MRC use: Time In _____ Out _____
Instructor use only: Notes and Book OK, Calculator OK, One Part Test, Time Limit 110 min., Last Day:

Name:	Date:

Math 25 Final Exam

Work for up to 110 minutes.

*Calculators **are** allowed. Your Math 25 notes and the Math 25 Packet **are** allowed. Looking at the Math25.net website online is **not** allowed.*

Reduce fraction answers. No need to change improper fraction answers to mixed numerals.

Show numbered step-by-step answers!

Review Problems (Do 5 of 13)

1. How many factors does 36 have?

2. Find the prime factorization of 90.

3. Solve $2 \times (3 + 6 \times 3) + 6 - 5 + 81 \div 3^2 \times 2^3$

4. Find $^{12}/_{21} \div {}^{6}/_{7}$

5. Find the sum of $^{1}/_{2}$, $^{1}/_{4}$, and $^{6}/_{8}$ using common denominators.

6. A number minus $^{1}/_{36}$ equals $^{1}/_{6}$. What is the number?

7. Brand A costs $11.79 for 12 ounces. Brand B costs $13.20 for 13 ounces. What is the price per ounce for each? Which is the better buy?

8. Solve: $^{6}/_{7} = {}^{n}/_{6}$

9. 121.5 is what percent of 405?

10. Two mad scientists are chatting. One brags that his travel-buster has a volume of 52 liters. The other mentally changes this amount into gallons. How many gallons is it? (There are about 3.785 liters in a gallon.)

11. Coffee-lover Chuck drinks 12 cups of coffee each day. How many gallons per year is this?

12. Stalwart the Wonder Snail crawls 400 yards in 4.2 minutes. Express this speed in miles per hour.

13. A crate has a mass of 401.405 grams. How many milligrams is this? Do not round your answer.

Math 25 Problems (Do 30 of 33)

1. One serving of french fries has 16 grams of fat, 46 grams of carbohydrates (including 0.5 from sugar), and 3 grams of protein. Change to calories these amounts of fat, carbohydrate, sugar, and protein.

2. Continuing the previous probem, what percentage of the food's calories come from fat?

3. Frank is a 36-year-old moderately active man who weighs 165 pounds and is 5 feet 10 inches tall.

What is his estimated BMR?

4. Continuing the previous probem, what is his estimated DCI?

5. Your friend is a 38-year-old minimally active woman who weighs 143 pounds and is 5 feet 6 inches tall. What is her estimated BMR?

6. Continuing the previous probem, what is her estimated DCI?

7. Continuing the previous probem, that same friend walks for 2 hours and 6 minutes. Walking burns 0.037 calories per pound per minute. How many calories does your friend burn? To how many 50-calorie *York Peppermint Pattie* mini-size candies is this equivalent?

8. Continuing the previous probem, what is that friend's maximum safe heart rate, minimum aerobic exercise heart rate, and maximum aerobic exercise heart rate?

9. A recipe that makes 7 servings requires 11 pounds of Jade Squash. Jade Squash have a yield percent of 74%. How many pounds of Jade Squash should you purchase if you are scaling up the recipe to make 201 servings?

10. Continuing the previous probem, if Jade Squash cost $0.67 per pound, what will that ingedient cost?

11. One gallon of olive oil weighs 7.6 pounds. What is the weight of 15 cups of olive oil?

12. Express 7 cups as 7 cups and some tablespoons.

13. Express 10 teaspoons as 3 tablespoons and some teaspoons.

14. Find the mean of these six numbers: 64, 44, 2, 10, 13, 5.

15. Continuing the previous probem, find the median of those six numbers.

16. A small business borrows $1,600 at a 26% annual simple interest rate. It repays the loan after 110 days. How much interest does it owe?

17. Joyce pays for a $600 payday loan for 10 days with a post-dated check for $604.27. What was the loan's simple interest rate?

18. Scrooge McDuck has an investment that appreciates 4% the first year. The next year the investment depreciates, and is worth what he started with. What is the second year's percent change?

