Student Name: _____

TSSM
Creating VCE Success

GENERAL MATHEMATICS 2024

Unit 3
Key Topic Test 5 – Recursion and Financial Modelling: Depreciation of Assets

Recommended writing time: 45 minutes
Total number of marks available: 25 marks

QUESTION BOOK

* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

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Conditions and restrictions

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers, approved CAS calculator and one bound reference book.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out liquid/tape.

Materials supplied

- Question and answer book of 7 pages.

Instructions

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic communication devices into the room for this test.

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SECTION A – Multiple-choice questions

Instructions for Section A

- All questions are worth one mark.
- Answer all questions by circling the correct response.
- Marks are not deducted for incorrect answers.
- No marks will be awarded if more than one answer is completed for any question

Question 1

A laptop is purchased for $1200 and depreciates by 20% of its purchase price each year. The recurrence relation to model the value of the laptop V_n after n years is:

A. $V_0 = 1200, V_{n+1} = 0.8V_n$

B. $V_0 = 1200, V_n = 0.8V_{n+1}$

C. $V_0 = 1200, V_{n+1} = V_n - 240$

D. $V_{n+1} = 0.8V_n$

E. $V_0 = 1200, V_{n+1} = 240 - V_n$

Question 2

The flat rate depreciation of a car is modelled by:

$$V_0 = 24\,500, V_{n+1} = V_n - 1450$$

The value of the car after 3 years is:

A. $24 500 **B.** $4350 **C.** $21 600

D. $20 150 **E.** $28 850

Question 3

A farm tractor is purchased for $45 000 and depreciates by $1.80 each hour it is used. The tractor averages 840 hours of use each month. The value of the tractor after 4 months is:

A. $38 952

B. $43 488

C. $45 000

D. $44 992.80

E. $37 265

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Question 4

A car is purchased for \$34 000 and is depreciated at a reducing balance rate of a % per annum. After 2 years the car is valued at \$28 777.60. The value of a is closest to:

A. 6

B. 10

C. 1.08

D. 7.5

E. 8

Question 5

A piano is purchased for \$8 200 and depreciates using a flat rate depreciation method of 4%. The amount of depreciation after 5 years is:

A. \$328

B. \$1640

C. \$6560

D. \$6686

E. \$1514

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SECTION B - Short-answer questions

Instructions for Section B

- Answer each question in the space provided.
- Please provide appropriate workings and use exact answers unless otherwise specified.

Question 1 (5 marks)

Office furniture is purchased and depreciated using a reducing balance method according to the following recurrence relation where V_n is the value after n years:

$$V_0 = 35\,400, V_{n+1} = 0.946\,V_n$$

a. State the purchase price of the office furniture.

_____

1 mark

b. Find the reducing balance depreciation rate

_____

1 mark

c. Find the value of the furniture after 8 years

_____

1 mark

d. How long until the value of the office furniture first falls below $10 000?

_____

_____

_____

2 marks

1 + 1 + 1 + 2 = 5 marks

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Question 2 (9 marks)

A printing machine is purchased for $\$2650$ and depreciates by $\$0.05$ per 100 prints.

a. Find the value of the printing machine after 400 000 prints.

_____

_____

2 marks

b. If the printing machine averages 600 000 prints per year. How many years until the printing machine is first valued below $1500?

_____

_____

_____

2 marks

Alternatively the printing machine could be depreciated by a flat rate of $a\%$.

c. If $a = 5$, state a recurrence relation to model the value of the printing machine V_n, after n years.

_____

_____

2 marks

d. Find the value of a, correct to 2 decimal places, such that the flat rate depreciation is equal to the unit cost depreciation of $0.05 per 100 prints, given the printing machine averages 600 000 prints each year.

_____

_____

_____

_____

3 marks

2 + 2 + 2 + 3 = 9 marks

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Question 3 (6 marks)

Patrick purchases a new car for $42 000 which will depreciate in value according to the recurrence relation

$$V_0 = 42\,000, \qquad V_{n+1} = 0.88 \times V_n$$

where V_n is the value of the car after *n* years.

a. Complete the table below to show the value of the car at the end of each year, to the nearest cent.

n	0	1	2	3
V_n	42 000			

2 marks

b. Find a rule that calculates the value of the car after *n* years.

_____

_____

1 mark

c. State the annual rate of depreciation of Patrick's car.

_____

1 mark

d. Patrick decides to sell his car when the value drops below $14 000. After how many years will Patrick sell his car?

_____

_____

_____

_____

2 marks

2 + 1 + 1 + 2 = 6 marks

END OF KEY TOPIC TEST

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