Formulas: $F = (1+i)^n P$ $\quad F = s_{\overline{n}|i}\ R$ $\quad P = a_{\overline{n}|i}\ R$

$$s_{\overline{n}|i} = \frac{(1+i)^n - 1}{i} \qquad a_{\overline{n}|i} = \frac{(1+i)^n - 1}{i(1+i)^n}$$

$$\text{If} \quad A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \text{ then } \quad A^{-1} = \begin{bmatrix} \frac{d}{ad-bc} & \frac{-b}{ad-bc} \\ \frac{-c}{ad-bc} & \frac{a}{ad-bc} \end{bmatrix}$$

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1. Let A = {c,d,e}, let B = {x,y}, and let the universal set U = {c,d,e,x,y,z}. Then $(A' \cap B')' =$

a) {z} b) {d,e} c) {c,d,e,x,y} d) U e) ∅

2. Out of 100 people in a certain class, 70 people did well on the first test, 60 did well on the second test, and 50 did well on both tests. How many people did well on **neither** test?

a) 60 b) 30 c) 50 d) 20 e) 40

3. A company has 10 cars and 10 garages. Each night the cars are all put away-exactly one to a garage. In how many ways can the cars be put away?

a) 10! b) 2^{10} c) $\binom{10}{1}$ d) P(10,5) e) 10^2

4. A person tosses a fair coin 3 times. What is the probability of getting exactly one tail out of the 3 tosses? a) $\frac{1}{8}$ b) $\frac{3}{8}$ c) $\frac{5}{8}$ d) $\frac{1}{3}$ e) $\frac{2}{8} \cdot \frac{1}{8}$

In the next 2 problems there is a house with exactly 400 books, 320 are math books and 80 are novels (which are not math books.)

5. How many different samples of 10 books can be chosen?

a) $\binom{400}{10}$ b) P(400,10) c) $\frac{320 \cdot 80}{6!}$ d) 400^{10} e) $\binom{320}{8}\binom{80}{2}$

6. How many samples of 10 books contain no math books?

a) 10^{320} b) $400^{10} - 80^{10}$ c) 80^{10} d) $\binom{400}{10} - \binom{320}{10}$ e) $\binom{80}{10}$

In the next 3 problems, let S be a sample space with E, F, G events associated to S. Assume P(E) = 0.5, P(F) = 0.6, P(E ∩ F) = 0.2 and P(G) = 0.4.

7. If E and G are independent the P(E ∩ G) = a) not enough information b) $\frac{1}{5}$ c) $\frac{4}{5}$ d) $\frac{1}{2}$ e) $\frac{2}{5}$

8. P(E|F) = a) 0.1 b) 0.12 c) 0.4 d) $\frac{2}{4}$ e) $\frac{1}{3}$

9. P(F′) = a) not enough information b) 0.6 c) 0.24 d) 0.4 e) 0.2

Problems 10 and 11 refer to the following 2 matrices

Let $M = \begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$, $N = \begin{bmatrix} 2 & 0 & -1 \\ 1 & 1 & 0 \end{bmatrix}$

10. Find M · N

a) $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 7 & 0 \end{bmatrix}$ b) $\begin{bmatrix} 5 & 3 & -1 \\ 11 & 7 & -2 \end{bmatrix}$ c) $\begin{bmatrix} 2 & 5 \\ 0 & 7 \\ 1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} -1 & 3 & 5 \\ 0 & 7 & 11 \end{bmatrix}$ e) They can't be multiplied

11. Find M^{-1}

a) $\begin{bmatrix} 7 & -3 \\ -2 & 1 \end{bmatrix}$ b) [−3 −14] c) $\begin{bmatrix} 2 & 7 \\ 1 & 3 \end{bmatrix}$ d) $\begin{bmatrix} 3 & -7 \\ -1 & 2 \end{bmatrix}$ e) $\begin{bmatrix} -14 \\ -3 \end{bmatrix}$

12. Suppose x and y satisfy the two equations $x + 4y = 2$ $2x + 6y = 1$ What is y?

a) 2 b) −1 c) $\frac{3}{2}$ d) $-\frac{5}{2}$ e) not enough information.

