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Student ID: _____

Test 3

This test is graded out of 50 marks. No books, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. *(1 mark each)* Evaluate and round solutions to two decimal places.

a. $-(1 - \sqrt[11]{11}) =$ 0.24

b. $(-1.0292)^{\frac{2}{3}} =$ 1.02

c. $\ln e^6$ $= 6$

d.

$$\frac{1 + \frac{3}{2}}{\frac{4}{5}} = \frac{25}{8} = 3.13$$

Question 2. *(3 marks)* Solve for x.

$$\frac{4}{3}\left(x - \frac{1}{5}\right) - \left(x - \frac{1}{2}\right) = 2 + \frac{1}{2}x - \frac{5}{7}(-x - 2)$$

$LCD: \ 210$

$$210\left(\frac{4}{3}\right)\left(x - \frac{1}{5}\right) - 210\left(x - \frac{1}{2}\right) = 2(210) + 210\left(\frac{1}{2}x\right) - (210)\left(\frac{5}{7}\right)(-x - 2)$$

$$280x - 56 - 210x + 105 = 420 + 105x + 150x + 300$$

$$-671 = 185x$$

$$\frac{-671}{185} = x$$

Question 3. *(3 marks)* Solve for x.

$$1.1 : 4.3 = 2 : x$$

$$\frac{1.1}{4.3} = \frac{2}{x}$$

$$x = 7.81$$

Question 4. *(4 marks)* A short-term loan of $2 500.00 at a rate of 9% p.a. is to be repaid in 73 weeks. What amount is due in 73 weeks?

$$S = P(1 + rt)$$
$$= 2500\left(1 + 0.09\left(\frac{73}{52}\right)\right)$$
$$= \$2815.87$$

∴ the amount due is $2815.87

Question 5. *(4 marks)* A principal amount of $5 000 is invested for 6 years and 2 months at a rate of 7% compounded quartely. What is the future value of the investment?

$$FV = PV(1+i)^n$$
$$= 5000(1 + 0.0175)^{\frac{74}{3}}$$
$$= \$7670.42$$

$$m = 4$$
$$n = mt = 4\left(6\frac{2}{12}\right) = \frac{74}{3}$$
$$i = \frac{j}{m} = \frac{7\%}{4} = 1.75\%$$

∴ the future value is $7670.42

Question 6. *(4 marks)* A payment of $2 is made at the end of each day into a savings account, compounded daily. The account has a nominal interest rate of 3%, what will the accumulated value be in 20 years?

$$FV = 2\left[\frac{\left(1 + \frac{0.03}{365}\right)^{7300} - 1}{\frac{0.03}{365}}\right]$$

$$m = 365$$
$$n = 365(20) = 7300$$
$$i = \frac{j}{m} = \frac{3\%}{365} =$$

$$= \$20\,003.80$$

∴ the accumulated value will be $20 003.80

Question 7. *(2 marks)* What is 15% of $487?
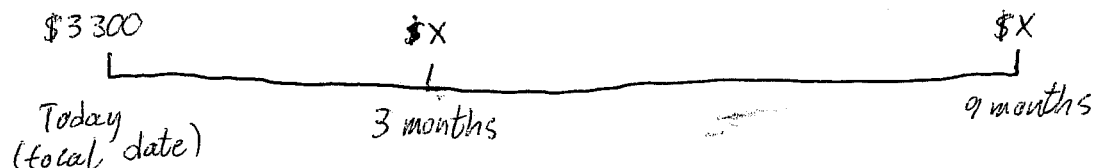
$$\text{Percentage} = (\text{base})(\text{rate})$$
$$= 487(0.15)$$
$$= \$73.05$$

Question 8. *(2 marks)* $495 is 9% of what amount?

$$\text{Percentage} = (\text{base})(\text{rate})$$
$$\$495 = (\text{base})(9\%)$$
$$\text{base} = \$5500$$

Question 9. *(6 marks)* Emilie takes out a short-term loan of $3 300, today. It is to be repaid by two equal payments: one in 3 months and the second in 9 months. If the interest rate is 8.75%, what is the size of the equal payments? *(Choose today as the focal date)*

