Enabling world-class education

Day: 1   **Topic:** Fractions

You need to be able to:
- understand equivalent fractions and simplify a fraction by cancelling
- calculate a given fraction of a quantity
- express one number as a fraction of another
- add and subtract fractions by writing them with a common denominator
- multiply and divide a fraction by an integer and by a fraction
- convert a simple fraction to a decimal or a percentage

You will need to think about:

Ordering fractions
You may be able to do this straight away by considering position on a number line but if not, write them with **a common denominator**

$\frac{1}{2}$ $\frac{2}{5}$ $\frac{3}{7}$ By considering **equivalent** fractions, these can be written with a common denominator of **70**

Multiply 2 x 5 x 7

Equivalent fractions : multiply the top number (numerator) and bottom number (denominator) by the same amount

$$\frac{1}{2} = \frac{35}{70} \qquad \frac{2}{5} = \frac{28}{70} \qquad \frac{3}{7} = \frac{30}{70}$$

So writing in order: $\frac{2}{5}$ $\frac{3}{7}$ $\frac{1}{2}$

Calculating a fraction of a quantity

$\frac{2}{5}$ of £30 $\frac{1}{5}$ of £30 = £30 ÷ 5 = £6   so $\frac{2}{5}$ of £30 = 2 x 6 = £12

Expressing one number as a fraction of another

25 as a fraction of 70

$$\frac{25}{70} = \frac{5}{14}$$

Cancel by dividing top and bottom by 5 giving the **simplest** fraction

Adding and subtracting

$$\frac{3}{4} + \frac{3}{8} = \frac{6}{8} + \frac{3}{8} = \frac{9}{8} = 1\frac{1}{8}$$

$$\frac{3}{4} - \frac{1}{3} = \frac{9}{12} - \frac{4}{12} = \frac{5}{12}$$

Remember to write each fraction with a common denominator first

Multiplying

$$\frac{2}{3} x \frac{3}{5} = \frac{2x3}{3x5} = \frac{6}{15} = \frac{2}{5}$$

Dividing

Dividing by ½ is the same as multiplying by 2

$$5 \div \frac{1}{2} = 5 \text{ x } 2 = 10$$

$$\frac{2}{3} \div \frac{1}{2} = \frac{2}{3} x \frac{2}{1} = \frac{4}{3} = 1\frac{1}{3}$$

$$1\frac{1}{3} \div \frac{2}{3} = \frac{4}{3} x \frac{3}{2} = \frac{12}{6} = 2$$
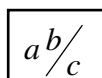
Dividing by $\frac{2}{3}$ is the same as multiplying by $\frac{3}{2}$

The equivalence of decimals, fractions and percentage - especially tenths, hundredths etc.

e.g. $0.4 = \frac{4}{10} = \frac{2}{5}$ $0.4 = \frac{4}{10} = \frac{40}{100} = 40\%$

$$0.37 = \frac{37}{100} = 37\%$$

Using the fraction key on your calculator $\boxed{a\,^b\!/_c}$

to calculate and check

Quick Questions

1. Which of these fractions are equivalent to $\frac{2}{3}$?

$$\frac{4}{9} \qquad \frac{4}{5} \qquad \frac{10}{15}$$

2. Write these fractions with a common denominator and put them in order (smallest to largest)

$$\frac{2}{3} \qquad \frac{3}{5} \qquad \frac{5}{9}$$

3. Find $\frac{2}{3}$ of £27

4. Find the value of each of the following. Leave your answer in its simplest form.

   a) $\frac{4}{5} - \frac{2}{3}$

   b) $\frac{3}{4} + \frac{7}{8}$

   c) $\frac{3}{7} \times \frac{2}{3}$

   d) $1\frac{2}{3} \times \frac{5}{6}$

   e) $\frac{3}{4} \div \frac{1}{2}$

   Check your answers using a calculator.

5. Convert $\frac{3}{20}$ to

   a) a decimal   b) a percentage

6. John is 10 years old. Peter is 30 years old. Write John's age as a fraction of Peter's age. Write your answer in its simplest form.

Past Paper Questions

N.B. problems involving fractions are combined with problems on decimals and/or percentages and ratio – see Days 4 & 5 for further practice.

1. (a)   Write down a decimal that lies between $\frac{1}{3}$ and $\frac{1}{2}$.

    …………………………………………………………………………………

    (1)

    (b)   (i)   Which of these two fractions is the bigger?

$$\frac{3}{4} \text{ or } \frac{2}{3}$$

    Show your working.

    …………………………………………………………………………

    …………………………………………………………………………

    …………………………………………………………………………

    (2)

2.   Which of the following fractions is nearest to $\frac{1}{2}$?

$$\frac{4}{10} \qquad \frac{9}{20} \qquad \frac{14}{30} \qquad \frac{19}{40}$$

    Show how you decide.

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

    (2)

3. Find the value of $4\frac{2}{3} - 2\frac{3}{4}$

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

                              Answer ....

    (3)

4. The chart shows the percentage of letters that are delivered the day after posting in each of six European countries.

Postal reliability

Percentage of letters delivered next day
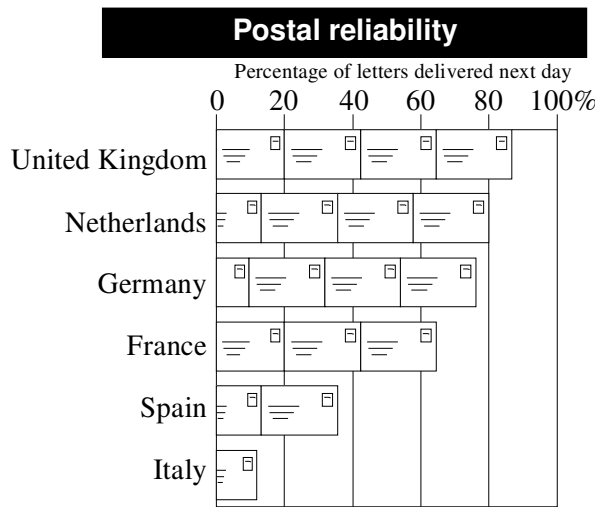
Source: Ec survey 1992

(a) In Germany, 72% of all letters posted are delivered the next day.
Write 72% as a fraction in its simplest form.

....

(1)

(b) Which country has approximately $\dfrac{7}{20}$ of its letters delivered the next day?

....

....

(1)

(c) Forty million letters are posted every day in the United Kingdom.

Nine-tenths of these are delivered the next day.

In your head, calculate $\dfrac{9}{10}$ of 40 000 000.

Write down your answer.

Explain clearly how you worked out your answer.

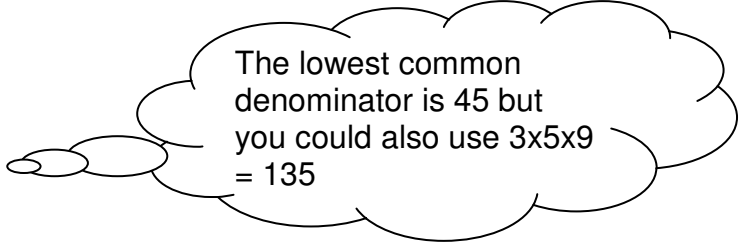...

....

(2)

END OF QUESTIONS

Day: 1   **Topic:** Fractions

Quick Questions

1. $\dfrac{2}{3} = \dfrac{4}{9} = \dfrac{10}{15}$

2. $\dfrac{2}{3} = \dfrac{30}{45}$ $\dfrac{3}{5} = \dfrac{27}{45}$ $\dfrac{5}{9} = \dfrac{25}{45}$

The lowest common denominator is 45 but you could also use 3x5x9 = 135

In order: $\dfrac{5}{9}$ $\dfrac{3}{5}$ $\dfrac{2}{3}$

3. $\dfrac{1}{3}$ of £27 = 27 ÷ 3 = £9 $\dfrac{2}{3}$ of £27 = £18

4. a) $\dfrac{4}{5} - \dfrac{2}{3} = \dfrac{12}{15} - \dfrac{10}{15} = \dfrac{2}{15}$

   b) $\dfrac{3}{4} + \dfrac{7}{8} = \dfrac{6}{8} + \dfrac{7}{8} = \dfrac{13}{8} = 1\dfrac{5}{8}$

   c) $\dfrac{3}{7} x \dfrac{2}{3} = \dfrac{6}{21} = \dfrac{2}{7}$

   d) $1\dfrac{2}{3} x \dfrac{5}{6} = \dfrac{5}{3} x \dfrac{5}{6} = \dfrac{25}{18} = 1\dfrac{7}{18}$

   e) $\dfrac{3}{4} \div \dfrac{1}{2} = \dfrac{3}{4} x \dfrac{2}{1} = \dfrac{6}{4} = \dfrac{3}{2} = 1\dfrac{1}{2}$

5. $\dfrac{3}{20}$ = 3 ÷ 20 = 0.15 = 15%

6. $\dfrac{10}{30} = \dfrac{1}{3}$

Past Paper Questions

1(a)   Any answer between $0.\dot{3}$ (0.333..) and 0.5 inclusive.

(b) $\dfrac{3}{4} = \dfrac{9}{12}$ and $\dfrac{2}{3} = \dfrac{8}{12}$

0.75 and 0.66

Largest fraction is $\dfrac{3}{4}$

2.   0.4, 0.45, 0.4666…, 0.475

$\dfrac{48}{120}, \dfrac{54}{120}, \dfrac{56}{120}, \dfrac{57}{120}$

$\dfrac{19}{40}, \dfrac{57}{120} \, or \, 0.475$ closest to $\dfrac{1}{2}$

3.

$$4\dfrac{2}{3} - 2\dfrac{3}{4} = \dfrac{14}{3} - \dfrac{11}{4} = \dfrac{56}{12} - \dfrac{33}{12} = \dfrac{23}{12} = 1\dfrac{11}{12}$$

4.

