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2014 Paper One - Project Maths > Section A > Question 1

A shopkeeper bought 25 school blazers at €30 each and 25 trousers at €20 each.

(a) Find the total cost to the shopkeeper.

(b) The shopkeeper sells a blazer and a trousers as a set for €89·95. Find her profit on this transaction.

(c) The shopkeeper sells 22 blazer and trouser sets at €89·95 each. She sells the remaining 3 sets at a discount of 20% on the selling price. Find her mark up (profit as a percentage of cost price) on the total transaction.

(a) Find the total cost to the shopkeeper.

$25 \times 30 = 750$

$25 \times 20 = 500$

$500 + 750 = €1250$

(b) The shopkeeper sells a blazer and a trousers as a set for €89·95. Find her profit on this transaction.

$89{\cdot}95 - 50 = €39{\cdot}95$

(c) The shopkeeper sells 22 blazer and trouser sets at €89·95 each. She sells the remaining 3 sets at a discount of 20% on the selling price. Find her mark up (profit as a percentage of cost price) on the total transaction.

$22 \times 89{\cdot}95 = €1978{\cdot}90$

$89{\cdot}95 \times 0{\cdot}8 = €71{\cdot}96$

$3 \times 71{\cdot}96 = €215{\cdot}88$

$1978{\cdot}90 + 215{\cdot}88 = €2194{\cdot}78$

$2194{\cdot}78 - 1250 = 944{\cdot}78$ (Profit)

$$\frac{944{\cdot}78}{1250} \times 100 = 75{\cdot}58\%$$

(a) Mary bought a new car for €20 000 on the 1st July 2010.
The value of the car depreciated at a compound rate of 15% each year.
Find the value of the car, correct to the nearest euro, on the 1st July 2014.

(b) Mary wishes to buy a new car, which costs €24 000, on the 1st July 2014.

(i) *Buy Right Car Sales* offers Mary €10 500 for her old car. She can borrow the balance for one year at a rate of 11·5%. How much would she repay on 1st July 2015?

(ii) *Bargain Deals Car Sales* offers Mary €10 000 for her old car and an interest free loan of the balance for six months. At the end of the six months Mary would make a payment of €4000 and would be charged interest at a compound rate of 1·5% per month for the next six months. How much would Mary repay on 1st July 2015?

(iii) Which of the above options should Mary choose if she wishes to pay the least amount? Justify your answer by calculation.

(a) Mary bought a new car for €20 000 on the 1st July 2010.
The value of the car depreciated at a compound rate of 15% each year.
Find the value of the car, correct to the nearest euro, on the 1st July 2014.

$20\,000(1-0{\cdot}15)^4 = €10\,440$

(b) Mary wishes to buy a new car, which costs €24 000, on the 1st July 2014.

(i) *Buy Right Car Sales* offers Mary €10 500 for her old car. She can borrow the balance for one year at a rate of 11·5%. How much would she repay on 1st July 2015?

$24\,000 - 10\,500 = €13\,500$ to borrow

$13\,500 \times 1{\cdot}115 = €15\,052{\cdot}50$ to repay on 1st July 2015

Note:
$13\,500 \times 11{\cdot}5\% = 1552{\cdot}50$

(ii) *Bargain Deals Car Sales* offers Mary €10 000 for her old car and an interest free loan of the balance for six months. At the end of the six months Mary would make a payment of €4000 and would be charged interest at a compound rate of 1·5% per month for the next six months. How much would Mary repay on 1st July 2015?

$24\,000 - 10\,000 = €14\,000$ Loan

$14\,000 - 4000 = 10\,000$ To repay after 6 months

$10\,000 \times (1{\cdot}015)^6 = €10\,934{\cdot}43$ to repay on 1st July 2015

(iii) Which of the above options should Mary choose if she wishes to pay the least amount? Justify your answer by calculation.

Total repayment *Buy Right* €15 052·50

Total repayment *Bargain deals* $10\,934{\cdot}43 + 4000 = €14\,934{\cdot}43$

[Difference €118·07]

She would pay less overall if she bought the car from *Bargain Deals* **(option (ii))**

Question 2 **(25 marks)**

(a) A sum of €5,000 is invested in an eight-year government bond with an annual equivalent rate (AER) of 6%. Find the value of the investment when it matures in eight years' time.

