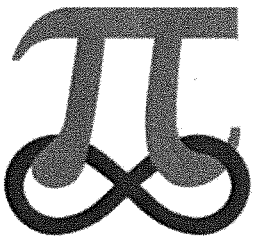
KumarMaths

Pearson Edexcel GCSE Maths (9 – 1)

Past Exam Questions by Topics

Indices: Higher

(Solutions)



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

$\dfrac{3^5}{3^3} = 3^2 = 9$

9

(2 marks)

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

$\left(\dfrac{2^4}{3^4}\right)^{3/4} = \dfrac{2^{4\times\frac{3}{4}}}{3^{4\times\frac{3}{4}}} = \dfrac{2^3}{3^3} = \dfrac{8}{27}$

8/27

(2)

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

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

$3^a = \dfrac{1}{3^2} = 3^{-2}$, $a = -2$

$3^b = 3^2 \times 3^{1/2} = 3^{5/2}$, $b = 5/2$

$3^c = \dfrac{1}{3^{1/2}} = 3^{-1/2}$, $c = -1/2$

$a + b + c = -2 + 5/2 - 1/2 = 0$

0

(2)

(4 marks)

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

$\sqrt{100} = 10$

10

(1)

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

$(5^3)^{2/3} = 5^{3\times\frac{2}{3}} = 5^2 = 25$

25

(2)

(3 marks)

5. $p^3 \times p^x = p^9$

(*a*) Find the value of x.

$p^{3+x} = p^9, \quad 3+x=9, \quad x=6$

$x =$ 6

(1)

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

(*b*) Find the value of y.

$7^{2y} = 7^{10}, \quad 2y=10, \quad y=5$

$y =$ 5

(1)

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

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

$(10^2)^a * (10^3)^b = 10^{2a} \times 10^{3b}$

$= 10^{2a+3b} = 10^w$

$\therefore \quad w = 2a + 3b$

(2)

(4 marks)

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

$\sqrt{36} = 6$

6

.....

(1)

(*b*) Write down the value of 23^0

1

.....

(1)

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

$\left(\frac{3}{3}\right)^{-\frac{2}{3}} = 3^{3\times-\frac{2}{3}} = 3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

$\frac{1}{9}$

.....

(2)

(4 marks)

4. (*a*) Simplify $m^3 \times m^4$

$m^{3+4} = m^7$

m^7

.....

(1)

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

$(5^1 n^1 p^3)^3 = 5^{1\times3} n^{1\times3} p^{3\times3}$

$= 5^3 n^3 p^9$

$125n^3p^9$

.....

(2)

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

$8q^{9-3} r^{4-1} = 8q^6r^3$

$8q^6r^3$

.....

(2)

(5 marks)

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

$\left(\frac{4}{3}\right)^{-1/2} = 3^{-2} = \frac{1}{3^2} = \frac{1}{9}$ 1/9

(2)

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

$\left(\frac{4^3}{5^3}\right)^{2/3} = \frac{4^2}{5^2} = \frac{16}{25}$ 16/25

(2)

(4 marks)

7. $16^{\frac{1}{5}} \times 2^x = 8^{\frac{3}{4}}$

Work out the exact value of x.

$(2^4)^{1/5} \times 2^x = (2^3)^{3/4}$

$2^{4/5} \times 2^x = 2^{9/4}$, $2^{\frac{4}{5}+x} = 2^{9/4}$

$\frac{4}{5} + x = \frac{9}{4}$, $x = \frac{9}{4} - \frac{4}{5} = \frac{45-16}{20} =$ 29/20

(3 marks)

8.. (a) Write down the value of $49^{\frac{1}{2}}$

$\sqrt{49} = 7$ 7

(1)

(b) Write $\sqrt{45}$ in the form $k\sqrt{5}$, where k is an integer.

$\sqrt{9 \times 5} = \sqrt{9} \times \sqrt{5} = 3\sqrt{5}$ $3\sqrt{5}$

(1)

(2 marks)

9. Find the value of n so that $\frac{2^6 \times 2^3}{2^n} = 2^5$

$\frac{2^9}{2^n} = 2^5$, $2^{9-n} = 2^5$, $9-n=5$, $n=4$

(2 marks)

10. Given that $\left(2^{\frac{1}{2}}\right)^n = \frac{2^x}{8^y}$

express n in terms of x and y.

$2^{\frac{1}{2}n} = \frac{2^x}{(2^3)^y}$

$2^{n/2} = \frac{2^x}{2^{3y}} = 2^{x-3y}$

$\frac{n}{2} = x-3y$

$n = 2(x-3y)$

.....

(3 marks)

11. (*a*) Write down the value of 25^0

1

.....

