

PERCENTAGES

62

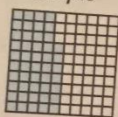
TARGET To recall and use equivalences between fractions, decimals and percentages.

Per cent means out of 100.

Percentages are fractions with a denominator of 100.

The symbol for per cent is %.

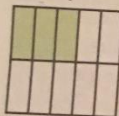
Example



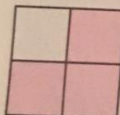
$$\frac{47}{100} = 47\% = 0.47$$

To express fractions as percentages, change them to equivalent fractions with denominators of 100.

Examples



$$\frac{3}{10} = \frac{30}{100} = 30\%$$



$$\frac{3}{4} = \frac{75}{100} = 75\%$$

To express decimals as percentages, multiply by 100.

Examples

$$0.2 = 20\% \quad (0.2 \times 100 = 20)$$

$$0.85 = 85\% \quad (0.85 \times 100 = 85)$$

It is useful to know that:

$$\frac{1}{100} = 0.01 = 1\%, \quad \frac{2}{100} = 0.02 = 2\%, \text{ etc.}$$

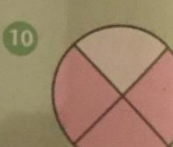
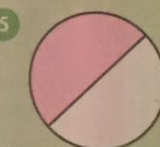
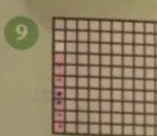
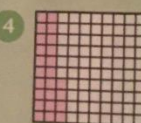
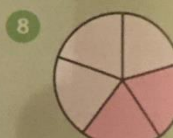
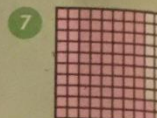
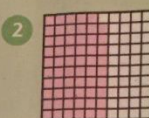
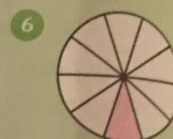
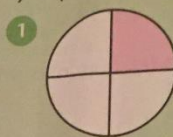
$$\frac{1}{10} = 0.1 = 10\%, \quad \frac{2}{10} = 0.2 = 20\%, \text{ etc.}$$

$$\frac{1}{4} = 25\%, \quad \frac{1}{2} = 50\%, \quad \frac{3}{4} = 75\%$$

A

Express each shaded area as:

- a fraction
- a decimal
- a percentage.



11 What percentage of the boxes contain:

- ticks
- crosses
- dots
- triangles?

x		✓	•	
✓	•			✓
		△	✓	•
•	✓		x	

What percentage of the boxes are blank?

B

- 1 Copy and complete the table.

Fractions	Decimals	%ages
$\frac{1}{10}$	0.1	10%
		50%
		32%
		90%
	0.18	
	0.25	
	0.02	
	0.4	
$\frac{7}{50}$		
$\frac{3}{4}$		
$\frac{6}{100}$		
$\frac{11}{25}$		
		1%
	0.95	

What percentage could be used in each sentence.

- 2 Half the tissues in the box had been used.
- 3 Nineteen of the twenty horses in the race were brown.
- 4 The basketball team won four in every five matches played.
- 5 Twenty-nine hundredths of the Earth's surface is water.
- 6 Ella and Elysia achieved full marks in the Maths Test.
- 7 Darren has read three quarters of his book.
- 8 Twenty-seven in every fifty visitors to the Museum stayed for more than two hours.
- 9 Nine out of the twenty-five balloons in the packet were yellow.
- 10 Three in every five chocolates had a soft centre.

C

Write each fraction as:

- a) a decimal
- b) a percentage.

- | | | | |
|------------------|--------------------|---------------------|-------------------|
| 1 $\frac{7}{10}$ | 3 $\frac{87}{100}$ | 5 $\frac{2}{5}$ | 7 $\frac{23}{25}$ |
| 2 $\frac{4}{50}$ | 4 $\frac{3}{20}$ | 6 $\frac{126}{200}$ | 8 $\frac{18}{40}$ |

Write each percentage as:

- a) a fraction in its simplest form
- b) a decimal.

- | | |
|--------|----------|
| 9 23% | 13 71% |
| 10 35% | 14 0.5% |
| 11 60% | 15 30% |
| 12 9% | 16 17.5% |

- 17 Eight children competed for the title School Master Chef. Their task was to produce cakes for the School Fête. Complete the list of results.

