Material for Exam 3 comes from Chapter 10.1, 10.2, 10.3, 13.2, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6

The exam will have 2 sections: Multiple Choice and Short Answer. Sample questions for the Short Answer section are included below.

**Short Answer Questions:** For calculations, show how you set-up each problem to receive full credit.

1. (a) Find the measure of the complement and the supplement of an angle measuring 48°.
   (b) Use an algebra equation to find the measure of the two angles described. The measure of the angle is three times greater than the measure of the supplement.

2. Find the measures of the angles 1, 2 and 3 in each of the figures provided below.

3. Find the measures of the numbered angles in each of the figures provided below.
4. Use similar triangles to find the missing length \( x \).

\[ \begin{array}{c}
10 \text{ m} \\
8 \text{ m} \\
30 \text{ m} \\
18 \text{ m}
\end{array} \]

5. Use algebraic equations to solve the following problems.

\( \begin{array}{c}
15 \text{ m} \\
36 \text{ m}
\end{array} \)

(a) One angle of a triangle is twice as large as another. The measure of the third angles is \( 20^\circ \) more than that of the smallest angle. Find the measure of each angle.

(b) A person who is 5 feet tall is standing 80 feet from the base of a tree. The tree casts an 86-foot shadow. The person’s shadow is 6 feet in length. What is the tree’s height, \( x \)? Draw a picture and label \( x \), the person’s height, the tree shadow and the person shadow.

6. Find the perimeter of the figure shown.

7. Find the sum of the measure of the angles of a five-sided polygon.

8. Find the measures of angles \( A \) and \( B \) given the regular polygon below.

9. Given the tessellation below

(a) Name the types of regular polygons that surround each vertex.

(b) Determine the number of angles that come together at each vertex, as well as the measures of each angle.

10. An American football field is a rectangle with a perimeter of 1040 feet. The length is 200 feet more than the width. Find the width and length of the rectangular field.

11. Use algebraic equations to find the measure of each angle that is represented in terms of \( x \).

12. Use the mathematical system given in the table below to answer the following questions.

<table>
<thead>
<tr>
<th>( \circ )</th>
<th>( e )</th>
<th>( p )</th>
<th>( q )</th>
<th>( r )</th>
<th>( s )</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( e )</td>
<td>( e )</td>
<td>( p )</td>
<td>( q )</td>
<td>( r )</td>
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<td>( q )</td>
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<td>( r )</td>
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<td>( p )</td>
<td>( e )</td>
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<tr>
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<td>( t )</td>
<td>( s )</td>
<td>( r )</td>
<td>( q )</td>
<td>( p )</td>
<td>( e )</td>
</tr>
</tbody>
</table>

(a) Explain why the closure property is satisfied for the given binary operation.

(b) Show that \( (r \circ t) \circ q = r \circ (t \circ q) \).

(c) What is the identity element?
(d) Find the inverse of \( r \).

14. Simplify each equation involving either addition or multiplication in modulo \( m \).
   (a) \((6 + 5) \mod 6\)
   (b) \((5 \times 7) \mod 12\)

15. You purchase an exercise machine with original price of $860 that is on sale at 12% off. The local sales tax rate is 8%.
   (a) What is the discount amount?
   (b) What is the sale price?
   (c) What is the tax paid?
   (d) What is the total cost?

16. A sofa regularly sells for $840. The sale price is $714. Find the percent decrease of the sale price from the regular price.

17. The principal \( P \) is borrowed at a simple interest rate \( r \) for a period of time \( t \).
   \[ P = 5000, \quad r = 8.5\%, \quad t = 9 \text{ months} \]
   (a) Find the interest owed.
   (b) Find the loan’s future value.

18. Given simple interest loan with \( P = 5000, \ A = 5900, \) and \( t = 2 \) years, determine the loan’s simple interest rate \( r \), to the nearest tenth of a percent.

19. Determine the present value \( P \) you must invest at a simple interest rate \( r = 9.5\% \) to have a future value \( A = 14000 \) after \( t = 6 \) years. Round answers to the nearest cent.

20. You borrow $2000 on a 7% discounted loan for a period of 8 months.
   (a) Determine the loan’s discount.
   (b) Determine the net amount of money you receive.
   (c) Determine the loan’s actual interest rate, to the nearest tenth of a percent.

21. In order to start a small business, a student takes out a simple interest loan for $4000 for 9 months at a rate of 8.25%.
    (a) How much interest must the student pay?
    (b) Find the future value of the loan.