13. Use the normal approximation to the binomial distribution to estimate the probability of getting 55 or more heads in 100 tosses of a fair coin.

a) .6179 b) .3821 c) .1841 d) .0359 e) .4500

14. The random variable Y has the probability distribution shown.

Y = k	−3	0	3	5
Pr(Y = k)	.1	.6	.1	.2

What is the expected value of Y? a) 0 b) − .5 c) .5 d) 1 e) 1.6

15. An experiment consists of rolling a fair die 10 times and counting the number of ones. What is the probability of getting 1 or 2 ones?

a) $\binom{10}{1} + \binom{10}{2}$ b) $\binom{10}{1}\left(\frac{1}{6}\right)^{1} + \binom{10}{2}\left(\frac{1}{6}\right)^{2}$ c) $\binom{10}{1}\left(\frac{1}{6}\right)^{10} + \binom{10}{2}\left(\frac{1}{6}\right)^{10}$

d) $\binom{10}{1}\binom{10}{2}\left(\frac{1}{6}\right)\left(\frac{5}{6}\right)$

e) $\binom{10}{1}\left(\frac{1}{6}\right)^{1}\left(\frac{5}{6}\right)^{9} + \binom{10}{2}\left(\frac{1}{6}\right)^{2}\left(\frac{5}{6}\right)^{8}$

16. Let X denote a random variable having a normal distribution with $\mu = 10$ and $\sigma = 4$. Find $Pr(10 \le X \le 14)$. a) .3413 b) .5000 c) .0060 d) .6915 e) .3085

17. Suppose the length of the Madagascar hissing cockroach is normally distributed with $\mu = 40$ millimeters and $\sigma = 5$. What is the probability of a Madagascar hissing cockroach having a length of 45 or more millimeters? a) .0228 b) .1587 c) .3085 d) .3821 e) .6179

18. A survey is conducted and it is found that 60% of Indiana residents can name the capital of Florida. What is the probability that exactly 4 out of 7 randomly chosen Indiana residents can name the capital of Florida?

a) $\binom{4}{7}(.6)$ b) $\binom{7}{4}(.6)(.4)$ c) $\binom{7}{4}(.6)^7$ d) $\binom{7}{4}(.6)^4 - \binom{7}{3}(.4)^3$ e) $\binom{7}{4}(.6)^4(.4)^3$

19. Dan invested \$10,000 at 12% annual interest compounded **monthly**. How much will he have at the end of 15 years?

a) 16,678.34 b) 59,958.02 c) 49,958.02 d) 83,321.66 e) 34,548.15

20. Sue took out a 25-year \$60,000 mortgage at 6% annual interest compounded **monthly**. What is the monthly payment? a) \$144.30 b) \$155.21 c) \$386.58 d) \$692.99 e) \$865.81

21. At the end of every 3 months Jason deposits \$100 into a savings account receiving 6% annual interest compounded **quarterly**. How much will Jason have in the account at the end of 5 years? a) 5,331.28 b) 6,977.00 c) 4,324.46 d) 1,716.86 e) 2,312.37

22. How much money must you deposit now into a savings account receiving 8% annual interest rate compounded **quarterly** in order to be able to withdraw \$2000 at the end of each quarter year for 12 years? a) 61,346.24 b) 68,085.11 c) 158,707.01 d) 50,977.68 e) 69,521.77

23. George took out a loan in the amount of \$563. He paid off the loan in 5 months with monthly payments of \$116. How much interest did he pay?

a) \$56.30 b) \$116 c) \$11.60 d) \$44.7 e) \$17

24. Helen would like to buy a \$50,000 recreational vehicle when she retires in 10 years. How much should she deposit at the end of each month into an account receiving 12% annual interest compounded **monthly** so that she will have enough money to purchase the vehicle?

a) \$348.50 b) \$717.35 c) \$555.10 d) \$217.35 e) \$331.29

25. Find the stable distribution $\begin{bmatrix} x \\ y \end{bmatrix}$ of the matrix $\begin{bmatrix} .2 & .4 \\ .8 & .6 \end{bmatrix}$.

a) $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{1}{4} \\ \frac{3}{4} \end{bmatrix}$ b) $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \end{bmatrix}$ c) $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{1}{3} \\ \frac{2}{3} \end{bmatrix}$

d) $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{2}{3} \\ \frac{1}{3} \end{bmatrix}$ e) $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{1}{4} \\ \frac{1}{4} \end{bmatrix}$

