



Math Olympiad and Problem Solving Programs  
E220 - Intermediate Math Competitions  
Problem Set 3.1 - Counting Factors

Name:

Date:

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1.  $\boxed{10}$
2. 96 has 12 factors, which pair up to make 6 possible multiplications to make a rectangle of area 96. However, we do not want to arrange it in the  $1 \times 96$  arrangement, so there are 5 possibilities left.  $\boxed{5}$
3. First, divide out 12:  $2^2 \times 3^2 \times 5 \div 12 = 3 \times 5$ . Now find how many factors  $3 \times 5$  has:  $(1+1)(1+1) = 2 \times 2 = \boxed{4}$
4.  $\boxed{36}$
5.  $n = 2^2 \cdot 3^3 \cdot 4^4 = 2^2 \cdot 3^3 \cdot (2^2)^4 = 2^{10} \cdot 3^3$ . Now find the number of factors:  $(10+1)(3+1) = 11 \cdot 4 = \boxed{44}$ .
6.  $\boxed{6}$
7.  $\boxed{6}$
8. Divide out  $150 = 2 \cdot 3 \cdot 5^2$ :  $2^{10} \cdot 3^{14} \cdot 5^8 \div 2 \cdot 3 \cdot 5^2 = 2^9 \cdot 3^{13} \cdot 5^6$ . Now count factors:  $(9+1)(13+1)(6+1) = 10 \cdot 14 \cdot 7 = \boxed{980}$ .
9.  $\boxed{30}$
10.  $\boxed{6}$