Applied Arithmetic Test

Sandford Park School

Ms. Duffy

Name: _____Answer Key – Ms Duffy_____

Date: _____

Read each question carefully

Label your answers **<u>clearly</u>**

Show all workings

Raise your hand if something is unclear

(out of 60)

$$Markup = \frac{profit}{cost}$$

(−2) Rounding error

$$Margin = \frac{Profit}{Selling\ Price}$$

(−2−4) Miscalculation

$$F = P(1 + i)^t$$

Question 1   [15 marks] [10 minutes]

A cute top was bought online for €26. If VAT was 22% of the cost of the top and the cost of delivery was €4.99, what was the total cost paid?

$$26$$
$$+ \quad 5.72 \quad 20\% \text{ of } 26$$
$$4.99$$
$$\overline{\hspace{2cm}}$$
$$36.71$$

(5)

MARKS

The markup on that top was 90%. What was the margin?

not enough info given

— sorry to stress you guys out!

Question 2   [10 marks] [5 minutes]

Eva bought an Xbox for $199.95 when she was on holidays in the United States. The exchange rate was $1.33 = €1

(a) Convert the cost of the Xbox to euro. Write your answer correct to the nearest cent.

$$\$1.33 = €1$$
$$\div 1.33 \quad \div 1.33$$
$$\overline{\hspace{3cm}}$$
$$\$1 = €0.7518796992$$
$$\$1 = €0.75$$

$$\$199.95$$
$$\times 0.75$$
$$\overline{\hspace{2cm}}$$
$$149.9625$$
$$€149.96$$

(5)

→ *other methods*

$$\$1.33 = €1$$

$$\div 1.33 \qquad \div 1.33$$

$$\$1 = 0.7518796992$$

$$\times 199.95$$

$$150.3383459$$

$$€150.34$$

OR, simply

$$199.95 \div 1.33 = €150.34$$

(b) An Xbox of the same model costs €269.99 in Ireland. How much money did Eva save by buying the Xbox in the United States?

269.99
− 149.96
─────────
120.03

OR if got 150

269.99
− 150.34
─────────
119.65   ⑤

Eva saved €120.03

[10 marks] [5 minutes]

Question 3

Jim invests 10,000 at a simple interest rate of 3.7% for 5 years.
Laura invests 10,000 at a compound interest rate of 3.7% for 5 years.
How much more or less does Laura earn than Jim?

simple interest : same amount added each yr

Jim   10,000 × 0.037 = 370   → or you could have done:

	Principal	Interest	Amt at End of Yr
YR1	10000	370	10370
YR2	10370	370	10740
YR3	10740	370	11110
YR4	11110	370	11480
YR5	11480	370	11850

10,000 + (370)(5)

11850

compound interest = interest on interest earned

	Principal	Interest = 3.7%	Final Amt
YR1	10,000	370	10370
YR2	10370	383.69	10753.69
YR3	10753.69	397.88653	11151.57653
YR4	11151.57653	412.6083316	11564.18486
YR5	11564.18486	427.8748399	11992.0597

11992.06

or you could have saved all that time + used the formula $F = P(1+i)^t$

$$F = P(1+i)^t \quad \leftarrow \text{time}$$

↑ Final AMT.

↑ principal

↑ interest rate as decimal

$$F = 10,000(1 + 0.037)^5$$

$$F = 11992.0597$$

$$F = 11992.06$$

$$1192.06 - 11850$$

Answer: Laura earns €142.06 more than Jim.

NOTE: The question asks "how much more or less did Laura earn than Jim" — Even if you did all correct workings but did not specifically answer the question you lost 2 marks.

Question 4 [15 marks] [10 minutes]

Eve is deciding which bank to invest her lottery winnings in. She wants to invest €1,000,000

Option A - Invest the amount for 3 years at a changing compound interest rate (12% for the first year, 6% for the second year, 3% for the last year)

Option B - Invest the amount at a compound interest rate of 8% for 3 years

Provide a mathematically sound argument as to which account Eve should invest her money into.

Option A

	Principal	Interest	Final
12% Yr 1	1 000 000	120,000	1120000
6% Yr 2	1120000	67200	1187200
3% Yr3	1187200	35616	1222816

1,222,816

Option B

Compound interest
* constant rate *

$$F = P(1+i)^t$$

$$F = 1000\,000\,(1 + 0.08)^3$$

$$F = 1259712$$

1, 259, 712

*OPTION B gives Eve 36,896 more.

she should invest using Option B.

Question 5

The standard rate of income tax is 20% and the higher rate is 41%
The standard rate cut-off point is €32 800

up to 32,800 can be taxed at 20%, any amount above tax is 41%

Liz's gross income is €30 000. What is her gross tax?

$$(30\ 000)(0.2) = 6000$$

Liz's gross tax is €6000

③

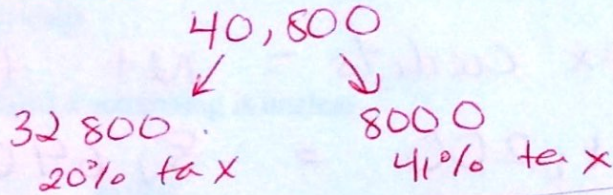Liz gets €2, 900 tax credits this year. What is Liz's net income?

NET TAX $6,000 - 2,900 = 3100$

NET INCOME $30,000 - 3,100 = 26,900$

Liz's net income is 26,900

⑤

Malcolm's gross income is €40, 800, what is his gross tax?

$$40,800$$

32 800 → 20% tax   8000 0 → 41% tax

GROSS TAX €6560 + €3280 = €9,840

Malcolm's gross tax is €9,840

⑦

Malcolm's net income after tax and a certain amount he put in his savings was €29, 160. If he got €1, 200 tax credits, how much did he put away in his savings account?

Net tax $9,840 - 1,200 = 8640$

$29,160 = $ net income

Net income = Gross income − (net tax and any other deductibles)

$$29,160 = 40,800 - (8640 + \text{Amt. he put in savings})$$

variable equation $29,160 = 40800 - 8640 - \text{Amt he put in savings}$

$$\begin{array}{rcl} -40800 & & -40800 \\ \hline -11\,640 & = & -8640 - \text{Amt he put in savings} \\ +8640 & & +8640 \\ \hline -3000 & = & -\text{Amt he put in savings} \end{array}$$

⑤

$$\left(-3000 = - \text{Amt. he put in savings} \right) \cdot -1$$

€ 3000 = Amt. he put in savings

Malcolm put € 3000 away into his savings.

Other way to solve

gross tax − tax credits = Net tax

9,840 − 1,200 = 8,640

gross income − Net tax = take home pay

40,800 − 8,640 = 32,160

32,160 (before put money in savings)

− 29,160 (net income)

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3,000 (AMT. PUT in savings)