(a) $\dfrac{72}{100} = \dfrac{18}{25}$

(b) $\dfrac{7}{20} = \dfrac{35}{100} = 35\%$ Spain

(c) $\dfrac{1}{10}$ of 40 000 000 = 4 000 000

$\dfrac{9}{10}$ of 40 000 000 = 9 x 4 000 000

= 36 000 000   or   36 million

END OF ANSWERS

Day: 2   **Topic:** Decimals

You need to be able to:
- recognise that each terminating decimal is a fraction
- recognise that recurring decimals are exact fractions and that some exact fractions are recurring decimals
- order decimals
- use the four rules with number confidently

You will need to think about:

The equivalence of decimals, fractions and percentage - especially tenths, hundredths etc.

e.g. $0.4 = \dfrac{4}{10} = \dfrac{2}{5}$ $0.4 = \dfrac{4}{10} = \dfrac{40}{100} = 40\%$

$0.37 = \dfrac{37}{100} = 37\%$

Place value and significant figures, especially when ordering decimals

e.g   0.025 is smaller than 0.24

A mental image of a number line will help you visualise the size of a decimal number

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├────────────────┼────────────────┤
0.1             0.15             0.2
```
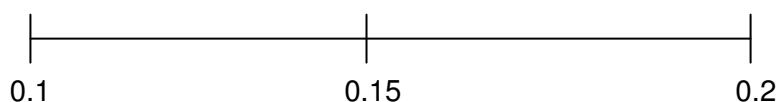
Recurring decimals converted to fractions

e.g   0.3333…..(recurring) $= \dfrac{1}{3}$ (Check: 1 ÷ 3 on calculator)

0.272727….. $= \dfrac{3}{11}$ (Check 3 ÷ 11 on the calculator)

Quick Questions

1. Write these fractions as decimals:

$$\frac{4}{5} \qquad \frac{3}{4} \qquad \frac{7}{20} \qquad \frac{2}{3} \qquad \frac{4}{9}$$

2 Write these decimals as fractions:

0.45   0.6   0.875   0.888888….. (recurring)

3. Write this list of decimal numbers in ascending order:

2.7   7.02   0.72   2.07   0.072   0.702

4. What is three point nine divided by two?

5. A teacher asked pupils to divide 28 by 3

> Gail wrote $28 \div 3 = 9.33$
>
> Ahmed wrote $28 \div 3 = 9\frac{1}{3}$

The teacher marked both correct, but said Ahmed's answer was better than Gail's answer.

Explain why $9\frac{1}{3}$ is not the same as 9.33

6. **Find the decimal**

Fill in the missing decimal number.

$$15 \div 10 \quad = \quad 15 \times 0.1$$

$$15 \div 1000 = 15 \times \ldots \ldots \ldots$$

Past Paper Questions

N.B. problems involving decimals are combined with problems on fractions and/or percentages and ratio – see Days 4 & 5 for further practice.

1. Which has the larger value, 0.88 or $\dfrac{7}{8}$?

Explain how you reached your answer.

…………………………………………………………………………………..…

…………………………………………………………………………….………….

(2)

2. This diagram shows part of the number line.
The arrow is in the middle of the line.
Fill in the box to show the number in the middle.

(a)

0.35   0.36

…………………………………………………………………………….……
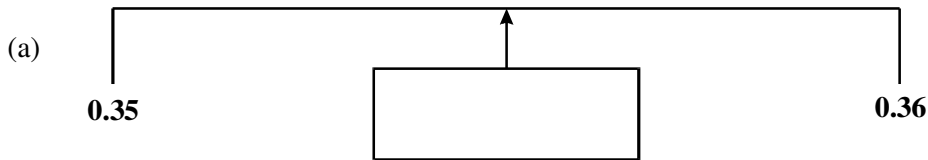
(1)

3. For many years, people have tried to find an estimate for the value for π.

Here are some of the estimates used.

Greek $\dfrac{22}{7}$ Hindu $\sqrt{10}$ Egyptian $\dfrac{256}{81}$ Roman $3\dfrac{1}{8}$

(a) Put these estimates in order of size, starting with the smallest.
    You **must** show all your working.

………………………………………………………………….………………

………………………………………………………………….………………….… **(2)**

(b) The value of π on a calculator is 3.141592654
    Which of the above estimates is closest to this value?

………

…………………………………………………….……………………………………………..…………….……… **(1)**

(Total 3 marks)

END OF QUESTIONS

Day: 2   **Topic:** Decimals

Quick Questions

1. $\frac{4}{5}$ = 0.8 $\frac{3}{4}$ = 0.75 $\frac{7}{20}$ = 0.35 $\frac{2}{3}$ = 0.66.. (rec) $\frac{4}{9}$ = 0.444.. (rec)

2   0.45 = $\frac{9}{20}$ 0.6 = $\frac{3}{5}$ 0.875 = $\frac{7}{8}$ 0.888888…= $\frac{8}{9}$

3   0.072 0.702 0.72   2.07   2.7   7.02

4   1.95

5.   Because Gail's answer is not exact; when 9.33 is multiplied by 3 you only get 27.99

6.   15 ÷ 1000 = 15 x 0.001

Past paper answers:

1. 0.88 is greater as 7/8 is 0.875.

2.   0.355

3. a $3\frac{1}{8}$ = 3.125   22/7 = 3.14285 $\frac{256}{81}$ = 3.1605 $\sqrt{10}$ = 3.16228

    b   22/7 is closest

Day 3   **Topic:** Percentages

You need to be able to:
- Work out simple percentages without a calculator
- Use a calculator for more complicated percentages
- Find percentages of amounts
- Use percentages to work out increases and decreases

You will need to think about:

How are you going to work out the percentage:

Can I do this in my head?

What percentage do I need to find?

What is the amount I started with?

What you will be doing with the percentage:

Do I just need the percentage?

Do I need to subtract from my starting amount (e.g. in a sale price)?

Do I need to add to the starting amount (e.g. house price rises)?

The equivalence of decimals, fractions and percentage (especially tenths, hundredths etc.)

e.g. $0.4 = \dfrac{4}{10} = \dfrac{2}{5}$ $0.4 = \dfrac{4}{10} = \dfrac{40}{100} = 40\%$

$0.37 = \dfrac{37}{100} = 37\%$

Always make sure you check your answer – does it make sense?

Remember:
In a sale your answer will be less than the starting amount, in a price rise the answer will be more than the starting amount.

Quick Questions

1.   What is twenty per cent of sixty pounds?

2.   Increase one pound fifty by fifty per cent.

3.   Ten per cent of a number is seven.
       What is the number?

4.   The table shows some percentages of amounts of money

	£10	£30	£45
5%	50p	£1.50	£2.25
10%	£1	£3	£4.50

You can use the table to help you work out the missing numbers.
       15%   of   £30   = £ …………………

       £6.75   =   15% of £ …………………

       £3.50   =   ……… % of £10

       25p   =   5% of £…………………

5.   Calculate

       (a)   8% of £26.50

                                                        ....

       (b)   12½ % of £98

                                                        ....

6.   In 1976 the average yearly wage was **£3275**
       On average, people spent **17%** of £3275 on their family holiday.
       How much is 17% of £3275?
       Show your working.

7.   (a)   Altogether, the area of the Earth's surface is **510** million km^2

             Only **29%** of this is land.

             Calculate how many million km^2 of land there are on the Earth's surface.
             Show your working.

(b) 29% of the Earth's surface is land.
The rest is water.
One of the pie charts shows the correct **ratio** of land to water.
On the correct pie chart, label the sections **Land** and **Water.**
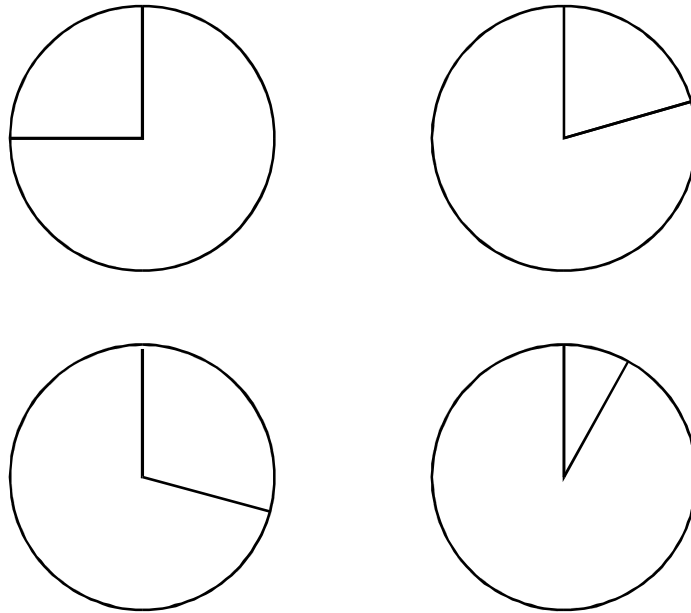
8. Each diagram below was drawn on a square grid.
(a) Write what **percentage** of each diagram is shaded.
The first one is done for you.

75 .... %

.... %

.... %
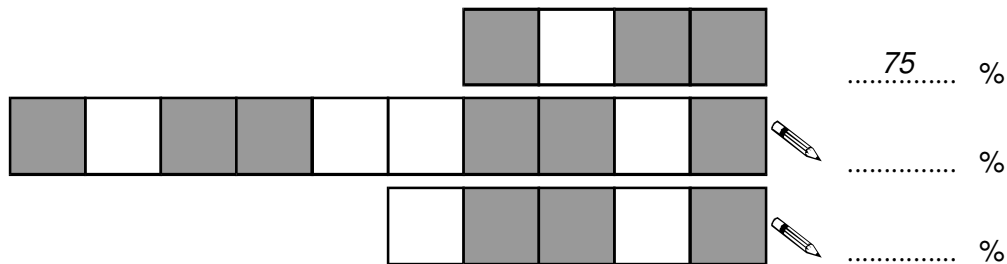
(b) Explain how you know that **12$\frac{1}{2}$%** of the diagram below is shaded.

(c) Shade **37$\frac{1}{2}$%** of the diagram below.
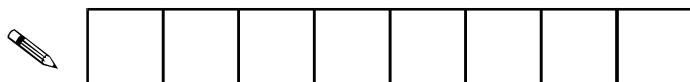
Past Paper Questions

N.B. problems involving fractions are combined with problems on decimals and/or percentages and ratio – see Days 4 & 5 for further practice.

1. Jim buys furniture for £74.40.
    Delivery will cost Jim an extra 5%.
    How much is the delivery charge?

    ....

    ....

    Answer £ ....

    (2)

2. Find $17\frac{1}{2}$ % of £174.80

    ....

    ....

    Answer £ ....

    (2)

3. Beth has 400 roses.
    48 are yellow.
    What percentage of the roses are yellow?

    ....

    ....

    Answer .... %

    (2)

4. (a) Andy has a part-time job.
         He is paid £31.50 for working from 8.00 am to 3.30 pm.
         How much is this per hour?

         ....

         ....

         Answer £ ....

         (2)

    (b) Andy is saving for a bike that costs £150.
         What percentage is £31.50 of £150?

         ....

         ....

         Answer .... %

         (2)