19. Sir Topham Hatt invests $7,000 by letting that amount grow for 20 years in an account that earns 3% annual interest, compounded monthly. At the start of the next year, he moves all the money into a different account for 10 years at 2% annual interest, compounded quarterly. How much is in the account at the end of all 30 years?

20. Mariposa can afford monthly mortgage payments of $730. Mariposa wants a 15-year loan. The interest rate is 6%. How large a loan is affordable?

21. How much will Mariposa pay total over the 15 years?

22. How much of what Mariposa pays over the 15 years is interest?

23. Cindy saved for retirement for 15 years, by depositing $800 each year into an accout with 6% annual interest. Then she stopped making more deposits. The account continued to grow at 6% annual interest for an additional 35 years before she and her husband retired. How much was in the account at the end of the first 15 years? How much was in the account at the end of all 50 years?

24. Leslie starts a new credit card that charges 18% annual interest per year to keep her bookkeeping simple when buying a $4,901 computer. (She will use the card for nothing else.) The credit card charges her one-twelfth of its annual interest rate each month. Leslie pays $900 per month until the balance is paid off. Finish the table below. Then find her total interest in dollars.

Month	Starting	Payment	Interest Due On	Interest	Ending
1	$4901.00	$900.00	$4001.00	$60.02	$4061.02
2	**?**	$900.00	**?**	**?**	$3208.44
3	$3208.44	$900.00	$2308.44	$34.63	$2343.07
4	$2343.07	$900.00	$1443.07	$21.65	$1464.72
5	**?**	$900.00	**?**	**?**	$573.19
6	$573.19	$573.19	$0.00	$0.00	$0.00
				TOTAL = ???	

25. A store uses a markup on wholesale cost of 21%. They buy an item from their supplier for $30. What retail selling price should they use when trying to sell this item?

26. A store uses a markup on retail selling price of 35%. They know an item can sell if it is priced at $375. What wholesale cost must they find if they want to stock this item?

27. An item that normally sells for $36 is on sale for 10% off. Then that sale price is reduced by another 15%. What is the new sale price?

28. A restaurant meal that serves 4 people has $25 food cost, $30 labor cost, and $26 other cost. What price per plate should the meal be assigned according to the *desired profit method* with a 10% desired profit?

29. A restaurant meal that serves 4 people has $25 food cost, $30 labor cost, and $26 other cost. What price per plate should the meal be assigned according to the *food cost percentage method* with a 22% scale factor?

30. What is the probability of rolling a sum of 7 or more on two dice? Write you answer as a fraction with denominator 36, and as a percentage.

31. What are the odds of rolling a sum of 7 or more on two dice?

32. A student is about to take a final exam. His grades so far in the class are listed below. What percent score is needed on the final to earn an overall grade of 74% in the class?

Item	Score	% of Grade
Attendance	41%	14%
Homework	75%	23%
Midterm #1	51%	19%
Midterm #2	50%	19%
Final	**??** %	25%

33. The final exam in the previous problem has 50 questions, each worth one point. How many problems does he need to get correct?

Answers for Random Problems

Review Problems

1. There are **9** factors: 1, 36, 2, 18, 3, 12, 4, 9, 6

2. The prime factorization is **2 × 3 × 3 × 5**.

3. The amount in the parenthesis simplifies to 21. So the first term is 2 × 21 = 42.

The second and third terms are plain numbers: add 6 and subtract 5.

The fourth term involves two exponents. The first part becomes 81 ÷ 9 = 9. The second exponent equals 8. Then 9 × 8 = 72

Thus the entire list of terms is 42 + 6 − 5 + 72 = **115**.

4. First flip the second fraction change division to multiplication: $^{12}/_{21} \times {}^{7}/_{6}$.

Then cancel the top right and bottom left: $^{2}/_{21} \times {}^{7}/_{1}$.

Then cancel the bottom right and top left: $^{2}/_{3} \times {}^{1}/_{1}$.