(1)

(*b*) Write down the value of $49^{-\frac{1}{2}}$

$\frac{1}{\sqrt{49}} = 1/7$

1/7

.....

(1)

(*c*) Write as a power of 2, $\frac{4 \times 8}{16^3}$

$\frac{2^2 \times 2^3}{(2^4)^3} = \frac{2^{2+3}}{2^{12}} = \frac{2^5}{2^{12}} = 2^{-7}$

2^{-7}

.....

(3)

(5 marks)

12. Write these numbers in order of size.

Start with the smallest number.

2^5	$64^{\frac{1}{2}}$	4^3	$8^{\frac{1}{3}}$	16	64^0
32	8	64	2	16	1

You must show clearly how you got your answer

64^0 $8^{1/3}$ $64^{1/2}$ 16 2^5

.....

(3 marks)

13. (a) Simplify $p^5 \times p^4$

$p^{5+4} = p^9$

p^9

.....

(1)

(b) Simplify $q^5 \div q^2$

$q^{5-2} = q^3$

q^3

.....

(1)

(c) Simplify $12tu^6 \div 6tu^5$

$\frac{12tu^6}{6tu^5} = 2u^1$

$2u$

.....

(2)

(d) Simplify $(9w^2y^6)^{\frac{1}{2}}$

$(3^2w^2y^6)^{1/2} = 3^1w^1y^3$

$3wy^3$

.....

(2)

(e) For $x > 1$, write the following expressions in order of size.

Start with the expression with the least value.

x^0	x^2	x	x^{-2}	$x^{\frac{1}{2}}$
1	4	2	$\frac{1}{4} = 0.25$	1.4..

Let $x=2$

(2)

x^{-2} x^0 $x^{1/2}$ x x^2

(8 marks)

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

$\sqrt{9} = 3$

3

.....

(1)

(b) Write down the value of $8^{-\frac{1}{3}}$

$\frac{1}{\sqrt[3]{8}} = \frac{1}{2}$

1/2

.....

(1)

$2^k = 16$

(c) Write down the value of k.

$2^k = 2^4, \quad k = 4$

$k = 4$

.....

(1)

(d) Solve $8^5 = 2^{2m+3}$

$\left(2^3\right)^5 = 2^{2m+3}$

$2^{15} = 2^{2m+3}$

$2m + 3 = 15$

$m = 6$

$m = 6$

.....

(3)

(Total 6 marks)

15. Find the value of x when $3^{2x} = \frac{1}{81}$

$3^{2x} = \frac{1}{3^4} = 3^{-4}$

$2x = -4$

$x = -2$

$x =$ -2

.....

(2 marks)

16. (*a*) Simplify, leaving your answers in index form,

(i) $7^5 \times 7^2 \times 7^1$ $\quad 7^{5+2+1} = 7^8$

7^8

(ii) $(4^7)^2 = 4^{7\times2} = 4^{14}$

4^{14}

(2)

(*b*) $\dfrac{5^n \times 5^3}{5^6} = 5^4$

Find the value of n.

$\dfrac{5^{n+3}}{5^6} = 5^{n+3-6} = 5^{n-3} = 5^4$

$n-3=4$, $n=7$

$n =$ 7

(2)

(4 marks)

17. Find the value of $64^{-\frac{2}{3}}$

$(2^6)^{-2/3} = 2^{-4} = \dfrac{1}{2^4} = \dfrac{1}{16}$

1/16

(2 mark)

18. Given that $3^{-n} = 0.2$

find the value of $(3^4)^n$

$(3^4)^n = 3^{4n} = (3^n)^4$

$3^{-n} = 0.2 = \dfrac{1}{5}$, $\dfrac{1}{3^n} = \dfrac{1}{5}$

$3^n = 5$

$(3^n)^4 = 5^4 = 625$

(2 marks)

19. (a) Find the value of $\sqrt[4]{27\times3\times10^8}$

$\sqrt[4]{81\times10^8} = (3^4\times10^8)^{1/4}$

$= 3^1\times10^2$

30

(2)

(b) Find the value of $\left(\frac{216}{1000}\right)^{-\frac{2}{3}}$

$\left(\frac{6^3}{10^3}\right)^{-2/3} = \frac{6^{3\times-2/3}}{10^{3\times-2/3}} = \frac{6^{-2}}{10^{-2}} = \frac{10^2}{6^2} = \frac{100}{36} = \frac{25}{9}$

(2)

(Total for Question 15 is 4 marks)

20. (*a*) Write down the value of

(i) 7^0

1

(ii) 5^{-2}

$1/25$

(iii) $16^{\frac{1}{2}}$

4

(3)

(*b*) Simplify fully $\frac{10a^7b^4}{2a^3b}$

$5a^4b^3$

(2)

(5 marks)