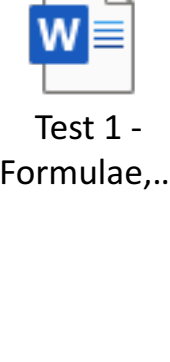
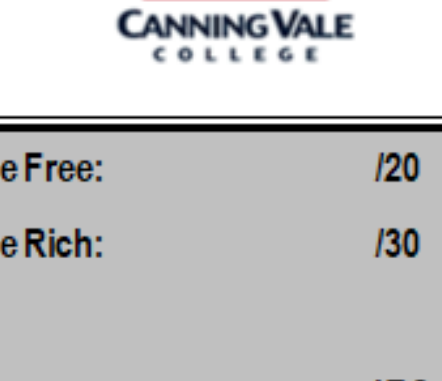


Test 1 – Formulae, Percentages and Interest Sol

Thursday, May 19, 2022 6:12 AM



NAME: Answers



**Response Item: Test 1 – Formulae, Percentages, and Interest**  
**Year 11 Applications Mathematics**

**Section 1: Resource Free**  
**Time: 25 minutes**

Resource Free:	/20
Resource Rich:	/30
<b>Total:</b>	<b>/50</b>
	<b>%</b>

**TIME ALLOCATION FOR THIS TEST**

**Section 1 – Resource Free**  
**25 minutes working time**

After exactly 25 minutes have elapsed Section 1 will be collected, and Section 2 will begin.

**Section 2 – Resource Rich**  
**30 minutes working time**

**Material required/recommended for this test**

**To be provided by the supervisor**

Question/answer booklet for Section One and Two, and formula sheet.

**To be provided by the candidate**

**Section One:**

Standard items: pens, pencils, pencil sharpener, highlighter, eraser, ruler  
Special materials: drawing instruments, templates.

**Section Two:**

Standard items: pens, pencils, pencil sharpener, highlighter, eraser, ruler  
Special materials: drawing instruments, templates, notes on a maximum of **one single sided** unfolded sheet of A4 paper, up to three calculators (CAS, graphics or scientific)

**Important note to candidates**

No other items may be taken into the test room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the test room. If you have any unauthorised material with you, hand it to the teacher **before** reading any further.

Although marks are not necessarily awarded for working, it is recommended that **enough working to justify** your responses is shown. Incorrect answers with no working will be awarded **zero** marks.

- [3 marks]**
1. Solve for  $A$  given  $P = 500$ ,  $r = 0.2$ , and  $t = 2$ :

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

$$A = 500(1 + 0.2)^2 \quad \checkmark \text{ (sub.)}$$
$$= 500 \times 1.2^2 \quad \checkmark \text{ (shows understanding of squaring)}$$
$$= 600 \times 1.2 \quad \checkmark \text{ (ans.)}$$

**[2 marks]**

2. Evaluate the expression below using  $a = 5$ ,  $b = 0.5$ , and  $x = 1.5$ :

$$\frac{3ab}{x} = \frac{3 \times 5 \times 0.5}{1.5} = \frac{7.5}{1.5} = 5 \quad \checkmark \text{ (ans.)}$$

$\checkmark \text{ (sub.)}$

**[5 marks – 2, 3]**

3. The formula below calculates distance travelled in meters ( $s$ ), over a given time in seconds ( $t$ ), with an initial velocity in meters per second ( $u$ ), and an acceleration in meters per second per second ( $a$ ):

$$s = ut + \frac{1}{2}at^2$$

- a) How far would an object travel over 12 seconds if it had an initial velocity of 2.5 meters per second and an acceleration of 4 meters per second per second?

$$s = 2.5 \times 12 + \frac{1}{2} \times 4 \times 12^2 \quad \checkmark \text{ (sub.)}$$
$$= 30 + 2 \times 144$$
$$= 318 \text{ m} \quad \checkmark \text{ (ans.)}$$

- b) By how much does the distance travelled in a) increase if the time is doubled and all other values remain the same?

