

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 18 have?
2. Find the prime factorization of 72.
3. Solve $3 \times (4 + 14 \times 4) + 8 - 6 + 81 \div 3^2 \times 2^3$
4. Find $21/32 \div 7/8$
5. Find the sum of $1/4$, $1/6$, and $7/12$ using common denominators.
6. A number minus $1/56$ equals $1/7$. What is the number?
7. Brand A costs \$27.65 for 14 ounces. Brand B costs \$33.71 for 16 ounces. What is the price per ounce for each? Which is the better buy?
8. Solve: $21/8 = n/63$
9. 99.24 is 12% of what?
10. Two mad scientists are chatting. One brags that his robo-booster has a length of 34 kilometers. The other mentally changes this amount into miles. How many miles is it? (There are about 1.61 kilometers in a meter.)
11. Coffee-lover Chuck drinks 15 cups of coffee each day. How many gallons per year is this?
12. Stalwart the Wonder Snail crawls 620 yards in 2.4 minutes. Express this speed in miles per hour.
13. A crate has a length of 389.827 millimeters. How many centimeters is this? Do not round your answer.

Math 25 Problems (Do 30 of 33)

1. One serving of veggie burger has 1 grams of fat, 8 grams of carbohydrates (including 0.5 grams from sugar), and 17 grams of protein. Change to calories these amounts of fat, carbohydrate, sugar, and protein.
2. Continuing the previous problem, what percentage of the food's calories come from carbohydrates?
3. Frank is a 18-year-old very active man who weighs 119 pounds and is 4 feet 10 inches tall. What is his estimated BMR?
4. Continuing the previous problem, what is his estimated DCI?
5. Your friend is a 20-year-old very active woman who weighs 112 pounds and is 5 feet 4 inches tall. What is her estimated BMR?
6. Continuing the previous problem, what is her estimated DCI?
7. Continuing the previous problem, that same friend bicycles for 2 hours and 44 minutes. Bicycling burns 0.045 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 problem, 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 26 servings requires 9 pounds of Juicycrunch Carrots. Juicycrunch Carrots have a yield percent of 81%. How many pounds of Juicycrunch Carrots should you purchase if you are scaling up the recipe to make 189 servings?
10. Continuing the previous problem, if Juicycrunch Carrots cost \$0.70 per pound, what will that ingredient cost?
11. One gallon of olive oil weighs 7.6 pounds. What is the weight of 18.5 cups of olive oil?
12. Express 2.8125 cups as 2 cups and some tablespoons.
13. Express 19 teaspoons as 6 tablespoons and some teaspoons.
14. Find the mean of these six numbers: 144, 104, 20, 3, 42, 23.
15. Continuing the previous problem, find the median of those six numbers.
16. A small business borrows \$3,221 at a 28% annual simple interest rate. It repays the loan after 122 days. How much interest does it owe?
17. Joyce pays for a \$1,221 payday loan for 22 days with a post-dated check for \$1,241.61. What was the loan's simple interest rate?
18. Scrooge McDuck has an investment that appreciates 7% 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 \$8,000 by letting that amount grow for 22 years in an account that earns 4% annual interest, compounded monthly. At the start of the next year, he moves all the money into a different account for 22 years at 3% annual interest, compounded weekly. How much is in the account at the end of all 44 years?
20. Henrietta can afford monthly mortgage payments of \$812. Henrietta wants a 20-year loan. The interest rate is 8%. How large a loan is affordable?
21. How much will Henrietta pay total over the 20 years?

22. How much of what Henrietta pays over the 20 years is interest?

23. Cindy saved for retirement for 16 years, by depositing \$1,120 each year into an account with 7% annual interest. Then she stopped making more deposits. The account continued to grow at 7% annual interest for an additional 34 years before she and her husband retired. How much was in the account at the end of the first 16 years? How much was in the account at the end of all 50 years?

