

# IGP

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1. Consider rectangle  $ABCD$  with  $AB = 6$ ,  $BC = 8$ . Let  $M$  be the midpoint of  $AD$  and let  $N$  be the midpoint of  $CD$ . Let  $BM, BN$  intersect  $AC$  at  $X, Y$ . Find  $XY$ . (W1)
2. Tangents from point  $C$  to circle  $O$  are extended to  $A$  and  $B$  such that  $AB$  is tangent to  $O$  at  $X$ . If the perimeter of  $\triangle ABC$  is 50 and  $[ABC] = 100$ , find the area of circle  $O$ . (1.8)
3. If triangle  $PQR$  has sides 40, 60, and 80, then the shortest altitude is  $K$  times the longest altitude. Find the value of  $K$ . (2.4)
4. Find  $\frac{1}{1 \cdot 2} + \frac{2}{2 \cdot 4} + \frac{3}{4 \cdot 7} + \frac{4}{7 \cdot 11} + \frac{5}{11 \cdot 16}$ . (3.1)
5. Find the number of subsets of  $\{1, 2, 3, 4, 5, 6, 7, 8\}$  that are subsets of neither  $\{1, 2, 3, 4, 5\}$  nor  $\{4, 5, 6, 7, 8\}$ . (4.3)
6. How many 4 digit falling numbers are there? (A falling number is a number whose last digit is strictly smaller than its second-to last digit, and so on. Ex. 4321) (4.6)