5. The diagram gives information about the population, in millions, of Ireland and the United Kingdom in 1994.
Also shown is the percentage of people who are unemployed in each country.

Ireland	
Population	3.5m
Unemployment	15%

United Kingdom	
Population	58m
Unemployment	10%
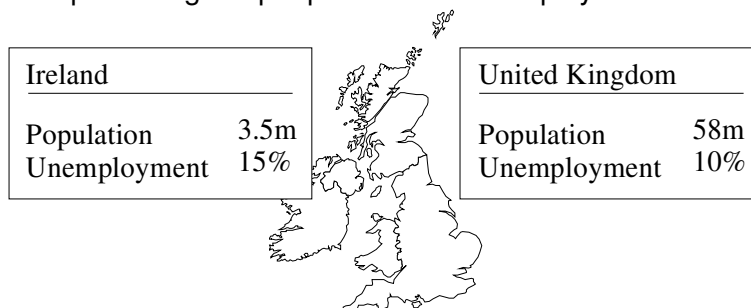
(a) 15% of people in Ireland were unemployed in 1994.
How many people was this?
Give your answer to the nearest hundred thousand.

....

....

....

(3)

(b) Explain why the following statement is incorrect:

> *Ireland has a higher percentage of unemployed people than the United Kingdom.*
> *This means there are more unemployed people in Ireland than in the United Kingdom.*

Show all the calculations that you make.

....

....

....

(3)

END OF QUESTIONS

30-4-10 Number   **Answers**

Day: 3   **Topic:** Percentage

Quick Questions

1. £12

2. £2.25

3. 70

4. 4.50
   45
   35
   5

5. (a) 0.08 x 26.50 = £2.12
   (b) 10% + (5% ÷ 2) = £9.80 + £2.45 = £12.25

6. 0.17 x 3275 = £ 556.75

7. (a) 0.29 x 510 million = 147.9 or 148 million

   (b)
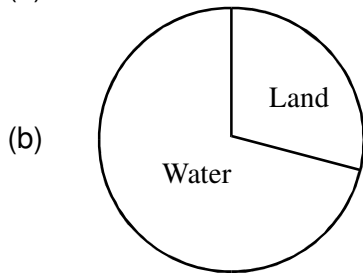
8. (a) 60
      60
   (b) 12.5% is $^1/_8$
   (c) Shade any three squares on the diagram

Answers to Past Paper Questions

1. $\dfrac{5}{100} \times £74.40$ or 10% 0f £74.40 = £7.44 so 5% is half of this value

    = £3.72

2. $\dfrac{17.5}{100} \times 174.80$ or '1 + half + quarter'

    =30.59

3. $\dfrac{48}{400} \times 100$

    = 12%

4. (a) 7.5
         4.20
    (b) 31.5 ÷ 150 × 100

         21

5. (a) 15 × 3.5 (m) ÷ 100
         = 0.525 (m)
         = 500 000

    (b) 10% of 58 m =
         5.8 or 6 million

         5.8 m > 500 000 or equivalent in words

END OF ANSWERS

Day: 4   **Topic:** Number 1: Ratio and Proportion

You need to be able to:
- Calculate with ratios and use them with understanding
- Calculate and use percentages
- Look at changes in values and relate them to scale factors, for both increasing and decreasing
- Use these proportional changes repeatedly when necessary to do so

---

You will need to think about:

Reading the question carefully, so that you allocate the correct amounts to the correct proportions;

     e.g.   cake mix includes flour, sugar and margarine in the ratio 2:1:1
     Do the amounts given refer to the whole mix or one of the ingredients?

Having a clear idea about the **original amount** when changes to it are applied
     e.g.   After an investment the amount resulting is changed from the original

Understand that any change can be expressed as a **scale factor** or **multiplier**

     e.g. an investment of £100 resulting in a value of £130 has a change given by 1.3 because **original x scale factor** is the new value

     or   an investment of $100 resulting in a value of $80 has a change given by 0.8 because **original x scale factor** is the new value

Remember that applying a proportional change two or three times is not the same as doubling or trebling the one change.

     e.g. an investment of £100 resulting in a value of £130 is maintained for two years. The final result will be:
         original x scale factor x scale factor   100 x 1.3 x 1.3 = 169
         (NOT original x scale factor x 2)

Quick Questions

1. Peter is 15 years old. His sister is 9 years old.
    a. What is the ratio of Peter's age to his sister's age in the lowest terms?
    b. What will their ratio of ages be in three years time?
    c. What will their ratio of ages be in five years time?
    d. Can their age ratios ever be 1:2? Explain your answer.

2. In a survey about recycling paper and glass, the results are represented below:
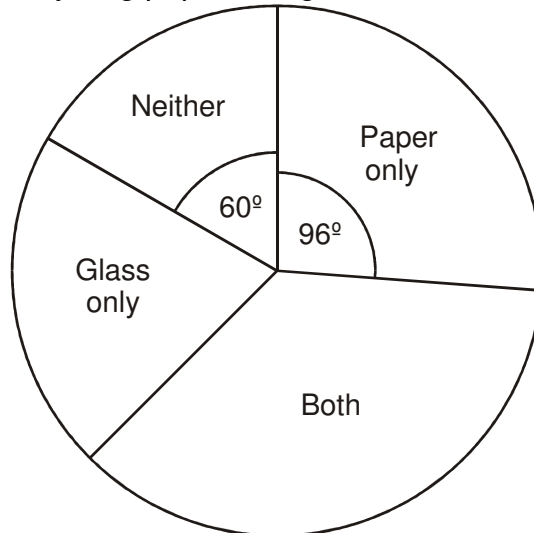
If 8 people gave the response 'Neither', how many people were included in the survey?

3. Two business men share profits in the ratio of 2 : 3. If the largest share was £19020, how much profit was there altogether?

4.
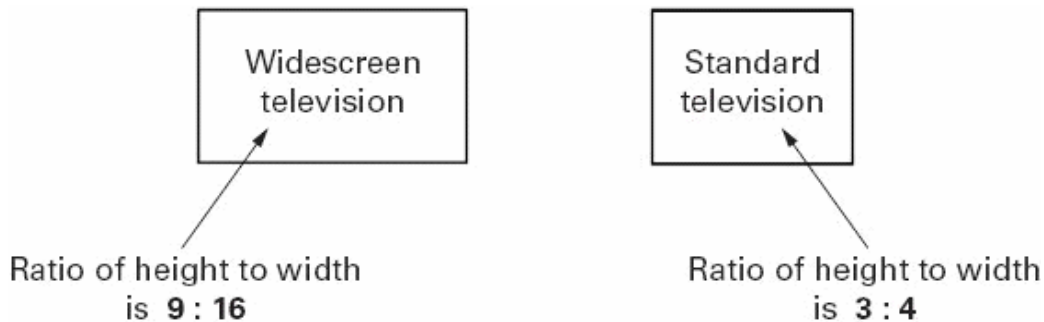
In a scale drawing of these two screen formats the **height** of each screen is drawn as 4.5 cm. What should the width of each be?

5.

What is the ratio of the yellow area to the white area?

Past Paper Questions

1. The scale of a map is 1 : 5 000 000.
   The distance between Leeds and London on this map is 6.5 cm.

   Calculate the actual distance between Leeds and London.
   Give your answer in kilometres.

   ....

   .... **(2)**

2. The frequency diagram shows the distribution of shoe sizes for a class of 40 pupils.
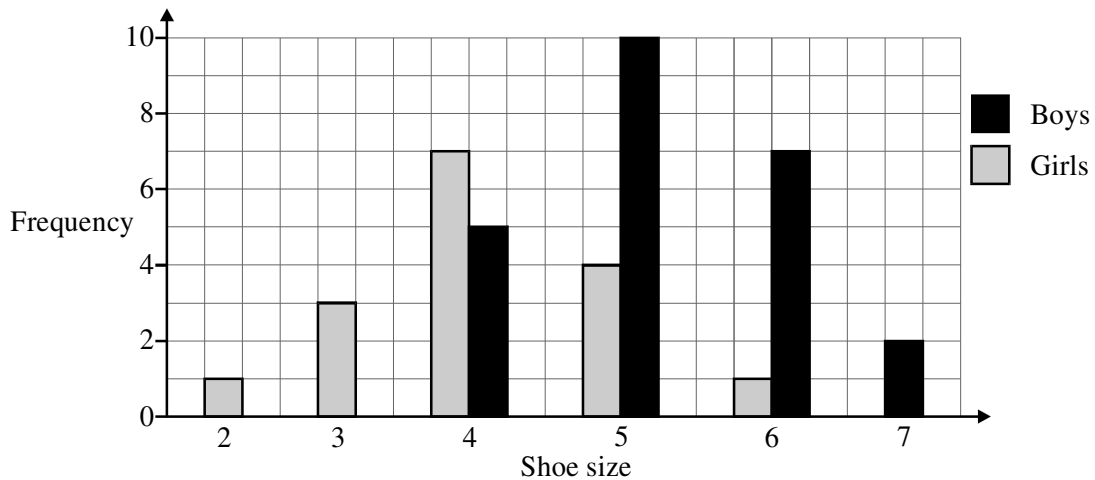
   What is the ratio of girls to boys in the class?

   Give your answer in its simplest form.

   ....

   Answer ....

   (2)

3. Craig and Sophie share 60 chocolates.
   They divide them in the ratio 2 : 3 with Sophie having the larger share.

   How many chocolates does Sophie have?

   ....
   Answer ....(**2**)

4. Six hundred people go to a concert.

   (a) Four fifths are teenagers.

       How many teenagers go to the concert?

       ....

       Answer .... **(2)**

70% of the people who go to the concert are female.

(b) (i) How many females go to the concert?

....

Answer ....

(2)

(ii) What is the ratio of males to females at the concert?
Give your answer in its simplest form.

....

....

Answer ....

(2)

5. A garden centre buys plants and resells them at a profit of 28%.
    How much was the original price of a rose bush which is sold for £4.80?

    ....

    ....

    ....

(3)

6. Mr Smith invests £2000 in a savings account at the beginning of a year.
    The money earns 3% per annum compound interest.
    The interest is added on at the end of each year.
    How much money will Mr Smith have in his account at the end of 4 years?

    ....

    ....

    ....

(3)

7. *ABCD* is a rectangle with length 25 cm and width 10 cm.
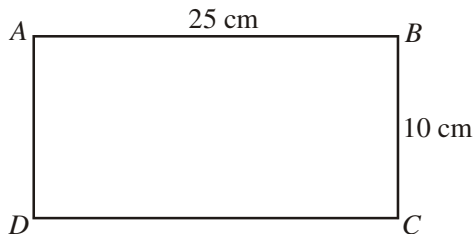
The length of the rectangle is increased by 10%.
The width of the rectangle is increased by 20%.
Find the percentage increase in the area of the rectangle.

....

....

Answer .... %

(3)

8. (a) A car cost £14 000 when it was new.
Now it is worth £9100.
Express its value now as a fraction of its value when it was new.
Give your answer in its simplest form.

…..………………………………………………………………………………

(2)

(b) The value of another car has dropped by 20%.
Its value is now £8200.
What was its original value?

…..…………………………………………………………………………

…..…………………………………………………………………………

(2)

9. In 1982 it was estimated that there were only 20 000 Minke whales left in the world.
The hunting of Minke whales was banned in 1982.
After 1982 the population increased by 45% each year.

(a) How many Minke whales were there in 1983 (1 year after the ban)?

…………………………………………………………………………………

…………………………………………………………………………………

(2)

(b) How many Minke whales were there in 1985 (3 years after the ban)?
Give your answer to a suitable degree of accuracy.

…………………………………………………………………………………

…………………………………………………………………………………**(3)**

(c) It was agreed that when the Minke whale population reached 250 000 some
hunting of Minke whales would be allowed again.
In what year did this happen?

…………………………………………………………………………………

…………………………………………………………………………………

(3)

END OF QUESTIONS

Day: 4   **Topic:** Ratio and Proportion

Answers to Quick Questions

1. a) 15:9 = 5:3
    b) 18:12 = 3:2
    c) 20:14 = 10:7
    d) Peter will always be older than his sister, so the first number of the ratio will always be larger than the second.

2. 8 people represented by 60 ∘ means that a multiplier of 6 will give whole survey number (60 x 6 = 360)   so 8 x 6 = 48

3. 19020 ÷ 3 = 6340 so total amount is 5 x £6340 = £31700

4. 9 : 16 needs a multiplier of 0.5 giving 4.5 : 8.   Widescreen width = 8 cm
    3 : 4   needs a multiplier of 1.5 giving 4.5 : 6.   Standard width = 6 cm

