

1. Simplify the expression:

$$\left[\left(\frac{-1}{2} \right)^2 \right]^{-2} = \left(\frac{1}{4} \right)^{-2} = 4^2 = 16$$

$$\left[\left(\frac{-1}{2} \right)^2 \right]^1 = \left(\frac{1}{4} \right)^1 = \frac{1}{4}$$

Multiply the results:

$$16 \times \frac{1}{4} = 4$$

Answer: B

2. Rewrite 27 and 9 as powers of 3:

$$(3^3)^x = \frac{3^2}{3^x} \implies 3^{3x} = 3^{2-x}$$

Equate the exponents:

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

Answer: A

3. Factor out common terms:

$$\frac{10 \times 5^{n+1} + 25 \times 5^n}{3 \times 5^{n+2} + 10 \times 5^{n+1}} = \frac{5^n(10 \times 5 + 25)}{5^n(3 \times 5^2 + 10 \times 5)} = \frac{5(10 \times 5 + 25)}{3 \times 25 + 10 \times 5}$$

Simplify the numerator and denominator:

$$= \frac{5(50 + 25)}{75 + 50} = \frac{5 \times 75}{125} = \frac{375}{125} = 3$$

Divide by the simplified denominator:

$$\frac{3}{5^2} = \frac{3}{25}$$

Answer: A

4. Simplify each term:

$$\left(\frac{1}{4} \right)^{-2} = 4^2 = 16$$

$$8^0 = 1, \quad \left(\frac{2}{3} \right)^{-2} = \left(\frac{3}{2} \right)^2 = \frac{9}{4}$$

Substitute and simplify:

$$16 - 3 \times 1 \times \frac{9}{4} = 16 - \frac{27}{4} = \frac{64}{4} - \frac{27}{4} = \frac{37}{4}$$

Answer: C

5. Simplify the expression:

$$x = \left(\frac{8}{5}\right)^2 \times \left(\frac{5}{8}\right)^2 = \left(\frac{8}{5} \times \frac{5}{8}\right)^2 = 1^2 = 1$$

Answer:

6. Rewrite in standard form:

$$0.0000000000085 = 8.5 \times 10^{-12}$$

Answer:

7. Combine the exponents:

$$\left(\frac{2}{9}\right)^{3-6} = \left(\frac{2}{9}\right)^{-3} = \left(\frac{2}{9}\right)^{2m-1}$$

Equate the exponents:

$$-3 = 2m - 1 \implies 2m = -2 \implies m = -1$$

Answer:

8. Simplify the expression:

$$\frac{1+1+1}{1 \times 1 \times 1} = \frac{3}{1} = 3$$

Answer:

9. Calculate a^b and b^a :

$$a^b = 2^3 = 8, \quad b^a = 3^2 = 9$$

Sum and find the reciprocal:

$$(8+9)^{-1} = 17^{-1} = \frac{1}{17}$$

Answer:

10. Simplify the expression:

$$(2^{20-15}) \times 2^3 = 2^5 \times 2^3 = 2^{5+3} = 2^8$$

Answer:

11. Simplify the expression:

$$(x^{a-b}) \times (x^{b-c}) \times (x^{c-a}) = x^{a-b+b-c+c-a} = x^0 = 1$$

Answer:

12. Rewrite 25 as 5^2 :

$$(5^2)^{x-1} = 5^{2x-2} = 5^{2x-1} - 100$$

This equation is not solvable in the real number system for x because 5^{2x-2} and 5^{2x-1} cannot differ by 100. **Answer:**

13. Calculate the distance:

$$2 \text{ hours} = 2 \times 3600 \text{ seconds} = 7200 \text{ seconds}$$

$$\text{Distance} = 3 \times 10^8 \times 7200 = 2.16 \times 10^{12} \text{ m}$$

Answer:

14. Combine like terms:

$$4 \times 4^x = 2^{10} \implies 4^{x+1} = 2^{10}$$

Rewrite 4 as 2^2 :

$$(2^2)^{x+1} = 2^{10} \implies 2^{2x+2} = 2^{10}$$

Equate the exponents:

$$2x + 2 = 10 \implies 2x = 8 \implies x = 4$$

Answer:

15. Simplify each term:

$$\left(\frac{1}{3}\right)^{-1} = 3, \quad \left(\frac{1}{4}\right)^{-1} = 4$$

Substitute and simplify:

$$[3 - 4]^{-1} = [-1]^{-1} = -1$$

Answer: