Student's name **Student's number** **Teacher's name**

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2009

TRIAL
HIGHER SCHOOL CERTIFICATE
EXAMINATION

General Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – $2\frac{1}{2}$ hours
- Write using blue or black pen
- Calculators may be used
- A formulae sheet is provided at the back of this paper

Total Marks – 100

Section I: Pages 2-6
22 marks

- Attempt questions 1-22, using the answer sheet on page 19.
- Allow about 30 minutes for this section

Section II: Pages 7-15
78 marks

- Attempt questions 23-28, using all 6 writing booklets provided
- Allow about 2 hours for this section

Multiple Choice	23	24	25	26	27	28	Total
							%

Section 1

22 marks
Attempt Questions 1 to 22.
Allow about 30 minutes for this section.

Use the multiple-choice answer sheet for Questions 1-22.

1. Which of the following graphs is a straight line:

(A) $y = \frac{2}{x}$

(B) $y = 2^x$

(C) $y = \frac{x}{2}$

(D) $y = x^2$

2. A survey question asked "What is your favourite McDonald's burger?".
The data collected is best described as:

(A) discrete
(B) continuous
(C) stratified
(D) categorical

3. Lucy works from 1pm to 5pm every weekday.
Her weekly wage is $236. Her hourly rate of pay is:

(A) $8.43 **(B)** $11.80 **(C)** $29.50 **(D)** $59.00

4. The **Real Meal Deal** allows diners to choose a main course, a dessert and a drink.
There are 5 different main courses, 5 different desserts and 5 drinks.
The number of different **Real Meal Deals** is:

(A) 10 **(B)** 15 **(C)** 60 **(D)** 125

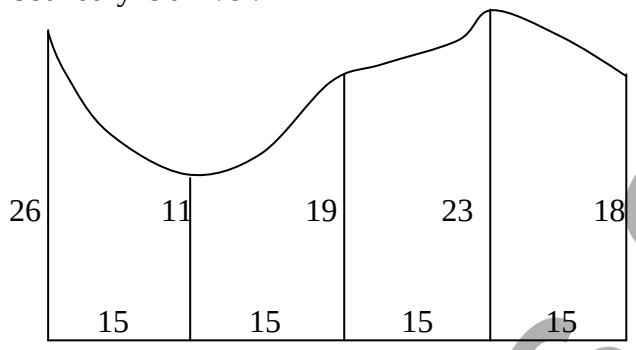
5. The volume of a sphere is 7240 cm^3.
The radius of the sphere is closest to:

(A) 6 cm **(B)** 12 cm **(C)** 24 cm **(D)** 48 cm

6. A rectangle has one side of length $(y+3)cm$.
The other side is double this length.
The perimeter of this rectangle is:

(A) $(2y+6)cm$ **(B)** $(3y+9)cm$ **(C)** $(6y+18)cm$ **(D)** $(8y+24)cm$

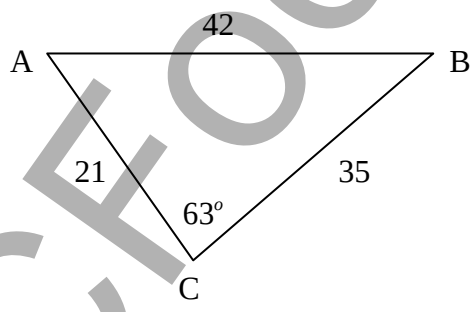
7. The diagram shows a block of land with 3 straight fences.
The 4th boundary is a river.



Using Simpson's Rule twice, the best estimate for the block of land is:

(A) 218 m^2 **(B)** 770 m^2 **(C)** 1090 m^2 **(D)** 3270 m^2

8. Which formula could be used to calculate the size of $\angle ABC$



(A) $\sin B = \dfrac{21\sin 63^o}{42}$ **(B)** $\sin B = \dfrac{35\sin 63^o}{21}$

(C) $\sin B = \dfrac{35\sin 63^o}{42}$ **(D)** $\sin B = \dfrac{42\sin 63^o}{21}$

9. A mobile phone manufacturer tests every 5th phone produced.
This is an example of:

(A) biased sampling **(B)** random sampling
(C) stratified sampling **(D)** systematic sampling

10. A researcher is trying to estimate the number of rats in the Year 12 common room. She captured 1500 rats, tagged them, then released them in the room. The next day she caught 100 rats. 30 of them were tagged.

The best estimate for the rat population is:

(A) 30 **(B)** 120 **(C)** 5000 **(D)** 19000

11. Seven students did a test. The results were 4, 5, 6, 7, 7, 9, 11
If the score of 4 is changed to 12, which measure would change?

