IGCSE (9-1) Edexcel Past Papers

FURTHER PURE MATHEMATICS

Paper 1, 1R

2020 - 2025

1 - (4PM1/1R_Summer_2020_Q9) - *Logarithmic Functions And Indices*

Showing your working clearly, use algebra to solve the equations

$$\frac{16^x}{8^y} = \frac{1}{4}$$

$$4^x 2^y = 16$$

(7)

2 - (4PM1/1_Winter_2020_Q7) - *Logarithmic Functions And Indices*

Solve the equation

$$\log_7(8x^2 - 6x + 3) - \log_{49} x^2 = 3\log_7 2$$

(5)

3 - (4PM1/1R_Winter_2020_Q1) - *Logarithmic Functions And Indices*

Given that $\frac{a + \sqrt{3}}{2 - \sqrt{3}} = 11 + b\sqrt{3}$ where a and b are integers,

find the value of a and the value of b.

(4)

4 - (4PM1/1R_Winter_2020_Q5) - *Logarithmic Functions And Indices*

(a) Show that $\log_4 32 = \frac{5}{2}$

(2)

(b) Hence, or otherwise, find the exact solutions of the equation

$$\log_2 x - \log_4 32 + \frac{1}{4}\log_x 16 = 0$$

(7)

5 - (4PM1/1_Summer_2021_Q8) - *Logarithmic Functions And Indices*

Given that n satisfies the equation

$$\log_a n = \log_a 3 + \log_a(2n - 1)$$

(a) find the value of n.

(3)

Given that $\log_p x = 3$ and $\log_p y - 3 \log_p 2 = 4$

(b) (i) express x in terms of p,

(1)

(ii) express xy in terms of p.

(4)

6 - (4PM1/1_Summer_2022_Q1) - *Logarithmic Functions And Indices*

Given that $\dfrac{2\sqrt{3} - 4}{3\sqrt{3} + 5}$ can be written in the form $a + b\sqrt{3}$ where a and b are integers,

find, without using a calculator, the value of a and the value of b

Show your working clearly.

(3)

7 - (4PM1/1R_Summer_2022_Q6) - *Logarithmic Functions And Indices*

Given that $\dfrac{a + \sqrt{5}}{\sqrt{5} - 2} = 11 + 5\sqrt{5}$

(a) without using a calculator, find the value of a
Show your working clearly.

(2)

Triangle PQR is such that

$$PR = (x + 3)\text{ cm} \qquad QR = x\text{ cm} \qquad \text{angle } QPR = 30° \qquad \text{angle } PQR = 45°$$

(b) Show that $x = 3 + 3\sqrt{2}$

(3)

Given that $\sin 105° = \dfrac{\sqrt{6} + \sqrt{2}}{4}$ and that the area of triangle PQR is A cm^2

(c) find the exact value of A in the form $\dfrac{9}{8}\left(p\sqrt{6} + q\sqrt{2} + r\sqrt{3} + s\right)$

where p, q, r and s are integers.

(3)

ANSWERS

1 – (4PM1/1R_Summer_2020_Q9) – *Logarithmic Functions And Indices*

	$\frac{2^{4x}}{2^{3y}} = \frac{1}{2^2}$	M1
	$2^{4x-2y} = 2^{-2}$ $(\rightarrow\ 4x - 3y = -2)$	dM1
	$2^{2x}2^{y} = 2^4$	M1
	$2^{2x+y} = 2^4$ $\rightarrow (2x + y = 4)$	dM1
	A fully correct method using for solving simultaneously leading to either $10x = 10$ **or** $5y = 10$ $4x - 3y = -2 \Rightarrow 10x = 10$ or $4x - 3y = -2 \Rightarrow 5y = 10$ $6x + 3y = 12$ $4x + 2y = 8$	ddddM1
	$y = 2$ $x = 1$	A1 A1 **[7]**
	Alternative Method $4^x = \frac{16}{2^y}$	M1
	$\frac{4^{2x}}{8^y} = \frac{1}{4}$	M1
	$\left(\frac{16}{2^y}\right)^2 \times \frac{1}{8^y} = \frac{1}{4}$	ddM1
	$8^y \times 2^{2y} = 4 \times 16^2$	dddM1
	$2^{3y} \times 2^{2y} = 2^2 \times 2^8$	ddddM1
	$(2^{5y} = 2^{10})$ $y = 2$	A1
	$(4^x \times 4 = 16)$ $x = 1$	A1

2 - (4PM1/1_Winter_2020_Q7) - *Logarithmic Functions And Indices*

	$\frac{\log_7 x^2}{\log_7 49}$	B1
	$\log_7\left(\frac{8x^2-6x+3}{x}\right)$, $\log_7 2^3$	M1 A1
	$\frac{8x^2-6x+3}{x} = 2^3$	
	$8x^2 - 14x + 3 = 0$	M1
	$(4x-1)(2x-3) = 0$	
	$x = \frac{1}{4}, \frac{3}{2}$	A1
		[5]

