

## Answer on Question #84091 – Math – Statistics and Probability

### Question

A bolt is manufactured by 3 machines  $a$ ,  $b$  and  $c$ . Machine  $a$  turn out twice as many items as  $b$ , and machines  $b$  and  $c$  produce equal number of items. 2% of bolts produced by  $a$  and  $b$  are defective and 4% of bolts produced by  $c$  are defective. All bolts are put into 1 stock pile and 1 is chosen from this pile. What is the probability that it is defective.

### Solution

Let  $A$  be the event 'an item has been produced by machine  $a$ ',  $B$  be the event 'an item has been produced by machine  $b$ ',  $C$  be the event 'an item has been produced by machine  $c$ ' and  $D$  be the event 'the item being defective'.

Then

$$P(A) = \frac{1}{2}, P(B) = \frac{1}{4}, P(C) = \frac{1}{4}.$$

$$P(D|A) = 0.02, P(D|B) = 0.02, P(D|C) = 0.04.$$

By theorem of total productivity,

$$\begin{aligned} P(D) &= P(A)P(D|A) + P(B)P(D|B) + P(C)P(D|C) = \frac{1}{2} \cdot 0.02 + \frac{1}{4} \cdot 0.02 + \frac{1}{4} \cdot 0.04 = \\ &= \frac{1}{4}(0.04 + 0.02 + 0.04) = \frac{1}{4} \cdot 0.1 = 0.25 \cdot 0.1 = 0.025. \end{aligned}$$

**Answer:** 0.025.