22. Find the accumulated value of an investment of $10,000 for 5 years at an interest rate of 5.5% if the money is
   (a) compounded semiannually
   (b) compounded quarterly
   (c) compounded monthly
   (d) compounded continuously

23. You deposit $10,000 in an account that pays 4.5% interest compounded quarterly.
(a) Find the future value after one year.
(b) Determine the effective annual yield.

24. You have two options for investing your money. Option 1: 5.5% compounded semiannually and Option 2: 5.4% compounded daily (use 360 days in a year). Determine the effective annual yield, to the nearest hundredth of a percent, for each investment and select the better investment.

25. Given the stock table below, answer the following questions:

<table>
<thead>
<tr>
<th>52-Week Yld Vol Net</th>
<th>High</th>
<th>Low</th>
<th>Stock</th>
<th>SYM</th>
<th>Div</th>
<th>%</th>
<th>PE</th>
<th>100s</th>
<th>Hi</th>
<th>Lo</th>
<th>Close</th>
<th>Chg</th>
</tr>
</thead>
<tbody>
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<td>73.25</td>
<td>45.44</td>
<td>Goodyear</td>
<td>GT</td>
<td>1.20</td>
<td>2.2</td>
<td>17</td>
<td>5915</td>
<td>56.38</td>
<td>54.38</td>
<td>55.50</td>
<td>+1.25</td>
<td></td>
</tr>
</tbody>
</table>

(a) What were the high and low prices for a share during the past 52 weeks?
(b) If you owned 700 shares of this stock last year, what dividend did you receive?
(c) What is the annual return for the dividends alone? How does this compare to a bank offering a 3% interest rate?
(d) Compute the company’s annual earnings per share.

26. You have two ways to invest $30,000 over a 20 year period. Round all answers to the nearest dollar.

(a) Option 1: You can make a lump sum deposit of $30,000 at a rate of 5% compounded annually for 20 years. What is the future value of your investment? How much interest did you make on this investment?
(b) Option 2: You can make deposits of $1500 at the end of each year into an annuity that has an interest rate of 5% compounded annually for 20 years. What is the future value of your investment? How much interest did you make on this investment?
(c) Which option should you choose to invest your money?

27. To save money for to take time off from work to earn a master’s degree, you deposit $2000 at the end of each year in an annuity that pays 7.5% compounded annually.

(a) How much will you have saved at the end of five years?
(b) Find the interest.

28. You would like to have $3500 in four years for a special vacation following graduation by making deposits at the end of every six months in an annuity that pays 5% compounded semiannually.

(a) How much should you deposit at the end of every six months?
(b) How much of the $3500 comes from deposits and how much comes from interest?

29. The cost of a sports utility vehicle is $27,000. You can finance this by paying $5000 down and $410 per month for 60 months.

(a) Determine the amount financed.
(b) Determine the total installment price.
(c) Determine the finance charge.
(d) What is the finance charge per $100?
(e) Using Table 8.5 on p. 482, determine the APR for this car loan.
Instead of making the thirty-sixth payment, you decide to pay the remaining balance and terminate the car loan. Use the actuarial method to determine how much interest will be saved by repaying the loan early. Be able to do this with the Rule of 78 as well.

By the actuarial method, what is the total amount due on the day of the loan’s termination? Be able to do this with the Rule of 78 as well.

30. A credit card has a monthly rate of 1.5%. In the March 1 - March 30 itemized billing, the March 1 unpaid balance is $3000. A payment of $2500 was received on March 6. There are no purchases or cash advances in this billing period. The payment is due on April 9. Find the interest due on this date using

(a) the unpaid balance method
(b) the previous balance method
(c) the average daily balance method

31. Which of the following mortgage options has the greatest total cost (closing cost + cost of points + interest paid)? Circle your answer and fill in the information requested below each option. Round answers to the nearest dollar.

(a) Mortgage A: 30-year fixed at 7% with closing costs of $2000 and one point.
   monthly payment: ________ cost of points: ________ interest paid: ________ total cost: ________

(b) Mortgage B: 30-year fixed at 6.5% with closing costs of $1500 and four points.
   monthly payment: ________ cost of points: ________ interest paid: ________ total cost: ________

32. Your credit card has a balance of $4200 and an annual interest rate of 18%. No further purchases are charged to the card.

(a) You decide to pay off the balance over two years. How much must you pay each month? How much total interest will you pay?

(b) You can get a bank loan at 10.5% compounded monthly with a term of 3 years. How much will you pay each month? How much total interest will you pay?

(c) Which method of paying off the credit card is best?