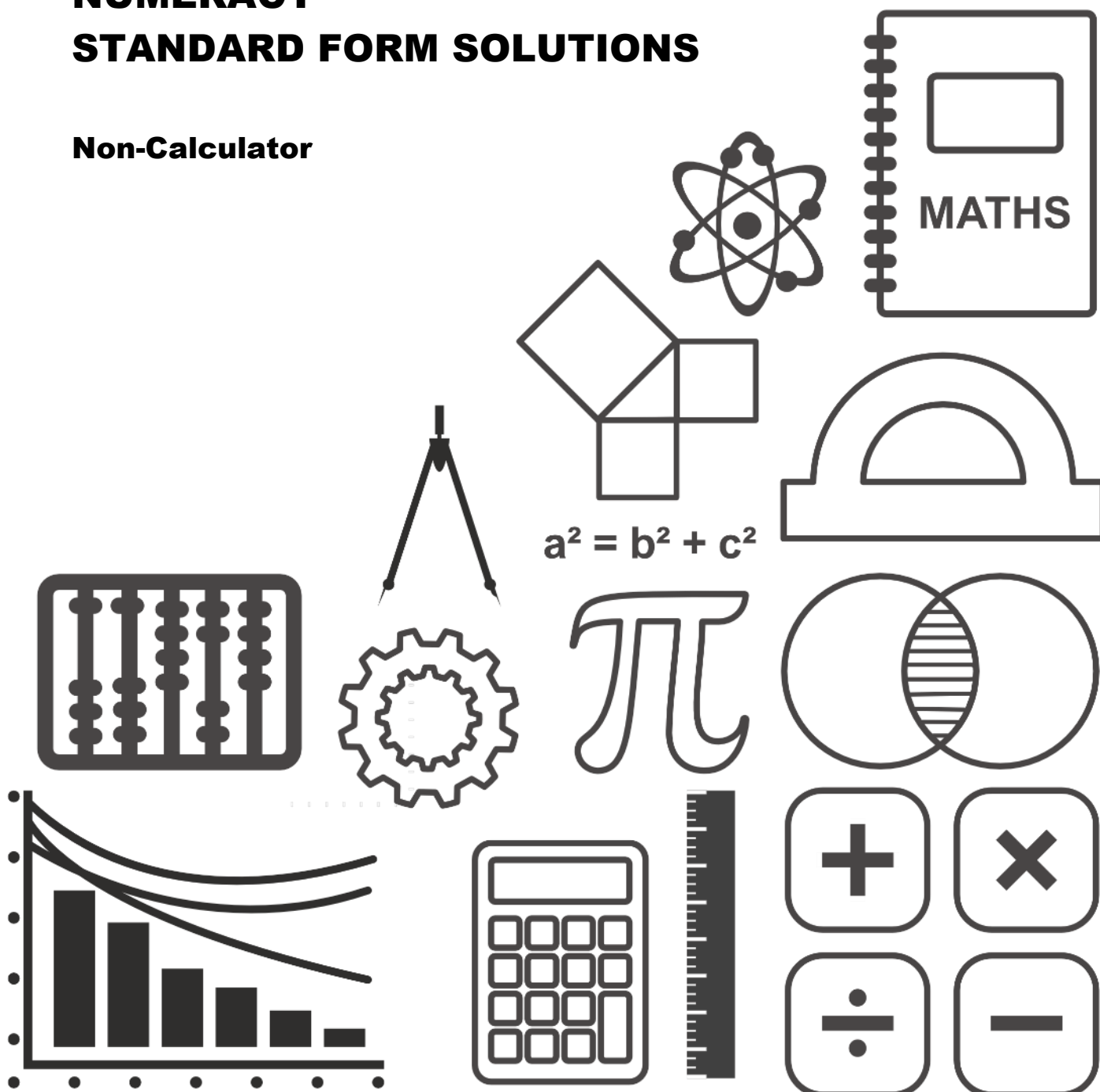


MATHSDIY

GCSE TOPIC BOOKLET NUMERACY STANDARD FORM SOLUTIONS

Non-Calculator



1. You are given that:

1 gigalitre = 1 000 000 m³

1 megalitre = 1 million litres = 1,000,000 = 1×10^6

Lake Vyrnwy is a reservoir in mid Wales.

- (a) Lake Vyrnwy can release between 25 and 45 megalitres of water per day from the dam.

The lake also supplies water through underground pipes to another reservoir at a rate of 230 000 m³ per day.



- (i) How many litres are there in 25 megalitres?
Circle your answer.

