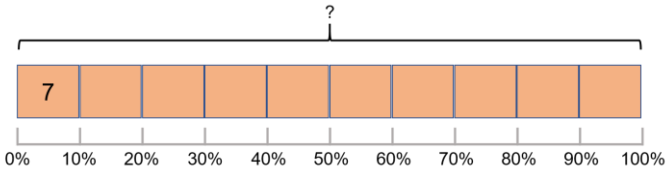
What is the most efficient way to find a missing value?

## Varied Fluency

- 350,000 people visited the Natural History Museum last week.
  15% of the people visited on Monday.
  40% of the people visited on Saturday.
  How many people visited the Natural History Museum during the rest of the week?

- If 7 is 10% of a number, what is the number?

  Use the bar model to help you.




- Complete:

10% of 150 = ☐ 30% of ☐ = 45

30% of 300 = ☐ 30% of ☐ = 900

Can you see a link between the questions?

# Percentages – Missing Values

## Reasoning and Problem Solving

What percentage questions can you ask about this bar model?


Possible answer:
If 20% of a number is 3.5, what is the whole?
What is 60%?
What is 10%?

Fill in the missing values to make this statement correct.
Can you find more than one way?

25% of ☐ = ☐ % of 60

Possible answers:

25% of 60 = 25% of 60

25% of 120 = 50% of 60

25% of 24 = 10% of 60

25% of 2.4 = 1% of 60

25% of 180 = 75% of 60

A golf club has 200 members.

58% of the members are male.
50% of the female members are children.

(a) How many male members are in the golf club?
(b) How many female children are in the golf club?

.

116 male members

42 female children