Name	Cakes made	Cakes sold	%age sold	%age unsold
Ailsa	50	39		
Bilal	54		50%	
Carmen	40			30%
Digby	60	39		
Esmé	45		80%	
Fred	56			25%
Gail	48	30		
Harry	55		60%	

- 18 Use squared paper.
Draw a 6×10 grid of 60 boxes.
- a) Colour 25% red.
 - b) Colour 20% blue.
 - c) Colour 9 boxes yellow.
 - d) Write down the percentage of the boxes not coloured.

MENTAL CALCULATIONS - FRACTIONS

64

TARGET To solve number problems involving fractions, decimals and percentages mentally.

A

- 1 What is one tenth of a right angle?
- 2 What is the product of 5 and 0.9?
- 3 Divide 2.8 by 4.
- 4 Take two thirds from 3.
- 5 What is 10% larger than 80?
- 6 How many fifths make 6?
- 7 What is 50% of 19?
- 8 What is the difference between 2.7 and 4.1?
- 9 Increase 4 by 50%.
- 10 Add three sevenths and two sevenths.
- 11 Which number is ten times greater than 1.2?
- 12 Which number is ten times smaller than 2.5?
- 13 Subtract five eighths from 7.
- 14 What is 10% of 5?
- 15 Find one quarter of 10.
- 16 Increase 5.6 by 2.1.

B

- 1 Halve 4.6.
- 2 What is three tenths plus one and a half?
- 3 How much is £5 increased by 50%?
- 4 Find the difference between 1.5 and 0.15.
- 5 Find one quarter of 180° .
- 6 What needs to be added to 1.36 to make 2?
- 7 How many eighths are there in two and a half?
- 8 Divide 5.8 by 100.
- 9 Add three tenths to 0.64.
- 10 What is 1% of £50?
- 11 Multiply 0.77 by 100.
- 12 Find seven ninths of 27.
- 13 What is seven tenths minus one quarter?
- 14 What is the cost of a £19 jumper if the price is reduced by 10%?
- 15 What is twice 0.8?
- 16 Find 90% of £35.

C

- 1 What is one quarter of £55?
- 2 Find the number which is 100 times greater than 0.009.
- 3 What is half of 0.13?
- 4 What is the total of one half, three quarters and five eighths?
- 5 Find 11% of £2400.
- 6 Take nine tenths from 1.382.
- 7 What is the product of 8 and 0.25?
- 8 Find eleven twelfths of 60.
- 9 What is added to 1.06 to make 8?
- 10 Increase £180 by 5%.
- 11 Add three quarters to 0.839.
- 12 Find 25% of 0.1.
- 13 What is 20 times greater than 0.08?
- 14 What is 90% of 360° ?
- 15 Subtract 0.315 from 1.
- 16 What is one fifth of 1.4?

PERCENTAGES OF AMOUNTS

65

TARGET To solve problems involving the calculation of percentages of amounts.

Examples

10% of 800 m

$\frac{1}{10}$ of 800 m

$800 \text{ m} \div 10$

80 m

30% of 800 m

$(10\% \text{ of } 800 \text{ m}) \times 3$

$80 \text{ m} \times 3$

240 m

5% of 800 m

$(10\% \text{ of } 800 \text{ m}) \div 2$

$80 \text{ m} \div 2$

40 m

75% of 800 m

$\frac{3}{4}$ of 800 m

$(800 \text{ m} \div 4) \times 3$

$200 \text{ m} \times 3$

600 m

A

Find 10% of:

- | | |
|-------|--------|
| 1 30 | 5 150 |
| 2 80 | 6 200 |
| 3 50 | 7 420 |
| 4 100 | 8 500. |

Find 10% of:

- | | |
|----------|-----------|
| 9 40p | 13 £2.00 |
| 10 70p | 14 £4.60 |
| 11 £1.00 | 15 £12.00 |
| 12 £1.80 | 16 90p. |

Find 10% of:

- | | |
|-----------|----------|
| 17 20 cm | 21 1 m |
| 18 60 cm | 22 5 m |
| 19 400 g | 23 1 kg |
| 20 1000 g | 24 3 kg. |

25 There are 240 trees in a wood. 10% are oak trees. How many oak trees are there in the wood?

26 A fridge costs £450. In a sale there is 10% off. What is the new price?

B

For each of the following amounts find:

a) 10% b) 5% c) 20%.

