24. The repair costs for boats in a marina have the following characteristics:

Boat Type	Number of boats	Probability that repair is needed	Mean of repair cost given a repair	Variance of repair cost given a repair
Power Boats	100	0.3	300	10,000
Sailboats	300	0.1	1000	400,000
Luxury Yachts	50	0.6	5000	2,000,000

At most one repair is required per boat each year. The marina budgets an amount, Y, equal to the aggregate mean repair costs plus the standard deviation of the aggregate repair costs.

Calculate Y.

A) 200,000   B) 210,000   C) 220,000   D) 230,000   E) 240,000

25. A writes to B and does not receive an answer. Assuming that one letter in n is lost in the mail, find the chance that B received the letter. It is to be assumed that B would have answered the letter if he had received it.

A) $\frac{n}{n-1}$ B) $\frac{n-1}{n^2} + \frac{1}{n}$ C) $\frac{n-1}{2n-1}$ D) $\frac{n}{2n-1}$ E) $\frac{n-1}{n^2}$

26. A study is done of people who have been charged by police on a drug-related crime in a large urban area. A conviction must take place in order for there to be a sentence of jail time.

The following information is determined:

(a) 75% are convicted.

(b) 10% of those convicted actually did not commit the crime.

(c) 25% of those not convicted actually did commit the crime.

(d) 2% of those who actually did not commit the crime are jailed.

(e) 20% of those who actually did commit the crime are not jailed.

Find the probability that someone charged with a drug-related crime who is convicted but not sentenced to jail time actually did not commit the crime.

A) .35   B) .40   C) .45   D) .50   E) .55

24. continued

Sailboats: Mean repair cost for one boat $= 1000(.1) = 100$,

second moment of repair cost for one boat $= [400,000 + 1000^2](.1) = 140,000$.

Variance of repair cost for one power boat $= 140,000 - 100^2 = 130,000$.

Luxury Yachts: Mean repair cost for one boat $= 5000(.6) = 3000$,

second moment of repair cost for one boat $= [2,000,000 + 5000^2](.6) = 16,200,000$.

Variance of repair cost for one power boat $= 16,200,000 - 3000^2 = 7,200,000$.

The mean of the aggregate repair cost is $100(90) + 300(100) + 50(3000) = 189,000$,

and the variance is $100(21,900) + 300(130,000) + 50(7,200,000) = 401,190,000$.

The amount budgeted by the marina is $189,000 + \sqrt{401,190,000} = 209,030$. Answer: B

25. $P[B \text{ received the letter}|A \text{ did not receive an answer after writing to } B]$

$$= \frac{P[(B \text{ received the letter}) \cap (A \text{ did not receive an answer after writing to } B)]}{P[A \text{ did not receive an answer after writing to } B]} \ .$$

But, $P[A \text{ does not receive a reply after writing to } B]$

$\quad = P[(A \text{ does not receive a reply after writing to } B) \cap (B \text{ received } A\text{'s letter})]$

$\quad + P[(A \text{ does not receive a reply after writing to } B) \cap (B \text{ did not receive } A\text{'s letter})]$.

$P[(A \text{ does not receive a reply after writing to } B) \cap (B \text{ received } A\text{'s letter})]$

$= P[A \text{ does not receive a reply after writing to } B|B \text{ received } A\text{'s letter}]$

$\qquad \times P[B \text{ received } A\text{'s letter}] = \frac{1}{n} \cdot \frac{n-1}{n}$, and

25. continued

$P[(A \text{ does not receive a reply after writing to } B) \cap (B \text{ did not receive } A\text{'s letter})]$

$= P[A \text{ does not receive a reply after writing to } B|B \text{ did not receive } A\text{'s letter}]$

$\qquad \times P[B \text{ did not receive } A\text{'s letter}] = 1 \cdot \frac{1}{n}$.

Therefore,

$P[A \text{ does not receive a reply after writing to } B] = \frac{n-1}{n} \cdot \frac{1}{n} + \frac{1}{n} = \frac{2n-1}{n^2}$ and

$P[B \text{ received the letter}|A \text{ did not receive an answer after writing to } B]$

$= \frac{P[(B \text{ received the letter}) \cap (A \text{ did not receive an answer after writing to } B)]}{P[A \text{ did not receive an answer after writing to } B]}$

$= \frac{(n-1)/n^2}{(2n-1)/n^2} = \frac{n-1}{2n-1}$.   Answer: C