Then multiply the fractions to find the final answer of $\mathbf{^{2}/_{3}}$.

5. The common denominator is 8. We add $^{4}/_{8} + {}^{2}/_{8} + {}^{6}/_{8} = {}^{12}/_{8}$. The reduced fraction is $\mathbf{^{3}/_{2}}$.

6. First notice that 36 will work as a common denominator. So change the second fraction to get $^{1}/_{36} + {}^{6}/_{36}$. Then add numerators to get $^{7}/_{36}$.

7. Brand A costs $0.98 per ounce. Brand B costs $1.02 per ounce. **Brand A** is the better buy.

8. $n = 6 \times 6 \div 7 \approx$ **5.1**

9. Translate the percent sentence as 121.5 = $y \times 405$. Solve for y by dividing both sides by 405. The answer is **30%**.

10. About 13.7 gallons.

11. There are 16 cups in a gallon, and 365 days in a year. So 12 cups per day is equal to about 274 gallons per year.

12. When we use Unit Analysis we find out we need to multiply by 3 (to change from yards to feet), divide by 5,280 (to change from feet to miles), and multiply by 60 (to change from minutes to hours).

$$\frac{\text{? yards}}{\text{?? minutes}} \cdot \frac{3 \text{ feet}}{1 \text{ yard}} \cdot \frac{1 \text{ mile}}{5{,}280 \text{ feet}} \cdot \frac{60 \text{ minutes}}{1 \text{ hour}}$$

So Stalwart crawls at about 3.25 miles per hour.

13. The *K-H-D-U-D-C-M-x-x-micro* shortcut from converting grams into milligrams is to scoot the decimal point 3 places to the right. So the answer is 401,405 milligrams.

Math 25 Problems

1. The french fries has 16 × 9 = **144 calories** from fat.

It has 46 × 4 = **184 calories** from carbohydrates.
Sugar is a kind of carbohydrate, so it also has 0.5 × 4 = **2 calories** from sugar.
It has 3 × 4 = **12 calories** from protein.

2. We find the total calories by adding up the calories from fat, carbohydrates, and protein. This total is 340. Then we divide the 144 calories from fat by the 340 total calories (and use RIP LOP) to get an answer of about **42%**.

3. A man's BMR = (weight × 4.55) + (height × 15.88) − (age × 5) − 161
= (165 × 4.55) + (70 × 15.88) − (36 × 5) − 161 ≈ **1,521 calories per day**.

4. The DCI for a moderately active man is BMR × 1.78 ≈ **2,707 calories per day**.

5. A woman's BMR = (weight × 4.55) + (height × 15.88) − (age × 5) + 5
= (143 × 4.55) + (66 × 15.88) − (38 × 5) + 5 ≈ **1,514 calories per day**.

6. The DCI for a minimally active woman is BMR × 1.56 ≈ **2,362 calories per day**.

7. 0.037 × 143 pounds × 126 minutes ≈ **667 calories**, equivalent to about 13 *York Peppermint Pattie* mini-size candies.

8. Our friend's maximum safe heart rate = 220 − age = 220 − 38 = **182 beats per minute**. The upper limit for aerobic exercise = maximum safe heart rate × 0.85 ≈ **155 beats per minute**. The lower limit for aerobic exercise = maximum safe heart rate × 0.5 ≈ **91 beats per minute**

9. We scale up the recipe by 201 desired servings ÷ 7 recipe servings ≈ 28.71.

So 11 pounds × 28.71 scale factor ÷ 0.74 yield percent ≈ **426.8 pounds of Jade Squash**.

10. 426.8 pounds × $0.67 per pound ≈ **$284.53**.

11. Replace 1 gallon with 16 cups. Then use a proportion.
If 16 cups weigh 7.6 pounds, how much will 15 cups weigh?
15 × 7.6 ÷ 16 ≈ **7.1 pounds**.

12. There are 16 tablespoons in a cup. So we multiply the 0 by 16.
0 × 16 ≈ 0 tablespoons.
So our final answer is **7 cups and 0 tablespoons**.