- | | |
|----------|--------|
| 1 £2.00 | 3 3 kg |
| 2 500 ml | 4 15 m |

Find:

- 5 20% of 300
6 70% of 250
7 30% of 600
8 60% of 25

- 9 5% of 500 g
10 5% of 2 kg
11 5% of 380 ml
12 5% of 8 litres

13 Toyah makes 5 litres of soup. 70% is used. How much is left?

14 There are 140 rooms in a hotel. 20% have been decorated since the hotel opened. How many have not been redecorated?

15 A tracksuit costs £25. The price goes up by 5%. What is the new price?

C

Find:

- 1 1% of £240
2 4% of £8
3 25% of 34 cm
4 15% of 2 m
5 11% of 500 g
6 15% of 4 kg
7 99% of 10 litres
8 95% of 600 ml

Copy and complete:

- 9 10% of = 25
10 20% of = 7
11 90% of = 18
12 25% of = 13
13 1% of = 1.4
14 2% of = 0.8
15 5% of = 12
16 75% of = 360

17 Latrice has £15 000 in a savings account at the start of the year. How much will she have in her account at the end of the year if the annual interest rate is:
a) 1% b) 5% c) 7.5%?

FRACTIONS/PERCENTAGES OF AMOUNTS

66

TARGET To calculate fractions and percentages of amounts.

Examples

$$\frac{1}{12} \text{ of } 600$$

$$600 \div 12$$

$$50$$

$$\frac{5}{12} \text{ of } 600$$

$$\left(\frac{1}{12} \text{ of } 600\right) \times 5$$

$$50 \times 5$$

$$250$$

$$10\% \text{ of } 350$$

$$\frac{1}{10} \text{ of } 350$$

$$35$$

$$70\% \text{ of } 350$$

$$(10\% \text{ of } 350) \times 7$$

$$35 \times 7$$

$$245$$

$$1\% \text{ of } 350$$

$$\frac{1}{100} \text{ of } 350$$

$$350 \div 100$$

$$3.5$$

A

Find:

- 1 $\frac{1}{3}$ of 18
- 2 $\frac{1}{5}$ of 35
- 3 $\frac{1}{6}$ of 24
- 4 $\frac{1}{4}$ of 36
- 5 $\frac{1}{8}$ of 40
- 6 $\frac{2}{3}$ of 24
- 7 $\frac{2}{5}$ of 15
- 8 $\frac{3}{4}$ of 16
- 9 $\frac{5}{6}$ of 36
- 10 $\frac{4}{7}$ of 28
- 11 10% of 30
- 12 10% of 150
- 13 10% of 80
- 14 10% of £1.00
- 15 10% of 500 cm
- 16 20% of 40
- 17 30% of 200
- 18 50% of 36
- 19 30% of 50
- 20 25% of 24

B

Work out:

- 1 $\frac{3}{4}$ of 32
- 2 $\frac{2}{3}$ of 21
- 3 $\frac{4}{5}$ of 100
- 4 $\frac{5}{8}$ of 64
- 5 $\frac{3}{7}$ of 42
- 6 $\frac{7}{9}$ of 45
- 7 20% of 90
- 8 30% of 140
- 9 5% of 520
- 10 75% of 480
- 11 40% of 250
- 12 1% of 110
- 13 Fifty 5 year olds were asked if they believed in Father Christmas. Three fifths said yes. 30% said no. How many were *don't knows*?
- 14 There are 80 straws in a box. 60% are used. How many are left?
- 15 Ninety children were asked if they have any brothers or sisters. Five ninths have at least one sister. 20% have no sister but at least one brother. How many children have neither brother nor sister?
- 16 A cinema has 400 seats. At the first screening of a film 78% of the seats were filled. At the second screening thirty seats were empty. Which screening had the bigger audience, and by how many?

C

Work out:

- 1 $\frac{5}{6}$ of 180
- 2 $\frac{3}{8}$ of 400
- 3 $\frac{2}{7}$ of 6.3
- 4 $\frac{7}{12}$ of 600
- 5 $\frac{8}{15}$ of 90
- 6 $\frac{49}{50}$ of 1000
- 7 4% of 150
- 8 15% of 280
- 9 2.5% of 5000
- 10 7% of 40
- 11 95% of 600
- 12 21% of 500
- 13 There are 3700 books in a library. 21% of them are out on loan. How many books are on the shelves?
- 14 A town has a population of 24 000. Three eighths are women. 35% are men. How many children live in the town?
- 15 The School Choir consists of 25% of the children in the school. 135 children are not in the choir. How many children are there in the school?
- 16 There were 12 600 runners registered to take part in a marathon. 3% were injured in training and unable to take part. One ninth dropped out during the race. How many runners completed the course?

