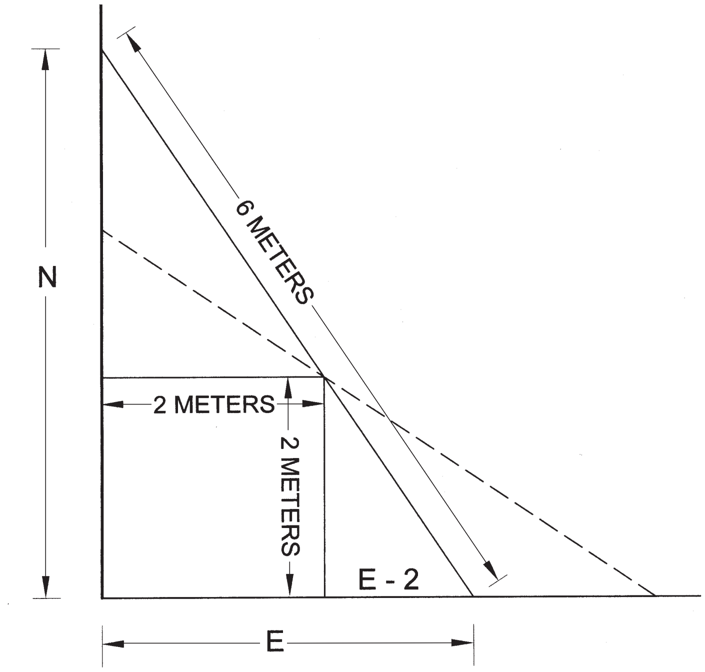
problem corner solution

Solution to Problem 140

by Dave Lindell, L.S.



$$\frac{N}{E} = \frac{2}{(E - 2)}$$

$$N = \frac{2E}{(E - 2)}$$

$$N^2 + E^2 = 6^2$$

$$\frac{(2E)^2}{(E - 2)^2} + E^2 = 36$$

Expanding and rearranging, $E^4 - 4E^3 - 28E^2 + 144E - 144 = 0 = f(E)$

Using the Newton-Raphson method to solve, where

$$x_{(n+1)} = x_n - \frac{f(x_n)}{f'(x_n)}$$

$$f'(E) = 4E^3 - 12E^2 - 56E + 144$$

Letting $E_0 = 3$, $E_1 = 3 - \dfrac{81 - 108 - 252 + 432 - 144}{108 - 108 - 168 + 144} = 3.375$

$$E_2 = 3.375 - \frac{129.7463379 - 153.7734375 - 318.9375 + 486 - 144}{153.7734375 - 136.6875 - 189 + 144} = 3.340444$$

$$E_3 = 3.3404444 - \frac{124.5135978 - 149.0982609 - 312.4398513 + 481.023936 - 144}{149.0982609 - 133.9027934 - 187.064864 + 144}$$

$E = 3.3404$

Note that $6^2 - 3.3404^2 = 4.9841^2$, the other possible position of the ladder as shown by the dashed line in the problem.

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Solution to Problem 141

by Benjamin Bloch, Ph.D.

The answer to every operation a) through e) is **9**. This is so because any product that contains a factor of 9, such as in problems a), b), and d) or that contains a factor that has an SDQ of 9, such as in problems c) and e), are just multiples of 9. e) 1.80 x 6^{11} = 653034700.8 => 36 => **9**.

Rule: Any multiple of 9 has an SDQ of **9**