



AP[®] Statistics 2001 Sample Student Responses

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2. A department supervisor is considering purchasing one of two comparable photocopy machines, A or B. Machine A costs \$10,000 and machine B costs \$10,500. This department replaces photocopy machines every three years. The repair contract for machine A costs \$50 per month and covers an unlimited number of repairs. The repair contract for machine B costs \$200 per repair. Based on past performance, the distribution of the number of repairs needed over any one-year period for machine B is shown below.

Number of Repairs	0	1	2	3
Probability	0.50	0.25	0.15	0.10

You are asked to give a recommendation based on overall cost as to which machine, A or B, along with its repair contract, should be purchased. What would your recommendation be? Give a statistical justification to support your recommendation.

— Machine A costs \$10,000. Repair costs for three years (at \$50/month) can be estimated at $50 \times 12 \times 3 = 1,800$. Therefore Machine A total cost^(for 3 year) can be estimated at $10,000 + 1,800 = \$11,800$

(machine) (repairs)

— Machine B costs \$10,500. The expected value for repairs/year can be found by:

$$\sum (\# \text{ of repairs} \cdot \text{cost of repair} \cdot \text{probability of } \#) =$$

$$\sum (0 \cdot 200 \cdot .5) \dots (3 \cdot 200 \cdot .10) = 170/\text{year}$$

$170 \cdot 3 \text{ years} = \510 expected repair costs for 3 years

Therefore Machine B total cost^(for 3 years) can be estimated at $10,500 + 510 = 11,010$.

(machine) (repairs)

Conclusion: Machine B would be a better investment. As long as the number of repairs needed for Machine B, follow the predicted pattern, the total sum of expected cost will be much less (\$790 less) than expected cost of Machine A.

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over a 3 yr. period machine A w/ the repair contract costs $\$10,000 + (\$50)(12)(3) = \$11,800$

the probability of machine B costing more than machine A $\Rightarrow \$11,800 - \$10,500 = \$1,300$ (# of repairs)

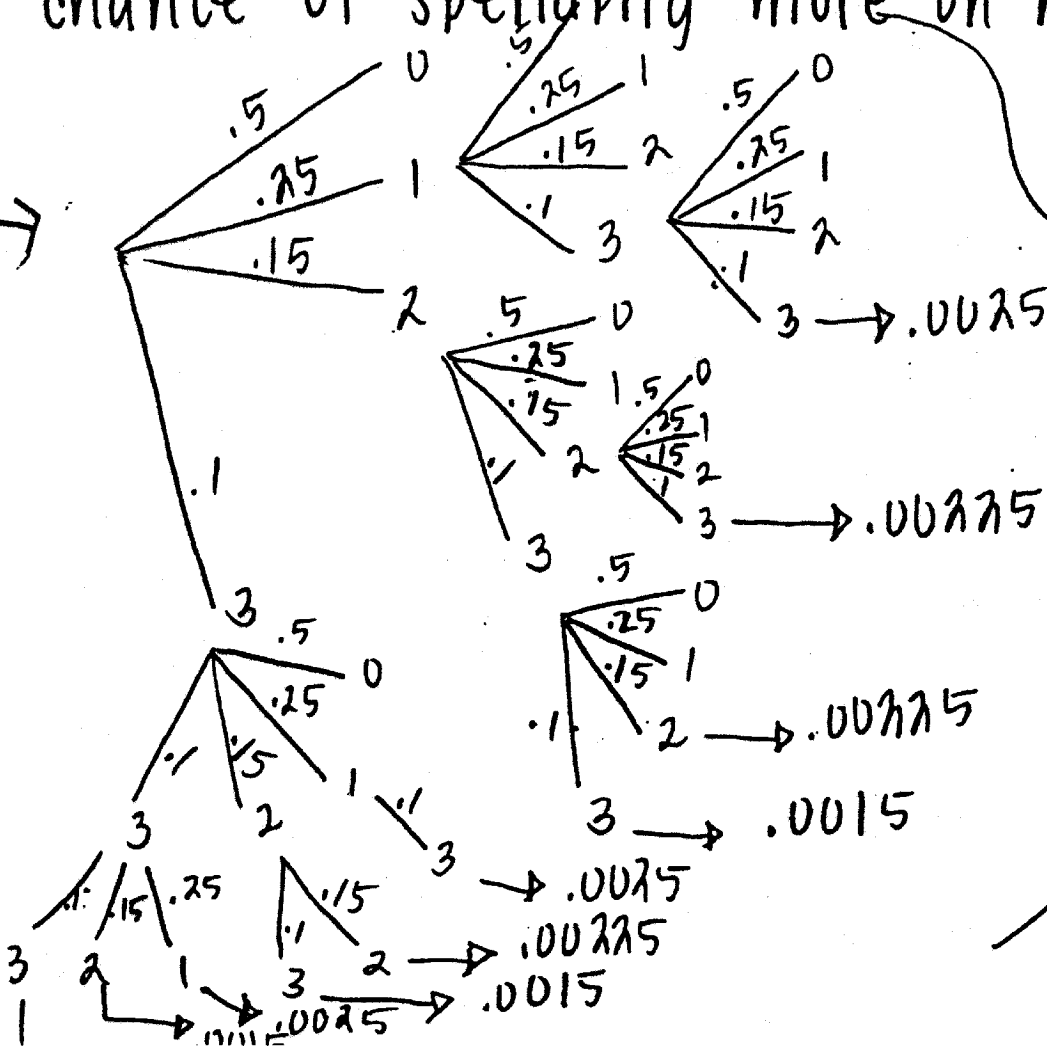
$$\$1,300 = \$200 (\# \text{ of repairs})$$

$$\# \text{ of repairs} = 0.5$$

over a 3-yr period the prob. of having 7 or more repairs = .01975

I would recommend to use machine B because the chance of spending more on machine B than machine A is very small.

$$P(\geq 7 \text{ repairs}) = .01975$$



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\$200/each

B	Number of Repairs	0	1	2	3
	Probability	0.50	0.25	0.15	0.10

You are asked to give a recommendation based on overall cost as to which machine, A or B, along with its repair contract, should be purchased. What would your recommendation be? Give a statistical justification to support your recommendation.

$$\text{expected \# of repairs (B)} = 0(.5) + 1(.25) + 2(.15) + 3(.1) = .85$$

$$\text{expected \$ / yr} = .85 (200) = \$170/\text{yr}$$

$$\text{expected \$ of B} = \$10,500 + \$170 = \$10,670$$

$$\text{expected \$ of A w/ repair} = \$10,000 + \$50(12) =$$

\$10,600

- I would recommend buying Machine A, along with its repair contract. It only costs \$10,600 and you are equipped with unlimited repairs. Whereas, Machine B costs \$10,500 but one repair will cost you \$200 (bringing total to \$10,700). Machine B is expected to have almost one repair a year. Therefore the expected price will be \$10,670 which is higher than the fully equipped Machine A priced at a low \$10,600/yr.