FRACTIONS/PERCENTAGES OF QUANTITIES

67

TARGET To calculate fractions and percentages of quantities.

Examples

$$\frac{1}{7} \text{ of } £630$$

$$£630 \div 7$$

$$£90$$

$$\frac{3}{7} \text{ of } £630$$

$$\left(\frac{1}{7} \text{ of } £630\right) \times 3$$

$$£90 \times 3$$

$$£270$$

$$10\% \text{ of } 25 \text{ m}$$

$$\frac{1}{10} \text{ of } 25 \text{ m}$$

$$2.5 \text{ m}$$

$$60\% \text{ of } 25 \text{ m}$$

$$(10\% \text{ of } 25 \text{ m}) \times 6$$

$$2.5 \text{ m} \times 6$$

$$15 \text{ m}$$

$$5\% \text{ of } 25 \text{ m}$$

$$(10\% \text{ of } 25 \text{ m}) \div 2$$

$$2.5 \text{ m} \div 2$$

$$1.25 \text{ m}$$

A

Find

1 $\frac{1}{4}$ of 28

2 $\frac{1}{3}$ of 24

3 $\frac{1}{5}$ of 30p

4 $\frac{1}{8}$ of 40 mm

5 $\frac{1}{6}$ of 48 kg

6 $\frac{2}{3}$ of 18

7 $\frac{3}{4}$ of 36

8 $\frac{5}{6}$ of 30 cm

9 $\frac{2}{5}$ of 35 g

10 $\frac{3}{7}$ of £21

11 10% of 50

12 10% of 120

13 10% of £2

14 10% of £3.20

15 10% of 1 m

16 20% of 40

17 30% of 70

18 50% of 34 cm

19 25% of 32 km

20 20% of 25p

B

Work out

1 $\frac{2}{3}$ of 600 g

2 $\frac{5}{8}$ of 72 cm

3 $\frac{7}{10}$ of 500 ml

4 $\frac{4}{5}$ of 60p

5 $\frac{6}{7}$ of 42 kg

6 $\frac{3}{4}$ of 120 km

7 $\frac{2}{9}$ of £45

8 $\frac{5}{6}$ of 54 m

9 30% of £250

10 25% of 30 m

11 40% of 75 kg

12 5% of 80p

13 90% of 360 ml

14 75% of 160 km

15 60% of 55 cm

16 5% of 10 g

17 Seventy-five per cent of a bag of sand has not been used. 4.5 kg has been used. How much sand was in the full bag?

18 Darnell has £160. He spends three eighths of his money in one shop and 30% of it in another. How much has he spent?

19 One 150 ml glass of drink is 5% of the amount in a jug. How much drink is in the full jug?

20 Shannon is cycling 70 km. She rides a quarter of the distance in the first hour and 20% in the second hour. How far has she cycled?

C

Work out

1 $\frac{4}{5}$ of £6.00

2 $\frac{33}{100}$ of 1 kg

3 $\frac{5}{9}$ of £126

4 $\frac{9}{20}$ of 400 g

5 $\frac{3}{8}$ of 96 cm

6 $\frac{13}{15}$ of 120

7 $\frac{9}{25}$ of 1 km

8 $\frac{7}{12}$ of 600 ml

9 1% of 500 g

10 3% of 150 m

11 5% of 1.8 kg

12 15% of £2.20

13 75% of 42 cm

14 2.5% of £7.20

15 95% of £3.00

16 99% of £68.00

17 Kizzy's bank account pays 4% interest. She has £640 in the account. How much interest will she earn?

18 A builder mixes 4.8 kg of materials to make concrete. 55% is gravel, 30% is sand and the rest is cement. How much does he use of each material?

19 Paul uses 5 litres of water washing up. This is 2% of the total amount of water he uses in a day. How much water does he use daily?

20 Pattie earns £800 per week. She receives a raise of 7.5%. How much does she now earn?

N35
Fractions, decimals and percentages
Fractions/decimals N36

Copy the number line from 0 to 1.

Mark each number on the line.

1 $\frac{2}{5}$

2 10%

3 25%

4 $\frac{6}{10}$

5 0.25

6 30%

7 $\frac{4}{5}$

8 50%

9 80%

10 $\frac{3}{4}$

11 0.4

12 $\frac{1}{5}$

13 0.9

14 $\frac{15}{100}$

Write all the fractions and percentages in order, smallest to largest.

