**Dawson College: Business Mathematics: 201-801-DW**

Name: SOLUTIONS

Student ID: _____

# Test 3

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 the following to two decimal places:

1. $-\ln e^5 = -5$
2. $(1.036)^{\frac{3}{2}} = 1.05$
3. $\frac{1}{2}(2-16)^2 = 98$
4. $\sqrt[6]{2318} = 3.64$

**Question 2.** *(3 marks)* Simplify expressing your answer with positive exponents only:

$$\frac{(-2xy)^4}{4x^{-2}y^5} = \frac{(-2)^4 x^4 y^4}{4 x^{-2} y^5} = \frac{16 x^4 x^2 y^4}{4 \quad y^5} = \frac{4x^6}{y}$$

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

$$\frac{12}{3}x - 3(5+x) = \frac{5}{2} + \frac{3}{7}(x-13) \qquad LCD = 42$$

$$42 \cdot \frac{12}{3}x - 42 \cdot 3(5+x) = 42 \cdot \frac{5}{2} + 42 \cdot \frac{3}{7}(x-13)$$

$$168x - 126(5+x) = 105 + 18(x-13)$$

$$168x - 630 - 126x = 105 + 18x - 234$$

$$42x - 630 = 18x - 129$$

$$42x - 18x = -129 + 630$$

$$24x = 501$$

$$x = \frac{501}{24} = \frac{167}{8}$$

**Question 4.** *(4 marks)* Marc invests $3300 for 5 years and 3 months at a rate of 7% compounded quarterly. What is the future value of the investment?

$$FV = PV(1+i)^n$$

$$i = \frac{j}{m} = \frac{7\%}{4} = 0.0175, \quad n = mt = (4)(5\tfrac{3}{12}) = 4(5.25) = 21$$

$$FV = 3300(1 + 0.0175)^{21} = \$4750.47$$

**Question 5.** *(4 marks)* How much will the owner of a house assessed at $237 000 owe in taxes if the mill rate has been set at 16.78?

$$PROPERTY\ TAX = (MILL\ RATE) \times (0.001) \times \left( \begin{matrix} ASSESSED\ VALUE\ OF \\ PROPERTY \end{matrix} \right)$$

$$= (16.78)(0.001)(237\ 000)$$

$$= \$3976.86$$

**Question 6.** *(2 marks)* 13% of what amount is $47.45.

$$47.45 = 13\% \ OF \ x$$

$$47.45 = 0.13x$$

$$\therefore x = \$365$$

**Question 7.** *(2 marks)* Solve for $x$:

$$5 : 3 = 12 : x$$

$$\frac{5}{3} = \frac{12}{x}$$

$$5x = 12 \cdot 3$$

$$5x = 36$$

$$x = \frac{36}{5}$$

**Question 8.** *(4 marks)*
Fran makes payments of $1300 into a savings account every six months. The account has an interest rate of 2.75% compounded semiannually. What will she have in her bank account after 12 years?

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

$$= 1300 \left[ \frac{(1 + 0.01375)^{24} - 1}{0.01375} \right]$$

$$= \$36\,668.94$$

$$i = \frac{0.0275}{2} = 0.01375$$

$$n = (2)(12) = 24$$

**Question 9.** *(6 marks)*
A local electronic shop pays $2516.00 for a digital projector less 25%, 18% and 8%. Expenses are 36% of selling regular selling price and they want to make a profit of 11% of regular selling price. To clear out old inventory the shop decides to sell the projectors at a markdown of 10%. What is the operating profit or loss?

