

MA 1E	Mathematics Embedded Credit
Cape Career & Technology Center	Last Update: April 2017
Topic: Integers	Focus: Personal/Business Finance

Show-Me Standards: MA1, MA5, G4-8, G3-8	MO Grade Level Expectations: N2D10, N3B9, N3D10	NCTM Standards: 20A, 20B, 22A, 22B, 22C
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OBJECTIVE: Students will be able to explain basic terminology of personal finance, perform mathematical operations with dollars and cents, estimate net income, calculate simple and/or compound interest on an amount of money, estimate monthly loan payments and apply percentages to figure merchandise pricing.

Introduction:

Applications of everyday problems of money are essential for success in the real world. Money is utilized in the purchase of merchandise, payment of labor and/or services and many other aspects of personal/business finance. Banks specialize in money matters and the business leader of today must be able to show good sense in personal and business finance to attract the assistance of these lending and savings institutions.

Definitions:

Gross Income: The money earned prior to payroll deductions and calculated by number of hours worked times the hourly rate. Can also be calculated as a salary in which case it is the yearly sum divided by the number of pays per year.

Net Income: The amount of money received after payroll deductions are withheld. The number of deductions is dependent on the individual's employment paperwork and/or benefits options.

Property Tax: A tax on the ownership of property – real estate and/or personal property.

Sales Tax: A tax placed, by the government, on goods and/or services.

Interest: Percentage of a sum of money that is saved or loaned. In a savings situation, the interest is paid to the individual. In a loan situation, the interest is paid to the lending institution.

Principal: Original amount of money loaned, or deposited, on which the interest is paid.

Interest Rate: The percentage applied to the principal.

Time: The duration, or period, for which the interest is compounding.

Simple Interest: Interest applied only to the principal of a savings account, or loan.

Annual Percentage Rate ("APR"): The average annual interest divided by the outstanding principal.

Retail Price: The amount charged to consumers in the retail stores.

Wholesale Cost: The price a store pays to buy an item.

Mark-Up: The amount the retail business adds to the wholesale cost to help in covering operating expenses and ensure a profit.

Discount: The amount subtracted from the retail price resulting in a lower price for sale.

FORMULAS:

Calculating Wages:

$$\mathbf{W \times B = RTP}$$

If hours > 40, then $(\mathbf{W} - 40) \times \mathbf{B} \times 1.5 = \mathbf{OP}$

$$\mathbf{RTP + OP = WI}$$

$$\mathbf{WI \times 52 = AGI}$$

Where: **W** = *Weekly Hours*; **B** = *Base Hourly Rate*; **RTP** = *Regular Time Pay*; **OP** = *Overtime Pay*; **WI** = *Weekly Income*; and **AGI** = *Annual Gross Income*.

Calculating Net Income:

$$\mathbf{GI - FT - ST - FICA - BC = NI}$$

Where: **GI** = *Gross Income*; **FT** = *Federal Taxes*; **ST** = *State Taxes*; **FICA** = *FICA/Social Security/Medicaid Taxes*; **BC** = *Benefit Costs*; and **NI** = *Net Income*.

Calculating Total Price with Sales Tax:

$$\mathbf{RP \times ST + RP = TPP}$$

Where: **RP** = *Retail Price*; **ST** = *Sales Tax* and **TPP** = *Total Purchase Price*.

Calculating Property Tax on a Home:

$$\mathbf{AV \times R = PT}$$

Where: **AV** = *Assessed Value*; **R** = *Rate*; and **PT** = *Property Tax*.

mil = *mileage rate* and is expressed as \$1 for every \$1,000 of home assessed value; or it can be stated that 1 mil = \$0.001 of the home's assessed value.

Simple Interest Loan (Interest Due for Loan):

$$\mathbf{(P \times APR) \times LP = ID}$$

Where: **P** = *Principal*; **APR** = *Annual Percentage Rate*; **LP** = *Loan Period (expressed in years)*; and **ID** = *Interest Due*

Calculating Savings Account Balance:

ID = P x R, where **ID** = *Interest Due*, **P** = *Principal*, and **R** = *Rate*.

Calculate for each of the periods required to total the entire Savings Period (divided into the Compounding periods). **Each time remember: After calculating the interest due to you for the compounding period, the 'new' principal equals the Interest Paid + Previous Balance, then go back to the formula.**

Another formula that can be used without having to recalculate interest for each period is the following.

$P(1 + \frac{R}{N})^{N \cdot Y}$, where **P** = *Principal*, **R** = *Rate*, **Y** = *years*, and **N** = *number of times interest is calculated in 1 year*

Calculating a Monthly Payment:

(LA x APR) x LP = ID, LA + ID = TP, TP/mnth = MP

Where: **LA** = *Loaned Amount*, **APR** = *Annual Percentage Rate*, **LP** = *Loan Period* (expressed in *years*); **TP** = *Total Principal*; **mnts** = *Loan Period expressed as months*, and **MP** = *Monthly Payment*.