(A) mean **(B)** median **(C)** mode **(D)** range

12. A digital television can be purchased for $660 cash or by paying a 15% deposit then $36.50 every month for 2 years.
How much extra do you pay if you don't pay the cash price?

(A) $315 **(B)** $260 **(C)** $216 **(D)** $117

13. In 10 matches the mean number of goals scored by a PLC netball team was 58. The coach wants the mean to be 60.
How many goals need to be scored in the next match to achieve this?

(A) 62 **(B)** 80 **(C)** 138 **(D)** 60

14. Light intensity (L) is inversely proportional to the square of the distance (d) from the light source.
Which of the following equations describes this relationship:

(A) $d = \frac{k}{L^2}$ **(B)** $L = kd^2$ **(C)** $L = \frac{k}{d^2}$ **(D)** $L = \frac{k}{d}$

15. The solution of the equation $10^x = 200$ is closest to:

(A) 2 **(B)** 2.3 **(C)** 2.4 **(D)** 20

16. A straight line passes through $(2,0)$ and $(0,-4)$.
The equation of the line is:

(A) $y = 2x - 4$ **(B)** $y = 2x + 2$

(C) $y = \frac{x}{2} - 4$ **(D** $y = \frac{x}{2} + 2$

Note: Questions 17, 18 and 19 are related to each other

17. Sophie has just turned 8. She wants to buy a car when she turns 18.
Her grandmother gave her $5 000.
She estimates that the car will cost $10 000.

When $5 000 is invested at 4% p.a. compounding annually, how many whole years does it take for the investment to be worth $10 000?

(A) 2 **(B)** 12 **(C)** 17 **(D)** 18

18. Sophie realises that the investment plan in Question 17 will not achieve her goal, so she decides to invest the $5 000 now, then add $500 to her investment at the end of each year.

When she adds the final $500 to her investment, on her 18th birthday, the value of her investment will be closest to:

(A) $6 003.05 **(B)** $10 000 **(C)** $13 404.27 **(D)** $14 802.44

19. Unfortunately, the car of her dreams has gone up in price, so she needs to borrow $5000, at 6% p.a. flat. She intends to repay the loan over 5 years.
The total amount of interest she will pay on this loan is:

(A) $300 **(B)** $1500 **(C)** $1691.13 **(D)** $6500

Note: Questions 20, 21 and 22 are related to each other

A company has produced a new test designed to identify athletes who have used banned substances. They used the test on a sample of 250 people. 50 of them took banned substances for the purposes of this experiment.
Consider the following two-way table:

	Test result was accurate	**Test result was inaccurate**	**Total**
The person **DID** take banned substances	Cell A	Cell B	Cell C
The person **DID NOT** take banned substances	Cell D	Cell E	Cell F
Total	Cell G	Cell H	Cell I

20. The cell that shows all 50 people who took banned substance is:

(A) Cell C **(B)** Cell F **(C)** Cell G **(D)** Cell H

21. 200 of the people tested did not use a banned substance. For 5 of them, the test result was positive. The cell that shows these people is:

(A) Cell A **(B)** Cell B **(C)** Cell D **(D)** Cell E

22. Some people use performance-enhancing drugs then use other banned substances to mask their presence. If this tactic is successful, in which cell would they be:

(A) Cell A **(B)** Cell B **(C)** Cell D **(D)** Cell E

End of Section 1

Question 23 (13 marks) Start a new writing booklet.

Marks

(a) Simplify the following expressions:

(i) $2x^2 + 6x^2$ **1**

(ii) $2x^2 \times 6x^2$ **1**

(iii) $2x^2 \div 6x^2$ **1**

(b) Expand the following, then simplify as much as possible: **2**

$4(x-2)-3(2x-5)$

(c) The price of a top was reduced from \$40 to \$30. What was the percentage discount? **2**

(d) Write down the coordinates of 2 points that lie on the line $y = 2x + 6$ **2**

(e) How much simple interest would you earn for investing 1 million dollars at 6% p.a. for 12 days. **2**

(f) When all the edges of a cube are doubled in length, what happens to the volume of the cube? **2**

End of Question 23

Question 24 (13 marks) **Start a new writing booklet.** **Marks**

(a) Point A on the surface of the Earth is 30^o S, 40^o W. **2**
Point B is 50 degrees North of Point A.
Point B is East of Point A.
There is a 2 hour time difference between A and B.
Write down the latitude and longitude of Point B.