5. Yellow area = 3 x 5 + 12 x 3 = 51 sq.cm
    White area = 12 x 5 + 3 x 3 = 69 sq.cm

    So ratio is   51 : 69 = 17 : 23

Answers to Past Paper Questions

1. 6.5 cm x 5000000 = 32500000 cm = 325000 m = 325km

2. girls : boys =   16 : 24 = 2 : 3

3. 60 ÷ 5 = 12   Sophie's share is 12 x 3 = 36 chocolates

4. a) 600 x 4/5 = 480 teenagers
    b) (i) 10% of 600 is 60, so 70% is 60 x 7 = 420 females
        (ii) males : females = 180 : 420 = 18 : 42 = 3 : 7

5. £4.80 is 128% of the original price so multiplier is $\frac{100}{128}$

    $4.80 \times \frac{100}{128} = £3.75$

6. £2000 x 1.03 x 1.03 x 1.03 x 1.03 = £2251.02 (to nearest penny)

7.   a) $\frac{9100}{14000} = \frac{91}{140} = \frac{13}{20}$
     b) £8200 is 80% of the original price so the multiplier is 100/80
         £8200 x 1.25 = £10250

8.	a) 20000 x 1.45 = 29000 whales
	b) 20000 x 1.45 x 1.45 x 1.45 = 60972.5 whales
		BUT sensibly this must be only 60972 whales
	c) Continue x 1.45 for each year (as in part b)
		or
	20000 x $(1.45)^n$ ≈ 250000 so $(1.45)^n$ ≈ 250000/20000
						$(1.45)^n$ ≈ 12.5
						6 < n < 7
					So hunting allowed in year 7

END OF ANSWERS

Day: 5   **Topic:** Solving Problems involving FDPRP

You need to be able to:
- Solve problems and word problems including ratio and proportion, percentages and reverse percentages, fractions and decimals.
- Check and estimate answers to problems

You will need to think about:

All the work you have done in the previous units in Number 1 (Fractions, Decimals, Percentages, Ratio & Proportion)

The equivalence of fractions, decimals and percentages and converting between them using a range of methods.

How to:
- find a percentage increase or decrease
- divide an amount in a given ratio

When solving a word problem follow these steps:
  1. Read the question carefully

  2. Highlight any key information or annotate any given diagrams – what do you already know? What information have you been given?

  3. Write down the calculation(s) you need to perform

  4. Carry out the calculation(s)

  5. Make sure your final answer is clearly written – include any relevant units

  6. Check that your answer makes sense

Don't panic! Don't be put off by all the words!

Quick Questions

1. 4/5 of the members of a club are male. ¾ of these males are over 18 years old. What fraction of the members of the club are males over 18 years old?

2. In a newspaper there are 3 different adverts on the same page. Advert 1 covers 1/8 of the page, advert 2 covers 1/16 of the page and advert 3 covers ¼ of the page. In total, what fraction of the page do the 3 adverts cover?

3. A plant is 12cm tall. After a month the plant has grown by 62%. What is the new height of the plant?

4. In a sale the price of a jacket is £119 after a reduction of 15%. What was the original price of the jacket?

5. A house is bought for £450 000. After 3 years the house is valued at £520 000. What is the percentage increase in its value?

6. Peter has £1200 to share between 2 people in the ratio 3:2. How much will each person receive?

7. The ratio of boys to girls in a class is 3:5. There are 20 girls in the class. How many boys are there?

8. On a map a length of 4.3cm represents a real-life measurement of 860m. What is the scale of the map? Write your answer in the form 1:n

Past Paper Questions

1. When a ball is dropped onto the floor, it bounces and then rises.
This is shown in the diagram.
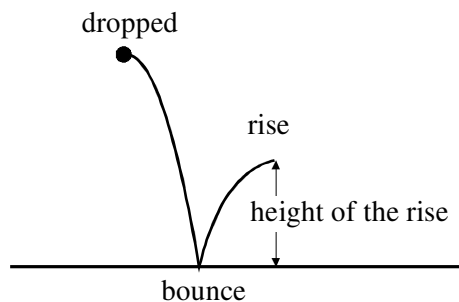
The ball rises to 80% of the height from which it was dropped.
It was dropped from a height of 3 metres.

(a) Calculate the height of the rise after the first bounce.

……………………………………………………………………………………

……………………………………………………………………………………

(1)

The ball bounces a second time.
It rises to 80% of the height of the first rise.

dropped

first
rise

second
rise

first
bounce

second
bounce

third
bounce
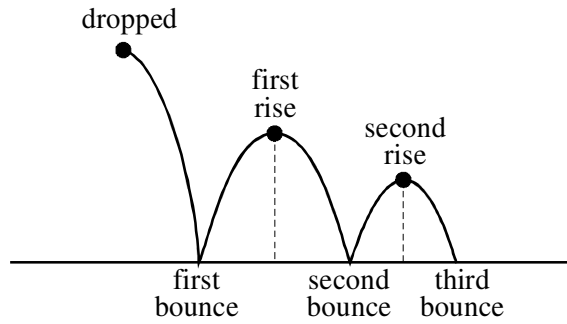
(b)   Calculate the height of the second rise.

………………………………………………………………………………………………

………………………………………………………………………………………………

(1)

(c)   The ball carries on bouncing in this way.
Each time it rises to 80% of the last rise.
For how many bounces does it rise to a height greater than 1 metre?

………………………………………………………………………………………………

………………………………………………………………………………………………

(2)

2.   A new car was bought for £17 500 in 1994.

During the first year of ownership the value decreased by 20%, and then by 15%
each following year.

(a)   What was the value of the car after 1 year?

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

(2)

(b)   What was the value of the car after 3 years?

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

(3)

3. A water plant has $\frac{7}{12}$ of its length in the air.

Nineteen centimetres of its length are in the water.

$\frac{1}{6}$ of its length is in the mud.

Calculate the total length of the plant.

Air
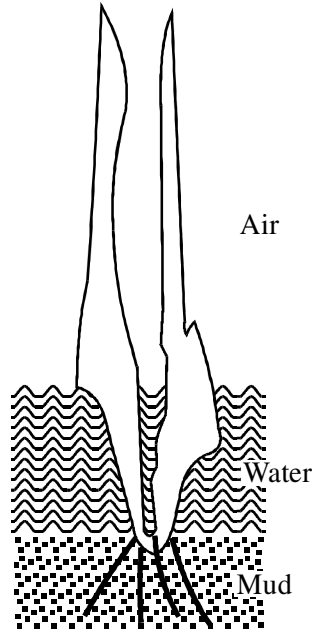
Not drawn accurately

Water

Mud

....

....

....

(3)

4. (a) (i) Chloe has 24 CDs and some cassettes.
The ratio of CDs to cassettes is 3:5.

How many cassettes does Chloe have?

....

....

(2)

(ii) Chloe sells 10 of her cassettes.

What is the new ratio of CDs to cassettes?
Give your answer in the form 1 : *n*.

....

....

(2)

(b) Calculate 5% of 1.4×10^8.

Give your answer in standard form.

....

....

(2)

(c)   In a sale, prices are reduced by 20%.
A toaster costs £8.80 in the sale.

What was the price of the toaster before the sale?

....

....

....

(3)

5.   *ABCD* is a rectangle with length 25 cm and width 10 cm.
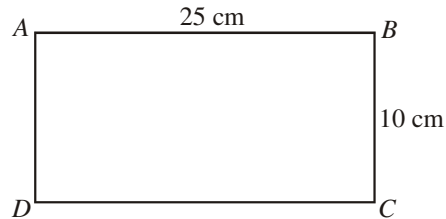
The length of the rectangle is increased by 10%.
The width of the rectangle is increased by 20%.
Find the percentage increase in the area of the rectangle.

....

....

....

....

(3)

6. Three musicians received £100 between them for playing in a concert.

They divided their pay in the ratio of the number of minutes for which each played.

Angela played for 8 minutes, Fran played for 14 minutes and Dan played for 18 minutes.

How much did each receive?

....

....

....

....

Answer   Angela received £ ....

Fran received £ ....

Dan received £ ....

(3)

7. There are 10 windmills in a line up a hillside.
Each windmill produces 20% more energy than the one below it.
The first windmill, the lowest on the hillside, produces 1.7 megawatts of energy.

(a)   How much energy does the second windmill produce?

. ...

....

....

Answer .... megawatts

(1)

(b)   How many of the windmills each produce more than 3 megawatts of energy?

....

....

....

....

....

Answer ....

(3)

30-4-10 Number Solving Problems involving FDPRP

Answers

Quick Questions

1. 4/5x3/4 = 12/20 = 3/5

2. 1/8+1/16+1/4 = 2/16+1/16+4/16 = 7/16

3. 1.62 x 12 = 19.44cm

4. 85% of original price = £119

   Original price =119/85 x 100 = £140

5. 70 000 ÷ 450 000 x 100 = 15.6%

6. 5 parts = £1200

   1 part = £240

   I person gets 3 x £240 = £720, the other gets 2 x £240 = £480

7. 3:5 = x : 20

   X = 12

8. 4.3 : 86 000

   1: 20 000

Past Paper Questions

1.   a) 3 x 0.8 = 2.4 m
     d)   3 x 0.8 x 0.8 = 1.92 m

     c)   Third rise = 1.536
           Fourth rise = 1.2288
           (Fifth rise = 0.98304)

                          4 bounces or 2 more bounces

9.   a) £17500 x 0.8 = £14000
     b) £14000 x 0.85 x 0.85 = £10115

3. $^7/_{12}$+$^1/_6$ =$^9/_{12}$ or $^3/_4$
                        1/4 = 19 cm

                Total length of plant = 19 + 57 = 76cm.

4. (a) (i) $\dfrac{24}{3} \times 5$

              = 40

(ii) 24 : 30

   1 : 1.25

   or $1:1\frac{1}{4}$

(b)   700000 = $7×10^6$

(b) 80% of original price = £8.80

   Original price = 8.80 ÷ 0.8 = £11.00

