1-2. A person will be selected at random from all those sorted by sex and gene type in the table below.

	AA	Aa	aa	
male	5	7	5	17
female	6	9	3	18
	11	16	8.	/35.

1. What is the probability the person does not have gene type aa?

a. $\frac{5}{17}$ b. $\frac{17}{35}$ c. $\frac{3}{18}$ d. $\frac{25}{35}$ e. $\frac{27}{35}$

~~27~~ 5 7
6 9 total 27

2. What is the conditional probability P(aa $|_{\text{if}}$ female), that the selected person has gene type aa if they are female?

a. $\frac{5}{17}$ b. $\frac{17}{35}$ c. $\frac{3}{18}$ d. $\frac{25}{35}$ e. $\frac{27}{35}$

$\frac{3}{18}$

3. The number X of insurance claims for broken windshield averages 400 per week. There are many opportunities for such a claim to be made and each has a small probability of happening. These appear to be independent events so the Poisson model is deemed appropriate for random variable X. Determine a 68% interval for X (answer rounded).

a. [380, 420] b. [180, 220] c. [0, 800] d. [360, 440] e. [300, 500]

$\mu = 400. = \lambda.$

$\sigma = \sqrt{400} = 20.$

4-7. Suppose that P(OIL) = 0.4, P(− $|_{\text{if}}$ OIL) = 0.3, P(− $|_{\text{if}}$ OIL^C) = 0.8.

4. P(OIL^C −) =

a. 0.2 b. 0.3 c. 0.8 d. 0.6 e. 0.48

$P(OIL^c)P(-|OIL^c)$
$= 0.6\times0.8 = 0.48$

5. P(−) =

a. 0.2 b. 0.3 c. 0.8 d. 0.6 e. 0.48

$P(OIL^-) + P(OIL^c -) = 0.4\times0.3 + 0.6\times0.8$
$= 0.12 + 0.48 = 0.6$

6. P(OIL $|_{\text{if}}$ −) =

a. 0.2 b. 0.3 c. 0.8 d. 0.6 e. 0.48 $= P(OIL^-)/P(-) = \frac{0.12}{0.6} = 0.2$

Suppose also that the cost to test is 10, the cost to drill is 60, and the gross return from finding OIL is 400.

7. NET return from policy "test, but only drill if the test is positive" for the contingency OIL^C+ is equal to:

a. 330 b. -70 c. -100 d. -60 e. 340

Test Drill OIL Return.
-10 -60 0 on OIL^c

$-10 - 60 + 0. = -70.$

8. People are equal-probability selected from a population and sorted by sex and gene type. Which one of the tables below exhibits independence between sex and gene type?

a.

	AA	Aa	aa
male	20	15	10
female	50	45	20

b.

	AA	Aa	aa
male	40	40	20
female	60	90	30

c.

	AA	Aa	aa
male	60	50	20
female	90	45	30

d.

	AA	Aa	aa
male	20	10	10
female	30	45	15

e.

	AA	Aa	aa
male	60	45	15
female	20	15	5

60:20 as 45:15 as 15:5
proportionality is the apperance of independence in tabled counts.

9-11. We are given the probability distribution and summary totals shown:

x	p(x)	x p(x)	x^2 p(x)
- 2	0.1	-0.2	0.4
0	0.7	0	0
4	0.2	0.8	3.2
totals	1.0	0.6	3.6
		EX	$E(X^2)$

$\sum_{x} x^2 P(x) = 3.6$

9. E X^2 =
a. ~7 b. 3.6 c. 3.24 d. 15 e. 2.8

10. Var X = (you may use a calculator or employ summary information above)
a. ~7 b. 3.6 c. 3.24 d. 15 e. 2.8

$Var X = E(X^2) - (EX)^2 = 3.6 - 0.6^2 = 3.24$
SHORT FORM.

11. P(2 X > 1) =
a. 0.5 b. 1 c. 0.2 d. 0.9 e. 0.3

$P(X > 0.5)$
Only 4 is larger than 0.5
$P(4) = 0.2$ / $\boxed{0.2}$

12-14. A plane has two engines. The probability of the left engine failing is 0.002. The probability of the right engine failing is 0.003. Engine failures are independent events.

12. What is the probability that neither engine fails?
a. 0.002 + 0.003 - 0.002 0.003 b. 0.002 0.003 c. 0.998 0.003 d. 0.002 0.997 e. 0.998 0.997

LNOT RNOT·

13. What is the probability that ~~(the left engine~~ fails) $\cap_{\text{and}}$ (the right does not)?
a. 0.002 + 0.003 - 0.002 0.003 b. 0.002 0.003 c. 0.998 0.003 d. 0.002 0.997 e. 0.998 0.997

14. What is the probability that (the left engine fails) $\cup_{\text{or}}$ (the right engine fails)?
a. 0.002 + 0.003 - 0.002 0.003 b. 0.002 0.003 c. 0.998 0.003 d. 0.002 0.997 e. 0.998 0.997

Additive Rule

15-19. A lottery has return X which is a random variable with
E X = 2 Var X = 9

15. Standard deviation of X =
a. 4 b. 1 c. 7 d. 2 e. 3 $\sqrt{VarX} = \sqrt{9} = 3$

16. Variance of (2 X + 7) =
a. 25 b. 9 c. 36 d. 18 e. 43 4 VarX = 36

For 100 independent plays of the lottery define $T = X_1 + \ldots + X_{100}$.

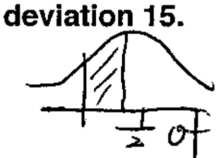
17. E T =
a. 30 b. 7 c. 200 d. 140 e. 3 100 EX = 200.

18. Var T =
a. 900 b. 300 c. 20 d. 140 e. 530 100 VarX = 900.

19. Approximate 68% interval for T = $200 \pm \sqrt{900} = 200 \pm 30$
a. [120, 280] b. [180, 220] c. [170, 230] d. [135, 265] e. [140, 260]

20-21. The distribution of IQ is normal with mean 100 and standard deviation 15.

20. The probability of an IQ in range [100-15, 100] is approximately:
a. 0.34 b. 0.05 c. 0.11 d. 0.68 e. 0.95



$\frac{1}{2}$ of 68%

21. The probability of IQ outside the range [100-30, 100+30] is approximately:
a. 0.34 b. 0.05 c. 0.11 d. 0.68 e. 0.95 (draw a picture and work with pieces)

1 − 0.95 = 0.05