Grade 11
Essential Math 30S
Final Exam
June 2016

Don't forget to put your calculator into DEGREES

Show all calculations. Money should have 2 decimals. Rounding counts.
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<th>Marks</th>
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<td><strong>Total Marks</strong></td>
<td><strong>115</strong></td>
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**General Directions:**

- You may use your 8 ½ by 11 study sheet as well as the trigonometry flowchart.
- You should have a formula sheet on your desk.
- Make sure your calculator is set to degrees.
- Show your calculations if the question is worth more than 1 mark!
- Make sure your phone is OFF and in your backpack.
Percent

1. Write 2.35% as a decimal. (1 mark)

\[ 0.0235 \]

2. Write 0.015 as a percent. (1 mark)

\[ 1.5\% \]
3. In the local news, 423 people in Altona are arrested on June 20th for spitting sunflower seeds on a public sidewalk. If the population of Altona is 4123, what percent of Altona was arrested? (1 mark)

\[
\frac{423}{4123} \times 100 = 10.26\%
\]

4. A leather jacket at the Leather Loft is on sale for 25% off. If the regular price is $349.99, what is the sale price? (2 marks)

\[
349.99 \times 0.25 = 87.50\text{ off}
\]

\[
349.99 - 87.50 = \$262.49
\]
5. The price of sunflower seeds in Altona is $3.99. Mayor Klassen predicts a 10% increase in the price of sunflower seeds by August. Calculate the price of sunflower seeds in August. (2 marks)

\[ 3.99 \times 1.10 = 4.39 \]

6. George works at McDonald’s earning $11.00 per hour. He recently received a promotion. His new pay is $12.25 per hour. Calculate the percent increase in George’s pay. (2 marks)

\[
\begin{align*}
12.25 - 11.00 &= 1.25 \\
\frac{1.25}{11} \times 100 &= 11.36\% \text{ increase}
\end{align*}
\]
Interest

7. You deposit $8,500 in the bank for 11 months. The interest rate is 2.15%. Find the simple interest earned. (2 marks).

\[
8500 \times 0.0215 \times \frac{11}{12} = 167.52
\]

8. You deposit $8,500 in the bank for 3 years. The interest rate is 2.35%, compounded semi-annually. Calculate the balance in your bank account at the end of the 3 years (assuming you let it compound). (3 marks)

\[
8500 \left(1 + \frac{0.0235}{2}\right)^6 = 9117.13
\]
9. What percent interest per year could you expect to get if you put your money into a savings account at the Access Credit Union in Altona? (1 mark)

0.5% or less

10. Is there a way to earn more interest than what is available in savings at the Access Credit Union? Explain. (1 mark)
12. A friend said they put $9,000 in the bank and 4 years later had earned $815 in interest. Calculate the interest rate with two decimals. (2 marks)

\[ r = \frac{I}{P \times t} = \frac{815}{(9000 \times 4)} = 2.26\% \]

13. Your grandma puts $1000 in the bank the day you are born. On your 18th birthday she gives you the money with interest. Grandma put the money in an account that compounds interest monthly. The interest rate was 1.75%. Calculate the total you will receive on your 18th birthday. (3 marks)

\[ 1000 \left(1 + \frac{0.175}{12}\right)^{216} = \$1369.94 \]
Credit

14. Hank wants to borrow $15,900 to buy a used car. His local credit union is offering him an interest rate of 5.00%.

<table>
<thead>
<tr>
<th>Annual Rate</th>
<th>1 Year Monthly</th>
<th>2 Years Monthly</th>
<th>3 Years Monthly</th>
<th>4 Years Monthly</th>
<th>5 Years Monthly</th>
<th>6 Years Monthly</th>
<th>7 Years Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.75%</td>
<td>$85.49</td>
<td>$43.76</td>
<td>$29.86</td>
<td>$22.92</td>
<td>$18.76</td>
<td>$15.99</td>
<td>$14.02</td>
</tr>
<tr>
<td>5.00%</td>
<td>$85.61</td>
<td>$43.87</td>
<td>$29.97</td>
<td>$23.03</td>
<td>$18.87</td>
<td>$16.10</td>
<td>$14.13</td>
</tr>
<tr>
<td>5.25%</td>
<td>$85.72</td>
<td>$43.98</td>
<td>$30.08</td>
<td>$23.14</td>
<td>$18.99</td>
<td>$16.22</td>
<td>$14.25</td>
</tr>
<tr>
<td>5.50%</td>
<td>$85.84</td>
<td>$44.10</td>
<td>$30.20</td>
<td>$23.26</td>
<td>$19.10</td>
<td>$16.34</td>
<td>$14.37</td>
</tr>
</tbody>
</table>

a) Calculate Hank’s monthly loan payment if he takes out a 3 year loan.
(2 marks)

\[
\frac{15900}{1000} \times 29.97 = 476.52
\]

b) Calculate the total interest that Hank pays over the life of the loan.
(2 marks)

\[
476.52 \times 36 = 17154.72
\]

\[
\frac{15900}{1254.72} = 12.65
\]
15. Hank decides to lengthen the term of his loan to 7 years instead of 3 years. The interest rate will stay the same at 5.00%.

