STUDENTS OF BOTH LECTURES SHOULD CONSULT THIS KEY TO THE 5:30 QUIZ.

1-25-10.

1-5. Events A, B are said to have P(A) = 0.8, P(B) = 0.4.

1. If **P(A $\cap_{\text{and}}$ B) = 0.3** then P(A $\cup_{\text{or}}$ B) = ADDITION RULE $P(A)+P(B)-P(A\cap_{\text{and}}B)$
a) 0.9 b) 0.32 c) 0.4 d) 0.37 e) 0.5 $.9 = .8 + .4 - .3$

2. If **P(A $\cap_{\text{and}}$ B) = 0.3** then P(B $|_{\text{if}}$ A) = DEFINITION $P(A\cap_{\text{and}}B)/P(A) = \frac{0.3}{0.8} = 0.375$
a) 0.9 b) 0.32 c) 0.4 d) 0.37 e) 0.5 (closest answer)

3. If **P(A $\cap_{\text{and}}$ B) = 0.3** then P(A $\cap_{\text{and}}$ B^C) = VENN $P(A)-P(A\cap_{\text{and}}B^c) = .8 - .3 = .5$
a) 0.9 b) 0.32 c) 0.4 d) 0.37 e) 0.5

4. If **P(B $|_{\text{if}}$ A) = 0.4** then P(A $\cap_{\text{and}}$ B) = MULTIPLICATION RULE $P(A)\,P(B|_{\text{IF}}A) = 0.8 \; 0.4 = 0.32$
a) 0.9 b) 0.32 c) 0.4 d) 0.37 e) 0.5

5. If **A, B are independent** then P(B $|_{\text{if}}$ ~~A~~) = IF INDEPENDENT P(B)
a) 0.9 b) 0.32 c) 0.4 d) 0.37 e) 0.5

6-10. Given the following:

OIL 0.2	**+** **0.6**	OIL +	.2 .6 = .12
	0.4 **−**	OIL −	.2 .4 = .08
OIL^C 0.8	**+** **0.1**	OIL^c +	.8 .1 = .08
	0.9 **−**	OIL^c −	.8 .9 = .72
			1

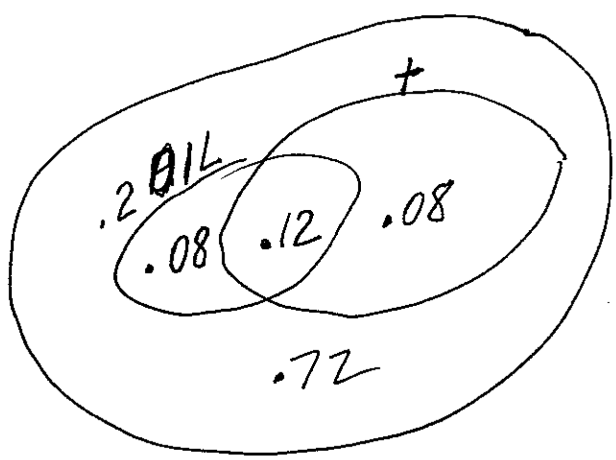


TABLE CONVENTION

6. P(+ **|** **if** OIL) = 0.6
a) 0.6 b) 0.06 c) 0.2 d) 0.12 e) 0.7

7. P(OIL $\cap_{\text{and}}$ +) = MULT RULE P(OIL) P(+ $|_{\text{IF}}$ OIL) = .2 .6 = .12
a) 0.6 b) 0.06 c) 0.2 d) 0.12 e) 0.7

8. P(+) = TOTAL PROBABILITY RULE P(OIL+) + P(OIL^c+) - 0 NO OVERLAP OF OIL+ WITH OIL^c+
.2 .6 + .8 .1 = .2
a) 0.6 b) 0.06 c) 0.2 d) 0.12 e) 0.7

9. P(OIL **|** **if** +) = BAYES, BUT JUST DEFINITION = $\frac{P(OIL+)}{P(+)} = \frac{.12}{.2} = .6$ (SEE VENN ALSO)
a) 0.6 b) 0.06 c) 0.2 d) 0.12 e) 0.7

10. Suppose that: Cost to test is 30.
Cost to drill is 100.
Gross return from drilling for oil, when it is present is 1000.

For the contingency **OIL^c+** determine the **NET return** from the policy: "test, but only drill if the test is +"
a) -30 b) -130 c) -200 d) 870 e) 970

OIL^c+ -30 - 100 + 0
TEST DRILL SINCE TEST+ NO OIL

11-13. A random variable X has the following probability distribution:

x	p(x)	x p(x)	x^2 p(x)
0	**0.4**	0	0
1	**0.2**	.2	1^2 .2 = .2
2	**0.4**	.8	2^2 .4 = 1.6
		1 = EX	1.8 = E X^2

11. P(X > 1) = .4
a) 0.1 b) 0.5 c) 0.4 d) 0.6 e) 0.9

12. E X = 1
a) 2.5 b) 0.9 c) 1.5 d) 0.8 e) 1

13. Variance X = E X^2 - (E X)^2 = $1.8 - 1^2 = 0.8$
a) 1 b) 0.6 c) 1.4 d) 2 e) 0.8

14-16. One play of a lottery has random return Y with:
E Y = 4.
Variance Y = 9 (so standard deviation = 3).

14. Determine the expected total return from 100 independent plays.
a) 400 b) 20 c) 0.03 d) 200 e) 300

$E(Y_1 + \cdots + Y_{100}) = 100\, EY = 400$

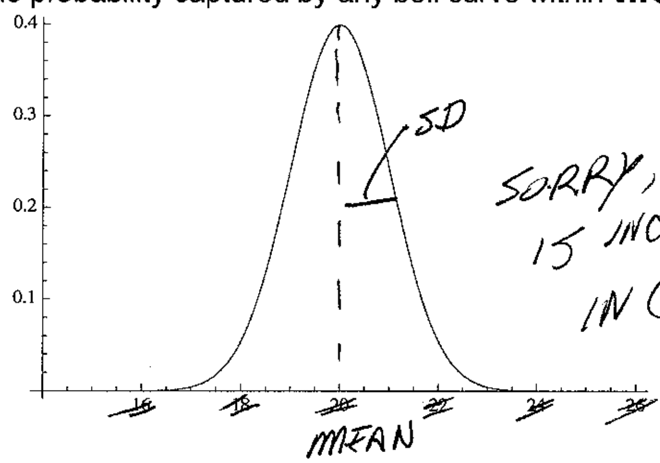
15. Determine the Variance of the total return from 100 independent plays.
a) 400 b) 60 c) 100 d) 2000 e) 900

$Var(Y_1 + \cdots + Y_{100}) \overset{INDEP}{=} 100\, Var\, Y = 900$

16. The probability distribution of the total return from 100 independent plays is approximated by a bell curve. What are the mean and **standard deviation (not variance)** of this bell curve?
a) (400, 400)) b) (400, 900) c) (0.04, 20) d) (400, 30) e) (400, 60)

SD TOTAL $= \sqrt{900} = 30$

17. (unrelated to above) Here is a sketch of a bell curve with mean 20 and standard deviation 4. What is the approximate probability of the interval [20-8, 20+8]? Use the rule of thumb given in lecture for the probability captured by any bell curve within **two** standard deviations of its mean.



SORRY, THE PLOT IS INCORRECT IN GENERAL

MEAN ± 1 SD 68%
MEAN ± 2 SD 95%

a) 0.46 b) 0.68 c) 0.95 d) 0.75 e) 0.5