

F.BF.B.5: Logarithmic Equations

- 1 If $\log 28 = \log 4 + \log x$, what is the value of x ?
1) 7 2) 14 3) 24 4) 32

- 2 In the equation $\log_x 4 + \log_x 9 = 2$, x is equal to
1) $\sqrt{13}$ 2) 6 3) 6.5 4) 18

- 3 If $\log_3(x+1) - \log_3 x = 2$, then x equals
1) $-\frac{9}{8}$ 2) $-\frac{6}{5}$ 3) $\frac{1}{8}$ 4) $\frac{1}{5}$

- 4 Solve for x : $\log_b 36 - \log_b 2 = \log_b x$

- 5 Solve for x : $\log_8(x-6) + \log_8(x+6) = 2$

- 6 Solve for all values of x :
 $\log_3(x+4) + \log_3(x-2) = 3$

- 7 Solve for x : $\log_4(x^2 + 3x) - \log_4(x+5) = 1$

- 8 Solve for x : $\log_3(x^2 - 4) - \log_3(x+2) = 2$

- 9 Solve algebraically for all values of x :
 $\log_{(x+3)}(2x+3) + \log_{(x+3)}(x+5) = 2$

- 10 Solve algebraically, to the *nearest hundredth*, for all values of x :
 $\log_2(x^2 - 7x + 12) - \log_2(2x - 10) = 3$

- 11 Solve for p algebraically:
 $\log_{16}(p^2 - p + 4) - \log_{16}(2p + 11) = \frac{3}{4}$

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Answer Section

1 ANS: 1 REF: 069626siii

2 ANS: 2

$$\log_x 4 + \log_x 9 = 2$$

$$\log_x (4 \cdot 9) = 2$$

$$x^2 = 36$$

$$x = 6$$

REF: 080209b

3 ANS: 3

$$\log_3(x+1) - \log_3 x = 2$$

$$\log_3 \frac{x+1}{x} = 2$$

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

$$9x = x+1$$

$$x = \frac{1}{8}$$

REF: 011711a2

4 ANS:

$$\log_b 36 - \log_b 2 = \log_b x$$

$$18. \quad \log_b \frac{36}{2} = \log_b x$$

$$x = 18$$

REF: 080624b

5 ANS:

10

REF: 089342siii

6 ANS:

5

REF: 010439siii

7 ANS:

$$\log_4(x^2 + 3x) - \log_4(x + 5) = 1$$

$$\log_4\left(\frac{x^2 + 3x}{x + 5}\right) = 1$$

$$\frac{x^2 + 3x}{x + 5} = 4^1$$

 $\{5, -4\}$.

$$4x + 20 = x^2 + 3x$$

$$x^2 - x - 20 = 0$$

$$(x - 5)(x + 4) = 0$$

$$x = 5 \text{ or } x = -4$$

REF: 060230b

8 ANS:

$$\log_3(x^2 - 4) - \log_3(x + 2) = 2$$

$$\log_3\left(\frac{x^2 - 4}{x + 2}\right) = 2$$

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

11.

$$\frac{(x + 2)(x - 2)}{x + 2} = 9$$

$$x - 2 = 9$$

$$x = 11$$

REF: 060833b

9 ANS:

$$\log_{(x+3)}(2x + 3)(x + 5) = 2 \quad -6 \text{ is extraneous}$$

$$(x + 3)^2 = (2x + 3)(x + 5)$$

$$x^2 + 6x + 9 = 2x^2 + 13x + 15$$

$$x^2 + 7x + 6 = 0$$

$$(x + 6)(x + 1) = 0$$

$$x = -1$$

REF: 011439a2

10 ANS:

$$\log_2 \left(\frac{x^2 - 7x + 12}{2x - 10} \right) = 3 \quad x = \frac{23 \pm \sqrt{(-23)^2 - 4(1)(92)}}{2(1)} \approx 17.84, 5.16$$

$$\frac{x^2 - 7x + 12}{2x - 10} = 8$$

$$x^2 - 7x + 12 = 16x - 80$$

$$x^2 - 23x + 92 = 0$$

REF: 081539a2

11 ANS:

$$\log_{16} \left(\frac{p^2 - p + 4}{2p + 11} \right) = \frac{3}{4}$$

$$\frac{p^2 - p + 4}{2p + 11} = 16^{\frac{3}{4}}$$

$$\frac{p^2 - p + 4}{2p + 11} = 8$$

$$p^2 - p + 4 = 16p + 88$$

$$p^2 - 17p - 84 = 0$$

$$(p - 21)(p + 4) = 0$$

$$p = 21, -4$$

REF: 061639a2