5 . Area of new rectangle = (1.10 x 25) x (1.20 x 10)

   = 330cm²

Area of original rectangle = 25 x 10

   = 250 cm²

Percentage increase = 80 ÷ 250 x 100 = 32%

OR

length x 1.1   width x 1.2

so area becomes   length x 1.1 x width x 1.2

or   length x width x 1.32

so area has a multiplier of 1.32

which means an increase of 32%

6.   Time played is 40 minutes

   ☐ Pay per minute is £$\frac{100}{40}$

   = £2.50

   ☐ Amounts are £20,£35,£45

7. (a) (1.7 × 1.2 =) 2.04

   (b)   2.04 × 1.2 or 2.448 or 2.45

   2.448 × 1.2 or 2.9376 or 2.94

   (2.9376 × 1.2 or 3.52512)

   6 (windmills)
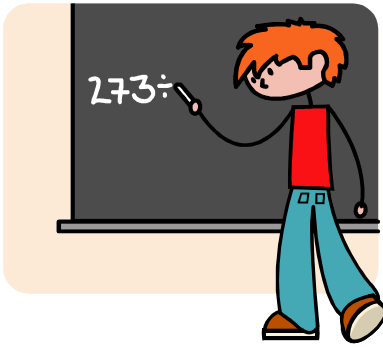
30-4-10 Number

Day: 6   **Topic:** Money

You need to be able to:
- Work out the total cost of items
- Work out change
- Interpret calculator displays to give money to the nearest 1p
- Work out which of two products is the best value for money
- Calculate compound interest
- Work out tax

You will need to think about:

How are you going to work out the cost:

How much does each item cost?

How much money was given to pay?

Do I need to compare costs?

What you will be doing with the money:

Do I just need the total cost?

Do I have to work out the change?

Is my answer sensible?

Always make sure you check your answer – does it make sense?

Remember:
Money is either given as £, or in £ and p.
Use two decimal places e.g. 50p = £0.50 (not £0.5); 7p = £0.07

Quick Questions

1. What is three-fifths of forty pounds?

2. Last month my telephone bill was thirty pounds.
   This month it is twenty per cent more.
   How much is this month's bill?

3. A car park shows this sign.

   Car Parking

   70p

   Pay using any of these coins:

   10p   20p   50p

   No change given
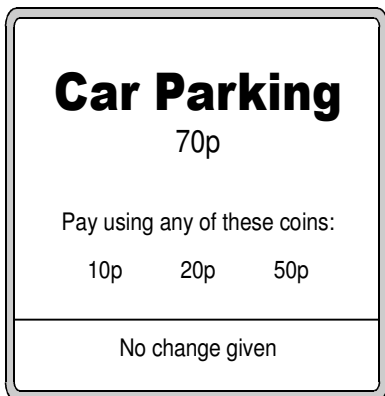
   Complete the table to show all the **different ways** of paying **exactly 70p**.

Number of **10p** coins	Number of **20p** coins	Number of **50p** coins
7	0	0

4. Stamps are **19p** each.
   Gwyn wants to buy **9** stamps.

   He knows that he will have to pay **less than £2**.
   (a) Show how you can tell that he will have to pay less than £2 **without** working out the exact answer.
   (b) Gwyn buys **9** stamps at **19p** each.
   Work out exactly how much he must pay.

5. (a) I pay **£16.20** to travel to work each week.
   I work for **45 weeks** each year.
   How much do I pay to travel to work each year?
   Show your working.
   (b) I could buy one season ticket that would let me travel for **all 45 weeks.**
   It would cost **£630**
   How much is that per week?

6.

Museum

entrance fee
£1.20 per person
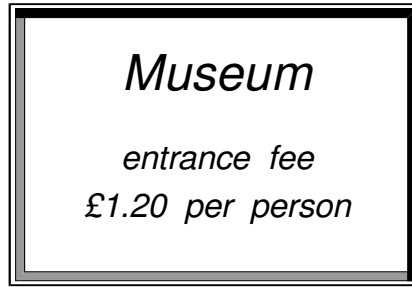
(a) **240 people** paid the entrance fee on Monday.
How much money is that altogether?
Show your working.

(b) The museum took £**600** in entrance fees on Friday.
How many people paid to visit the museum on Friday?
Show your working.

7. (a) A shop sells plants.

95p each

Find the cost of 35 plants.
Show your working.

(b) The shop sells trees.

£17 each

Mr Bailey has **£250**
He wants to buy as many trees as possible.
How many trees can Mr Bailey buy?
Show your working.

Past Paper Questions

1. **Do not use a calculator to answer this question.**
    Shopkeepers pay tax on the goods they sell.
    A rule for calculating this tax is given below.

    > Divide the selling price by 47
    > then multiply by 7.

    (a) Calculate the tax paid on a carpet which is sold for £893.
        Write down all your working to show that you have not used a calculator.

        ....
        ....
        ....

        (3)

    (b) Using estimation, write down a rough check to show that your answer to 893 ÷ 47
        is reasonable.

        ....
        ....
        ....

        (2)

2. James invests £700 for 2 years at 10% per year compound interest.
    How much interest does he earn?

    ....
    ....
    ....

    Answer £ ....

    (2)

3. (a) Caroline buys 1.4 kilograms of bananas at 95 pence per kilogram.
        She also buys 0.8 kilograms of apples.
        Her total bill is £1.93
        How much per kilogram was she charged for the apples?

        ....
        ....
        ....
        ....

        Answer .... pence

        (4)

    (b) Jane spends £4.50 on fruit.
        Her total bill is £22.50
        What percentage of her total bill is for fruit?

        ....
        ....

        Answer .... %

        (2)

4. (a) Andy has a part-time job.

He is paid £31.50 for working from 8.00 am to 3.30 pm.
How much is this per hour?

....
...
....
...

Answer £ ....

(2)

(b)   Andy is saving for a bike that costs £150.
What percentage is £31.50 of £150?

....
...
....
...

Answer .... %

(2)

5.   A gas bill is £49.34 plus VAT at 5%.
Calculate the VAT charged.

....
....
....

Answer £ ....……………………………

(2)

6.   Claire wants to buy a box of chocolates.
(a)   She sees a special offer from a local shop.

DELICIOUS CHOCS

save $\frac{1}{3}$
off normal price of
£4.80

How much do these chocolates cost?

....
....
....

Answer £ ....……………………………

(3)

(b)   In another shop Claire can obtain a discount of 40% off the normal price of £4.80
How much would Claire pay in this shop?

....
....
....

Answer £ ....……………………………

(3)

7.   (a)   Packets of chocolate biscuits are sold in two sizes.
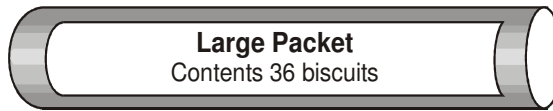
Standard Packet	Large Packet
Contents 12 biscuits	Contents 36 biscuits
£1.09	£3.17

Which size is the better value for money?
You **must** show your working.

....
.....
....
.....
....
.....
....
.....

Answer ....

(2)

(b) Danielle eats $\dfrac{3}{4}$ of a bar of chocolate every day.

How many bars of chocolate does Danielle eat in six days?

....
.....
....
.....

Answer ....

(2)

END OF QUESTIONS

30-4-10 Number   Answers

Day: 6   **Topic:** Money

Quick Questions

1.   £24

2.   £36

3.   Indicates the remaining five combinations in any order, with no duplicates and none incorrect

10p	20p	50p
7	0	0
5	1	0
3	2	0
2	0	1
1	3	0
0	1	1

                                                                                        [2]

4.   (a)   Indicates why 9 × 19 must be less than 2000, eg: 1
         • That's enough for 10 stamps.
         • For stamps 1p more its still less than £2.
         • Make them 20p each..
         • 9 × 20 = 180
         • 10 × 19 = 190
         • 20 × 10 = 200
         • 20 + 20 + 20 + 20 + 20 + 20 + 20 + 20 + 20 = 180
         • All the 10s in 19 is only 90p, and all the 9s is less than that.
         • 9 × 10 = 90 and 9 × 9 = 81, both less than £1.
      (b)   States 171(p) and indicates use of a correct non-calculator method
                                                                                        [2]

5.   (a)   £729(.00)   2
         (b)   £ 14   1
                                                                                        [3]

6.   (a)   288   2
         (b)   500   2
                                                                                        [4]

7.   (a)   Indicates £33.25, eg: 2
         • 33.25
         • 33.25p on answer line.
         (b)   Indicates 14   2
                                                                                        [4]

Past Paper Questions

1. (a) For showing evidence of ability to work out 893 x 47.   M1
   Any valid method of division which does not use a calculator is acceptable.
   19   A1
   19 × 7 = £133   A1
   (b) 900 x 50   M1
   18   A1
   [5]

2. $700 \times 1.1^2 - 700$ M1
   147(.00)   A1
   [2]

3. (a) 1.4 × 95 (= 133 pence)   M1
   193 – (their 133) (= 60 pence)   DM1
   (their 60) $\square$ 0.8   M1
   75 (pence)   A1
           £0.75
   (b) 4.50/22.50 × 100   M1
   20(%)   A1
   [6]

