The Maths Society

Interest

Simple

Compound

My budget

1. James invests £200 for 1 year in a bank account.
The account pays simple interest at a rate of 3% per year.

Work out the total amount of money in the account at the end of the year.

$I = Prt$
$= 200 . 0.03 . 1$
$= 6$
total $= 200 + 6$
$= £206$

£ 206

(2)

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2. Sami invested £400 for 2 years at 5% per year simple interest.

Work out the total interest Sami gets.

$I = Prt$
$= 400 . 0.05 . 2$
$= £40$

£ 40

(3)

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3. Carolyn invested £700 for 3 years at 2% per annum simple interest.

Work out the total amount of interest Carolyn earned.

$I = Prt$
$= 700 . 0.02 \times 3$
$= £42$

£ 42

(3)

4. £2700 is invested for 2 years at 5% per year simple interest.

Work out the total interest.

$I = Prt$
$= 2700 . 0.05 . 2$
$= £270$

£ 270

(3)

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5. Faith invests £800 for 3 years in a bank account.
The account pays simple interest at a rate of 0.4% per year

Work out the total amount of interest Faith has got at the end of the 3 years.

$I = Prt$
$= 800 . 0.004 . 3$
$= £9.6$

£ 9.6

(3)

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6. Nina invested £1500 for 4 years at 2.5% per annum simple interest.

Work out the total amount of money in the account at the end of 4 years.

$I = Prt$
$= 1500 . 0.025 . 4$
$= £150$

$\text{total} = 1500 + 150$
$= 1650$

£ 1650

(3)

7. Mary invests £8000 in an account paying 1.2% simple interest each year.

Calculate the amount of money in her account after 2 years.

$I = Prt$

$= 8000 \cdot 0.012 \cdot 2$

$= £192$

total $= 8000 + 192$

$= £8192$

£ 8192

(3)

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8. £12500 is invested for 5 years at 1.1% per year simple interest

Work out the total interest.

$I = Prt$

$= 12500 \cdot 0.011 \cdot 5$

$= 687.5$

£ 687.5

(3)

9. Jonah invests £400 in a bank account that pays 3.5% simple interest per year.

At the end of each year Jonah spends $\frac{3}{5}$ of the interest and gives the rest to his brother.

How much money does Jonah give to his brother each year?

$I = Prt$

$= 400 \cdot 0.035 \cdot 1$

$= 14$

$\frac{2}{5} \times 14 = £5.6$

£ 5.6

(4)

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10. Evie is saving up to buy a guitar that costs £109.
She opens an account at Corbett Bank that pays 3% per annum simple interest.

She puts £800 into the account.
Evie does not make any deposits or withdrawals.

After how many whole years will Evie have earned enough interest to buy the guitar?

$I = Prt$

$109 = 800 \times 0.03 \times t$

$t = \frac{109}{24}$

$= 4.5$

≈ 5 years

5

(4)

11. Solomon wants to invest £600 for 3 years.

Corbett Bank	Banks'R'us
2% per annum simple interest.	2.5% per annum simple interest for the first year and 1% per annum simple interest for the following years.

Which bank should Solomon choose?

C.B

$I = Prt$

$= 600 \times 0.02 \times 3$

$= £36$

B.R.U

$I = Prt$

$= 600 . 0.025 . 1$

$= 15$

$I = Prt$

$= 600 . 0.01 . 2 = 12$

total $= 15 + 12$

$= £27$

Corbett Bank

(4)

12. Laura invests £2400 in an account that pays 1.2% simple interest per annum. She invests the money for 5 years.

At the end of each year Laura gives the interest to her two sisters, Hannah and Freya in the ratio 3:7

How much money does Freya receive in total?

$I = Prt$

$= 2400 . 0.012 . 5$

$= 144$

$F = \frac{7}{10} \times 144$

$= £100.8$

£ 100.8

(5)

13. Jaxon invests £3000 in a bank account that pays 2% simple interest per year. He invests the money for 7 months.

Calculate the amount of interest Jaxon earns.

$I = Prt$

$= 3000 \cdot 0.02 \cdot \frac{7}{12}$

$= £35$

£ 35

(3)

14. Nicole invested some money for 3 years into an account that pays 2% per year simple interest.

She earned £7.20 interest in total.

How much money did Nicole originally invest?

$I = Prt$

$7.20 = P \cdot 0.02 \cdot 3$

$P = £120$

£ 120

(3)

1. Sebastian leaves £3000 in the bank for two years.
It earns compound interest of 2% per year.

Calculate the total amount Sebastian has in the bank at the end of the two years.

$A = P\left(1+\frac{r}{100}\right)^n$

$= 3000(1+0.02)^2$

$= £3121.2$

£ 3121.2

(2)

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2. Fiona leaves £1600 in the bank for four years.
It earns compound interest of 4% each year.

Calculate the total amount Fiona has in the bank at the end of the four years.

