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REVIEW – CHAPTER 7

7.1 – ANNUITIES

FORMULAS

FUTURE VALUE

$$FV = \frac{PMT[(1+i)^n - 1]}{i}$$

$$PMT = \frac{iFV}{(1+i)^n - 1}$$

PRESENT VALUE

$$PV = \frac{PMT[1-(1+i)^{-n}]}{i}$$

$$PMT = \frac{iPV}{1-(1+i)^{-n}}$$

i = r ÷ N

n = yN

1. **$1250** is invested at the end of each year for **4 years** into a fund that pays **3.25% per year, compounded <u>annually</u>.** Determine the **future value** of the annuity

2. Determine the **future value** of each annuity:

(a) **$300** is invested at the end of each month for **0.75 years** into an account that pays **2.65% per year, compounded <u>monthly</u>**

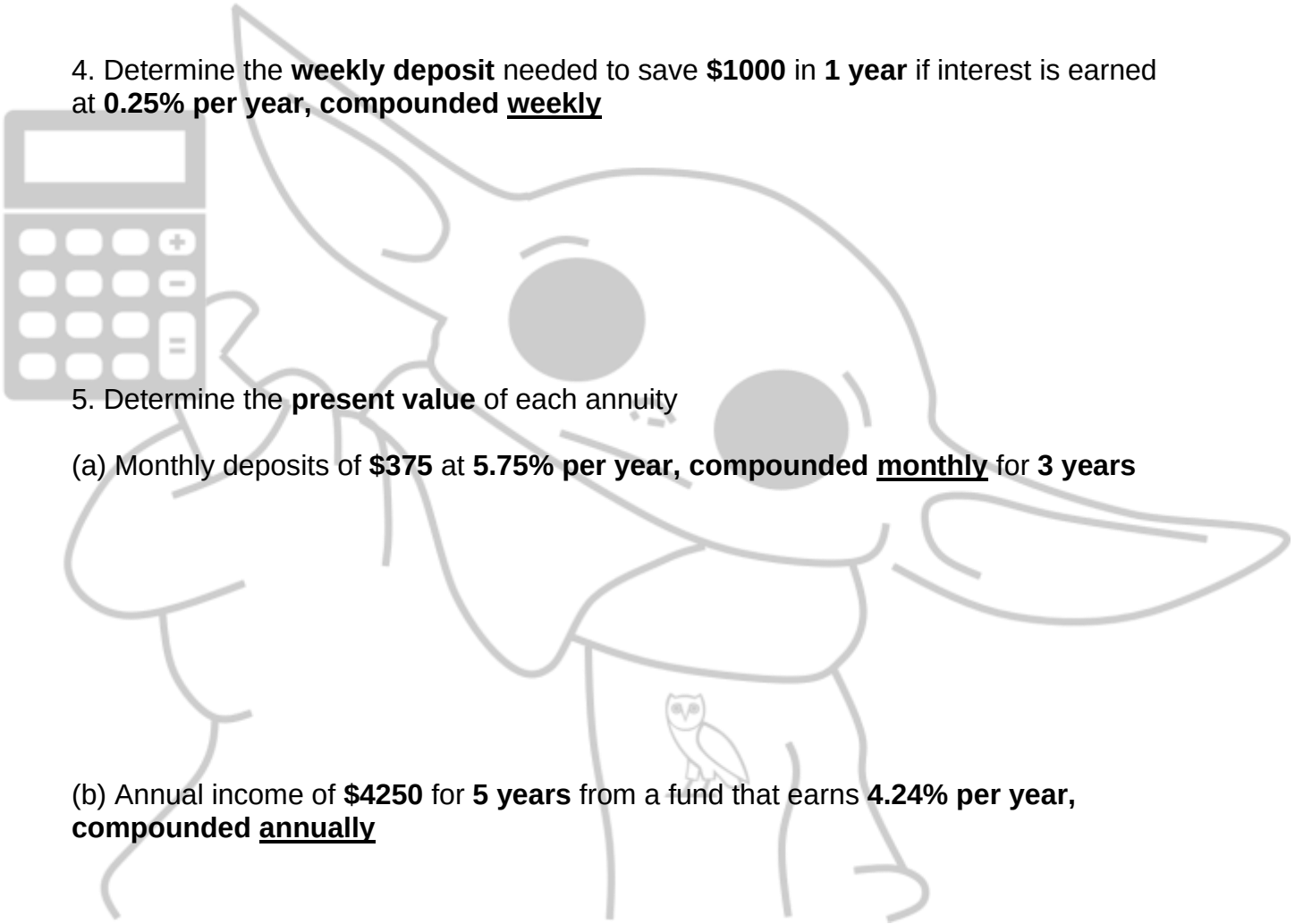
(b) **$750** is deposited quarterly for **2 years** into a fund that pays **8.25% per year, compounded <u>quarterly</u>**