a) What effect does lengthening the term of his loan have on his monthly payment? (1 mark)

monthly payment decreases

b) What effect does lengthening the term of his loan have on the total interest paid over the life of the loan? (1 mark)

total interest paid increases
18. Karla's monthly credit card statement has a previous balance of $1343.67. Karla made a payment of $550 during the month. She also made several more purchases totaling $841.54. The credit card company also charged Karla $42.19 interest.

a) Calculate Karla's new credit card balance. (2 marks)

\[
\begin{align*}
1343.67 & \quad - 550 \\
+ 841.54 & \quad + 42.19 \\
\hline
1677.40 & \\
\end{align*}
\]

b) Calculate Karla's minimum monthly payment if it is 5% of her balance or $15, whichever is greater. (1 mark)

\[
1677.40 \times 0.05 = 83.87
\]
19. Complete the following chart that compares several different sources of credit when getting a loan. Be sure to explain why the Credit Card and Store Credit card make sense in some situations. (3 marks)

<table>
<thead>
<tr>
<th></th>
<th>Bank or Credit Union Ex. Access, CIBC</th>
<th>Credit Card Ex. MasterCard, VISA</th>
<th>Store Credit Card Ex. Sears, Best Buy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interest Rate</strong></td>
<td>4.95% - 7.5%</td>
<td>19.99%</td>
<td>29.99%</td>
</tr>
<tr>
<td><strong>Makes sense when...</strong></td>
<td>best</td>
<td>points</td>
<td>pay off at end of month</td>
</tr>
</tbody>
</table>

20. Why is it important to check your credit card statement every month? (1 mark)

accept almost any thing

check errors
21. You are purchasing a tuba from St. Frank’s Music Store and have two payment options: Cash or Installment Plan. The tuba you want has a sticker price of $2,999.99.

a) Calculate the price of the tuba if you paid cash. Assume 8% PST and 5% GST must be added to the sticker price. (2 marks)

\[ 2999.99 \times 1.13 = 3389.99 \]

b) Calculate the total paid if you choose the installment plan. (2 marks)

<table>
<thead>
<tr>
<th>St. Frank’s Music – Installment Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>(no taxes at all!)</td>
</tr>
<tr>
<td>(Money Down)</td>
</tr>
<tr>
<td>$299.00</td>
</tr>
</tbody>
</table>

\[ 299 + (36 \times 129.99) = 4978.64 \]
Managing Money

22. Jerry keeps track of his grocery spending for 3 months and has spent the following:

January - $323.75  
February - $310.29  
March - $321.82

Jerry should enter the following number into his budget spreadsheet: Circle the BEST response. (1 mark)

a) $300.00  
b) $323.75  
c) $955.86  
d) $318.62  
e) $325.00

Average is $318.62

23. Jerry's net pay is $1450 per month. He is told that he should spend 25% of his income on food. Calculate how much money Jerry should spend on food every month. (1 mark)

$1450 \times 0.25 = $362.50
24. Carlie earns $27,700 every year before deductions.

   a) What is Carlie’s monthly gross pay? (1 mark)

   \[
   \frac{27,700}{12} = 2,308.33
   \]

   b) Carlie’s deductions are 30% of her gross pay. Calculate her monthly deduction amount. (1 mark)

   \[
   27,700 
   \times 0.3
   \]

   \[
   \frac{8,310}{12} = 692.50
   \]

   c) Calculate monthly Carlie’s net pay. (1 mark)

   \[
   2308.33
   - 692.50
   \]

   \[
   1615.83
   \]
25. Ray is trying to prepare a budget for himself. His net pay is $789.50 every two weeks. Calculate the monthly income amount Ray should use when preparing his budget. (2 marks)

\[ 789.50 \times 26 = 91710.58 \]

26. Herb cleans his apartment and finds the following:

- 30 two-dollar coins \( \times 2 = 60.00 \)  
- 40 loonies \( \times 1 \) = 40.00
- 27 quarters \( \times 0.25 = 6.75 \)  
- 13 dimes \( \times 0.10 \) = 1.30
- 7 nickels \( \times 0.05 = 0.35 \)  
- 2 ten-dollar bills \( \times 10 \) = 20
- 3 five-dollar bills \( \times 5 = 15.00 \)  
- a cheque for $45.00

\[ \frac{82.10}{106.30} \]

Calculate the total amount of money Herb found. (2 marks)

\[ \$188.40 \]
27. Don wants to save money on coffee. He buys a coffee every day on his way to work. He works 5 days a week. If he buys a coffee maker, a thermos, and tins of coffee, he feels he can save a few bucks every month. Assume Don works 5 days a week for 5 weeks in June.