Calculating Wholesale Cost, Retail Cost, or Percent Mark-Up:

WC x PMU = RP

Where: **WC** = *Wholesale Cost*, **PMU** = *Percent Mark-Up*; and **RP** = *Retail Price*.

NOTE: PMU is expressed as a whole + the percent. [For Example: a 35% mark-up equals a PMU of 1.35; a 175% mark-up equals a PMU of 2.75; etc.]

Or in other words,

WC x (1 + PMU) = RP

Calculating Retail Price, Sale Price, or Percent Discount:

RP x PD = SP

Where: **RP** = *Retail Price*, **PD** = *Percent Discount*; and **SP** = *Sale Price*.

NOTE: PD is expressed as 100% - the percent. [For Example: a 35% discount equals 65% of the RP; a 15% discount equals 85% of the RP; etc.]

Or in other words,

RP x (1 - PD) = SP

PRACTICE PROBLEMS:

	Weekly Hours	Base Hourly Rate	Regular Time Pay	Overtime Pay (@ 1 ½ rate)	Total Weekly Income	Annual Gross Income
1	35	\$7.25				
2	37					\$19,500
3	40				\$340	
4	50	\$16.00				
5	55		\$260			

	Gross Income	Federal Tax	State Tax	FICA	Family Insurance	Net Income
1	\$675 Weekly	\$165	\$34	\$54.40	\$46	
2	\$35,200 Annually	35%	6%	8%	\$1500	
3	\$460 Weekly	25%	6%	8%	\$25	
4	\$46,800 Annually	\$16,380	\$2808	\$3744	\$1500	
5	\$3875 Monthly	35%	6%	8%	\$1500	

	Retail Price	Sales Tax	Total Purchase Price
1	\$14.95	6%	
2	\$298.50	6.25%	
3	\$1,899.99	6.5%	
4	\$15,990.00	7%	
5	\$52,995.00	7.25%	
	Assessed Value	Mil Rate	Property Tax Due
1	\$6,500.00	18.2	
2	\$22,300.00	18	
3	\$69,500.00	6	
4	\$125,000.00	18.1	
5	\$250,000.00	6.4	

	Principal	Loan Period (in months)	APR %	Interest Due
1	\$250.00	12	8.25%	
2	\$1,495.00	18	7.75%	
3	\$22,540.00	48	6.25%	
4	\$125,225.00	240	5.75%	
5	\$375,000.00	360	4.95%	

	Savings	APR %	Compounding Period	Savings Period	New Balance
1	\$1,250.00	2.25%	Quarterly	1 year	
2	\$4,995.00	1.75%	Monthly	1 ½ years	
3	\$1,795.00	3.25%	Quarterly	12 months	
4	\$5,500.00	1.75%	Monthly	9 months	
5	\$5,495.00	2.75%	Quarterly	3 months	

	Loaned Amount	APR %	Loan Period	Monthly Payment
1	\$950.00	8.25%	1.5 years	
2	\$6,950.00	7.75%	24 months	
3	\$25,450.00	6.25%	5 years	
4	\$78,300.00	5.75%	120 months	
5	\$125,350.00	4.75%	25 years	

	Wholesale Cost	Retail Price	Percent Mark-Up
1	\$19.95	\$32.49	
2		\$42.25	50%
3	\$125.00		35%
4		\$1,299.00	150%
5	\$1,499.00		75%
	Retail Price	Sale Price	Percent Discount
1	\$45.50	\$38.50	
2	\$129.95		25%
3		\$319.00	1/3
4	\$1,899.99		80%
5		\$2,595.00	Half-price

Word Problems – Practice:

1. If $2\frac{1}{2}$ pounds of fiberglass compound costs \$14.85, what is the cost per pound?
2. A salesperson earns \$7.25 per hour, plus 2.5% commission on all sales. If the total sales for this employee during a 35-hour workweek were \$12,500, what was her gross pay?
3. A mobile home is valued by the local government at \$19,500. The personal property tax in the area is 6.25% and the property tax is 6.5 mils. If the mobile home is considered personal property, what is the tax that the local government will charge the owner of the mobile home if it sits in a trailer park?
4. Someone deposits \$3,900 into a savings account offering 2.25% interest compounded quarterly. What is the balance at the end of 1 year? (NOTE: 1 quarter = 13 weeks)
5. Principal Amount = \$8000, APR = $7\frac{1}{2}\%$, loan period is 18 months. Find the estimated monthly payment for the loan. Round to the nearest dollar.