Name ANSWERS	Class

MATHS TEACHER HUB

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Estimation

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

4 A cycle race across America is 3069.25 miles in length. (3000 miles)

Juan knows his average speed for his previous races is 15.12 miles per hour. (15mph)
For the next race across America he will cycle for 8 hours per day.

(a) Estimate how many days Juan will take to complete the race.

15mph x 8 hours = 120 miles a day

$\frac{3000 \text{miles}}{120} = \frac{300}{12} = \frac{100}{4} = 25$ days

25

(3)

Juan trains for the race.
The average speed he can cycle at increases.
It is now 16.27 miles per hour.

(b) How does this affect your answer to part (a)?

16.27 would still round to 15, so the estimated answer would not change.

(1)

(Total for Question 4 is 4 marks)

5 Sophie drives a distance of 513 kilometres on a motorway in France. (500 km)
She pays 0.81 euros for every 10 kilometres she drives.

(a) Work out an estimate for the total amount that Sophie pays. (0·8 Euros)

$\frac{500}{10} = 50$

$50 \times 0.8 = 40$

40 euros

(3)

(b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

Underestimate, I rounded the cost and the distance both down.

(1)

May 2024 – Paper 1H

(Total for Question 5 is 4 marks)

5 A plane travels at a speed of 213 miles per hour. (200 mph)

(a) Work out an estimate for the number of seconds the plane takes to travel 1 mile.

200 miles per hour
200 miles per 60 minutes
200 miles per 3600 seconds
100 miles per 1800 seconds
1 mile per 18 seconds

18 seconds

(3)

(b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

Overestimate, the distance was rounded down which means the plane will travel more than 1 mile in 18 seconds.

(1)

(Total for Question 5 is 4 marks)

5 Lara is a skier.

She completed a ski race in 1 minute 54 seconds. → 1·9 minutes
The race was 475 m in length.

Lara assumes that her average speed is the same for each race.

(a) Using this assumption, work out how long Lara should take to complete a 700 m race.
Give your answer in minutes and seconds.

$$\text{Speed} = \frac{475\text{m}}{1{\cdot}9\text{ minutes}} = 250\text{ metres/minute}$$

$$\text{Time} = \frac{700\text{m}}{250\text{m/m}} = 2{\cdot}8\text{ minutes}$$

2·8 minutes = 2 minutes 48 seconds

2 minutes 48 seconds

(3)

Lara's average speed actually increases the further she goes.

(b) How does this affect your answer to part (a)?

It would take Lara less time.

(1)

(Total for Question 5 is 4 marks)

8 (a) Work out an estimate for the value of $\sqrt{63.5 \times 101.7}$

$\sqrt{64} \times \sqrt{100}$

8×10

80

(2)

$(2.3)^6 = 148$ correct to 3 significant figures.

(b) Find the value of $(0.23)^6$ correct to 3 significant figures.

$\left(\frac{2.3}{10}\right)^6 = \frac{148}{100000} = 0.000148$

0.000148

(1)

(c) Find the value of 5^{-2} $= \frac{1}{5^2}$

$\frac{1}{25}$

(1)

(Total for Question 8 is 4 marks)

8 Work out an estimate for $\sqrt{4.98 + 2.16 \times 7.35}$

$\sqrt{5+2\times7}$

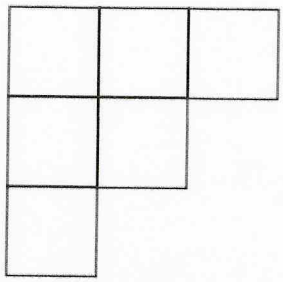
$\sqrt{19}$

$\sqrt{16} = 4$
$\sqrt{19} =$
$\sqrt{25} = 5$

4.4

(Total for Question 8 is 3 marks)

10 The diagram shows a shape made from 6 identical squares.



The total area of the shape is 5406 cm^2 (5400cm^2)

(a) Find an estimate for the length of one side of each square.
Give your answer correct to the nearest whole number.

$\frac{5400}{6}$ = 900cm^2 for each square

30 | 900 | 30

$\sqrt{900}$ = 30cm

30 cm

(3)

(b) Is your answer to part (a) an underestimate or an overestimate?
You must give a reason for your answer.

Underestimate, the total area was rounded down

(1)

(Total for Question 10 is 4 marks)

11 One uranium atom has a mass of 3.95×10^{-22} grams. $(4 \times 10^{-22}$ grams$)$

(a) Work out an estimate for the number of uranium atoms in 1 kg of uranium.