$$s = 2.5 \times 24 + \frac{1}{2} \times 4 \times 24^2 \quad \checkmark \text{ (correctly doubles t)}$$
$$= 60 + 2 \times 576$$
$$s = 1212 \quad \checkmark \text{ (new s)}$$

**[5 marks – 2, 3]**

$$\therefore \Delta s = 1212 - 318 = 894 \text{ m} \quad \checkmark \text{ (ans.)}$$

4. Evaluate:

- a) 18% of 68 kg

$$10\% = 6.8 \quad 1\% = 0.68 \quad \checkmark \text{ (some correct working)}$$
$$20\% = 13.6 \quad 2\% = 1.36$$
$$\therefore 18\% = 13.6 - 1.36 = 12.24 \text{ kg} \quad \checkmark \text{ (ans.)}$$

- b)  $\frac{3\sqrt{9x-18}}{(12-x)^2}$  when  $x = 6$

$$\frac{3 \times \sqrt{9 \times 6 - 18}}{(12 - 6)^2} = \frac{3 \times \sqrt{36}}{36} = \frac{18}{36} = 0.5 \quad \checkmark \text{ (ans.)}$$

$\checkmark \text{ (simp. 'i' and 'j')}$

**[5 marks – 2, 3]**

5. A company buys graphics cards for \$320 per unit and sells them for \$800

- a) Represent this mark up as a percentage:

$$\frac{800}{320} = 2.5 \quad \checkmark \text{ (divides by cost)}$$
$$\therefore 150\% \text{ mark up} \quad \checkmark \text{ (ans.)}$$

- b) What percentage of the sale price is profit?

$$800 - 320 = 480 \quad \checkmark \text{ (calculates profit)}$$
$$\frac{480}{800} = 0.6 \quad \checkmark \text{ (divides by sale price)}$$
$$60\% \text{ profit} \quad \checkmark \text{ (ans.)}$$

NAME: \_\_\_\_\_ **Section 2: Resource Rich**

**End of Section 1**

**Answers cont.**

**Time: 30 minutes**

**[7 marks – 3, 2, 2]**

6. The Body Adiposity Index ( $BAI$ ) is used in health fitness applications to give a rough calculation of body fat. The spreadsheet below has been filled out using this formula where  $c$  represents hip circumference in centimetres, and  $h$  represents height in meters:

$$BAI = \frac{c}{h^{1.5}} - 18$$

	A	B	C	D	E	F	G
1					Height (m)		
2			1.5	1.6	1.7	1.8	1.9
3		50	9.2	6.7	4.6	4.5	1.1
4		60	14.7	11.6	9.1	6.8	4.9
5		70	20.1	16.6	13.6		8.7
6		80	25.5	21.5	18.1	15.1	12.5
7		90	31.0	26.5	22.6	19.3	16.4

- a) Calculate the value of the empty cell with appropriate rounding:

$$BAI = \frac{70}{1.8^{1.5}} - 18 = 11.0 \quad \checkmark \text{ (rounding correct i.e. 11.0)}$$

$\checkmark \text{ (calc)} \quad \checkmark \text{ (ans.)}$

- b) One of the precalculated cells is incorrect, identify this cell by its cell reference (e.g. B2) and calculate the correct value for the cell

$$F3 \quad BAI = 2.7 \quad \checkmark \text{ (correct calculation)}$$

$\checkmark \text{ (cell reference)}$

- c) Cell D6 is calculated correctly using a spreadsheet formula, write the formula for this cell below:

$$= B6 / D2 ^ {1.5} - 18 \quad \checkmark \text{ (cell references)} \quad \checkmark \text{ (symbols)}$$

7. The Uncommonwealth Bank offers a term deposit (investment account). This account pays interest at 5.25% p.a., compounding monthly, but requires a deposit of \$10 000 and the initial deposit and interest accrued will only be released after three years:

- a) Yash wishes to invest in this term deposit but only has \$9200 saved and has decided to take out a simple interest loan at a daily interest rate of 0.0475% for the remainder.

