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## PURE MATHS

### Algebra and Functions

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	SURDS AND INDICES
PAPER TYPE:	SOLUTION -1
TOTAL QUESTIONS	8
TOTAL MARKS	40

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**Surds and indices 1 (Solution)****Q1.**

First, let's rewrite the equation

$$\frac{(2^x)^2}{2} - 3(2^x) + 4 = 0$$

Let  $2^x = y$ 

$$\frac{y^2}{2} - 3y + 4 = 0$$

Multiply by 2

$$y^2 - 6y + 8 = 0$$

Factorize

$$y^2 - 2y - 4y + 8 = 0$$

$$y(y - 2) - 4(y - 2) = 0$$

$$y - 0 \quad ; \quad y = 0$$

So

$$x = 2 \quad ; \quad x = 1$$

Hence the solution to the given equation are  $x = 2$  and  $x = 1$ **Q2.****(a)** Identify the two errors made by the student.First error is  $2^{2x}$ 

Second error is -8

**(b)** Find the exact solution to the equation.

$$2^{2x} - 9(2^x) = 0$$

Let  $2^x = y$ 

$$y^2 - 9y = 0$$

$$y(y - 9) = 0$$

$$y = 0 \quad ; \quad y = 9$$

So,

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Hence, the exact solution is  $y = 0$  and  $y = 9$

**Q3.**

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

So, we can rewrite the equation as:

$$\Rightarrow 2^x = 2^{-3}$$

$$\Rightarrow x = -3$$

**(ii)**

$$2 \cdot (2^x)^2 - 5(2^x) + 2 = 0$$

Let  $y = 2^x$

$$2y^2 - 5y + 2 = 0$$

$$2y^2 - y - 4y + 2 = 0$$

$$y(2y - 1) - 2(2y - 1) = 0$$

$$y = 2, \quad y = \frac{1}{2}$$

But  $2^x = 2, \quad 2^x = \frac{1}{2}$

$$x = 1, \quad x = -1$$

So, solution to be equation are  $x = 1$  and  $x = -1$

**Q4.**

$$2^{2x+1} - 6(2^x) + 4 = 0$$

$$(2^x)^2 \cdot 2 - 6(2^x) + 4 = 0$$

Let  $y = 2^x$

$$2y^2 - 6y + 4 = 0$$

Factorize

$$2y^2 - 2y - 4y + 4 = 0$$

$$2y(y - 1) - 4(y - 1) = 0$$

$$(2y - 4)(y - 1) = 0$$

$$y = \frac{1}{2}, \quad y = 1$$

But  $2^x = \frac{1}{2}, \quad 2^x = 1$

$$x = -1, \quad x = 0$$

So, the solutions to the original equation are  $x = -1$  and  $x = 0$

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**Q5.****(i)****Step 1:** Rewrite 16 as a power of 2

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

$$2^x = 2^{-4}$$

**Step 2:** Since the bases are same

$$x = -4$$

So, the solution to the equation  $x = -4$ **(ii)****Step 1:** Rewrite the equation

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

$$2^{6x-4} = 2^{-\frac{5}{2}}$$

$$\Rightarrow 6x - 4 = -\frac{5}{2}$$

$$\Rightarrow 6x = -\frac{5}{2} + 4$$

$$\Rightarrow 6x = \frac{-5+8}{2}$$

$$\Rightarrow x = \frac{1}{4}$$

So, the solution to the equation  $4^{3x-2} = \frac{1}{4\sqrt{2}}$  is  $x = \frac{1}{4}$ **Q6.****(i)**

Dividing by 2

$$16/2 a^2 = \sqrt{a}$$

$$8a^2 = \sqrt{a}$$

Square on both sides

$$64a^4 = a$$

$$64a^4 - a = 0$$

$$a(64a^3 - 1) = 0$$

$$a = 0, \quad 64a^3 - 1 = 0$$

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$$, \quad a^3 = \frac{1}{64}$$

$$, \quad a^3 = \frac{1}{4^3}$$

Taking cube root on  $, \quad a = \frac{1}{4}$

So, the solutions to the equation are  $a = 0$ , and  $a = -2$

(ii)

$$(b^2)^2 + 6b^2 - 27 = 0$$

Let  $y = b^2$   $y^2 + 6y - 27 = 0$

$$y^2 + 9y - 3y - 27 = 0$$

$$y(y + 9) - 3(y + 9) = 0$$

$$(y - 3)(y + 9) = 0$$

$$y = 3 \quad , \quad y = -9$$

But  $b^2 = 3 \quad , \quad b^2 = -9$

$$\Rightarrow b = \pm\sqrt{3} \quad , \quad b = \pm 3i$$

So, the solution to the original equation are  $\pm\sqrt{3}$  and  $\pm 3i$ .

**Q7.**

First, simplify the denominator. Since 9 is equal to  $3^2$ , we can rewrite it as:

$$\frac{3^{x-1}}{3^{2(-y-2)}} = 27$$

$$\frac{3^{x-1}}{3^{-2y-4}} = 27$$

$$3^{x-1+2y+4} = 3^3$$

Since the base are same, we can equate the exponents:

$$\Rightarrow x - 1 + 2y + 4 = 3$$

$$\Rightarrow x + 2y + 3 = 3$$

$$\Rightarrow x + 2y = 0$$

$$\Rightarrow y = \frac{-x}{2}$$

This is the simplest form of the expression for y in terms of x.

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**Q8.**

First, let's simplify the equation, So, we can rewrite it as:

$$2^x \times 2^{2y} = \frac{1}{2^2}$$

$$2^{x+2y} = \frac{1}{2^2}$$

$$2^{x+2y} = 2^{-2}$$

Since, the base are same, we can equate the exponents.

$$x + 2y = -2$$

$$2y = -x - 2$$

$$y = \frac{-(x+2)}{2}$$

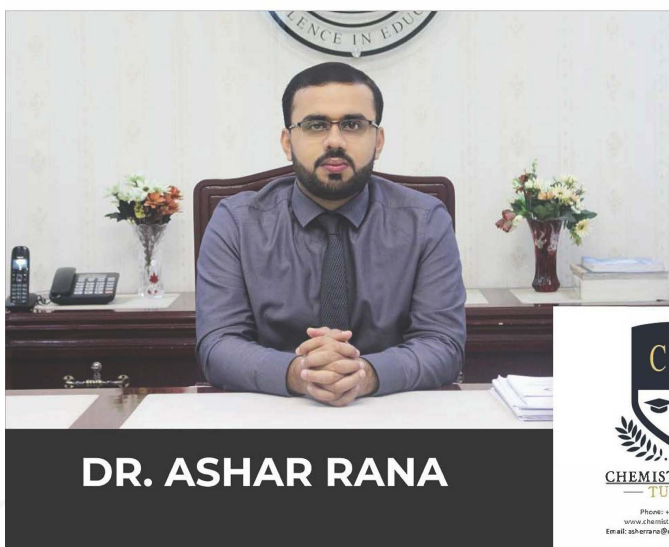
This is the simplest form of the expression for y as function of x.



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**DR. ASHAR RANA**



- Founder & CEO of Chemistry Online Tuition Ltd.
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