1000g $= 1 \times 10^3$ grams

$$\frac{1 \times 10^3}{4 \times 10^{-22}} = 0.25 \times 10^{25}$$

$$= 2.5 \times 10^{24}$$

2.5×10^{24}

(3)

(b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

Under estimate, the mass was rounded up so dividing by a smaller value gives you a larger answer

(1)

(Total for Question 11 is 4 marks)

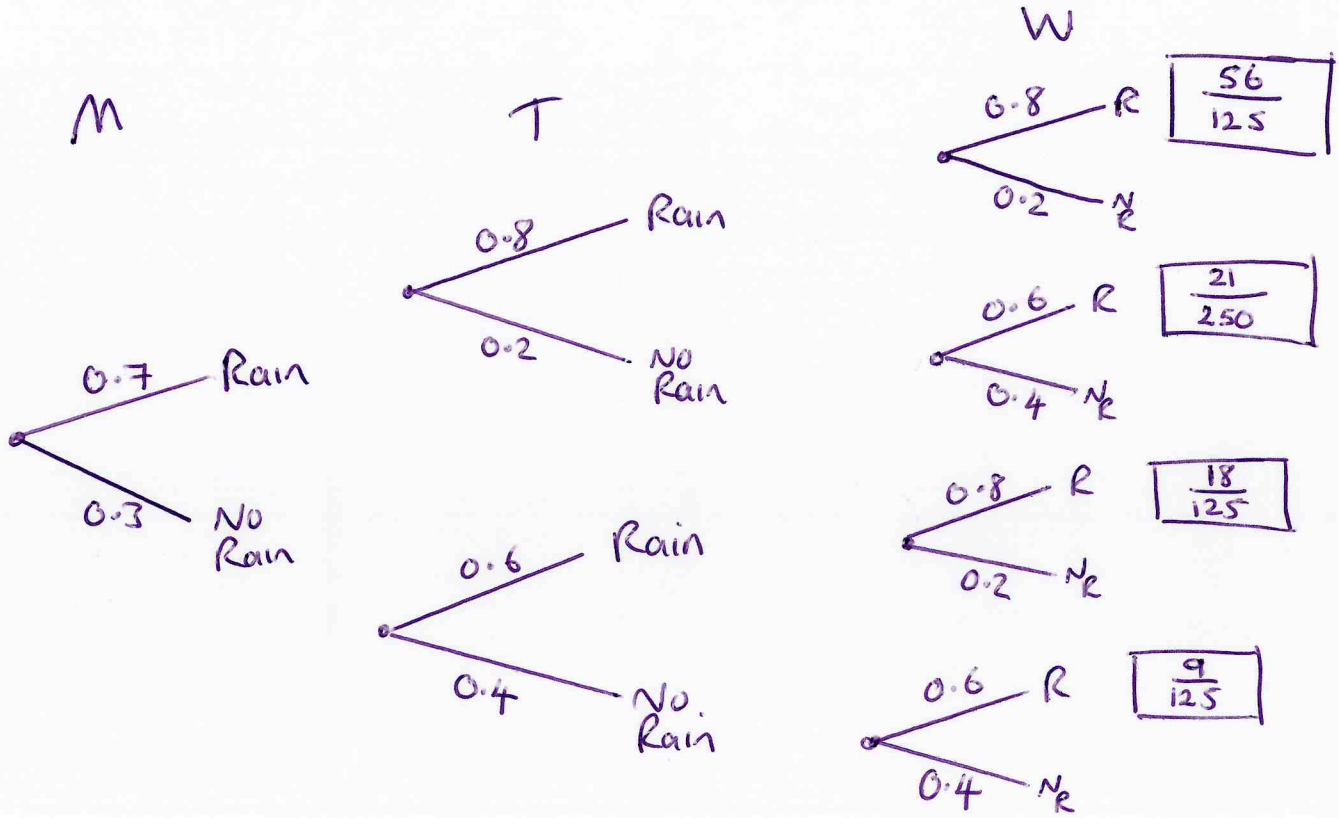
20 In a village,

if it rains on one day, the probability that it will rain on the next day is 0.8
if it does **not** rain on one day, the probability that it will rain on the next day is 0.6

A weather forecaster says,

"There is a 70% chance that it will rain in the village on Monday."

Work out an estimate for the probability that it will rain in the village on Wednesday.
You must show all your working.



$$\frac{56}{125} + \frac{21}{250} + \frac{18}{125} + \frac{9}{125} = \frac{187}{250}$$

$\frac{187}{250}$

November 2021 – Paper 2H **(Total for Question 20 is 4 marks)**