4. (a) 7.5   B1
   4.20   B1
   (b) $31.5 \div 150 \times 100$ M1
   21   A1
   [4]

5. $\text{VAT} = \frac{5}{100} \times £49.34$ M1
   = £2.47   A1
   [2]

6. (a) Discount = £4.80 × $\frac{1}{3}$ M1

         £4.80 × $\frac{2}{3}$ M1

   = £1.60   A1
   (b) Discount is $\frac{40}{100}$ × £4.80   M1

   = £1.92   A1

   $\frac{60}{100}$ × £4.80   M1 A1

   She pays £2.88   A1
         = £2.88   A1
   [6]

7. (a) Large is 3 times standard   M1

         Or standard is $\frac{1}{3}$ of large

         Price per biscuit 9...p and 8...p
   Which costs 3 × £1.09 = £3.27   Large is better   A1
         Which is £1.05 or £1.06
         Large is better

(b) Number of bars = $\dfrac{3}{4} \times 6$ M1

$= \dfrac{18}{4}$

$4\dfrac{1}{2}$ bars   A1

[4]

END OF ANSWERS
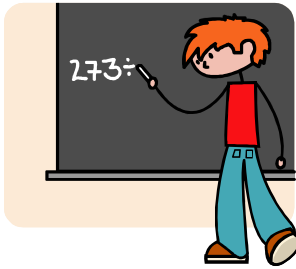
30-4-10 Number

Day: 7 **Topic:** Indices, powers and roots

You need to be able to:
- use the terms square, positive square root, negative square root, cube and cube root
- use index notation and index laws for multiplication and division of integer powers

You will need to think about:

- square numbers and cube numbers
- operations such as squaring, cubing and raising to a given power
- finding or remembering square roots and cube roots
- why the "index laws" work

Remember:

Square numbers: $1^2 = 1$, $2^2 = 4$, $3^2 = 9$, $4^2 = 16$ etc
Cube numbers: $1^3 = 1$, $2^3 = 8$, $3^3 = 27$, $4^3 = 64$ etc

Index laws:

$$a^m \times a^n = a^{(m+n)} \qquad \frac{a^m}{a^n} = a^{(m-n)} \qquad (a^m)^n = a^{mn} \qquad a^0 = 1$$

Quick questions:

1. What is the square root of :

   a) $\dfrac{9}{16}$ b) 1 000 000

2. (a) Look at these numbers.

   1^6 2^5 3^4 4^3 5^2 6^1
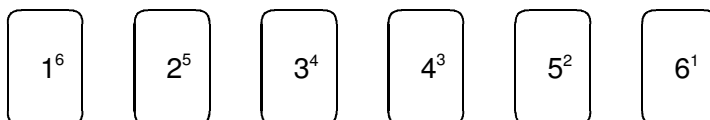
   Which is the **largest**?   Which is equal to 9^2?

   (b) Which **two** of the numbers below are **not** square numbers?

   2^4 2^5 2^6 2^7 2^8
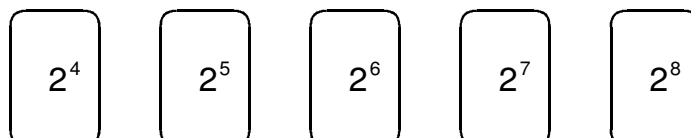
3. The volume of a cube 64 cm^3.
   What is the length of an edge of the cube?

4. What number is five cubed?

5. To the nearest whole number, what is the square root of 83.9?

6. Here is an equation.

$$x^y = 64$$

   Give four **different** pairs of values for x and y that satisfy this equation.

7. What would be the last digit of one hundred and thirty-three to the power four?

8. (a)   Write the values of *k* and *m*.

   $$64 = 8^2 = 4^k = 2^m$$

   (b)   Complete the following:

   $$2^{15} = 32\ 768$$

   $$2^{14} =$$

9. Give the following as a single power of 2, and then find the value of this

   a) $2^6 \div 2^2$ b) $2^3 \times 2^2$ c) $(2^3)^2$

Past Paper Questions

1. Work out the value of

    (a) 5^3

    ....

    (1)

    (b) 10^4

    ....

    (1)

2. (a) Work out $\dfrac{1}{0.2^2}$

    ....

    (2)

    (b) Evaluate 6^8 giving your answer in standard form.

    ....

    (2)

3. (a) Work out $\sqrt{7}$.
        Give your answer correct to 2 decimal places.

    ....

    ....

    (2)

    (b) Work out 7^3

    ....

    (1)

4. (a) Use approximations to estimate the value of $\dfrac{9.67^2}{0.398}$.

        You must show all your working.

    ....

    ....

(b)   *p* and *q* are prime numbers.

Find the values of *p* and *q* when $p^3 \times q = 24$.

....

....

(2)

5.   For each of the following equations, write down the value of *n*.

(a) $2^n = 32$

....

(1)

(b) $n^3 = 125$

....

(1)

(c) $8^n = 8$

....

(1)

6.   Computer magazines often use the fact that 2^{10} is approximately equal to 10^3

To how many significant figures is this true?

....

....

(2)

7.   Find the values of:

(a) $\sqrt{25} + \sqrt{144}$

....

(2)

(b) $\sqrt{25 \times 144}$

....

(1)

8. Look at this pattern:

$$15^2 - 14^2 = 29 \quad \textit{row 1}$$

$$14^2 - 13^2 = 27 \quad \textit{row 2}$$

$$13^2 - 12^2 = 25 \quad \textit{row 3}$$

$$12^2 - 11^2 = 23 \quad \textit{row 4}$$

(a) Write down *row 6* in the pattern.

....

(2)

(b) Complete this line to give the general rule for this pattern.

....

....

$$n^2 - \text{................} = \text{...................}$$

(2)

9. (a) Work out the value of 4^3

....

(1)

(b) $2^n = 8$
Work out the value of n.

....

(1)

(c) Write $4^3 \times 4^5$ as a single power of 4.

....

(1)

10. Write down the value of $\sqrt[3]{27}$

....

(1)

END OF QUESTIONS

Day: 7   **Topic:** Indices, powers and roots

Quick Questions

1.   a) $\dfrac{3}{4}$ b) 1000

2.   a) largest is $3^4 = 81$; $9^2 = 3^4 = 81$
      b) 2^5 and 2^7

3.   4 cm

4.   125

5.   9

6.   Gives four different correct pairs of values for x and y
      eg

$$x = 64 \quad y = 1$$
$$x = 8 \quad y = 2$$
$$x = 4 \quad y = 3$$
$$x = 2 \quad y = 6$$

      or $x = \dfrac{1}{64} \quad = -1$

$$x = 4096 \quad y = \dfrac{1}{2}$$
$$x = \sqrt{8} \quad y = 4$$
$$x = -8 \quad y = 2$$

7.   1

8.   a) k = 3;   m = 6   b)   16384

9.   a) $2^4 = 16$ b) $2^5 = 32$ c) $2^6 = 64$

Past Paper Questions:

1.   (a)   125   (b)10 000

2.   (a)   25

    (b)   1 679 616 $= 1.6796... \times 10^6$

3.   (a)   2.6 ..   (b)   343

4.   (a) $\dfrac{100}{0.4 \; or \; 0.5}$ or $\dfrac{90}{0.4 \; or \; 0.5}$

        250 or 200 (225 or 180)

   (b) $p = 2$ and $q = 3$

5.   (a)   5

   (b)   5

   (c)   1

6. $2^{10} = 1024$ and $10^3 = 1000$

   Either 1 sf or 2 sf

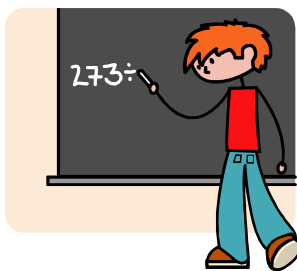7.   (a)   17
     (b)   60

8.   (a) $10^2 - 9^2$

      19

   (b) $(n - 1)^2$
        *n + (n − 1) or 2*n *− 1*

9.   (a)   64
    (b)   3
    (c) 4^8

10.   3

END OF ANSWERS

Day: 8 **Topic:** Estimation and Approximation

You need to be able to:
- Recognise and use place value properties
- Give any value to one significant figure
- Calculate with numbers to one significant figure mentally
- Understand and use the order of operations (BIDMAS)
- Realise that any value is only accurate to the number of figures recorded

---

You will need to think about:

Vocabulary used in a question:

least; smallest amount; shortest distance; lowest value; minimum value…..
most; largest; biggest; longest; highest; maximum value………

Have a clear idea about the **recorded amount** and the range of possible values
this might mean   (always one more place value than that given)
e.g. 13.4 cm

| 13.35 | **13.4** | 13.45 |
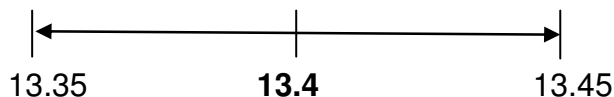
Understand and use the **correct notation**
e.g. If the value of n is 13.4   then $13.35 \leq n < 13.45$
which means
the value of n is **greater than or equal to** 13.35 and **less than** 13.45

Link these ideas together
So if a length is recorded as being 13.4 cm, the minimum length it might
be is 13.35 cm, but it may also be longer than 13.4 cm. It may be a value
up to *but not including* 13.45 cm

Recording maximum values is difficult. Try to consider writing the maximum
value for yourself to illustrate this.
This is why it is easier just to write it as   < 13.45

Quick Questions

1. A calculation requires the answer to the following: 13.42 x 2.8
   Estimate the answer, showing clearly the stages in your working.

2. Given the following statement: 28.2 ÷ 4.8 = 5.875
   Write down the result of 282 ÷ 4.8

3. The length of a piece of string is given as 15 cm, to the nearest centimetre. Write down the least length the string might be.

4. The weight of a cat is given as 4.5 kg to 2 significant figures. Write down the lightest weight the cat might be.

5. Estimate the answer to $\dfrac{8.62 + 22.1}{5.23}$

   Give your answer to **1 significant figure**.

6. **Estimate** the answer to $\dfrac{28.6 \times 24.4}{5.67 \times 4.02}$

7. A diagram of a field is given below:

   24 m

   95 m
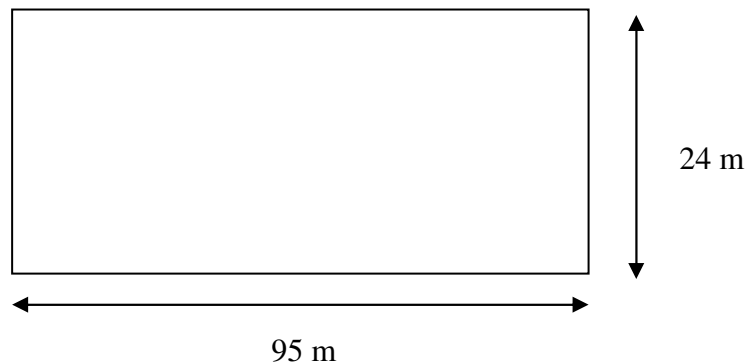
   a) If the dimensions given are accurate to the nearest metre calculate the smallest possible area of the field.