[1]

25×10^8

25×10^{-6}

25×10^7

2.5×10^6

2.5×10^7

25×10^6

$= 2.5 \times 10^7$

- (ii) Which is the best estimate for the volume of water passing through the underground pipes **per hour**?
Circle your answer.

[1]

8500 m³

9600 m³

10040 m³

10400 m³

11000 m³

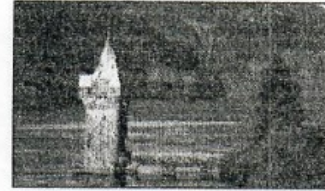
$230\,000 \text{ m}^3 / \text{day}$

$= \frac{230\,000 \text{ m}^3}{24} / \text{hour}$

$= \frac{95}{24} \overline{) 230\,000}$
 $\quad - 216\,000$
 $\quad \quad \underline{14\,000}$
 $\quad \quad - 12\,000$
 $\quad \quad \quad \underline{2\,000}$

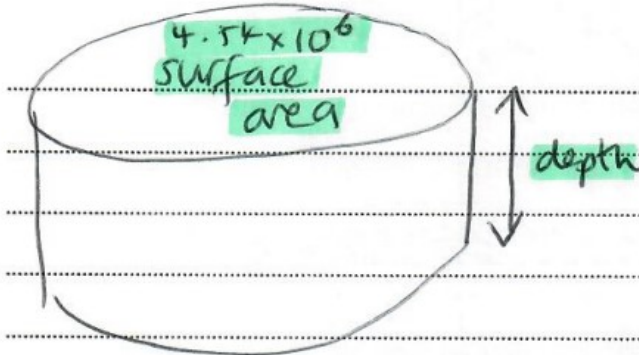
Don't need to complete the long division. You can see 9600 m³ will be the best estimate.

- (b) Lake Vyrnwy has a surface area of approximately $4\,540\,000\text{ m}^2$.
 Lake Vyrnwy contains 59.7 gigalitres of water.



Calculate an estimate of the average depth of the lake.
 Give your answer in metres.

[3]



$$\begin{aligned} \text{Volume} &= 59.7 \text{ gigalitres} \\ &= 59.7 \times 1 \times 10^6 \text{ m}^3 \\ &= \underline{5.97 \times 10^7 \text{ m}^3} \end{aligned}$$

$$\begin{aligned} \text{Depth} &= \text{Volume} \div \text{Surface Area} \\ &= \frac{5.97 \times 10^7}{4.54 \times 10^6} = \frac{59.7}{4.54} \approx \frac{60}{5} = 12 \end{aligned}$$

Estimate of average depth is 12 m

2. (a) A standard piece of A4 paper is usually 0.08 mm thick.
 What is 0.08 mm written in **metres** in standard form?
 Circle your answer. [1]

8×10^4 8×10^{-4} 8×10^{-3} 8×10^3 8×10^{-5}

$\div 1000$
 $MM \rightarrow M$ $0.08 \div 1000 = 0.00008$
 $= 8 \times 10^{-5}$

- (b) A piece of card is 1 mm thick.
 A stack of these pieces of card is 3×10^{-2} metres high. [2]

- (i) Calculate how many pieces of card there are in the stack. [2]

3×10^{-2} metres = 0.03 metres
 = 3 cm = 30 mm
 \therefore 30 pieces of card

- (ii) What assumption have you made in answering (b)(i)? [1]

- eg
- no gaps between the cards
 - all of the cards are exactly 1mm thick
 - none of them are folded

- (c) In 2012 it was recorded that
- the total mass of the paper used for printing newspapers, in the world, was 2.88×10^7 tonnes,
 - the world population was approximately 7.2×10^9 people.

Use this information to calculate the mass of paper per person used to print newspapers in 2012.

Give your answer in kg per person.

[4]

Mass/person this gives us a clue that we divide the mass by the number of people

$$\frac{2.88 \times 10^7}{7.2 \times 10^9}$$

$$7.2 \times 10^9$$

but this would give tonnes/person and we want kg/person

$$1 \text{ tonne} = 1000 \text{ kg}$$

$$= \frac{2.88 \times 10^7 \times 1000}{7.2 \times 10^9} = \frac{2.88 \times 10^{10}}{7.2 \times 10^9}$$

$$= \frac{28.8}{7.2} = 4 \quad \left(\begin{array}{l} 7 \times 4 = 28 \\ 0.2 \times 4 = 0.8 \end{array} \right) \quad 7.2 \times 4 = 28.8$$

Mass of paper: 4 kg per person