

### Merit Simplifying Exponents #1

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

1.  $3^x \times 4^x$

2.  $2^a \times 2^{2a}$

3.  $8 \times 2^n$

4.  $\frac{10^x}{5^x}$

5.  $\frac{3^x}{3^y}$

6.  $\frac{9^a}{27}$

7.  $125^a \times 25$

8.  $2^x \times 4^{x+2}$

Solve the following:

9.  $3 \times 2^x = 48$

10.  $\frac{2^x}{5} = 6.4$

11.  $3^{x-2} > 99$  where  $x$  is the smallest possible whole number

12.  $25^{m-2} = 5^m$

13.  $4^x = 32$

14.  $4^{n+1} < 80$  where  $n$  is a positive integer

15.  $16^{x+1} = 2^{3x}$

16.  $81^x = 27$

## Answers: Merit Simplifying and Solving Exponents #1

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

1.  $3^x \times 4^x = 12^x$

2.  $2^a \times 2^{2a} = 2^{3a}$

3.  $8 \times 2^n = 2^3 \times 2^n = 2^{n+3}$

4.  $\frac{10^x}{5^x} = 2^x$

5.  $\frac{3^x}{3^y} = 3^{x-y}$

6.  $\frac{9^a}{27} = \frac{(3^2)^a}{3^3} = 3^{2a-3}$

7.  $125^a \times 25 = (5^3)^a \times 5^2 = 5^{3a} \times 5^2 = 5^{3a+2}$

8.  $2^x \times 4^{x+2} = 2^x \times (2^2)^{x+2} = 2^x \times 2^{2x+4} = 2^{3x+4}$  note that the  $x+2$  **both** double

9.  $3 \times 2^x = 48 \Rightarrow 2^x = 48/3 \Rightarrow 2^x = 16 = 2^4 \Rightarrow x = 4$

10.  $\frac{2^x}{5} = 6.4 \Rightarrow 2^x = 6.4 \times 5 \Rightarrow 2^x = 32 = 2^5 \Rightarrow x = 5$

11.  $3^{x-2} > 99$  99 is between  $3^4 = 81$  and  $3^5 = 243$ , so  $3^{x-2}$  is more than  $3^4$   
 $\Rightarrow 3^{x-2} > 3^5 \Rightarrow x-2 > 5 \Rightarrow$  lowest value for  $x$  is 7

12.  $25^{m-2} = 5^m \Rightarrow (5^2)^{m-2} = 5^m \Rightarrow 5^{2m-4} = 5^m \Rightarrow 2m-4 = m \Rightarrow m = 4$

13.  $4^x = 32 \Rightarrow (2^2)^x = 2^5 \Rightarrow 2^{2x} = 2^5 \Rightarrow 2x = 5 \Rightarrow x = 2.5$

14.  $4^{n+1} < 80 \Rightarrow 4^{n+1} \leq 4^3 [= 64] \Rightarrow n+1 \leq 3 \Rightarrow n$  is 1 or 2 [accept 0]

15.  $16^{x+1} = 2^{3x} \Rightarrow (2^4)^{x+1} = 2^{3x} \Rightarrow 2^{4x+4} = 2^{3x} \Rightarrow 4x+4 = 3x \Rightarrow x = -4$

16.  $81^x = 27 \Rightarrow (3^4)^x = 3^3 \Rightarrow 3^{4x} = 3^3 \Rightarrow 4x = 3 \Rightarrow x = 3/4$