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3. Determine the **monthly payment** for a **3 year loan** on a **$15000** motorcycle at **5.9% per year, compounded <u>monthly</u>**

4. Determine the **weekly deposit** needed to save **$1000** in **1 year** if interest is earned at **0.25% per year, compounded <u>weekly</u>**



5. Determine the **present value** of each annuity

(a) Monthly deposits of **$375** at **5.75% per year, compounded <u>monthly</u>** for **3 years**

(b) Annual income of **$4250** for **5 years** from a fund that earns **4.24% per year, compounded <u>annually</u>**

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6. Rajinder would like to *borrow* **$7500**. His bank offered him a **3 year** personal loan with monthly payments. The interest rate on the loan is **6.25% per year, compounded <u>monthly</u>**

(a) Determine Rajinder's **monthly payment**

(b) Calculate the **total amount** that he will pay to the bank

Monthly p*ayment amount* × *total # of payments*

(c) Calculate the **total interest** paid over the loan

Interest paid = Total amount paid – loan amount

7. Miyako is in Grade 12 and lives at home. She has a part-time job and earns $1200 **per month**. Miyako deposits **$500** at the end of each month into an account that pays **2.1% per year, compounded <u>monthly</u>**

(a) How much was in Miyako's account at the end of **1 year**?

(b) How much was in Miyako's account at the end of **3 years**?

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(c) Which TVM Solver screen is correct for Part (b)?

A

```
N=12
I%=2.1
PV=0
PMT=-500
▪FV=6058.088205
P/Y=12
C/Y=12
PMT:END BEGIN
```

B

```
N=36
I%=.021
PV=0
PMT=-500
▪FV=18005.51359
P/Y=12
C/Y=12
PMT:END BEGIN
```

C

```
N=36
I%=2.1
PV=0
PMT=-500
▪FV=18562.34276
P/Y=12
C/Y=12
PMT:END BEGIN
```

D

```
N=36
I%=2.1
PV=0
PMT=-500
▪FV=18562.67742
P/Y=12
C/Y=36
PMT:END BEGIN
```

7.2 – THE CONDITIONS OF AN ANNUITY

1. Use the TVM Solver to determine the monthly payment (PMT) on **$2700** borrowed at **5.75% per year, compounded <u>monthly</u>** for each time period. An example has been provided for you

(a) 1 year

N = 12
I% = 5.75
PV = 2700
PMT = **- 232.07**
FV = 0
P/Y = 12
C/Y = 12

(b) 2 years

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

(c) 2.5 years

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

(d) 3.25 years

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

2. Enuka plans to borrow **$25000** to pay for college. The annual interest rate on the loan is **4.65%, compounded <u>monthly</u>.** Using the TVM Solver, determine the **number of months (N)** required to repay the loan for each monthly payment amount. An example has been provided for you

(a) $300

N = **100.8**
I% = 4.65
PV = 25000
PMT = - 300
FV = 0
P/Y = 12
C/Y = 12

(b) $350

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

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(c) $400

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

(d) $475

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

3. For each interest rate, determine the **quarterly payment (PMT)** for a **3 year loan** of **$10000** if interest is **compounded <u>quarterly</u>**. An example has been provided for you.

