Name	Class

MATHS TEACHER HUB

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Indices

(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.

1 (a) Simplify $(x^3)^5$

.....

(1)

June 2022 – Paper 2H **(Total for Question 1 is 5 marks)**

1 (a) Simplify $n^3 \times n^5$

.....

(1)

(b) Simplify $\dfrac{c^3d^4}{c^2d}$

.....

(2)

November 2020 – Paper 3H **(Total for Question 1 is 3 marks)**

1 Work out the value of $\dfrac{3^7 \times 3^{-2}}{3^3}$

.....

November 2018 – Paper 1H **(Total for Question 1 is 2 marks)**

1 (a) Simplify $m^3 \times m^4$

.....

(1)

(b) Simplify $(5np^3)^3$

.....

(2)

(c) Simplify $\dfrac{32q^9r^4}{4q^3r}$

.....

(2)

June 2018 – Paper 2H **(Total for Question 1 is 5 marks)**

1 (a) Simplify $(t^3)^2$

.....

(1)

(b) Simplify $\frac{w^9}{w^4}$

.....

(1)

Specimen 2 – Paper 1H **(Total for Question 1 is 2 marks)**

1 (a) Simplify $(m^2)^3$

.....

(1)

(b) Simplify $x^5 \times x^8$

.....

(1)

June 2023 – Paper 3H **(Total for Question 1 is 2 marks)**

2 (a) (i) Write down the value of 5^0

.....

(1)

(ii) Write down the value of 5^{-2}

.....

(1)

(b) Write $\frac{2^5 \times 2^4}{2^3}$ in the form 2^n where n is an integer.

.....

(2)

November 2023 – Paper 1H **(Total for Question 2 is 4 marks)**

3 Simplify $(2^{-5} \times 2^8)^2$

Give your answer as a power of 2

.....

November 2022 – Paper 1H **(Total for Question 3 is 2 marks)**

3 Simplify $5u^2w^4 \times 7uw^3$

.....

(Total for Question 3 is 1 mark)

6 $p^3 \times p^x = p^9$

(a) Find the value of x.

$x =$ .....

(1)

$(7^2)^y = 7^{10}$

(b) Find the value of y.

$y =$ .....

(1)

$100^a \times 1000^b$ can be written in the form 10^w

(c) Show that $w = 2a + 3b$

(2)

(Total for Question 6 is 4 marks)

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

.....

(2)

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

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

.....

(1)

(c) Find the value of 5^{-2}

.....

(1)

(Total for Question 8 is 4 marks)

9 (a) Express $\sqrt{\dfrac{10^{360}}{10^{150} \times 10^{90}}}$ as a power of 10

.....

(3)

Liam was asked to express $(12^{50})^2$ as a power of 12

Liam wrote $(12^{50})^2 = 12^{50^2} = 12^{2500}$

Liam's method is wrong.

(b) Explain why.

.....

.....

.....

(1)

(Total for Question 9 is 4 marks)

9 (a) Write down the value of 7^0

.....

(1)

(b) Find the value of $3 \times 3^6 \times 3^{-6}$

.....

(1)

(c) Find the value of 2^{-4}

.....

(1)

(d) Find the value of $27^{\frac{1}{3}}$

.....

(1)

(Total for Question 9 is 4 marks)

9

$$\frac{y^4 \times y^n}{y^2} = y^{-3}$$

Find the value of n.

.....

(2)

November 2018 – Paper 3H **(Total for Question 9 is 8 marks)**

9 (a) Write down the value of $36^{\frac{1}{2}}$

.....

(1)

(b) Write down the value of 23^0

.....

(1)

(c) Work out the value of $27^{-\frac{2}{3}}$

.....

(2)

June 2018 – Paper 1H **(Total for Question 9 is 4 marks)**

10 (a) Write down the value of $100^{\frac{1}{2}}$

.....

(1)

(b) Find the value of $125^{\frac{2}{3}}$

.....

(2)

November 2017 – Paper 1H **(Total for Question 10 is 3 marks)**

10 (a) Write down the value of $64^{\frac{1}{2}}$

.....

(1)

(b) Find the value of $\left(\frac{8}{125}\right)^{-\frac{2}{3}}$

.....

(2)

Sample 1 – Paper 1H **(Total for Question 10 is 3 marks)**

11 (a) Find the value of $\sqrt[4]{81 \times 10^8}$

.....