$A = P\left(1+\frac{r}{100}\right)^n$

$= 1600(1+0.04)^4$

$= £1871.77$

£ 1871.77

(3)

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3. A car was bought for £18000.
Its value depreciated by 15% each year for the first three years.

What was its value at the end of the three years?

$A = P\left(1-\frac{r}{100}\right)^n$

$= 18000(1-0.15)^3$

$= £11054.25$

£ 11054.25

(3)

4. Sally bought a piano for £2200.
In each year the value of the piano increases by 11% of its value at the start of that year.

(a) Find the value of the piano after one year.

$A = P\left(1+\frac{r}{100}\right)^n$

$= 2200\,(1+0.11)^1$

$= £2442$

£ 2442

(2)

(b) Calculate after how many complete years the value of the piano will be at least £3200.

1^{st} yr $= 2442$

$2^{nd} = 2200\,(1.11)^2 = 2710.62$

$3^{rd} = 2200\,(1.11)^3 = 3008.7882$

$4^{th} = 2200\,(1.11)^4 = 3339.754902$

4 years

(2)

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5. Natalie invests £600 for 2 years at 10% per year compound interest.
How much interest does she earn?

$A = P\left(1+\frac{r}{100}\right)^n$

$= 600\,(1+0.1)^2$

$= 726$

$726 - 600 = £126$

£ 126

(2)

6. Jenny invests £400 for two years at 5% compound interest, paid yearly.
Tim says that the interest Jenny will receive will be £40.

Is Tim right? NO
Explain your answer.

$A = P(1 + \frac{r}{100})^n$

$= 400(1 + 0.05)^1$

$= £420$

$420 - 400 = 20$

(3)

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7. When a tennis ball is dropped, it bounces and then rises.

The ball rises to 60% of the height from which it is dropped.
The ball is dropped from a height of 2 metres.

(a) Calculate the height of the rise after the first bounce.

$\frac{60}{100} \times 2 = 1.2m$

1.2 ..... m
(1)

(b) Calculate the height of the rise after the second bounce.

$1.2 \times \frac{60}{100} = 0.72$

0.72 ..... m
(1)

The ball carries on bouncing, each time rising to 60% of the last rise.

(c) For how many bounces does it rise to a height greater than 20cm?
Show your working

0.2

1st = 1.2m

2nd = 0.72m

3rd = $2 \times 0.6^3 = 0.432m$

4 = 2×0.6^4
= 0.2592m

5 = $2 \times 0.6^5 = 0.15552m$

4 bounces ..... **(2)**

8. The value of a television was £600 on 1st March 2013.
Every four months, the value of the television decreased by 8% of its value at the start of that four months. → 3 times

What was the value of the television on 1st March 2014?

$A = P\left(1 - \frac{r}{100}\right)^n$

$= 600(1 - 0.08)^3$

$= 467.2128$

£ 467.2128

(3)

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9. £5200 is invested at 2.8% compound interest per annum.
How many years will it take for the investment to exceed £7000.

$A = P\left(1 + \frac{r}{100}\right)^n$

4 yrs → $5200(1 + 0.028)^4$

$= 5807.32$

5 → $5200(1 + 0.028)^5$

$= 5969.926$

6 → $5200(1 + 0.028)^6$

$= 6137.083$

8 → $5200(1 + 0.028)^8$

$= 6485.57$

10 → $5200(1 + 0.028)^{10}$

$= 6853.84$

11 → $5200(1 + 0.028)^{11}$

$= 7045.756$

11 years

(3)

10. A radioactive substance decays over time.
Every year its mass decreases by 14%.

How many years will it take for 500kg of the substance to decay to a mass less than 200kg?

4 yrs → $500(1-0.14)^4$
$= 273.5$

5 → $500(1-0.14)^5$
$= 235.21$

6 → $500(1-0.14)^6$
$= 202.28$

7 = $500(1-0.14)^7$
$= 173.96$

7 .....years
(3)

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11. Martyn has some money to invest and sees this advert.

Bank of Maths

Double your money in 15 years.

The average annual growth for your investment is 4.5%

Will Martyn double his money in 15 years by investing his money with "Bank of Maths?"
You **must** show your workings.

If he had £1000

$A = P\left(1+\frac{r}{100}\right)^n$

$= 1000(1+0.045)^{15}$

$= 1935.28$ ←

No will not double

(4)

12. James weighed 100kg.
His target was to weigh 80kg or less.
His weight decreased by 3% each month.

Has he achieved his target after six months?
Show your workings.

$A = P\left(1 - \frac{r}{100}\right)^n$

$= 100\,(1 - 0.03)^6$

$= 83.297$

No, he will not achieve his target.

(3)

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13. A fish tank has sprung a leak, at the base of the tank.
5% of the water is lost every minute.

How much water is lost from the tank after ten minutes?

Initial $\Rightarrow$ 100

$A = 100\,(1 - 0.05)^{10}$

$= 59.87$ left in tank

water lost $\Rightarrow$ $100 - 59.87$

$= 40.1263$

40.1263

(3)