Merit Simplifying Exponents #2

Write the following in the form b^a, where b is a single integer and a is a simplified expression.

1. $2^a \times 2^b$

2. $5^k \times 2^k$

3. $\frac{5^{3x}}{5^{x-2}}$

4. 125×5^n

5. $16^a \times 8$

6. $\sqrt{64^{3x}}$

7. $3^x \times 9^{x-3}$

8. $\frac{9^{x+2}}{3^x}$

Solve the following:

9. $5 \times 3^x = 405$

10. $2^{x-1} \times 2^{3x} = 64$

11. $9^x = 27$

12. $5^{x-1} > 200$ where x is an integer

13. $8^x = 16$

14. $2^{n-1} < 50$ where n is a whole number

15. $8^{m-2} = 2^{5m}$

16. $2^{x+1} + 2^x = 48$

Answers: Merit Simplifying and Solving Exponents #2

These are generally in terms of the lowest possible integer, but some might also be solved in terms of a larger integer.

1. $2^a \times 2^b = 2^{a+b}$

2. $5^k \times 2^k = 10^k$

3. $\frac{5^{3x}}{5^{x-2}} = 5^{3x-(x-2)} = 5^{2x+2}$

4. $125 \times 5^n = 5^3 \times 5^n = 5^{n+3}$

5. $16^a \times 8 = (2^4)^a \times 2^3 = 2^{4a} \times 2^3 = 2^{4a+3}$

6. $\sqrt{64^{3x}} = 8^{3x}$ [or $= 64^{1.5x}$]

7. $3^x \times 9^{x-3} = 3^x \times (3^2)^{x-3} = 3^x \times 3^{2x-6} = 3^{3x-6}$ note that the $x-3$ **both** double

8. $\frac{9^{x+2}}{3^x} = \frac{(3^2)^{x+2}}{3^x} = \frac{3^{2x+4}}{3^x} = 3^{x+4}$ or $= \frac{9^2 \times 9^x}{3^x} = 3^4 \times 3^x = 3^{x+4}$

9. $5 \times 3^x = 405 \implies 3^x = 405 / 5 \implies 3^x = 81 = 3^4 \implies x = 4$

10. $2^{x-1} \times 2^{3x} = 64 \implies 2^{4x-1} = 2^6 \implies 4x - 1 = 6 \implies x = {}^7/_4$

11. $9^x = 27 \implies (3^2)^x = 3^3 \implies 3^{2x} = 3^3 \implies 2x = 3 \implies x = 1.5$ [or ${}^3/_2$]

12. $5^{x-1} > 200$ 200 is between $5^3 = 125$ and $5^4 = 625$, so 5^{x-1} is more than 5^3

    $\implies 5^{x-1} > 5^3 \implies x - 1 > 3 \implies x > 4$ [or "x is more than 4"]

13. $8^x = 16 \implies (2^3)^x = 2^4 \implies 2^{3x} = 2^4 \implies 3x = 4 \implies x = {}^4/_3$

14. $2^{n-1} < 50 \implies 2^{n-1} < 2^6$ [$= 64$] $\implies n - 1 < 6 \implies n$ is from 1 to 6

15. $8^{m-2} = 2^{5m} \implies (2^3)^{m-2} = 2^{5m} \implies 2^{3m-6} = 2^{5m} \implies 3m - 6 = 5m \implies m = -3$

16. $2^{x+1} + 2^x = 48 \implies 2 \times 2^x + 2^x = 48 \implies 3 \times 2^x = 48 \implies 2^x = 16 \implies x = 4$