$3\,300 \qquad \$X \qquad\qquad\qquad\qquad \$X$

Today (focal date) 3 months   9 months

$$3\,300 = \frac{X}{1 + 0.0875\left(\frac{3}{12}\right)} + \frac{X}{1 + 0.0875\left(\frac{9}{12}\right)}$$

$$3\,300 = 0.978593272X + 0.938416422X$$

$$3\,300 = 1.917009694x$$

$$x = \$1721.31$$

∴ the size of the equal payments is

$$\$1721.31$$

Question 10. *(6 marks)*
The local ski shop paid $1 200.00 for a pair of Volkl skis less 30%, 10% and 5%. Overhead expenses are 25% of the regular selling price and profit is 10% of the regular selling price. During a sale the skis were sold at a markdown of 10%. What was the operating profit or loss on the sale?

$$N = (1-d_1)(1-d_2)(1-d_3)L$$
$$= (1-30\%)(1-10\%)(1-5\%)1200.00$$
$$= \$718.20$$

$$S = C + E + P$$
$$S = 718.20 + 0.25S + 0.1S$$
$$0.65S = 718.20$$
$$S = 1104.92$$

$$\text{Sale price} = (1-10\%)1104.92$$
$$= \$994.43$$

$$\text{Total cost} = C + E = 718.20 + 0.25(1104.92) = 994.43$$

$$\text{Profit} = \text{Sale price} - \text{Total cost}$$
$$= 994.43 - 994.43$$
$$= \$0$$

∴ break-even.

Question 11. *(4 marks)*
What principal value will have a future value of $2 345.34 at 6% in 17 months?

$$P = \frac{S}{1+rt} = \frac{2\,345.34}{1+0.06\left(\frac{17}{12}\right)}$$

$$= \$2161.60$$

∴ the principal value is $2161.60

Question 12. *(4 marks)*
The IWW GDC wants to accumulate $50 000 into their fund in 5 years. They will make payments at the end of each quarter. If their fund is compounded quartely at 6%, what must be the size of the payments?

$$FV = PMT \left[\frac{(1+i)^n - 1}{i} \right]$$

$$FV = 50\,000$$

$$i = \frac{6\%}{4} = 0.015$$

$$n = 5 \cdot 4 = 20$$

$$50\,000 = PMT \left[\frac{(1+0.015)^{20} - 1}{0.015} \right]$$

$$PMT = \$2162.29$$

∴ the size of the payment should be
$2162.29

Question 13. *(4 marks)*
Find the sum of money that will grow to $5 000 in 5 years compounded daily at 4.15%?

$$PV = \frac{FV}{(1+i)^n}$$

$$FV = 5000$$

$$m = 365$$

$$n = 5 \cdot 365 = 1825$$

$$i = \frac{4.15\%}{365}$$

$$= \frac{5000}{\left(1 + \frac{4.15\%}{365}\right)^{1825}}$$

$$= \$4063.11$$

∴ the sum of money is $4063.11

Question 14. *(4 marks)*

Yann is planning his retirement for next year and wants to receive a monthly payment of $1 000 per month for the next 20 years after his retirement. How much money does Yann need in his retirement fund next year if the account has an interest rate of 5% compounded *monthly* ?

$$PV = PMT \left[\frac{1 - (1+i)^{-n}}{i} \right]$$

$$PMT = 1000$$
$$i = \frac{5\%}{12}$$
$$n = 12 \cdot 20 = 240$$

$$= 1000 \left[\frac{1 - (1 + \frac{0.05}{12})^{-240}}{\frac{0.05}{12}} \right]$$

$$= \$151\,525.31$$

Bonus Question *(4 marks)*

How many payments of $200 made at the end of each quarter amounts to $5 726.70 at 6% compounded quartely?

$$FV = PMT \left[\frac{(1+i)^n - 1}{i} \right]$$

$$526.70 = 200 \left[\frac{(1 + 0.015)^n - 1}{0.015} \right]$$

$$=$$

$$1.4295025 = (1.015)^n$$
$$\ln(1.4295025) = n \ln(1.015)$$
$$n = 24$$

$$\therefore \quad 24 \ payments$$