Write each percentage as a fraction in its simplest form.

15. $40\% = \frac{40}{100}$
 $\frac{40}{100} = \frac{4}{10} = \frac{2}{5}$

15 40%

19 10%

23 35%

16 30%

20 80%

24 45%

17 20%

21 75%

25 7%

18 5%

22 2%

26 60%

Write each percentage as a decimal

15a. $40\% = 0.4$

Fractions, decimals and percentages

Write the missing numbers.

1 $25\% = \frac{1}{4}$

I. $25\% = \frac{1}{4}$

2 $0.3 = \frac{\quad}{10}$

3 $\frac{12}{100} = 12\%$

4 $\frac{73}{100} = 0.73$

5 $\frac{2}{10} = 20\%$

6 $54\% = \frac{\quad}{100}$

7 $\frac{14}{100} = 0.\quad$

8 $\frac{1}{5} = \quad\%$

9 $0.18 = \frac{\quad}{100}$

10 $50\% = \frac{5}{10}$

Write $<$, $>$ or $=$ between each pair.

11 $75\% \quad 0.68$

II. $75\% > 0.68$

12 $0.71 \quad \frac{17}{100}$

13 $0.36 \quad \frac{36}{100}$

14 $85\% \quad 0.85$

15 $\frac{27}{100} \quad 30\%$

16 $55\% \quad \frac{44}{100}$

17 $31\% \quad 0.13$

18 $21\% \quad \frac{21}{100}$

19 $0.43 \quad \frac{44}{100}$

20 $8\% \quad \frac{80}{100}$

Write each set in order, from smallest to largest.

21. $0.27, \frac{35}{100}, 50\%$

22. $0.75, \frac{70}{100}, 71\%$

23. $\frac{43}{100}, 0.33, 34\%$

24. $0.18, \frac{81}{100}, 8\%$

25. $\frac{99}{100}, 0.9, 41\%$

26. $2\%, \frac{2}{10}, 0.21$

27. $\frac{3}{10}, 0.2, 25\%$

Fractions, decimals and percentages

Write each fraction as a decimal.

1 $\frac{3}{4}$ 2 $\frac{2}{5}$ 3 $\frac{1}{8}$

4 $\frac{3}{8}$ 5 $\frac{7}{20}$ 6 $\frac{4}{5}$

8 $\frac{5}{8}$ 9 $\frac{7}{8}$ 10 $\frac{6}{15}$

7 $\frac{1}{5}$

11. $\frac{9}{25}$

Use a calculator to help you.

Fractions/decimals N36

I. $\frac{3}{4} = 3 \div 4$
 $3 \div 4 = 0.75$

Use a calculator to compare these fractions.

12 $\frac{3}{8}$ $\frac{4}{10}$ 13 $\frac{3}{5}$ $\frac{17}{20}$ 14 $\frac{1}{4}$ $\frac{5}{16}$

15 $\frac{2}{7}$ $\frac{30}{100}$ 16 $\frac{37}{50}$ $\frac{2}{3}$ 17 $\frac{6}{7}$ $\frac{21}{25}$ 18 $\frac{4}{9}$ $\frac{5}{12}$

Write <, > or = between each pair.

12. $\frac{3}{8} = 0.375$
 $\frac{4}{10} = 0.4$
 $\frac{3}{8} < \frac{4}{10}$

Problems

19 A group of **60** people go on a trip to Stratford.

$\frac{2}{3}$ are adults. **60%** of the children are girls.

How many children are there?

How many boys are there?

20 Jake has **72** marbles, of which $\frac{3}{8}$ are red, **25%** are blue and $\frac{1}{3}$ are green.

The rest are silver.

How many silver marbles does he have?

21 Marshton School football team play **30** matches.

They win $\frac{1}{6}$ of them and draw **20%** of them.

How many matches do they lose?

22 Layla goes to a burger bar with some friends for her birthday. The bill is **£35**.

$\frac{1}{7}$ of the bill is for milk shakes. **40%** of the bill is for ice creams.

The rest is for burgers.

How much did the burgers cost? 49

Fractions and percentages

Fractions, decimals, percentages

N18

Write these fractions as percentages.