13. First we divide to switch to tablespoons.
10 tsp ÷ 3 tsp per Tbsp = 3.33 Tbsp.
Then we multiply the decimal amount by 3 to go backwards and change it back to teaspoons.
0.33 × 3 = 1 teaspoons.
So our final answer is **3 tablespoons and 1 teaspoons**.

14. The sum of the six numbers is 138. The mean is 138 ÷ 6 = **23**.

15. The sorted numbers are: 2, 5, 10, 13, 44, 64, so the median is the average of 10 and 13, which is **11.5**.

16. Use the simple interest formula.

$I = P \times r \times t$ = $1,600 × 0.26 × (110 ÷ 365) = **$125.37**.

17. Use the simple interest formula.

$I = P \times r \times t$ = $4.27 = $600 × r × (10 ÷ 365)

We can isolate the rate by dividing by $600 and then dividing by (10 ÷ 365).

Then we use RIP LOP to turn the decimal value into percent format.

Our final answer is r = 26%.

18. The decrease is a percent change.

change ÷ *original* = (0.04 × *principal*) ÷ (1.04 × *principal*) = 0.04 ÷ 1.04 ≈ **3.85%**.

19. We use the compound interest formula twice. Each time the new total = $P \times (1 + r)^t$.

For the first account, $\$7{,}000 \times (1 + 0.0025)^{240} = \$12{,}745.28$.

For the second account, $\$12{,}745.28 \times (1 + 0.005)^{40}$ = **$15,559.37**.

20. The Amortization Table value for 15 years and 6% is $8.44 per thousand dollars of loan. We divide $730 ÷ $8.44 ≈ 86 thousands of loan, so a **$86,000** loan.

21. Over the 15 years Mariposa will pay $730 × 12 × 15 = **$131,400**.

22. The amount of interest is thus $131,400 − $86,000 = **$45,400**.

23. We use the sum of annuity due formula to find out that Cindy has saved **$19,738.02** at the end of the first 15 years. Then we use the compound interest formula to find that 35 years later the final amount is **$151,708.13**.

24. The second row is

2	$4061.02	$900.00	$3161.02	$47.42	$3208.44

The fifth row is

5	$1464.72	$900.00	$564.72	$8.47	$573.19

The total interest is **$172.19**.

25. The store should use a retail selling price of $30 × (1 + 0.21) = **$36.30** for that item.

26. The store should find a wholesale cost of $375 × (1 − 0.35) = **$243.75** to stock that item.

27. After the first discount 90% of the original price remains. After the second discount 85% of that reduced price remains. So the final sale price is $36 × 0.9 × 0.85 = **$27.54**.

28. The *desired profit method* has a cost per plate of
(food cost + labor cost + other costs) × scale factor ÷ servings = ($25 + $30 + $26) × 1.10 ÷ 4 = **$22.28**.

29. The *food cost percentage method* has a cost per plate of
food cost ÷ scale factor ÷ servings = $25 ÷ 0.22 ÷ 4 = **$28.41**.

30. There are 21 ways to roll 7 or more on two dice. So we write can probability as the fraction $^{21}/_{36}$, or as the rounded percentage **58%**.

31. There are 21 ways to roll 7 or more on two dice, so there are 36 − 21 = 15 ways this might not happen. The odds are **21 to 15**. We can reduce the odds and say **7 to 5**.

32. Multiply across each row, using RIP LOP on only one of the percentages in

each row, to find the expected values.

Item	Score	% of Grade	Expected Value
Attendance	41%	14%	5.74
Homework	75%	23%	17.25
Midterm #1	51%	19%	9.69
Midterm #2	50%	19%	9.5
Final	**??** %	25%	
			Total: 42.18

Since he wants an overall grade of 74% in the class, the final exam needs an expected value of 74 − 42.18 = 31.82, which requires a final exam score of **127%**

33. Unfortunately, a final exam score of **127%** is impossible.