		Amortization Table (monthly payment per \$1,000 of loan)				
		Years				
		10	15	20	25	30
Rate	5%	\$10.60	\$7.91	\$6.60	\$5.85	\$5.36
	6%	\$11.10	\$8.44	\$7.16	\$6.44	\$6.00
	7%	\$11.60	\$8.99	\$7.75	\$7.07	\$6.65
	8%	\$12.10	\$9.56	\$8.36	\$7.72	\$7.34

24. Leslie starts a new credit card that charges 21% annual interest per year to keep her bookkeeping simple when buying a \$3,111 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 \$570 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	\$3111.00	\$570.00	\$2541.00	\$44.47	\$2585.47
2	?	\$570.00	?	?	\$2050.74
3	\$2050.74	\$570.00	\$1480.74	\$25.91	\$1506.65
4	\$1506.65	\$570.00	\$936.65	\$16.39	\$953.04
5	?	\$570.00	?	?	\$389.74
6	\$389.74	\$389.74	\$0.00	\$0.00	\$0.00
				TOTAL = ???	

25. A store uses a markup on wholesale cost of 23%. They buy an item from their supplier for \$12. What retail selling price should they use when trying to sell this item?

26. A store uses a markup on retail selling price of 17%. They know an item can sell if it is priced at \$815. What wholesale cost must they find if they want to stock this item?

27. An item that normally sells for \$19 is on sale for 22% off. Then that sale price is reduced by another 17%. What is the new sale price?

28. A restaurant meal that serves 5 people has \$27 food cost, \$32 labor cost, and \$25 other cost. What price per plate should the meal be assigned according to the *desired profit method* with a 18% desired profit?

29. A restaurant meal that serves 5 people has \$27 food cost, \$32 labor cost, and \$25 other cost. What price per plate should the meal be assigned according to the *food cost percentage method* with a 38% scale factor?

30. What is the probability of rolling a sum of 8 or more on two dice? Write your answer as a fraction with denominator 36, and as a percentage.

2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10
6	7	8	9	10	11
7	8	9	10	11	12

31. What are the odds of rolling a sum of 8 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 76% in the class?

Item	Score	% of Grade
Attendance	69%	16%
Homework	73%	24%
Midterm #1	79%	11%
Midterm #2	68%	12%
Final	?? %	37%

33. The final exam in the previous problem has 32 questions, each worth one point. How many problems does he need to get correct?

Answers for Random Problems

Review Problems

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

2. The prime factorization is $2 \times 2 \times 2 \times 3 \times 3$.

3. The amount in the parenthesis simplifies to 60. So the first term is $3 \times 60 = 180$.

The second and third terms are plain numbers: add 8 and subtract 6.

The fourth term involves two exponents. The first part becomes $81 \div 9 = 9$. The second exponent equals 8. Then $9 \times 8 = 72$

Thus the entire list of terms is $180 + 8 - 6 + 72 = \mathbf{254}$.

4. First flip the second fraction change division to multiplication: $\frac{21}{32} \times \frac{8}{7}$.

Then cancel the top right and bottom left: $\frac{3}{32} \times \frac{8}{1}$.

Then cancel the bottom right and top left: $\frac{3}{4} \times \frac{1}{1}$.

Then multiply the fractions to find the final answer of $\frac{3}{4}$.

5. The common denominator is 12. We add $\frac{3}{12} + \frac{2}{12} + \frac{7}{12} = \frac{12}{12}$. The reduced fraction is $\frac{1}{1}$.

6. First notice that 56 will work as a common denominator. So change the second fraction to get $\frac{1}{56} + \frac{8}{56}$. Then add numerators to get $\frac{9}{56}$.

7. Brand A costs \$1.98 per ounce. Brand B costs \$2.11 per ounce. **Brand A** is the better buy.

8. $n = 21 \times 63 \div 8 \approx \mathbf{165.4}$

9. Translate the percent sentence as $99.24 = 0.12 \times y$. Solve for y by dividing both sides by 0.12. The answer is **827**.

10. About 21.1 miles.

11. There are 16 cups in a gallon, and 365 days in a year. So 15 cups per day is equal to about 342 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 8.81 miles per hour.

13. The *K-H-D-U-D-C-M-x-x-micro* shortcut from converting millimeters into centimeters is to scoot the decimal point 1 place to the left. So the answer is 38.9827 centimeters.

Math 25 Problems

1. The veggie burger has $1 \times 9 = 9$ **calories** from fat.

It has $8 \times 4 = 32$ **calories** from carbohydrates.