(b) Solve the equation **2**

$$\frac{2h+1}{3} = h-2$$

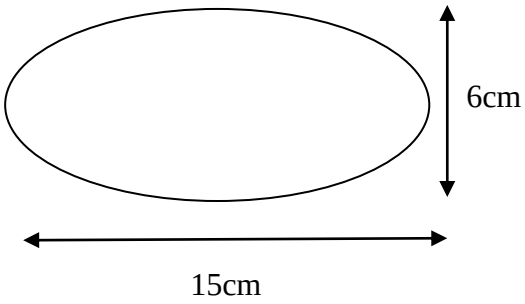
(c) Melissa is hiking over flat ground from C.
She has walked 10km on a bearing of 100 degrees to D.

(i) If she wants to turn around at D and go back to C, on what bearing must she travel? **2**

(ii) If she travels due North from D, how far must she travel to be due East of C? **2**

Question 24 is continued on the next page.

(d) The diagram shows an ellipse.
It is the cross-section of a jar of face cream.



(i) Calculate the area of the ellipse. **1**

(ii) The jar is 10 cm tall. Calculate the volume of the jar. **2**
Give your answer correct to the nearest cubic centimetre.

(iii) The instructions advise that 5mL be used each day. **2**
For how many days will 1 jar last?

End of Question 24

Question 25 (13 marks) Start a new writing booklet. Marks

(a) Stella borrowed $25000 to buy a violin.
The interest rate is 6% p.a., calculated monthly.
She agreed to pay off the loan in equal monthly instalments.
She drew up the following table to keep track of her loan:

Month	Opening Balance	Interest	Instalment	Closing Balance
1	$25000	$125	$300	$24825
2	$24825	A	$300	B
3			$300	C

(i) Calculate the values of A, B and C. **3**

(ii) How much interest did Stella pay in the first 3 months? **1**

(iii) Amy also borrowed $25000. **2**
She wants to repay her loan in 10 years.
Use the present value formula to calculate her monthly instalment.

(b) Write the number 78 300 000 in scientific notation. **1**

(c) Consider the following 3 positions on Earth:
A (36^o N, 1 40^o E)
B (36^o N, 120^o W)
C (35^o S, 1 40^o E)

(i) Which 2 points lie on the same great circle? **2**
Explain your answer.

(ii) Calculate the time difference between A and B **2**

(d) Divide $6 000 in the ratio 3:2. **2**

End of Question 25

Question 26 (13 marks) Start a new writing booklet.

Marks

(a) There are 6 students in Mr Friend's Drama class.

(i) He needs to choose 3 girls to sell tickets for a show. In how many different ways can he do this? **1**

(ii) The other 3 girls are going to fill the 3 seats in the front row. In how many different ways can he do this? **1**

(b) **(i)** Sophie and Lucy are playing a gambling game. Sophie says: "The financial expectation of this game is 0". Explain what Sophie's statement means. **2**

(ii) Katie is playing a gambling game at a casino. She pays $1 then spins this wheel, on which the odd numbers are red, the even numbers are black and the 0 is green.

If the number she spins is red, she collects $2. Otherwise, she collects nothing.

1 What is the financial expectation of this game? **2**

2 Explain the meaning of your answer. **2**

Question 26 is continued on the next page.

(c) Rachel has 5 coins in her purse:

$2 $1 50 cents 20 cents 10 cents

She chooses 1 coin at random.

(i) What is the probability that she chooses a $1 coin? **1**

(ii) What is the probability that the coin is not gold? **1**

(iii) She put the coin back in her purse, then randomly chose 2 coins. What is the probability that the sum of the 2 coins is more than $2. **2**

(iv) If Rachel repeated the experiment in part (iii) 500 times, on how many occasions would she expect the sum of the 2 coins to be more than $2? **1**

End of Question 26

Question 27 (13 marks) **Start a new writing booklet.** **Marks**

(a) **(i)** Make s the subject of the formula: **2**

$$A = \pi r^2 + \pi rs$$

(ii) Find the value of A when $r = 5$ and $s = 6$ **2**
(Give your answer correct to 3 decimal places)

(iii) Find the value of s when $A = 250$ and $r = 6$ **2**
(Give your answer correct to 3 decimal places)

(b) Caitlin can swim 50 metres in 26 seconds.

(i) Calculate her average speed in kilometres per hour **2**

(ii) If she were able to keep this pace up for an entire day, how far could she swim? **2**
Give you answer in kilometres, correct to 1 decimal place.

Question 27 is continued on the next page.

(c) Consider the following frequency distribution table:

Score	Frequency
2	7
3	X
4	3
5	2

The mean of the scores is 3.