- 1 $\frac{7}{10}$ 2 $\frac{1}{4}$ 3 $1\frac{3}{4}$ 4 $2\frac{1}{2}$ 5 $\frac{13}{100}$ 6 $\frac{3}{8}$

Write these percentages as fractions.

- 7 75% 8 60% 9 150% 10 225% 11 87% 12 12.5%

Write these fractions as percentages by converting them into hundredths.

- 13 $\frac{3}{5} = \frac{\quad}{100}$ 14 $\frac{7}{20} = \frac{\quad}{100}$ 15 $\frac{13}{50} = \frac{\quad}{100}$
16 $\frac{27}{50} = \frac{\quad}{100}$ 17 $\frac{17}{25} = \frac{\quad}{100}$ 18 $\frac{34}{25} = \frac{\quad}{100}$

13. $\frac{3}{5} = \frac{60}{100} = 60\%$



Estimate the order of each set, from smallest to largest, by writing the letters in sequence.

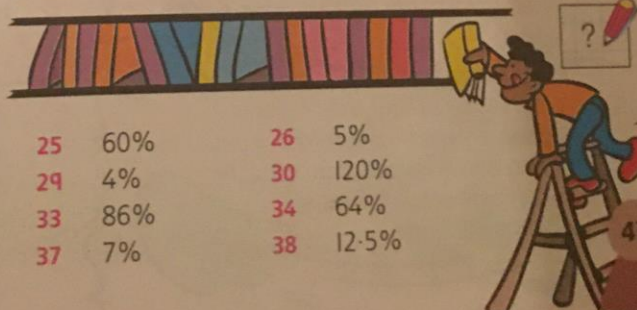
Convert each fraction to a percentage, then write the correct order. Compare with your estimate.

- 19 A $\frac{3}{5}$ B $\frac{4}{10}$ C $\frac{11}{20}$ D $\frac{1}{2}$ E $\frac{3}{4}$
21 K $\frac{68}{200}$ L $\frac{7}{10}$ M $\frac{37}{50}$ N $\frac{13}{20}$ O $\frac{3}{5}$

- 20 F $\frac{17}{25}$ G $\frac{35}{100}$ H $\frac{1}{4}$ I $\frac{3}{2}$ J $\frac{7}{10}$
22 P $\frac{6}{25}$ Q $\frac{5}{2}$ R $\frac{3}{10}$ S $\frac{7}{20}$ T $\frac{69}{300}$

Write these percentages as fractions in their simplest form.

- 23 10% 24 25% 25 60% 26 5%
27 65% 28 80% 29 4% 30 120%
31 135% 32 72% 33 86% 34 64%
35 35% 36 18% 37 7% 38 12.5%



Fractions, decimals and percentages

Fractions, decimals, percentages

Use your calculator to convert these fractions to percentages, correct to 1 decimal place.

1 $\frac{5}{6}$

2 $\frac{4}{7}$

3 $\frac{7}{9}$

4 $\frac{3}{11}$

5 $\frac{4}{3}$

6 $\frac{8}{15}$

7 $\frac{5}{12}$

8 $\frac{7}{8}$

9 $\frac{11}{18}$

10 $\frac{6}{13}$

For each set of cards, calculate the percentages shown.



11 black

12 red

13 spades

14 diamonds

15 clubs

16 more than 4

17 odd

18 not hearts



19 red

20 diamonds

21 clubs

22 black

23 hearts

24 even



25 black

26 red

27 hearts

28 clubs

29 more than 5

30 less than 5

Write '<', '>' or '=' between each pair.

31 $\frac{3}{4}$ 0.72

34 45% $\frac{11}{25}$

37 $\frac{5}{6}$ 0.8

32 0.81 $\frac{4}{5}$

35 $\frac{3}{7}$ 43%

38 $\frac{7}{8}$ 0.82

33 $\frac{7}{20}$ 34%

36 45% $\frac{5}{12}$

39 $\frac{4}{7}$ $\frac{6}{9}$

40 In a test $\frac{3}{7}$ of the children passed. What percentage failed?

Problems

42 When asked about their favourite season, $\frac{5}{12}$ voted for summer, $\frac{2}{7}$ voted for spring and $\frac{2}{9}$ for autumn. What percentage voted for winter?

41 In the Year 6 class 72% of children have had measles. What fraction have not?

43 At a match 40% of the fans are children and the rest are adults. If $\frac{4}{5}$ of the adults are male, what percentage of the fans are women?