   b) If P is the perimeter of the field find the range of values that P might have.

1.   David worked out that $\dfrac{40}{0.08}$ = 50. His teacher did a quick mental calculation and told David he had made a mistake.

Show how David's teacher could have done this calculation mentally.

....

....

(2)

2. (a) Work out the answer to this sum in your head.

Do not use a calculator.

$$900 \times 0.6$$

....
.

Explain clearly the method you used.

....
.

(2)

(b)   Work out the answer to this sum in your head.
Do not use a calculator.

$$40 \div 0.8$$

....

Explain clearly the method you used.

....

(2)

3. a) Use your calculator to work out

(i) $\dfrac{59.7}{3.14 \times 2.8}$

....

(ii) $\dfrac{57}{9.8 + 7.3}$

....

(iii) $\dfrac{1}{3.9} + \dfrac{3.1}{4.3}$

....

(3)

(b) Explain how you could quickly check that your answer to (a) (iii) is of the right order of magnitude.

....

....

(2)

4. Find an approximate value of $\dfrac{421 \times 2.9}{0.197}$

You **must** show all your working.

....

....

....

....

Answer .... (3)

5. Emma uses her calculator to work out

$$\frac{7.8 \times 5.2}{0.5 \times 16}$$

She gets the answer 5.07.

Without using a calculator, she does a quick calculation to see whether her answer is about right.

Explain how Emma can do this.

....

....

....

(3)

6. The radius of the Earth is 6376 km.

Using suitable approximations estimate the surface area of the Earth.
Give your answer in standard form.

Assume the Earth is a sphere and the surface area of a sphere is given by

$$A = 4\pi r^2$$

....

....

Answer .... km^2

(4)

7. Jonathan uses his calculator to work out the value of 42.2 × 0.027
    The answer he gets is 11.394

Use approximation to show that his answer is wrong.

....

....

.... (2)

END OF QUESTIONS

30-4-10   Number   Answers

Day: 8   **Topic:** Estimation and Approximation

Quick Questions

6. $13.42 \approx 13$ $2.8 \approx 3$ $13 \times 3 = 39$

7. $5.875 \times 10 = 58.75$

8. 14.5 cm

9. 4.45 kg

10. (9) $8 + 22 = 30$ So   (31) $30 \div 5 = 6$

11. $30 \times 20 = 600$ $6 \times 4 = 24$ $600 \div 24 = 25$

   OR   about   28 .6   (as $6 \times 4 = 24$ and $24 \div 24 = 1$) so about 30

12. (a) Smallest dimensions would be: 23.5 m and 94.5 m
        So smallest area is $23.5 \times 94.5 = 2220.75 \ m^2$

   (b) Minimum perimeter $= 2(23.5 + 94.5) = 236$ m
        Maximum perimeter $= 2(24.5 + 95.5) = 240$ m
                                            So $236 \ m \leq P < 240 \ m$

Past Paper Questions

10. $40 \div 0.08 = 5 \div 0.01 = 500$

11. (a) $900 \times 0.6 = 9 \times 6 \times 100 \times 0.1 = 54 \times 10 = 540$

    (b) $40 \div 0.8 = 400 \div 8 = 50$

12. (a) (i) 6.79 (3 sig.fig)   (ii) 3.33 (3 sig.fig)   (iii) 0.977 (3 sig fig)
    (b)   Using estimations of the values gives ¼ + ¾ = 1

13. $400 \times 3 \div 0.2 = 200 \times 3 \div 0.1 = 2000 \times 3 = 6000$
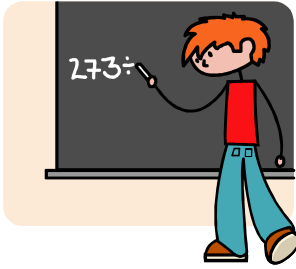
14. Estimating gives $8 \times 5 \div (5 \times 1.6) = 8 \div 1.6 = 80 \div 16 = 5$

15. Surface area is $A = 4\pi r^2$
         So $4 \times \pi \times 6376 \times 6376$ or about $4 \times 3 \times 6000 \times 7000$ which is about
            $12 \times 40 \times 1000000 = 48 \times 10000000$ so about $5 \times 10^7 \ km^2$

16. 42.2×0.027 is about 40×0.03 or 0.4×3 which is about 1.2
      So the answer is of the wrong size. (It might be 1.1394 rather than 11.394)

END OF ANSWERS

Day: 9   **Topic:** Number Properties

You need to be able to:
- Understand and use the concepts and vocabulary of factor (divisor), multiple, common factor, highest common factor, least common multiple, prime number and prime factor decomposition
- Understand and use the terms square and cube. Generate square numbers and cube numbers

You will need to think about:

The definition of a **prime number**
A prime number has exactly two factors, 1 and itself

> Remember 1 is **not** a prime number

What are **factors** and **multiples**?
e.g factors of 6 are 1,2,3,6
     the prime factors of 6 are 2 and 3
     multiples of 6 are 6,12,18,24,30……….

The highest common factor and lowest common multiple can be found by listing
e.g   factors of 20 are 1,2,5,**10**,20   factors of 30 are 1,2,3,5,6,**10**,15,30
     Highest Common Factor (HCF) is 10
     Multiples of 20 are 20,40,**60**,80,…..Multiples of 30 are 30,**60**,90,120…..
     Lowest Common Multiple (LCM) is 60
or
by breaking numbers down as a product of their prime factors (prime decomposition)

20

   (2)   10

     (2)(5)

30

   (3) 10

     (2)(5)
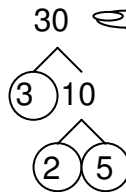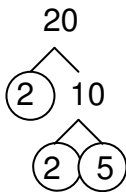
> Use a **factor tree** to breakdown a number into its prime factors

20 = 2x**2x5**   (=2²x5 using **index notation**)   30 = **2**x3**x5**
HCF of 20 and 30 = 2x5 = 10

20 = 2x2x5   30 = 2x3x5
LCM of 15 and 20 = 2x2x3x5 = 60

Square numbers are 1² = 1, 2²=4, 3²=9, 4²=16, 5²=25,……
Cube numbers are 1³=1, 2³=8, 3³=27, 4³=64, ……..

Quick Questions

1. a) Write down the first 10 prime numbers
    b) Write down the first 10 square numbers
    c) Write down the first 5 cube numbers

2. a) Write down all the factors of 16 and 24
    b) Write down the Highest Common Factor of 16 and 24
    c) Which of the factors of 16 are square numbers?
    d) Which of the factors of 16 are cube numbers?

3. a) Write down all the factors of 42
    b) What are the prime factors of 42?

4. a) Write down the first six multiples of 15 and 25
    b) Write down the Lowest Common Multiple of 15 and 25

5. a) Write 42 as a product of its prime factors
    b) Write 28 as a product of its prime factors
    c) Use your answers to parts a and b to find the Highest Common Factor and Lowest Common Multiple of 42 and 28

Past Paper Questions

1. (a) Work out the cube of 4.

    ....

    Answer ....

    (1)

    (b) Work out 0.2^2

    ....

    Answer ....

    (1)

    (c) A list of numbers is given below.

    15   16   19   27   34   42   45

    From this list, write down

    (i) a cube number,

    ....

    Answer ....

    (1)

    (ii) a prime number.

    ....

    Answer ....

    (1)

2. (i) p and q are prime numbers.

    Find the values of p and q when $p^3 \times q = 24$.

    ....

    ....

    Answer $p =$ .... $q =$ ....

    (2)

    (ii) Write 18 as a product of prime factors.

    ....

    ....

    Answer ....

    (2)

    (iii) What is the lowest common multiple of 24 and 18?

    ....

    Answer .... (1)

3. 36 expressed as a product of its prime factors is $2^2 \times 3^2$

   (a) Express 45 as a product of its prime factors.
       Write your answer in index form.

....

....

....

Answer ....

(3)

   (b) What is the Highest Common Factor (HCF) of 36 and 45?

....

Answer ....

(1)

   (c) What is the Lowest Common Multiple (LCM) of 36 and 45?

....

Answer ....

(1)

4. (a) Express 96 as a product of its prime factors.
       Give your answer in index form.

....

....

....

Answer ....

(3)

   (b) Find the Highest Common Factor (HCF) of 36 and 96.

....

....

Answer ....

(2)

END OF QUESTIONS

30-4-10 Number   Answers

Day: 9   **Topic:** Number Properties

**Quick Questions**
1.   a) 2,3,5,7,11,13,17,19,23,29
        b) 1,4,9,16,25,36,49,64,81,100
        c) 1,8,27,64,125
2.   a) factors of 16 are 1,2,4,8,16   factors of 24 are 1,2,3,4,6,8,12,24
        b) HCF = 8
        c) 1,4,16
        d) 1,8
3.   a) 1,2,3,6,7,14,21,42
        b) 2,3,7
4.   a) multiples of 15 are 15,30,45,60,75,90..
            multiples of 25 are 25,50,75,100,125,150..
        b) LCM = 75
5   a) 42 = 2 x 3 x 7   b) 28 = 2 x 2 x 7 = 2^2 x 7
        c) HCF = 2 x 7 = 14   LCM = 2 x 2 x 3 x 7 = 84