Sugar is a kind of carbohydrate, so it also has $0.5 \times 4 = 2$ **calories** from sugar.

It has $17 \times 4 = 68$ **calories** from protein.

2. We find the total calories by adding up the calories from fat, carbohydrates, and protein. This total is 109. Then we divide the 32 calories from carbohydrates by the 109 total calories (and use RIP LOP) to get an answer of about **29%**.

3. A man's BMR = (weight \times 4.55) + (height \times 15.88) – (age \times 5) – 161
= $(119 \times 4.55) + (58 \times 15.88) - (18 \times 5) - 161 \approx 1,211$ **calories per day**.

4. The DCI for a very active man is $\text{BMR} \times 2.1 \approx 2,543$ **calories per day**.

5. A woman's BMR = (weight \times 4.55) + (height \times 15.88) – (age \times 5) + 5
= $(112 \times 4.55) + (64 \times 15.88) - (20 \times 5) + 5 \approx 1,431$ **calories per day**.

6. The DCI for a very active woman is $\text{BMR} \times 1.82 \approx 2,604$ **calories per day**.

7. $0.045 \times 112 \text{ pounds} \times 164 \text{ minutes} \approx 827$ **calories**, equivalent to about 17 *York Peppermint Pattie* mini-size candies.

8. Our friend's maximum safe heart rate = $220 - \text{age} = 220 - 20 = 200$ **beats per minute**. The upper limit for aerobic exercise = maximum safe heart rate $\times 0.85 \approx 170$ **beats per minute**. The lower limit for aerobic exercise = maximum safe heart rate $\times 0.5 \approx 100$ **beats per minute**

9. We scale up the recipe by $189 \text{ desired servings} \div 26 \text{ recipe servings} \approx 7.27$.

So $9 \text{ pounds} \times 7.27 \text{ scale factor} \div 0.81 \text{ yield percent} \approx 80.8$ **pounds of Juicycrunch Carrots**.

10. $80.8 \text{ pounds} \times \$0.70 \text{ per pound} \approx \56.56 .

11. Replace 1 gallon with 16 cups. Then use a proportion. If 16 cups weigh 7.6 pounds, how much will 18.5 cups weigh?

2	\$2585.47	\$570.00	\$2015.47	\$35.27	\$2050.74
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The fifth row is

5	\$953.04	\$570.00	\$383.04	\$6.70	\$389.74
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The total interest is **\$128.74**.

25. The store should use a retail selling price of $\$12 \times (1 + 0.23) = \mathbf{\$14.76}$ for that item.

26. The store should find a wholesale cost of $\$815 \times (1 - 0.17) = \mathbf{\$676.45}$ to stock that item.

27. After the first discount 78% of the original price remains. After the second discount 83% of that reduced price remains. So the final sale price is $\$19 \times 0.78 \times 0.83 = \mathbf{\$12.30}$.

28. The *desired profit method* has a cost per plate of $(\text{food cost} + \text{labor cost} + \text{other costs}) \times \text{scale factor} \div \text{servings} = (\$27 + \$32 + \$25) \times 1.18 \div 5 = \mathbf{\$19.82}$.

29. The *food cost percentage method* has a cost per plate of $\text{food cost} \div \text{scale factor} \div \text{servings} = \$27 \div 0.38 \div 5 = \mathbf{\$14.21}$.

30. There are 15 ways to roll 8 or more on two dice. So we write can probability as the fraction $\frac{15}{36}$, or as the rounded percentage **42%**.

31. There are 15 ways to roll 8 or more on two dice, so there are $36 - 15 = 21$ ways this might not happen. The odds are **15 to 21**. We can reduce the odds and say **5 to 7**.

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	69%	16%	11.04
Homework	73%	24%	17.52
Midterm #1	79%	11%	8.69
Midterm #2	68%	12%	8.16
Final	?? %	37%	
			Total: 45.41

Since he wants an overall grade of 76% in the class, the final exam needs an expected value of $76 - 45.41 = 30.59$, which requires a final exam score of **83%**

33. To earn a final exam score of 83% on a test that has 32 questions will require **27 correct problems**.