Prove or disprove Don's theory. (4 marks)

*Hint: Communicate your solution clearly.*

<table>
<thead>
<tr>
<th>Coffee at McDonald's</th>
<th>Make your own coffee</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2.50 per cup</td>
<td></td>
</tr>
<tr>
<td>2.50 \times 5 = 12.50</td>
<td>Coffee maker - $35.00</td>
</tr>
<tr>
<td>\times 5 weeks</td>
<td>Thermos - $30.00</td>
</tr>
<tr>
<td>$62.50</td>
<td>Coffee (1 kg) - $16.99</td>
</tr>
</tbody>
</table>

According to an online source, 1 kg tin of coffee will make 70 cups of coffee.

\[
\begin{align*}
\text{Month 1} & \\
\text{Equip} & 35 + 30 = 65, \text{ Nope} \\
\text{Coffee} & 70 / 2.5 = 28 \text{ months} \\
\text{So 1 tin last 2 months} & \text{ easy!} \\
\text{Total} & 33.50 \quad 8.50 \\
\text{Month 2} & \quad 8.50 \quad \text{saved!} \\
\text{Ok.} & \quad 35 + 30 + 16.99 = 81.99 \\
\text{70} & \quad 1 \text{ month} \quad 81.99 \\
\end{align*}
\]

(2)
Trigonometry

28. A tree casts a shadow that is 550 meters long. The angle of elevation to the top of the tree is 38°. How tall is the tree? (2 marks)

\[
\tan 38° = \frac{\text{opp}}{550}
\]

\[
\text{opp} = 429.71\, \text{m}
\]
29. A hiker is 150 feet away from a tree and measures the angle of elevation to its peak to be 37°. He measures the angle of elevation to its base to be 5°.

Calculate the height of the tree. (5 marks)

\[
\tan 37° = \frac{\text{opp}}{150} \quad \text{opp} = 113.03
\]

\[
\tan 5° = \frac{\text{opp}}{150} \quad \text{opp} = 13.12
\]

Tree is 126.15 ft tall

\[\underline{5}\]
30. From the top of a 44 foot building, the angle of elevation to the top of a second taller building is \(41^\circ\). The angle of depression to the bottom of the taller building is \(24^\circ\). How tall is the second building? \((5\) marks\)}

\[\tan 24 = \frac{44}{x}\]

\[x = \frac{98.83}{2}\]

\[\tan 41 = \frac{y}{98.83}\]

\[y = 85.91\]

\[85.91 + 44 = 129.91\text{ ft}\]

\((1)\text{ tall}\)

\[\frac{5}{5}\]
31. A radio station tower was built in two sections. From a point 330 feet from the base of the tower, the angle of elevation of the top of the first section is 25°, and the angle of elevation of the top of the second section is 40°. To the nearest foot, what is the height of the top section of the tower (x)?

\[
\tan 40^\circ = \frac{x}{330} \\
x = 276.90 \\
\tan 25^\circ = \frac{y}{330} \\
y = 153.88 \\
276.90 - 153.88 = 123.02 \\
123.02 \div 5 = 24.60 \\
\]

(5 marks)
Surface Area

32. Tanks Inc. is a pet store that specializes in exotic fish. They have been asked by a customer to build a large fish tank. The dimensions of the tank are 8 feet long by 3 feet wide and 4 feet high. There is no top on the tank.

a) Draw a net of the fish tank and label it with the dimensions. (2 mark)

b) Calculate the surface area of the glass needed to build the tank. (3 marks)

\[ 32 + 32 + 12 + 12 + 24 = 112 \text{ ft}^2 \]
33. A home owner wants a cover for the top of their circular swimming pool. The pool has a diameter of 14 feet.

b) Convert your material area to square yards. (2 marks)

\[
\frac{\pi r^2}{3^2} = 17.10 \text{ yds}^2
\]
34. Jim is painting the outside of his grandpa's house this summer. It is 34 feet long by 22 feet wide. The walls are 17 feet high. The gable ends are 5 feet high at the center. All four walls need paint. Ignore the windows and doors.

