SHENTON COLLEGE

Mathematics Applications Year 12

Test 3 2019 Calculator Assumed

Name: .....

Teacher: Mackenzie McRae Ryan Staffe

Time Allowed: 50 minutes

Marks /54

Materials allowed: Calculator, 1 A4 page of notes, formula sheet provided.
Attempt all questions.

Question 1 [2, 2, 2, 2 marks]

(a) How much does $40 000 amount to if it is invested at 3.7% per annum, compounded

(i) quarterly for one year? (2 marks)

(ii) monthly for 10 years? (2 marks)

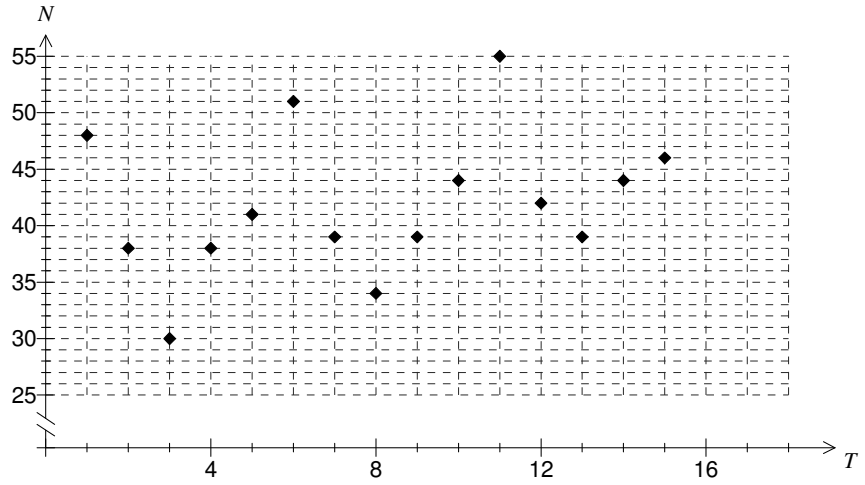
(b) What is the effective rate of interest when $40 000 is invested at 3.7% per annum, compounded quarterly? (2 marks)

(c) Compare the effective rate of interest found in (b) with the effective rate of interest when $40 000 is invested at 3.7% per annum, compounded every fortnight. (2 marks)

Question 2 [2, 1, 1, 2, 2, marks]

The table and graph below show N, the number of calls per weekday to a new enquiry line, over a three week period, together with five-point moving averages, M.

	Week 1					Week 2					Week 3				
Day	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F
T	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
N	48	38	30	38	41	51	39	34	39	44	55	42	39	44	46
M			39.0	39.6	39.8	40.6	**(b)**	41.4	42.2	42.8	43.8	44.8	45.2		



(a) i) Explain with detail why a five-point moving average is used. (2 marks)

ii) Explain why so many scores have no moving average value. (1 mark)

(b) Write down the calculation that was used to determine the five-point moving average for Tuesday of Week 2. (1 mark)

(c) Determine the equation of the linear regression line that can be used to predict the moving average, M, from time, T. (2 marks)

(d) Draw the line of regression calculated in (c) on the graph. (2 marks)

Question 3 [1, 2, 2, 1, 2 marks]

George, a young teacher, begins saving up for a deposit on a home. His savings account already has $5000 in it. Account interest helps to grow the balance of the account at a rate of 2.7% p.a, compounded monthly, and George deposits another $275 into the account at the end of every month.

The table below shows the amount in the account at the start of each month, the interest added, the next deposit, and the balance at the end of the month.

Month	Amount at the start of month	Interest for month	Deposit	Balance at the end of the month
1	5000.00	11.25	275.00	5286.25
2	5286.25	11.89	275.00	5573.14
3	5573.14	A	275.00	B
4				

(a) Give the monthly interest rate as a percentage. (1 mark)

(b) Calculate the values of entries A and B in the table above. (2 marks)

(c) Write the recurrence relation used to determine the amount in the account at the end of each month.

(2 marks)

(d) George has just made his ninth deposit.

(i) How much money is now in his account? (1 mark)

(ii) How much interest has he earned to date? (2 marks)

Question 4 [2, 2 marks]

Casio has just released its seasonal index for share prices in June 2019 as being 0.941. John is considering purchasing shares of Casio for his shares portfolio. He knows that with shares, you "buy when the price is low and sell when it is high".

a) Would you consider June to be a good month for John to buy shares in Casio? Justify your answer. (2 marks)

b) John purchased 100 shares for a total of $450. Determine the seasonally adjusted price for a single share of Casio in June 2019. (2 marks)

Question 5 [1, 2, 2 marks]

Dave is wanting to buy a property in Albany for when he retires from teaching and is looking to buy a property in Merchant Street worth $540 000. He has a deposit of $30 000 and a local bank is willing to loan him the remainder at 4.3% p.a. compounded quarterly.
Dave feels he can make repayments of $9000 a quarter.

(a) How much will he still owe after 6 years? (1 mark)

(b) How many years will it take him to pay off the loan and what will be his final payment?

(2 marks)

(c) How much will Dave end up paying in total for the property when he has repaid the loan?

(2 marks)

Questions 6 [2, 3, 2, 2 marks]

Thunderbolt, a new electric car from the car manufacturer Tesla, can be purchased for $70000 brand new. It can depreciate at either

- 12% p.a. reducible balance **or**
- Flat rate depreciation is set at 9.6% p.a. **or**
- the expensive batteries that it runs on have a lifespan of 5000 hours before the car must be sold for a salvage cost of $22000.

(a) If the car depreciates at a flat rate, how much will the car be worth after 7 years?

(2 marks)

(b) Tesla also claims that at some point in time, the reducible balance depreciated value will start giving higher resale values for the Thunderbolt than the flat rate depreciated value. After how many years will this happen and what is the difference in their value at this time?

(3 marks)

(c) Tesla does not like advertising it but realises that the battery life is a possible factor in the Thunderbolt's depreciation. If the car's value is based on battery life,

i) What is the loss in car value for every hour it is driven?

(2 marks)

ii) What would be the value of the car after one year if the customer drove 1400 hours.

(2 marks)

Question 7 [5, 2, 2, 3 marks]

A travelling group of famous comedians, The Monty Python Players, are performing four times a week at a local theatre. The audience number for the first 3 weeks of their shows is displayed in the table below.

Week	Day	Number in Audience (in hundreds)	Weekly average (to 2 d.p.)	Percentage of daily mean (to 2 d.p.)	Seasonally adjusted figures
One	Thurs	12	A	67.61	
	Fri	15		84.51	
	Sat	23		129.58	
	Sun	21		E	
Two	Thurs	13	18.75	69.33	
	Fri	B		90.67	
	Sat	25		133.33	
	Sun	20		106.67	
Three	Thurs	D	C	75.95	
	Fri	16		81.01	
	Sat	26		131.65	
	Sun	22		111.39	

a) Determine the values of A, B, C, D and E in the table above.

(5 marks)

b) The average seasonal index for Friday was found to be 85.40%. Find the average seasonal index for Saturday, clearly showing how you determined your answer.

(2 marks)

c) Seasonally adjust the audience numbers for Saturday only and record your answers in the last column in the table.

(2 marks)

d) The equation of the regression line, using t and the seasonally adjusted data, N, is

$$\boldsymbol{N = 0.2587t + 17.15}$$

A financial consultant for the group wishes to determine the potential audience numbers for Friday of Week 4. Determine this prediction and comment on its reliability.

(3 marks)