3 - (4PM1/1R_Winter_2020_Q1) - *Logarithmic Functions And Indices*

	$\frac{(a+\sqrt{3})}{(2-\sqrt{3})} \times \frac{(2+\sqrt{3})}{(2+\sqrt{3})} = \frac{2a+\sqrt{3}(a+2)+3}{1}$	M1
	$2a+\sqrt{3}(a+2)+3 = 11+b\sqrt{3} \Rightarrow 11 = 2a+3, \quad b = a+2$	M1M1
	Solves the equations in a and b $\Rightarrow a = 4, \quad b = 6$	A1 [4]
	ALT	
	$\frac{a+\sqrt{3}}{2-\sqrt{3}} = 11+b\sqrt{3} \Rightarrow a+\sqrt{3} = (2-\sqrt{3})(11+b\sqrt{3})$	{M1}
	$\Rightarrow a+\sqrt{3} = (22-3b)+(2b-11)\sqrt{3}$	
	$\Rightarrow a = 22-3b$ and $1 = 2b-11$	{M1}{M1}
	Solves the equations in a and b $\Rightarrow a = 4, \quad b = 6$	{A1} [4]

4 - (4PM1/1R_Winter_2020_Q5) - *Logarithmic Functions And Indices*

(a)	$\log_4 32 = \frac{\log_2 32}{\log_2 4} = \frac{5}{2}$* or $\log_4 32 = \log_4 4^{\frac{5}{2}} = \frac{5}{2}$* or $\log_4 32 = \log_{2^2} 2^5 = \frac{5}{2}$* **ALT** $\log_4 32 = a \quad \Rightarrow 4^a = 32 \quad \Rightarrow a = \frac{5}{2}$ *	M1A1cso [2] {M1}{A1} cso [2]
(b)	$\log_2 x - \log_4 32 + \frac{1}{4}\log_x 16 = 0$ Let $\log_2 x = y$ $y - \frac{5}{2} + \frac{1}{4}\left(\frac{\log_2 16}{\log_2 x}\right) = 0$ or $y - \frac{5}{2} + \frac{1}{\log_2 x} = 0$ $\Rightarrow y - \frac{5}{2} + \frac{1}{y} = 0$ $\Rightarrow 2y^2 - 5y + 2 = 0$ $\Rightarrow (2y-1)(y-2) = 0$ $\Rightarrow y = \log_2 x = \frac{1}{2}$ or 2 $\Rightarrow x = 2^{\frac{1}{2}} = \sqrt{2}$ and $x = 2^2 = 4$	M1 M1A1 M1 M1 M1A1 [7]

5 - (4PM1/1_Summer_2021_Q8) - *Logarithmic Functions And Indices*

(a)	$\log_a n = \log_a 3(2n-1)$	M1
	$n = 3(2n-1)$	M1
	$n = \frac{3}{5}$	A1 (3)
(b)(i)	$x = p^3$	B1 (1)
(b)(ii)	$\log_p y - \log_p 2^3 = 4 \Rightarrow \log_p\left(\frac{y}{2^3}\right) = 4$ or $\log_p\left(\frac{y}{8}\right) = 4$	M1
	$\frac{y}{2^3} = p^4 \Rightarrow \left(y = 2^3 p^4 \text{ or } 8p^4\right)$	M1
	$xy = 8p^7$	M1A1 (4)
	ALT (b)(ii)	
	$\log_p x + \log_p y - 3\log_p 2 = 4 + 3 \Rightarrow \log_p\left(\frac{xy}{2^3}\right) = 7$	{M1}
	$\frac{xy}{2^3} = p^7$	{M1}
	$xy = 8p^7$	{M1A1} (4)
		Total 8 marks

6 - (4PM1/1_Summer_2022_Q1) - *Logarithmic Functions And Indices*

	$\frac{2\sqrt{3}-4}{3\sqrt{3}+5} \times \frac{3\sqrt{3}-5}{3\sqrt{3}-5}$	M1
	$= \frac{18-10\sqrt{3}-12\sqrt{3}+20}{27-25}\left(= \frac{38-22\sqrt{3}}{2}\right)$ oe	dM1
	$= 19-11\sqrt{3}$ correct working throughout only	A1 (3)
ALT	$2\sqrt{3}-4 = \left(3\sqrt{3}+5\right)\left(a+b\sqrt{3}\right)$	M1
	$2\sqrt{3}-4 = 5a+9b+3\sqrt{3}a+5\sqrt{3}b \Rightarrow "5a+9b" = -4;\ "3a+5b" = 2$	dM1
	$15a+27b=-12$ or $25a+45b=-20$	A1
	$15a+25b=10$ $27a+45b=18$	
	$2b=-22 \Rightarrow b=-11$ $2a=38 \Rightarrow a=19$	
	$15a-297=-12 \Rightarrow a=19$ $57 + 5b = 2 \Rightarrow b=-11$	
	$= 19-11\sqrt{3}$ correct working throughout only	(3)
		Total 3 marks