(b) A different investment bond gives 20% interest after 8 years.
Calculate the AER for this bond.

Question 2 **(25 marks)**

(a) A sum of €5,000 is invested in an eight-year government bond with an annual equivalent rate (AER) of 6%. Find the value of the investment when it matures in eight years' time.

We know that the future value F of a present investment P invested for n years at a rate of $i\%$ is given by

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

In our case, P =€5000, $n = 8$ and $i = 6$. This gives $F = 5000(1.06)^8$ which is €7,989.24 correct to the nearest cent.

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(b) A different investment bond gives 20% interest after 8 years. Calculate the AER for this bond.

We know that the future value of our investment is the original amount plus the 20% interest, so if our investment is P then the value after 8 years is $1.2P$
We wish to find a value for i such that

$$1.2P = P\left(1+\frac{i}{100}\right)^8$$

We divide across by P to get $1.2 = \left(1+\frac{i}{100}\right)^8$. We can then solve for i:

$$\begin{aligned} 1.2 = \left(1+\frac{i}{100}\right)^8 &\Leftrightarrow \sqrt[8]{1.2} = 1+\frac{i}{100} \\ &\Leftrightarrow \sqrt[8]{1.2}-1 = \frac{i}{100} \\ &\Leftrightarrow 100\left(\sqrt[8]{1.2}-1\right) = i \end{aligned}$$

From a calculator, this gives that the equivalent AER for this bond is $i = 2.305\%$ correct to three decimal places.

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(b) Michael has a credit card with a credit limit of €1000. Interest is charged monthly at 1·5% of the amount owed. Michael gets a bill at the end of each month. At the start of January, Michael owes €800 on his credit card. If Michael makes no repayments and no more purchases, show that he will exceed his credit limit after 15 months.

(c) Michael buys an item costing £95 on the internet and pays with his credit card. If the exchange rate is €1 = £0·8473, calculate, correct to the nearest cent, the amount that will be included on Michael's credit card bill.

$$F = P(1+i)^t$$
$$= 800(1+0\cdot 015)^{15}$$
$$= 800(1\cdot 015)^{15}$$
$$= 1000\cdot 18...$$

€1000·18... > €1000

$$\frac{95}{0 \cdot 8473} = 112 \cdot 1208... \approx €112 \cdot 12$$

Question 2 **(25 marks)**

(a) A sum of €5000 is invested in an eight-year government bond with an annual equivalent rate (AER) of 6%. Find the value of the investment when it matures in eight years' time.

(b) A different investment bond gives 20% interest after 8 years.
Calculate the AER for this bond.

Question 1 **(25 marks)**

Alan pays income tax, a universal social charge (USC) and pay-related social insurance (PRSI) on his gross wages. His gross weekly wages are €510.

(a) Alan pays income tax at the rate of 20%. He has weekly tax credits of €63. How much income tax does he pay?

(b) Alan pays the USC at the rate of 2% on the first €193, 4% on the next €115 and 7% on the balance. Calculate the amount of USC Alan pays.

(c) Alan also pays PRSI. His total weekly deductions amount to €76·92. How much PRSI does Alan pay?

(a) Alan pays income tax at the rate of 20%. He has weekly tax credits of €63. How much income tax does he pay?

Total tax: $€510 \times 0{\cdot}2 = €102$

Tax paid: $€102 - €63 = €39$

$€193 \times 0{\cdot}02 = €3{\cdot}86$
$€115 \times 0{\cdot}04 = €4{\cdot}60$

$€510 - (€193 + €115) = €202$

$€202 \times 0{\cdot}07 = €14{\cdot}14$

USC: $€3{\cdot}86 + €4{\cdot}60 + €14{\cdot}14 = €22{\cdot}60$

(c) Alan also pays PRSI. His total weekly deductions amount to €76·92. How much PRSI does Alan pay?

PRSI $= €76{\cdot}92 - (€39 + €22{\cdot}60) = €15{\cdot}32$