1. [2 marks] A company car is valued at $y = 62,500 - 2370x$, where y is in dollars and x is the number of years after 2019.

a) In which year will the value be \$22,210?

Sub $y = 22210$: $22210 = 62500 - 2370x$

$-40290 = -2370x$

$17 = x$

$x = \text{year} - 2019$

$17 = \text{year} - 2019$

$2036 = \text{year}$

b) What was the value in the year 2025?

$x = \text{year} - 2019$

$x = 2025 - 2019$

$x = 6$

Sub $x = 6$: $y = 62500 - 2370(6)$

$y = \$48,280$

2. [2 marks] At a certain company: 32% of employees are gym members, 40% of employees work in finance, and 18% of employees work in finance and are gym members. Find the probability that an employee who works in finance is a gym member.

given

$\Pr(\text{gym member} \mid \text{finance})$

$= \dfrac{\Pr(\text{gym member and finance})}{\Pr(\text{finance})}$

$= \dfrac{0.18}{0.4}$

$= 0.45$

3. [2 marks] Events E and F are independent.
Calculate $Pr(E)$ in each situation.

a) $Pr(E \cap F) = 0.56$ and $Pr(F) = 0.7$

$Pr(E \cap F) = Pr(E) \cdot Pr(F)$ if E and F are independent.

$0.56 = Pr(E)(0.7)$

$0.8 = Pr(E)$

b) $Pr(E|F) = 0.3$ and $Pr(F) = 0.4$

$Pr(E|F) = Pr(E)$ if E and F are independent.

$0.3 = Pr(E)$

4. [3 marks] Four radio stations each randomly select one of 12 broadcast frequencies. What is the probability that at least two of the stations select the same frequency?

E: at least 2 stations select the same frequency

E': all stations select different frequencies

$n(S) = 12 \times 12 \times 12 \times 12 = 12^4$

$n(E') = P(12,4)$ or $12 \times 11 \times 10 \times 9 = 11880$

$Pr(E') = \frac{11880}{12^4} \approx 0.57$

$Pr(E) = 1 - Pr(E') \approx 0.43$

5. [3 marks] A box contains nine \$20 bills and seven \$100 bills. You pay \$30 and randomly draw a bill from the box. Let X be your net winnings (in dollars).

a) Find the probability distribution of X.

\$20	\$100
9	7

total = 16

X = net winnings (\$)
= amount won − 30

	X	P(X)
draw a \$20 bill	−10	9/16
draw a \$100 bill	70	7/16

b) Find the expected value of X.

$$\mu = -10\left(\frac{9}{16}\right) + 70\left(\frac{7}{16}\right)$$

$$\mu = 25.$$

or $E(x) = 25$

We expect to win \$25 net, on average.

6. [4 marks] A telemarketer has a 12% chance of making a sale on each call. Find the probability that the telemarketer makes a sale on at most two of the next 20 calls.

Binomial Experiment

$n = 20$

$p = 0.12$

$q = 1 - p = 0.88$

$x =$ # of sales made

$P(x \leq 2)$

$= P(x=0) + P(x=1) + P(x=2)$

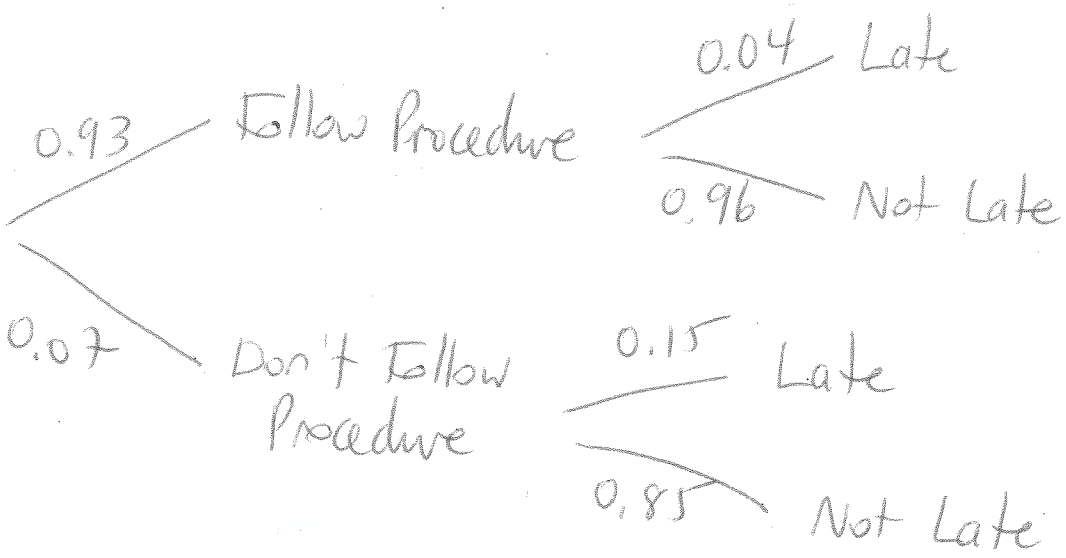
$\boxed{{}_nC_x \, p^x q^{n-x}}$

$= {}_{20}C_0 (0.12)^0 (0.88)^{20} + {}_{20}C_1 (0.12)^1 (0.88)^{19} + {}_{20}C_2 (0.12)^2 (0.88)^{18}$

≈ 0.56

7. [4 marks] Employees at a courier company follow procedure 93% of the time. When procedure is followed, 4% of packages are delivered late. When procedure is not followed, 15% of packages are delivered late. What is the probability that procedure was followed, given that a package is delivered late?

given



$$\Pr(\text{Follow Procedure} \mid \text{Late})$$

$$= \frac{\Pr(\text{Follow Procedure} \cap \text{Late})}{\Pr(\text{Late})}$$

$$= \frac{0.93(0.04)}{[0.93(0.04) + 0.07(0.15)]}$$

$$\approx 0.78$$