26. If $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} \\ \frac{1}{2} & \frac{3}{4} \end{bmatrix}$ is the transition matrix of a Markov process and the initial distribution is $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$. Then the next two distributions are:

a) $\begin{bmatrix} \frac{1}{4} \\ \frac{3}{4} \end{bmatrix}$ and $\begin{bmatrix} \frac{2}{3} \\ \frac{1}{3} \end{bmatrix}$ b) $\begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \end{bmatrix}$ and $\begin{bmatrix} \frac{2}{3} \\ \frac{1}{3} \end{bmatrix}$ c) $\begin{bmatrix} \frac{1}{4} \\ \frac{3}{4} \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \end{bmatrix}$

d) $\begin{bmatrix} \frac{1}{4} \\ \frac{3}{4} \end{bmatrix}$ and $\begin{bmatrix} \frac{5}{16} \\ \frac{11}{16} \end{bmatrix}$ e) $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \end{bmatrix}$

27. Let $\begin{bmatrix} 0 & \frac{1}{3} & \frac{1}{3} \\ 1 & \frac{1}{3} & \frac{1}{3} \\ 0 & \frac{1}{3} & \frac{1}{3} \end{bmatrix}$ be the transition matrix of a Markov process. Then the matrix is:

a) regular but not absorbing
b) regular and absorbing
c) absorbing but not regular
d) neither absorbing nor regular
e) none of the above

28. Which of the following statements are **impossible**:

(1) A graph with 7 vertices each of degree 5.
(2) A connected graph with 5 vertices and 4 edges.
(3) A connected graph with 5 vertices and 3 edges.
(4) A graph with 4 vertices and 4 edges.

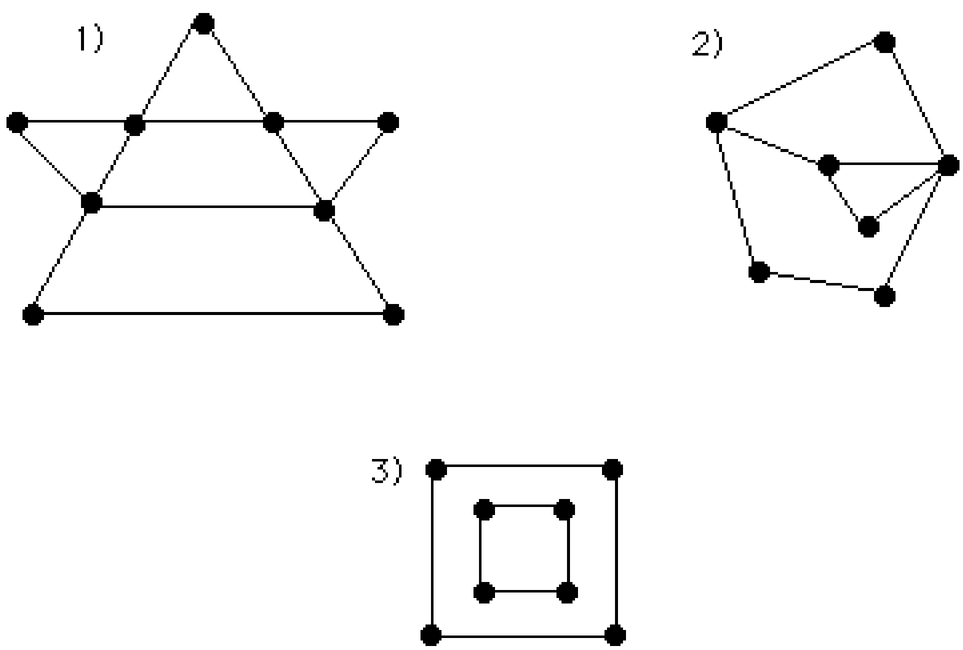
a) (1), (3) and (4) b) (1) and (3) c) (2) and (3)

d) (2) and (4) e) (1) and (2)

29. A graph has 4 vertices, of degrees 2, 3, 4, 5 respectively. What is the number of edges?

a) 10 b) 6 c) 4 d) 7 e) not enough information

30. Which of the following graphs contain an Euler circuit?



a) 1 and 2 b) 1, 2 and 3 c) 1 and 3 d) 2 and 3 e) 1