(2)

(b) Find the value of $64^{-\frac{1}{2}}$

.....

(2)

(c) Write $\frac{3^n}{9^{n-1}}$ as a power of 3

.....

(2)

(Total for Question 11 is 6 marks)

11 Write down the value of $125^{\frac{2}{3}}$

.....

Specimen 1 – Paper 1H **(Total for Question 11 is 1 mark)**

11 Write $\dfrac{(6x^5y^3)^2}{3x^2y^7 \times 4xy^{-3}}$ in the form ax^by^c where a, b and c are integers.

.....

June 2023 – Paper 1H **(Total for Question 11 is 3 marks)**

12 $(ax^6)^{\frac{1}{n}} = 7x^3$

Work out the value of a and the value of n.

$a =$ .....

$n =$ .....

November 2021 – Paper 3H **(Total for Question 12 is 2 marks)**

12 Patrick has to work out the exact value of $64^{\frac{1}{4}}$

Patrick says,

"$\frac{1}{4}$ of 64 is 16 so $64^{\frac{1}{4}} = 16$"

Explain what is wrong with what Patrick says.

.....

.....

.....

June 2019 – Paper 3H **(Total for Question 12 is 1 mark)**

12 (a) Find the value of $81^{-\frac{1}{2}}$

.....

(2)

(b) Find the value of $\left(\frac{64}{125}\right)^{\frac{2}{3}}$

.....

(2)

May 2017 – Paper 1H **(Total for Question 12 is 4 marks)**

14 Work out the value of $27^{\frac{2}{3}} + \left(\frac{1}{2}\right)^{-3}$

.....

November 2023 – Paper 1H **(Total for Question 14 is 3 marks)**

14 Simplify fully $(3x^5y^6)^4$

.....

(2)

November 2022 – Paper 3H **(Total for Question 14 is 2 marks)**

14 (a) Work out the value of $\left(\frac{16}{81}\right)^{\frac{3}{4}}$

.....

(2)

$3^a = \frac{1}{9}$ $3^b = 9\sqrt{3}$ $3^c = \frac{1}{\sqrt{3}}$

(b) Work out the value of $a + b + c$

.....

(2)

November 2018 – Paper 1H **(Total for Question 14 is 4 marks)**

17 Work out the value of $\left(\frac{8}{27}\right)^{\frac{4}{3}}$

.....

November 2022 – Paper 1H **(Total for Question 17 is 2 marks)**

14 (a) Write $\frac{1}{16}$ in the form 4^n where n is an integer.

.....

(1)

(b) Work out the value of $8^{\frac{5}{3}} - 9^{\frac{3}{2}}$

.....

(3)

June 2023 – Paper 1H **(Total for Question 14 is 4 marks)**

15 (a) Find the value of $\sqrt[3]{8 \times 10^6}$

.....

(1)

(b) Find the value of $144^{\frac{1}{2}} \times 64^{-\frac{1}{3}}$

.....

(2)

(c) Solve $3^{2x} = \frac{1}{81}$

$x =$ .....

(2)

(Total for Question 15 is 5 marks)

18 Work out the value of $\dfrac{\left(5\frac{4}{9}\right)^{-\frac{1}{2}} \times \left(4\frac{2}{3}\right)}{2^{-3}}$

You must show all your working.

.....

(Total for Question 18 is 4 marks)

18 $16^{\frac{1}{5}} \times 2^x = 8^{\frac{3}{4}}$

Work out the exact value of x.

.....

June 2017 – Paper 2H **(Total for Question 18 is 3 marks)**

19 Given that $9^{-\frac{1}{2}} = 27^{\frac{1}{4}} \div 3^{x+1}$
find the exact value of x.

$x =$ .....

November 2019 – Paper 1H **(Total for Question 19 is 3 marks)**

20 Here is a list of five numbers.

98^{53} 98^{64} 98^{73} 98^{88} 98^{91}

Find the lowest common multiple of these five numbers.

.....

November 2020 – Paper 3H **(Total for Question 20 is 1 mark)**

20 $2^x = \dfrac{2^n}{\sqrt[3]{2}}$ $\quad 2^y = \left(\sqrt{2}\right)^5$

Given that $x + y = 8$

work out the value of n.

$n =$ .....

(Total for Question 20 is 3 marks)