Past Paper Questions
1.   (a) 64
        (b) 0.04
        (c)   (i) 27
              (ii) 19
2.   (i) $p = 2$ and $q = 3$
                (2x2x2x3 = 24)
        (ii)   18 = 2 × 3 × 3 or 2 × 3^2

        (iii)   Multiples of 24 are 24,48,72,96,……
                 Multiples of 18 are 18,36,54,72,90…..
                 LCM = 72.
3.   (a)   45 = 3 × 15 or 5 × 9
               = 3 × 3 × 5
               = 3^2 × 5
        (b)   Factors of 36 = 1,2,3,4,6,9,12,18,36
                Factors of 45 = 1,3,5,9,15,45
                HCF = 9
        Or   36= 2x2x3x3 = 2^2 x 3^2 45 = 3x3x5 = 3^2 x 5
                HCF = 3x3 = 9
        (c)   Multiples of 36 are 36,72,108,144,180,216,…..
                Multiples of 45 are 45,90,135,180,225,270,…..
                LCM = 180
        Or   36 = 2x2x3x3 = 2^2 x 3^2 45 = 3x3x5 = 3^2 x 5
                LCM = 2^2 × 3^2 × 5 = 180
4   (a)   96 = 2 × 2 × 2 × 2 × 2 × 3 = 2^5 × 3
        (b)   Factors of 36 = 1,2,3,4,6,9,12,18,36
                Factors of 96 = 1,2,3,4,6,8,12,16,24,32,48,96
                HCF = 12
        Or   36 = 2x 2 x3 x 3   96 = 2 x 2 x 2 x 2 x 2 x 3
                HCF = 2 x 2 x 3 = 12

END OF ANSWERS
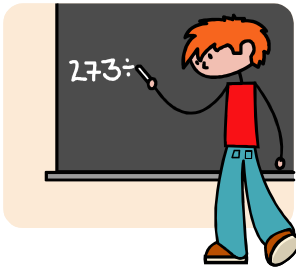
30-4-10 Number

Day: 10   **Topic:** Standard Index Form

You need to be able to:
- Convert between ordinary and standard index form representations
- Calculate with standard index form
- Know how to enter numbers in standard index form on a calculator and interpret the standard index form display

You will need to think about:

Standard index form is a shorthand way of writing very large and very small numbers. It uses powers of 10.

e.g. $5\ 700\ 000 = 5.7 \times 1000\ 000 = 5.7 \times 10^{6}$

$0.000\ 072 = 7.2 \times 0.000\ 01 = 7.2 \times 10^{-5}$

A number written in standard index form has two parts

A power of 10

A number between 1 and 10

Most calculators will show a number in standard index form as

5.7	06

To enter a number in standard index form in to your calculator use the $\boxed{\text{Exp}}$ key

e.g. 3.8×10^{5} enter $\boxed{3}$ $\boxed{.}$ $\boxed{8}$ $\boxed{\text{Exp}}$ $\boxed{5}$

6.3×10^{-8} enter $\boxed{6}$ $\boxed{.}$ $\boxed{3}$ $\boxed{\text{Exp}}$ $\boxed{8}$ $\boxed{+/-}$

Quick Questions

1. Express these numbers in standard form
a) 56 000 000
b) 0.000 0083

2. Write these as ordinary numbers
a) 7.9×10^{7}
b) 2.11×10^{-3}

3. List these numbers in ascending order

| 4.5×10^{6} | 4.5×10^{-6} | 7.6×10^{4} | 1.5×10^{4} |

| 1.8×10^{6} | 3.2×10^{-3} |

4. Use a calculator to find
a) $8.9 \times 10^{9} \div 4.3 \times 10^{12}$ Give your answer in standard form
b) $1.16 \times 10^{-8} \times (2.7 \times 10^{15})$

Past Paper Questions

1.   In the box are six numbers written in standard form.

$$8.3 \times 10^{4} \qquad 3.9 \times 10^{5} \qquad 6.7 \times 10^{-3}$$
$$9.245 \times 10^{-1} \qquad 8.36 \times 10^{3} \qquad 4.15 \times 10^{-2}$$

(a)   (i)   Write down the largest number.

....

(1)

(ii)   Write your answer as an ordinary number.

....

(1)

(b)   (i)   Write down the smallest number.

....

(1)

(ii)   Write your answer as an ordinary number.

....

(1)

2. (a) Write 7 billion as a number in standard form.

1 billion = 1000 million

.............………………………………………………………………………..

(1)

(b) Write the number 4.5×10^{-3} as an ordinary number.

.............………………………………………………………………………..

(1)

(c) Find the value of $(2.7 \times 10^3) \div (3.375 \times 10^5)$
Give your answer in standard form.

..............………………………………………………………………………..

..............………………………………………………………………………..

..............………………………………………………………………………..

(2)
(Total 4 marks)

3. $p = 5.4 \times 10^7$ and $q = 3.5 \times 10^6$

Calculate the value of each of the following.
Give all your answers in standard form.

(a) $p \times q$

..............………………………………………………………………………..

(2)

(b) $5p + 8q$

..............………………………………………………………………………..

..............………………………………………………………………………..

(2)

(c) $p - q$

..............………………………………………………………………………..

..............………………………………………………………………………..

(2)

4. (a) $p = 3.7 \times 10^{-4}$

Write p as an ordinary number.

…………………………………………………………………………………

(1)

(b) Work out each of the following.

Give your answers in standard form.

(i) $5.2 \times 10^4 + 9.6 \times 10^5$

…………………………………………………………………………………..

…………………………………………………………………………………..

(2)

(ii) $\dfrac{8.2 \times 10^4}{2.5 \times 10^5}$

…………………………………………………………………………………..

…………………………………………………………………………………..

(2)

5. The weight of 1 grain of sand is given as 43×10^{-9} grams.

(a) (i) Write 43×10^{-9} in standard form.

....

(2)

(ii) What is the weight of 5 billion grains of sand?
(1 billion is 1000 million).

....

....

(2)

(b) A piece of sandstone weighs 1kg.
How many grains of sand is this equivalent to?

....

....

(2)

6. Last year the population of the United Kingdom was approximately 5.3×10^7.

(a) An average of £680 per person was spent on food last year in the United Kingdom.

What was the total amount spent on food last year in the United Kingdom?
Give your answer in standard form.

....

....

(3)

(b) Last year there were 1.4×10^7 car drivers in the United Kingdom.
They spent a total of £1.5×10^{10} on their cars.

What was the average amount spent by each car driver?
Give your answer to a suitable degree of accuracy.

...…..……………………………………………………………………………………………

...…..……………………………………………………………………………………………

(3)

7. A rectangular picture measures 1.2×10^2 cm by 4.3×10^3 cm.

(a) What is the perimeter of the picture?
Give your answer in standard form.
Remember to state the units in your answer.

…………………………..…..………………………………………………………………….

…………………………..…..………………………………………………………………….

(2)

(b) What is the area of the picture?
Give your answer in standard form.
Remember to state the units in your answer.

…………………………..…..………………………………………………………………….

……………………………..…..…………………………………………………………………

(3)

8. In 1998, the population of Scotland was 5 137 000.

(a) Write this population in standard form.

.....................……………………………………………………………………………………

Answer ....

(1)

(b) In 1998, there was, on average in Scotland, one doctor for every 72.2 people.

How many doctors were there in Scotland?

Give your answer in standard form to an appropriate degree of accuracy.

.....................…………………………………………………………………………………

.....................…………………………………………………………………………………

.....................…………………………………………………………………………………

Answer ....

(3)

30-4-10   Number   Answers

Day: 10   **Topic:** Standard Index Form

Quick Questions

   1. a) 5.6×10^{7} b) 8.3×10^{-6}

   2. a) 79 000 000   b) 0.00211

   3. 4.5×10^{-6}

       3.2×10^{-3}

       1.5×10^{4}

       7.6×10^{4}

       1.8×10^{6}

       4.5×10^{6}

   4. a) $0.00206976744 = 2.07 \times 10^{-3}$ b) 31 320 000

Past Paper Questions

1. (a) (i) 3.9×10^{5} (ii) 390000

  (b) (i) 6.7×10^{-3} (ii) 0.0067

2. (a) 7×10^{9} (b) 0.0045

  (c) 8×10^{-3}

3.   (a) 1.89×10^{14} (b) 2.98×10^{8}

  (c) 50500000; 5.05×10^{7}

4. (a) 0.00037

  (b)   (i)   1012000; 1.012×10^{6}

           (ii)   0.328; 3.28×10^{-1}

5.   (a)   (i) 4.3×10^{-8} (ii) $4.3 \times 10^{-8} \times 5 \times 10^{9} = 215$ (g)

    (b) $1000 \times (4.3 \times 10^{-8}) = 2.3 \times 10^{10}$

6.   (a)   £680 $\times 5.3 \times 10^{7}$ = 3.604×10^{10}

    (b)   £$1.5 \times 10^{10} \div 1.4 \times 10^{7}$

         = £1071.4286

         = £1100 or; £1000 or £1070

7.   (a) 8.84×10^{3} cm   (b) 5.16×10^{5} cm^2

8.   (a) 5.137×10^{6}

    (b) No of doctors $= \dfrac{5137000}{72.2}$

         = 71149… or 71150 or 71100 or 71000

         7.1×10^{4}

         7.11×10^{4}

         7.115×10^{4}

END OF ANSWERS