$$N = (1 - d_1)(1 - d_2)(1 - d_3)L$$

$$= (1 - 0.25)(1 - 0.18)(1 - 0.08)\ 2516.00$$

$$= \$1423.55$$

$$S = C + E + P$$

$$S = 1423.55 + 0.36S + 0.11S$$

$$0.53S = 1423.55$$

$$S = \$2685.94$$

REDUCED PRICE = $2685.94(1 - 0.10) = \$2417.35$

TOTAL COST = $C + E = 1423.55 + (0.36)(2685.94)$

$$= 2340.49$$

PROFIT = $2417.35 - 2340.49$

$$= \$26.86$$

∴ PROFIT OF $\$26.86$

**Question 10.** *(4 marks)* How much should be invested to accumulate $8000 in 3 years compounded daily at 4.35%?

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

$$= 8000(1+0.00011917-8)^{-1095}$$

$$= \$ 7021.31$$

$$i = \frac{0.0435}{365} = 0.00011917-8$$

$$n = (365)(3) = 1095$$

**Question 11.** *(4 marks)*

James is planning a long trip and wants to receive a payment of $3000 every two months for the 2 years. Interest is 6% compounded every 2 months. How much money does he need to have in his account at the beginning of the 2 year period?

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

$$= 3000\left[\frac{1-(1+0.01)^{-12}}{0.01}\right]$$

$$= \$ 33765.23$$

$$i = \frac{0.06}{6} = 0.01$$

$$n = 2(6) = 12$$

**Question 12.** *(5 marks)*

Yann purchased a carbon fiber road bike today for $4600. What is the amount of the equal payments that he must make every 2 months for the next 2 years to pay for the bike if interest is 8% compounded every 2 months?

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

$$4600 = PMT\left[\frac{1-(1+0.01\dot{3})^{-12}}{0.01\dot{3}}\right]$$

$$4600 = PMT(11.02160856)$$

$$\therefore PMT = \$ 417.36$$

$$i = \frac{0.08}{6} = 0.01\dot{3}$$
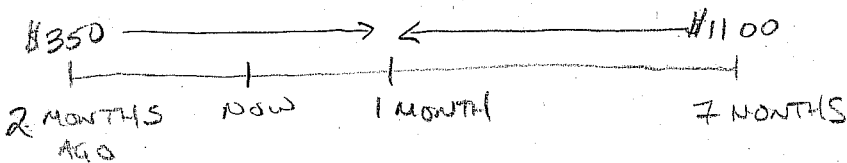
$$n = 2(6) = 12$$

**Question 13.** *(2 marks)*
What is $16\frac{1}{2}\%$ of 5217?

$16\frac{1}{2}\%$ of $5217 = (0.165)(5217) = 860.805$

**Question 14.** *(4 marks)*
John owed $350 2 months ago and owes $1100 in 7 months. He arranges to settle the debts with one payment to be made in 1 month from now. What is the size of the payment to be made in 1 month? (use one month from now as the focal date). INTEREST IS 8% p.a.

$350 \longrightarrow \longleftarrow \$1100$

2 MONTHS AGO — NOW — 1 MONTH — 7 MONTHS

EQUIVALENT VALUE OF $350 IN ONE MONTH:
$$S = P(1 + rt) = 350\left(1 + 0.08\left(\tfrac{3}{12}\right)\right)$$
$$= 350(1.02) = \$357$$

EQUIVALENT VALUE OF $1100 IN ONE MONTH:
$$P = \frac{S}{1+it} = \frac{1100}{1 + 0.08\left(\tfrac{6}{12}\right)} = \$1057.69$$

SIZE OF PAYMENT $= \$357 + \$1057.69 = \$1414.69$

**Question 15.** *(5 marks)*
How many payments of $100 each month amounts to $3439.01 at 5.52% compounded monthly?

$$FV = PMT\left[\frac{(1+i)^n - 1}{i}\right] \qquad i = \frac{0.05}{12} = 0.0046$$

$$3439.01 = 100\left[\frac{(1+0.0046)^n - 1}{0.0046}\right]$$

$$34.39 = \left[\frac{(1.0046)^n - 1}{0.0046}\right]$$

$$0.158194 = (1.0046)^n - 1$$

$$1.158194 = (1.0046)^n$$

$$\ln(1.158194) = n\ln(1.0046)$$

$$n = \frac{\ln(1.158194)}{\ln(1.0046)} = 32.00 \qquad \therefore 32 \text{ PAYMENTS}$$