Calculate the amount of interest this loan will accrue over the three years:

$$I = 800 \times 0.000475 \times 365 \times 3 \quad \checkmark \text{ (correct working)}$$
$$= \$416.18 \quad \checkmark \text{ (ans.)}$$

- b) With the money from the loan, Yash invests \$10 000 in the term deposit, calculate the amount of interest this investment will accrue over the three years:

$$A = 10000(1 + \frac{0.0525}{12})^{12 \times 3} \quad \checkmark \text{ (sub.)}$$
$$= \$11701.79 \quad \checkmark \text{ (A)}$$
$$\text{Interest} = \$1701.79 \quad \checkmark \text{ (I)}$$

- c) Over the three years of the loan inflation stayed steady at 3.5% p.a. Show that by Yash investing his money he was able to outpace inflation hence increasing the buying power of his money

$$9200 \times 1.035^3 = \$10200.20 \quad \checkmark \text{ (inflated value)}$$
$$9200 + 1701.79 - 416.1 = \$10485.69 \quad \checkmark \text{ (investment value)}$$

$\checkmark \text{ (statement showing increase in buying power)}$

8. Below is an account statement including all transactions in the account for the month of September (30 days).

Date	Transaction	Debit	Credit	Balance
01/09/2021	Initial Balance			\$320
07/09/2021	Nando's inc.	\$19.80		\$300.20
19/09/2021	HJ's HO		\$290.45	\$590.65
25/09/2021	Coles	\$52.10		\$538.55

- a) Calculate the interest this account accrued using the Minimum Monthly Balance method given that the interest rate was 5.4% p.a. for the entire month:

$$I = 300.2 \times 0.054 \times \frac{30}{365} = \$1.33 \quad \checkmark \text{ (ans.)}$$

$\checkmark \text{ (correct working)}$

- b) Recalculate the interest for this account using the Daily Balance method and state the increase in interest this method gives as a percentage:

$$320 \times 0.054 \times \frac{6}{365} = \$0.28 \quad \textcircled{1} \text{ using correct balances}$$
$$300.2 \times 0.054 \times \frac{12}{365} = \$0.53 \quad \textcircled{1} \text{ correct days}$$
$$590.65 \times 0.054 \times \frac{6}{365} = \$0.52 \quad \textcircled{1} \text{ correct interest}$$
$$538.55 \times 0.054 \times \frac{6}{365} = \$0.48 \quad \textcircled{1} \text{ total interest}$$
$$I = \$1.81 \quad \textcircled{1} \text{ total interest}$$
$$\text{Total Increase} = \frac{1.81}{1.33} - 1 = 36.1\% \quad \textcircled{1} \text{ increase as \% (ignore rounding)}$$

**[8 marks – 2, 3, 3]**

9. A business buys products at **cost price**, increases this price by a fixed percentage to the **pre-GST price**, then increases this amount by 10% to get the **GST included** price (i.e. sale price). Sometimes items are then discounted or marked up due to sales or shortages etc.

Item ID	Item Description	Cost Price	Pre-GST	GST Included (Sale Price)
111093	Deck Chair	\$58	\$127.60	\$140.36
121004	4-Burner BBQ	\$280	\$616	\$677.60
118501	Outdoor Umbrella	\$40	\$88	\$96.80
113387	Insect Zapper	\$78	\$171.60	\$188.76
000203	Wheelbarrow	\$120	\$264	\$290.40

- a) By what fixed percentage is the cost price increased to get the pre-GST price?

$$\frac{616}{280} = 2.2 \quad \therefore \% \text{ increase} = 120\% \quad \checkmark \text{ (ans.)}$$

$\checkmark \text{ (any correct calc.)}$

- b) Add the missing values to the table above (1 mark each)

- c) This company has decided to sell a specific item with a cost price of \$190 to their customers however, to be competitive they have decided to sell it for \$400 (inc. GST).

By how much has this decision reduced their pre-GST profit compared to their normal pricing scheme?

$$\text{Normal Profit} = 190 \times 1.2 = \$228 \quad \checkmark$$
$$\text{This item's Profit} = 400 \div 1.1 - 190 = \$173.64 \quad \checkmark$$

$$\text{Profit reduced by } \$54.36 \quad \checkmark$$

**End of Test**