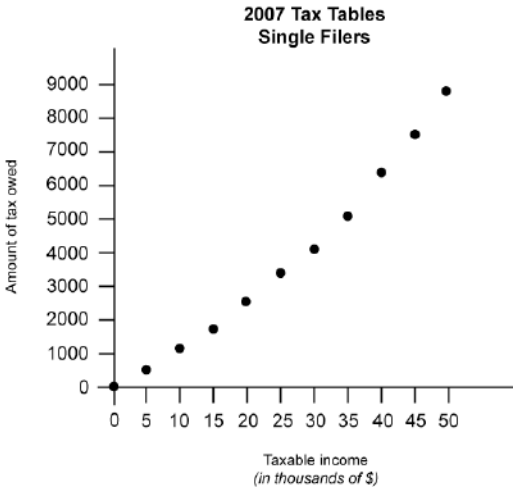
Advanced Mathematical Decision Making

Diagnostic Pre-Test

Spring Semester

1. Consider the following graph. Who are the subjects in the study? What are the variables of interest?

The subjects are single tax filers in 2007. The variables of interest are each participant's taxable income and the amount of tax owed.



2. Decide if the data creates a linear function or not. If it is linear give the formula for it.

x	1	2	3	4
G(x)	4	10	16	22

Linear; G(x) = 6x - 2

x	1	2	3	4
P(x)	3	7	11	21

Non-Linear

3. Coen decides to take a job with a company that sells magazine subscriptions. He is paid $20 to start selling and then earns $1.50 for each subscription he sells. How much money will Coen earn by the time he makes his 5th sale?

$27.50

4. Suppose Coen's earning structure changed so that for every magazine subscription he sold, he made 1.5 times his previous earnings. Again, assume that he starts with $20 for 0 subscriptions sold. How much money will Coen earn by the time he makes his 4th sale?

$101.25

Use the following information to answer questions 4 & 5:

During the 1990s and early 21st century, many states deregulated electricity. As a result, numerous electric companies can now provide electricity for a particular area. One such company is Lights and Power. To attract customers, Lights and Power is advertising a special:

Cheapest Electricity in Town!
To 1,000 kWh—$0.11 per kWh
More than 1,000 to 1,500 kWh—$0.18 per kWh
More than 1,500 kWh—$0.25 per kWh
No hidden fees! We promise!

5. According to the advertisement, how much does the first 1,000 kilowatt-hours (kWh) of electricity cost a customer?

$0.11 per kilowatt-hour

6. Suppose Mrs. Brown uses 1,200 kilowatt-hours of electricity. How much does she pay altogether for 1,200 kilowatt-hours of electricity?

$0.11(1,000) + $0.18(200) = $146

Kafi is considering three job offers in educational publishing.

- **One is a full-time position as an editor that pays a salary of $37,500 per year.**
- **Another is a full-time position as an e-Learning designer that pays an hourly wage of $26.50. The job assumes five 8-hour days per week.**
- **The final offer is for a sales representative that pays a 5% commission. Sales representatives typically sell an average of $100,000 per month in textbooks.**

7. Estimate the gross *annual* income and the gross *monthly* income for each job offer. For the purposes of his comparison, Kafi assumes that each job pays monthly.

Jobs	Editor	Designer	Sales Representative
Process	None	26.50 • 40 • 52	$100, 000 • 0.05 • 12
Gross annual income	$37,500.00	$55,120.00	$60,000.00
process	37, 500 ÷ 12	55 ,120 ÷ 12	60, 000 ÷ 12
Gross monthly income	$3,125.00	$4,593.33	$5,000.00

8. Traci purchases a car for $16,000. If its value depreciates by 12% per year, what will be the car's value in 5 years?

$8443.71

Match each of the sequences with the correct closed form or recursive form formula shown.

9. 3, 12, 27, 48, … _____c_____ a) $t_n = 3n - 2$ for n = 1, 2, 3,…

10. 3, −9, 27, −81, … _____d_____ b) $t_1 =$ _____, $t_{n+1} = t_n + 5$

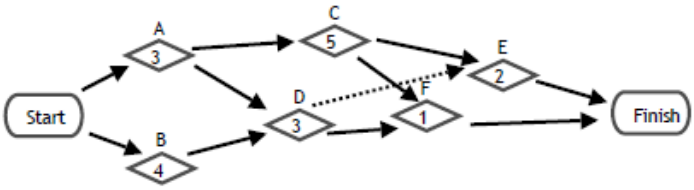
11. 1, 4, 7, 10, … _____a_____ c) $t_n = 3n^2$ for n = 1, 2, 3,…

12. 1, 6, 11, 16, … _____b_____ d) $t_1 =$ _____, $t_{n+1} = -3 \cdot t_n$

13. The population of flies in Mr. Bunn's classroom doubles every 5 days. If there were 10 flies on the first day of school, when will the population reach 2,000,000?

≈88 days

14. Determine the minimum time required to complete all the activities shown in the graph.



10

15. Give the first 5 terms of each sequence:

a) $a_n = 3n + 4$ if n = 1, 2, 3, …

7, 10, 13, 16, 19, 22

b) $a_1 = 3$ and $a_n = a_{n-1} - 2$

3, 1, -1, -3, -5

16. If a job pays $44,000 per year, what would be the estimated monthly after-tax income if you are required to pay 15% in federal income tax, 6.2% SSN, and 1.45% for Medicare?

$34,034.00

17. Which of the following is the adjacency matrix for the graph below?

a.

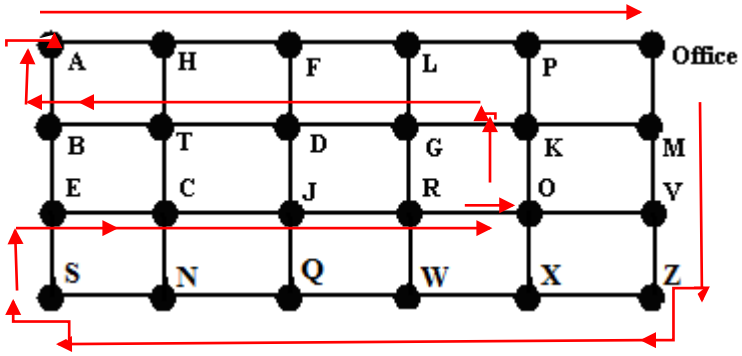
18. The recurrence relation is $t_n = 3t_{n-1} + 1$. What is the value of t_n when n = 4?

a. 94
b. 31
c. 78
d. 124

n	t_n
1	3
2	
3	
4	
5	

19. A mail carrier is assigned a new section of town. Before heading out, he wants to determine the most efficient route that still allows him to visit each house and return to the post office without visiting a house twice.

a. Find such a route on the map below or explain why no such route exists.
(List the letters as you visit them or highlight the path using arrows to show direction.)



Multiple solutions are possible.