Compound Interest & Percentage Profit

Practice Worksheet (Problem Solving)

I Do

(a) Paul invests £5000 for 3 years at 2.4% compound interest per year. Work out the value of his investment after 3 years, to the nearest penny.

£ ..... *(2 marks)*

(b) Paige buys a watch for £40 and sells it for £47.20. Calculate her percentage profit.

.....% *(2 marks)*

(Total for Question is 4 marks)

We Do

(a) Sophie invests £6000 for 4 years at 3.5% compound interest per year. Work out the value of her investment after 4 years, to the nearest penny.

£ ..... *(2 marks)*

(b) Ben buys a jacket for £60 and sells it for £73.20. Calculate his percentage profit.

.....% *(2 marks)*

(Total for Question is 4 marks)

You Do 1

(a) Tom invests £3500 for 3 years at 4.2% compound interest per year. Work out the value of his investment after 3 years, to the nearest penny.

£ ..... *(2 marks)*

(b) Katie buys a bicycle for £120 and sells it for £151.20. Calculate her percentage profit.

.....% *(2 marks)*

(Total for Question is 4 marks)

You Do 2

(a) Ryan buys a new van for £18,000. The value of the van depreciates by 12% each year. Work out the value of the van after 3 years, to the nearest penny.

£ ..... *(2 marks)*

(b) Emma buys a camera for £250 and sells it for £207.50. Calculate her percentage loss.

.....% *(2 marks)*

(Total for Question is 4 marks)

You Do 3

(a) Catherine invests £8000 in a savings account. The account pays 3% compound interest in the first year, and 1.5% compound interest in each subsequent year. Work out the total interest Catherine earns after 3 years, to the nearest penny.

£ ..... *(3 marks)*

(b) Mark buys a table for £160 and spends £40 restoring it. He then sells the table for £256. Calculate his percentage profit on his total cost.

.....% *(2 marks)*

(Total for Question is 5 marks)

Challenge 1

John invests £4000 in a savings account paying x% compound interest per year.

At the end of 3 years, the value of his investment is £4630.50.

Work out the value of x.
Show all of your working clearly.

$x =$ .....

(Total for Question is 3 marks)

Challenge 2

Keeley invests £5000 in Bank A and £5000 in Bank B for 2 years.

- Bank A pays 4% compound interest per year.
- Bank B pays 5% compound interest in the first year, and r% compound interest in the second year.

At the end of the 2 years, both investments have the exact same value.

Work out the value of r.
Give your answer correct to 2 decimal places.
Show all of your working clearly.

$r =$ .....

(Total for Question is 4 marks)

Extreme Challenge

Zoe invests £P in a savings account that pays 5% compound interest per year for 2 years.

At the end of the 2 years, she withdraws the full amount and uses all of it to buy a vintage motorcycle.

She then sells the motorcycle for £5292, making a 20% profit on the amount she paid for it.

(a) Work out the original amount, £P, that Zoe invested.

£ ..... *(3 marks)*

(b) Calculate Zoe's overall percentage profit from her original investment £P to the final selling price of £5292.

.....% *(2 marks)*

(Total for Question is 5 marks)

Worked Answers

I Do (Paul & Paige)
(a) Multiplier for a 2.4% increase $= 1 + 0.024 = 1.024$.
Value $= 5000 \times 1.024^3 = 5000 \times 1.073741824 = 5368.70912$.
To the nearest penny: **£5368.71**.
(b) Profit $=$ £$47.20 -$ £$40 =$ £7.20.
Percentage profit $= \frac{7.20}{40} \times 100\% =$ **18%**.

We Do (Sophie & Ben)
(a) Multiplier $= 1.035$.
Value $= 6000 \times 1.035^4 = 6000 \times 1.147523\cdots = 6885.138\ldots$
To the nearest penny: **£6885.14**.
(b) Profit $=$ £$73.20 -$ £$60 =$ £13.20.
Percentage profit $= \frac{13.20}{60} \times 100\% =$ **22%**.

You Do 1 (Tom & Katie)
(a) Multiplier $= 1.042$.
Value $= 3500 \times 1.042^3 = 3500 \times 1.131366\cdots = 3959.781\ldots$
To the nearest penny: **£3959.78**.
(b) Profit $=$ £$151.20 -$ £$120 =$ £31.20.
Percentage profit $= \frac{31.20}{120} \times 100\% =$ **26%**.

You Do 2 (Ryan & Emma)
(a) Multiplier for a 12% decrease $= 1 - 0.12 = 0.88$.
Value $= 18000 \times 0.88^3 = 18000 \times 0.681472 = 12266.496$.
To the nearest penny: **£12,266.50**.
(b) Loss $=$ £$250 -$ £$207.50 =$ £42.50.
Percentage loss $= \frac{42.50}{250} \times 100\% =$ **17%**.

You Do 3 (Catherine & Mark)
(a) Value after 3 years $= 8000 \times 1.03 \times 1.015^2 = 8240 \times 1.030225 = 8489.054$.
Total interest earned $= 8489.054 - 8000 = 489.054$.
To the nearest penny: **£489.05**.
(b) Total cost $=$ £$160 +$ £$40 =$ £200.
Profit $=$ £$256 -$ £$200 =$ £56.
Percentage profit $= \frac{56}{200} \times 100\% =$ **28%**.

Challenge 1 (John)
1. Let the annual multiplier be m:
$4000 \times m^3 = 4630.50$
2. Divide by 4000:
$m^3 = \frac{4630.50}{4000} = 1.157625$
3. Take the cube root:
$m = \sqrt[3]{1.157625} = 1.05$.
4. Convert the multiplier to a percentage increase:
$(1.05 - 1) \times 100 = 5$.
Therefore, **x** $=$ **5**.

Challenge 2 (Keeley)
1. Find the value in Bank A after 2 years:
Value $= 5000 \times 1.04^2 = 5000 \times 1.0816 =$ £5408.
2. Find the value in Bank B after the first year:
$5000 \times 1.05 =$ £5250.
3. Let m be the multiplier for the second year in Bank B:
$5250 \times m = 5408 \implies m = \frac{5408}{5250} = 1.030095\ldots$
4. Convert m to the percentage rate r:
$r = (1.030095\cdots - 1) \times 100 = 3.0095\ldots$
Correct to 2 decimal places: **r** $=$ **3.01**.

Extreme Challenge (Zoe)
(a) 1. Work backwards from the selling price to find the price Zoe paid for the motorcycle:
Selling price of £5292 represents 120% of the purchase price.
Purchase price $= \frac{5292}{1.2} =$ £4410.
2. £4410 is the value of Zoe's investment after 2 years at 5% compound interest:
$P \times 1.05^2 = 4410$
$P \times 1.1025 = 4410$
$P = \frac{4410}{1.1025} =$ £**4000**.

(b) Overall profit $=$ £$5292 -$ £$4000 =$ £1292.
Overall percentage profit $= \frac{1292}{4000} \times 100\% =$ **32.3**%.