(a) 6.5%

N = 12
I% = 6.5
PV = 10000
PMT = **- 923.95**
FV = 0
P/Y = 4
C/Y = 4

(b) 7%

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

(c) 8%

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

(d) 9.25%

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

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7.3 – MORTGAGES AND AMORTIZATION

*** RECALL THAT ALL MORTGAGES ARE PAID <u>MONTHLY</u> AND INTEREST IS COMPOUNDED <u>SEMI-ANNUALLY</u>**

1. Use the TVM Solver for each mortgage listed below,

(i) Determine the **monthly payment**

(ii) Calculate the **total amount paid** over the term of the mortgage

(iii) Calculate the **total principal paid** over the term of the mortgage

(iv) Calculate the **total interest paid** over the term of the mortgage

An example has been provided for you

(a) A **$179 000** mortgage amortized over **20 years** at an annual interest rate of **4.75%**

(i) Determine the **monthly payment (PMT)**

N = 240
I% = 4.75
PV = 179000
PMT = **- 1152.22**
FV = 0
P/Y = 12
C/Y = 2

(ii) Total amount paid = PMT × total # of payments

(iii) Total Principal paid = ∑Prn(1, 240, 2) = _____

(iv) Total Interest paid = ∑Int(1, 240, 2) = _____

(b) A **$289000** mortgage amortized over **25 years** at an annual interest rate of **5.25%**

(i) Determine the **monthly payment (PMT)**

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

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(ii) Total amount paid = PMT × total # of payments

(iii) Total Principal paid = ∑Prn(1, _____, 2) = _____

(iv) Total Interest paid = ∑Int(1, _____, 2) = _____

(c) A **$450000** mortgage amortized over **35 years** at an annual interest rate of **4.99%**

(i) Determine the **monthly payment (PMT)**

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

(ii) Total amount paid = PMT × total # of payments

(iii) Total Principal paid = ∑Prn(1, _____, 2) = _____

(iv) Total Interest paid = ∑Int(1, _____, 2) = _____

2. Liang and Gurpreet recently purchased their first home for **$179000**. They made the minimum **5% downpayment** and mortgaged the remaining amount. They agreed to a mortgage amortized over **25 years** at **5.25% per year**

(a) Calculate the **downpayment**

(b) Calculate the **remaining amount** to be mortgaged

(c) Use the TVM Solver to determine the amount of the **monthly payment**

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

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3. Latesha purchased a two-bedroom condominium for **$189000** and made a **5% downpayment**. The mortgage rate is **5.65% per year**, amortized over **25 years**.

(a) Calculate the **downpayment**

(b) Calculate the **remaining amount** to be mortgaged

(c) Use the TVM Solver to determine the amount of the **monthly payment**

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

7.4 – THE CONDITIONS OF A MORTGAGE

1. Kassim and Neela have a pre-approved mortgage for **$325000**. The current annual interest rate is **5.25%**

(a) Use the TVM Solver to determine the **monthly payment (PMT)** for a **25 year amortization period**

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

(b) Calculate the **total amount paid** for the mortgage

Total amount paid = PMT × Total # of payments

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(c) Use the TVM Solver to determine the **monthly payment (PMT)** for a **20 year amortization period**

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

(d) How much more is the monthly payment for this mortgage compared to the 25 year amortization period?

2. Janesha bought a house for **$279900** and made a **downpayment of $52000**. The annual interest rate for the mortgage is **5%**

(a) Determine the **remaining amount** to be mortgaged

(b) Use the TVM Solver to determine the **monthly payment (PMT)** for a **25 year amortization period**

N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

(c) Use the TVM Solver to determine the **monthly payment (PMT)** for a **20 year amortization period**