(i) Find a possible value for X **1**

(ii) Find another possible value for X **1**

(iii) Explain why it is possible for X to have many different values. **1**

End of Question 27

Question 28 (13 marks) Start a new writing booklet. Marks

(a)

500 **Durapower** batteries were tested.
Their lives were found to be normally distributed with a mean of 60 and standard deviation 10.

500 **Neveready** batteries were also tested and were found to be normally distributed with a mean of 50 and standard deviation 5.

(i) One of the **Durapower** batteries lasted for 65 hours. **1**
What is the z-score for this battery?

(ii) Approximately what percentage of the **Durapower** batteries lasted more than 40 hours? **2**

(iii) Approximately how many of the **Neveready** batteries lasted more than 65 hours? **1**

(iv) Durapower batteries cost $2 each.
Neveready batteries cost $1 each. **2**

Which would you buy?
Use the means and standard deviations to explain your answer.

Question 28 is continued on the next page.

(b) **(i)** Claudia bought a car for \$4000 and estimates that it will lose \$300 in value every year. Using the grid on page 21, draw a graph to show the value of her car over the first 12 years. **2**

(ii) How much is Claudia's car worth at the end of the 12^{th} year? **1**

(iii) Laura uses the formula $V = 4000 \times (0.88)^t$ to estimate the value (V) of her car after t years.

1 How much is Laura's car worth at the end of the third year? **1**

2 On the same grid, draw a graph to show the value of her car over the first 12 years. **2**

3 Estimate the number of years it will take for Claudia's car and Laura's car to have the same value. Give your answer to 1 decimal place. **1**

End of Question 28

End of Examination

General Mathematics Formulae Sheet (page 1 of 2)

Area of an annulus

$A = \pi\left(R^2 - r^2\right)$

R = radius of outer circle
r = radius of inner circle

Area of an ellipse

$A = \pi ab$

a = length of semi-major axis
b = length of semi-minor axis

Area of a sector

$A = \dfrac{\theta}{360}\pi r^2$

θ = number of degrees in central angle

Arc length of a circle

$l = \dfrac{\theta}{360}2\pi r$

θ = number of degrees in central angle

Simpson's rule for area approximation

$A \approx \dfrac{h}{3}\left(d_f + 4d_m + d_l\right)$

h = distance between successive measurements
d_f = first measurement
d_m = middle measurement
d_l = last measurement

Surface area

Sphere $A = 4\pi r^2$
Closed cylinder $A = 2\pi rh + 2\pi r^2$

r = radius
h = perpendicular height

Volume

Cone $V = \dfrac{1}{3}\pi r^2 h$

Cylinder $V = \pi r^2 h$

Pyramid $V = \dfrac{1}{3}Ah$

Sphere $V = \dfrac{4}{3}\pi r^3$

r = radius
h = perpendicular height
A = area of base

Sine rule

$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Area of a triangle

$A = \dfrac{1}{2}ab\sin C$

Cosine rule

$c^2 = a^2 + b^2 - 2ab\cos C$

or

$\cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$

General Mathematics Formulae Sheet (page 2 of 2)

Simple interest

$I = Prn$

P = initial quantity
r = percentage interest per period, expressed as a decimal
n = number of periods

Compound interest

$A = P(1+r)^n$

A = final balance
P = initial quantity
n = number of compounding periods
r = percentage interest per compounding period, expressed as a decimal

Future value (A) of an annuity

$$A = M\left\{\frac{(1+r)^n - 1}{r}\right\}$$

M = contribution per period, paid at the end of the period

Present value (N) of an annuity

$$N = M\left\{\frac{(1+r)^n - 1}{r(1+r)^n}\right\}$$

or

$$N = \frac{A}{(1+r)^n}$$

Straight-line formula for depreciation

$S = V_0 - Dn$

S = salvage value of asset after n periods
V_0 = purchase price of the asset
D = amount of depreciation apportioned per period
n = number of periods

Declining balance formula for depreciation

$S = V_0(1-r)^n$

S = salvage value of asset after n periods
r = percentage interest rate per period, expressed as a decimal

Mean of a sample

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$\bar{x}$ = mean
x = individual score
n = number of scores
f = frequency

Formula for a z - score

$$z = \frac{x - \bar{x}}{s}$$

s = standard deviation

Gradient of a straight line

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

Gradient-intercept form of a straight line

$y = mx + b$

m = gradient
b = y-intercept

Probability of an event

The probability of an event where outcomes are equally likely is given by:

$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$

General Mathematics: Multiple Choice Answer Sheet

Student Number_____

Completely fill the response oval representing the most correct answer.