Calculate the total surface area Jim must paint. (6 marks)

\[
S_A = 578 \, \text{ft}^2 + 374 \, \text{ft}^2 + 374 \, \text{ft}^2 + 55 \, \text{ft}^2 = 2014 \, \text{ft}^2
\]
Volume

35. A gardener has a compost bin that is 72 inches long, 48 inches wide, and 36 inches tall.

a) Calculate the volume of the bin in cubic inches. (2 marks)

\[ 72 \times 48 \times 36 = 124,416 \text{ in}^3 \]

b) Calculate the volume of the bin in cubic feet. (2 marks)

\[ \frac{124,416}{12^3} = 72 \text{ ft}^3 \]

c) Calculate the volume of the bin in cubic yards. (2 marks)

\[ \frac{124,416}{3^3} = 2.67 \text{ yd}^3 \]
36. A home owner wants to fill their circular swimming pool. The pool has a diameter of 14 feet (4.2672 meters) and a depth of 4 feet (1.2192 meters).

\[ \text{Diameter: } 4.2672 \text{ m} \]
\[ \text{Depth: } 1.2192 \text{ m} \]

Aqua-Tech 14

a) Label the pool with the correct metric dimension. \(1 \text{ mark}\)

b) Calculate the volume of the pool. \(3 \text{ marks}\)

\[ V = \frac{1}{2} \times 2.1336^2 \times 1.2192 \]
\[ = 17.44 \text{ m}^3 \]

\[ V = \pi \times 2.1336^2 \times 1.2192 \]
\[ = 615.75 \text{ ft}^3 \]

(Handwritten solution on the page)

\[ 1 \text{ m}^3 = 1000 \text{ L} \]
\[ 17.44 \text{ m}^3 = 17440 \text{ L} \]

(Handwritten solution on the page)
37. A home owner wants to make a concrete ramp to get into their garden shed.

a) Calculate the volume of concrete needed in cubic meters to make the ramp. (3 marks)

\[ \frac{(0.2 \times 1.8)}{2} \times 1.2 = 0.216 \text{ m}^3 \]

b) Convert your answer above to cubic yards. (2 marks)

\[ 0.216 \times 1.09361 = 0.236 \text{ m}^3 \]
Variations and Formulas

38. You are riding with a cattle rancher. He is driving a load of steers to town and notices a sign that says “hill ahead”. Because you are a carpenter, you wonder what pitch a 32% grade is. Calculate the equivalent pitch for 32% and then indicate which roof pitch is closest to the grade. (3 marks)

\[
\frac{32}{100} = \frac{x}{12}
\]

\[
x = 3.84 = \frac{4}{12}
\]
39. A chicken farmer offers to pay you $100 if you scrape all the manure out of his barn. You estimate that the job will take you a full 8 hour day if you take no breaks.

a) What will you make per hour? (1 mark)

\[ \frac{100}{8} = \$12.50 \]

b) The farmer says he will pay you the same rate for several other barns he has. Write a formula using your answer from a) that would work for any number of hours. (2 marks)

\[ \text{Pay} = 12.50 \times \text{hours} \]
40. You are in New York and want to take a taxi from your hotel to a restaurant across town. The taxi pulls up and you notice the sign on the side:

![TAXI FARE]

<table>
<thead>
<tr>
<th>INITIAL CHARGE</th>
<th>$2.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per 1/5 Mile</td>
<td>40¢</td>
</tr>
<tr>
<td>Per 1 Minute</td>
<td>40¢</td>
</tr>
<tr>
<td>Stopped/Slow Traffic</td>
<td>50¢</td>
</tr>
<tr>
<td>Weekday Surcharge</td>
<td>40¢</td>
</tr>
<tr>
<td>4pm - 8pm</td>
<td>$1.00</td>
</tr>
<tr>
<td>Night Surcharge</td>
<td>50¢</td>
</tr>
<tr>
<td>8pm - 6am</td>
<td></td>
</tr>
</tbody>
</table>

Calculate the cost of a ride that is 2 miles long, including a stop for 3 minutes at an ATM. The ride occurred at 10 pm at night. Note: a surcharge is an extra charge added to something. (4 marks)

\[
0.50 + 2.50 + 0.40 \times 10 + 0.40 \times 3 = \frac{4.60}{1.20} = 8.20
\]

\[\boxed{\$8.20}\]
41. Mr. Dueck hops on his bicycle and pedals 210 meters to the post office to collect his mail. He takes exactly 1 minute. Calculate his speed in km/h.

\[ \frac{210}{1000} = 0.21 \text{ km/min} \times 60 \]

\[ = 12.6 \text{ km/hour} \]

42. What is one thing you learned about math, yourself, or your teacher this semester? (1 extra mark)
Jason = \frac{Father - 3}{3}

10 = \frac{Father - 3}{3}

39 - 3

13 - 3

10 + 3 = \frac{x - 3 + 3}{3}

13 + 3 = \frac{x + 3}{3}

39 = x