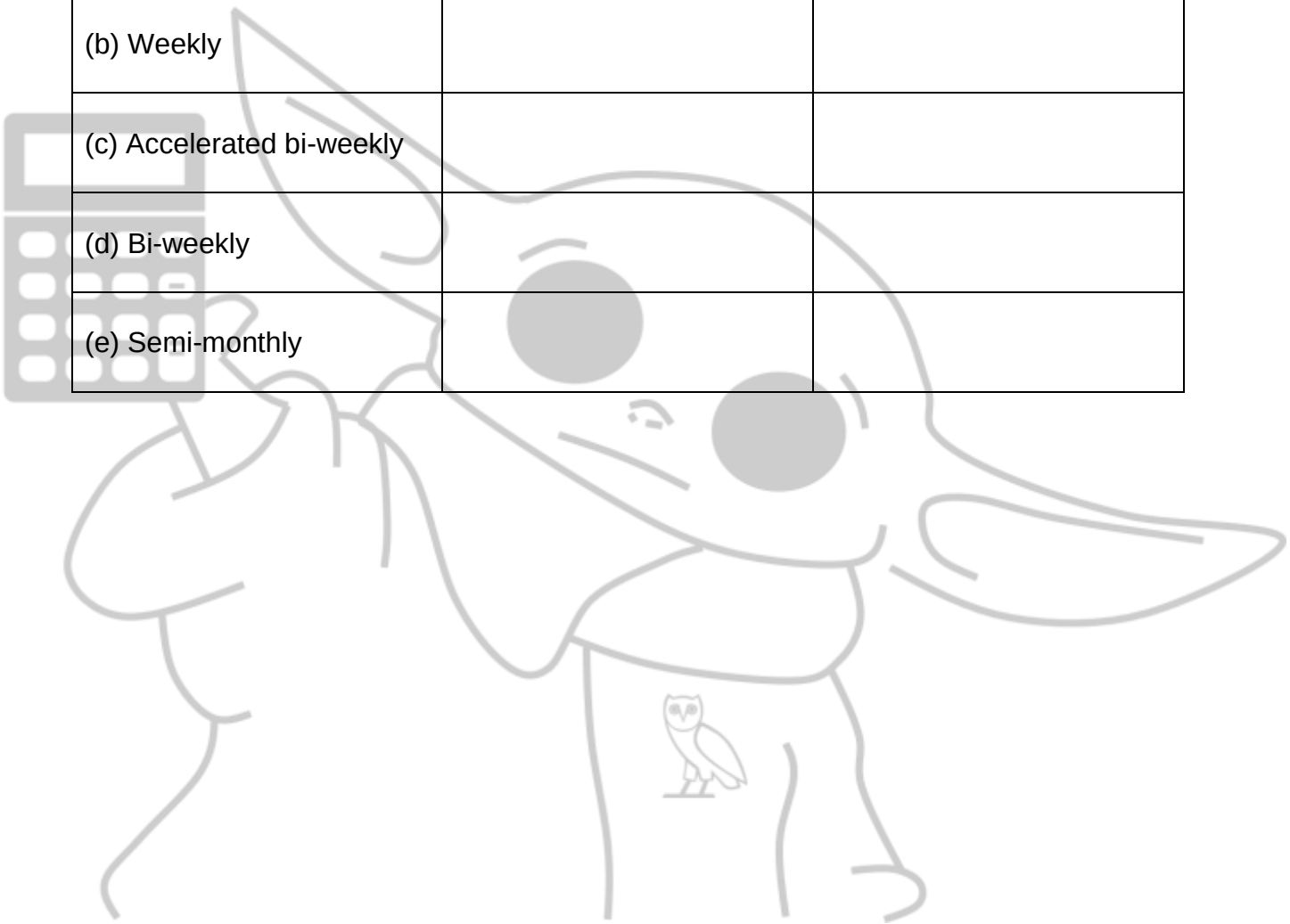
N =
I% =
PV =
PMT =
FV =
P/Y =
C/Y =

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3. Mai Yu can afford to pay approximately **$1500** per month on her mortgage. Determine the payment amount for each payment frequency. ***** Use the classroom example to help you with this question**

PAYMENT FREQUENCY	***AMOUNT OF PAYMENT FOR THE INTERVAL***	***TOTAL PAID IN ONE YEAR***
(a) Accelerated weekly		
(b) Weekly		
(c) Accelerated bi-weekly		
(d) Bi-weekly		
(e) Semi-monthly		