1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭
11.	A ⬭	B ⬭	C ⬭	D ⬭
12.	A ⬭	B ⬭	C ⬭	D ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭
16.	A ⬭	B ⬭	C ⬭	D ⬭
17.	A ⬭	B ⬭	C ⬭	D ⬭
18.	A ⬭	B ⬭	C ⬭	D ⬭
19.	A ⬭	B ⬭	C ⬭	D ⬭
20.	A ⬭	B ⬭	C ⬭	D ⬭
21.	A ⬭	B ⬭	C ⬭	D ⬭
22.	A ⬭	B ⬭	C ⬭	D ⬭

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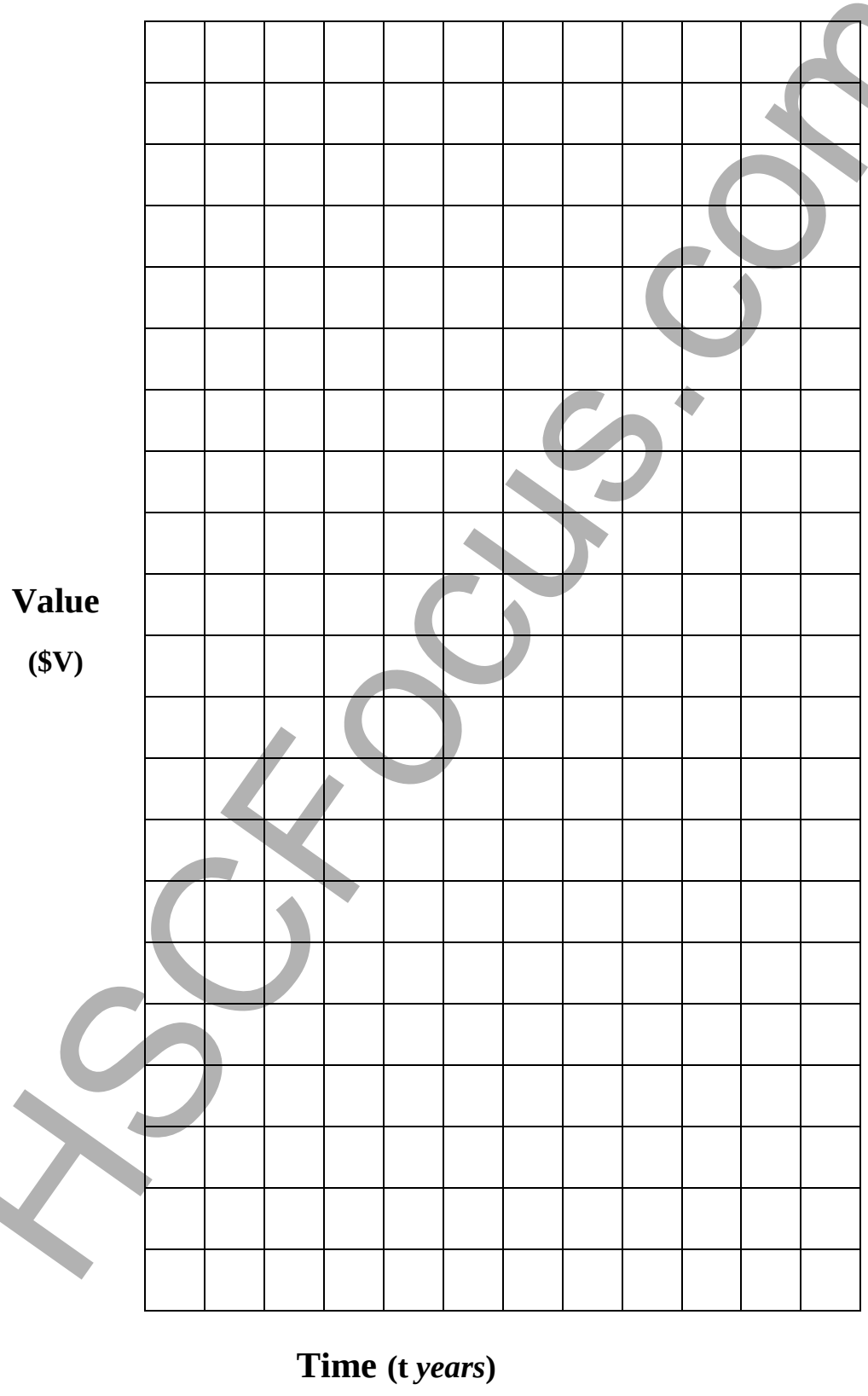
Question 28(b)

Detach this page, complete the table and attach it to your answers for Question 28(b).



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