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SOLUTIONS

7.1

1. $5249.08

2. (a) $2723.97 (b) $645146

3. $455.65

4. $19.21

5. (a) $14696.01 (b) $23130.04

6. (a) $229.02 (b) $8244.72 (c) $744.72

7. (a) $6058.09 (b) $18562.34 (c) C

7.2

1. (a) $232.07 (b) $119.36 (c) $96.84 (d) $76.07

2. (a) 100.8 months (b) 83.8 months (c) 71.7 months (d) 59 months

3. (a) $923.95 (b) $931.14 (c) $945.60 (d) $963.84

7.3

1. (a) (i) $1152.22 (ii) $69133.20 (iii) $30411.98 (iv) $38720.95

   (b) (i) $1722.20 (ii) $103332 (iii) $32219.52 (iv) $71112.66

   (c) (i) $2253.59 (ii) $135215.40 (iii) $27262.03 (iv) $107953.36

2. (a) $8950 (b) $170050 (c) $1013.36

3. (a) $9450 (b) $179550 (c) $1111.69

7.4

1. (a) $1936.73 (b) $581019 (c) $2179.75 (d) $243.02

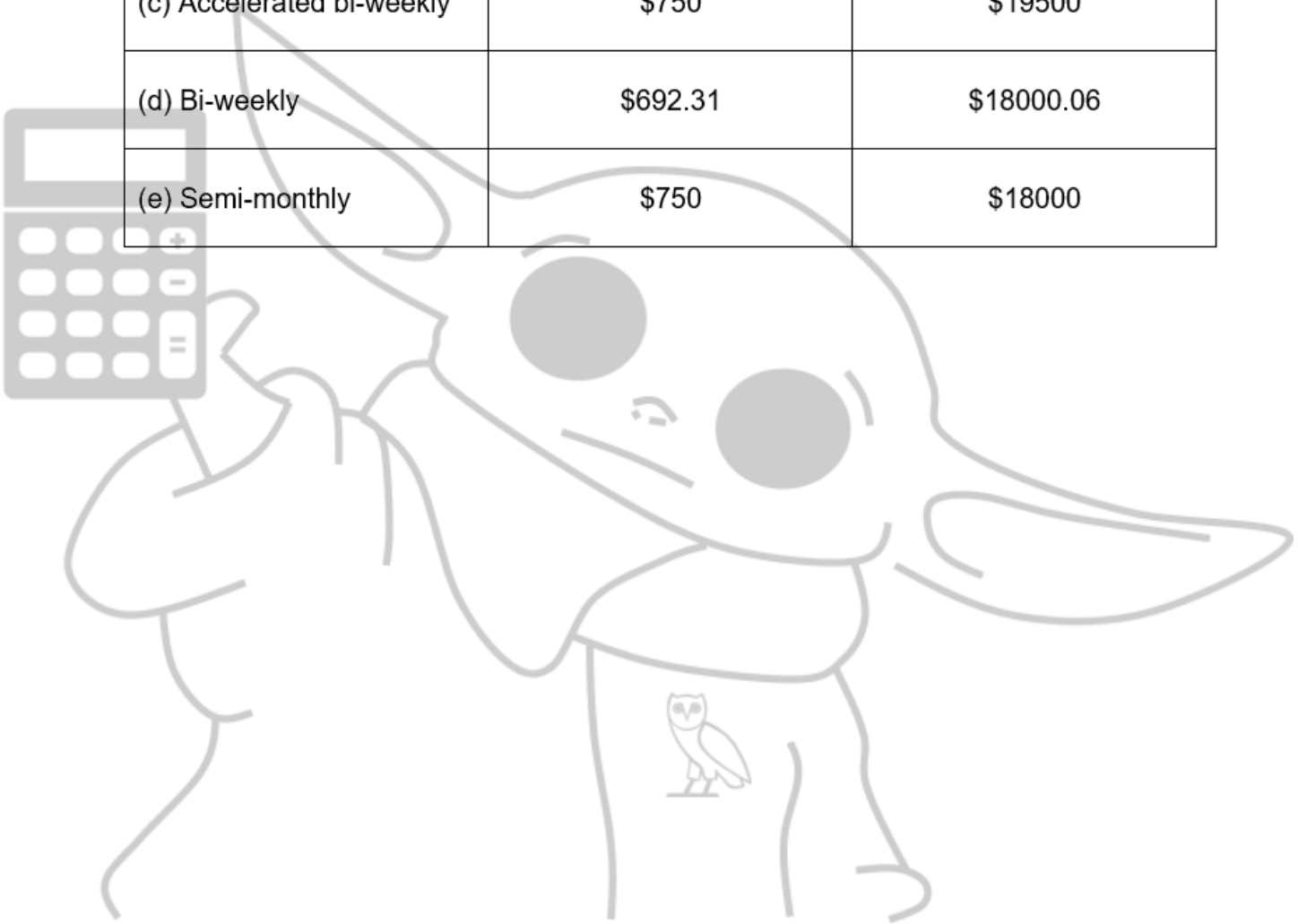
2. (a) $227900 (b) $1325.48 (c) $1497.59

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3.

PAYMENT FREQUENCY	AMOUNT OF PAYMENT FOR THE INTERVAL	TOTAL PAID IN ONE YEAR
(a) Accelerated weekly	$375	$19500
(b) Weekly	$346.15	$17999.80
(c) Accelerated bi-weekly	$750	$19500
(d) Bi-weekly	$692.31	$18000.06
(e) Semi-monthly	$750	$18000



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