

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 28 have?
2. Find the prime factorization of 1800.
3. Solve  $5 \times (6 + 36 \times 6) + 6 - 2 + 81 \div 3^3 \times 2^4$
4. Find  $15/24 \div 3/4$
5. Find the sum of  $2/2$ ,  $3/4$ , and  $9/5$  using common denominators.
6. A number minus  $1/54$  equals  $1/9$ . What is the number?
7. Brand A costs \$13.14 for 18 ounces. Brand B costs \$13.92 for 22 ounces. What is the price per ounce for each? Which is the better buy?
8. Solve:  $63/10 = n/27$
9. What is 25% of 704?
10. Two mad scientists are chatting. One brags that his electro-helper has a volume of 47 quarts. The other mentally changes this amount into liters. How many liters is it? (There are about 1.057 quarts in a liter.)
11. Coffee-lover Chuck drinks 15 cups of coffee each day. How many gallons per year is this?
12. Stalwart the Wonder Snail crawls 5,800 yards in 3.7 minutes. Express this speed in miles per hour.
13. A crate has a mass of 395.704 milligrams. How many micrograms is this? Do not round your answer.

## Math 25 Problems (Do 30 of 33)

1. One serving of oatmeal has 2 grams of fat, 27 grams of carbohydrates (including 0.5 from sugar), and 6 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 protein?
3. Frank is a 60-year-old minimally active man who weighs 111 pounds and is 5 feet 1 inches tall. What is his estimated BMR?
4. Continuing the previous problem, what is his estimated DCI?
5. Your friend is a 62-year-old very active woman who weighs 117 pounds and is 5 feet 8 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 runs for 3 hours and 50 minutes. Running burns 0.09 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 27 servings requires 6 pounds of Red Blossom Leeks. Red Blossom Leeks have a yield percent of 75%. How many pounds of Red Blossom Leeks should you purchase if you are scaling up the recipe to make 195 servings?
10. Continuing the previous problem, if Red Blossom Leeks cost \$0.57 per pound, what will that ingredient cost?
11. One gallon of heavy cream weighs 8.4 pounds. What is the weight of 19.5 cups of heavy cream?
12. Express 3.625 cups as 3 cups and some tablespoons.
13. Express 16 teaspoons as 5 tablespoons and some teaspoons.
14. Find the mean of these six numbers: 21, 162, 99, 1, 50, 27.
15. Continuing the previous problem, find the median of those six numbers.
16. A small business borrows \$4,848 at a 26% annual simple interest rate. It repays the loan after 135 days. How much interest does it owe?
17. Joyce pays for a \$848 payday loan for 35 days with a post-dated check for \$869.14. What was the loan's simple interest rate?
18. Scrooge McDuck has an investment that appreciates 22% 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 \$4,000 by letting that amount grow for 14 years in an account that earns 6% annual interest, compounded monthly. At the start of the next year, he moves all the money into a different account for 35 years at 5% annual interest, compounded weekly. How much is in the account at the end of all 49 years?

20. Gertrude can afford monthly mortgage payments of \$1,025. Gertrude wants a 30-year loan. The interest rate is 5%. How large a loan is affordable?

21. How much will Gertrude pay total over the 30 years?

22. How much of what Gertrude pays over the 30 years is interest?

	Years				
	10	15	20	25	30
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	\$9.55	\$8.35	\$7.70	\$7.31

**23.** Cindy saved for retirement for 12 years, by depositing \$2,250 each year into an account with 9% annual interest. Then she stopped making more deposits. The account continued to grow at 9% annual interest for an additional 38 years before she and her husband retired. How much was in the account at the end of the first 12 years? How much was in the account at the end of all 50 years?

**24.** Leslie starts a new credit card that charges 27% annual interest per year to keep her bookkeeping simple when buying a \$3,895 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 \$710 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	\$3895.00	\$710.00	\$3185.00	\$71.66	\$3256.66
2	?	\$710.00	?	?	\$2603.96
3	\$2603.96	\$710.00	\$1893.96	\$42.61	\$1936.57
4	\$1936.57	\$710.00	\$1226.57	\$27.60	\$1254.17
5	?	\$710.00	?	?	\$556.41
6	\$556.41	\$556.41	\$0.00	\$0.00	\$0.00
<b>TOTAL = ???</b>					

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

**26.** A store uses a markup on retail selling price of 30%. They know an item can sell if it is priced at \$679. What wholesale cost must they find if they want to stock this item?

**27.** An item that normally sells for \$34 is on sale for 35% off. Then that sale price is reduced by another 14%. What is the new sale price?

**28.** A restaurant meal that serves 7 people has \$39 food cost, \$35 labor cost, and \$18 other cost. What price per plate should the meal be assigned according to the *desired profit method* with a 14% desired profit?

**29.** A restaurant meal that serves 7 people has \$39 food cost, \$35 labor cost, and \$18 other cost. What price per plate should the meal be assigned according to the *food cost percentage method* with a 30% scale factor?

**30.** What is the probability of rolling a sum of 4 or more on two dice? Write your answer as a fraction with denominator 36, and as a percentage.

**31.** What are the odds of rolling a sum of 4 or more on two dice?

**32.** A student is about to take a final exam. Her 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?

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

Item	Score	% of Grade
Attendance	55%	20%
Homework	75%	19%
Midterm #1	65%	9%
Midterm #2	65%	12%
Final	?? %	40%

**33.** The final exam in the previous problem has 45 questions, each worth one point. How many problems does she need to get correct?

Answers for Random Problems

### Review Problems

- There are **6** factors: 1, 28, 2, 14, 4, 7
- The prime factorization is  $2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$ .
- The amount in the parenthesis simplifies to 222. So the first term is  $5 \times 222 = 1110$ .  
The second and third terms are plain numbers: add 6 and subtract 2.  
The fourth term involves two exponents. The first part becomes  $81 \div 27 = 3$ .  
The second exponent equals 16. Then  $3 \times 16 = 48$   
Thus the entire list of terms is  $1110 + 6 - 2 + 48 = \mathbf{1162}$ .
- First flip the second fraction change division to multiplication:  $\frac{15}{24} \times \frac{4}{3}$ .  
Then cancel the top right and bottom left:  $\frac{5}{24} \times \frac{4}{1}$ .  
Then cancel the bottom right and top left:  $\frac{5}{6} \times \frac{1}{1}$ .  
Then multiply the fractions to find the final answer of  $\frac{5}{6}$ .
- The common denominator is 20. We add  $\frac{20}{20} + \frac{15}{20} + \frac{36}{20} = \frac{71}{20}$ .
- First notice that 54 will work as a common denominator. So change the second fraction to get  $\frac{1}{54} + \frac{6}{54}$ . Then add numerators to get  $\frac{7}{54}$ .
- Brand A costs \$0.73 per ounce. Brand B costs \$0.63 per ounce. **Brand B** is the better buy.
- $n = 63 \times 27 \div 10 \approx \mathbf{170.1}$
- Translate the percent sentence as  $y = 0.25 \times 704 = \mathbf{176}$ .
- About 44.5 liters.
- 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.
- 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 53.44 miles per hour.

**13.** The *K-H-D-U-D-C-M-x-x-micro* shortcut from converting milligrams into micrograms is to scoot the decimal point 3 places to the right. So the answer is 395,704 micrograms.

### Math 25 Problems

**1.** The oatmeal has  $2 \times 9 = 18$  calories from fat.

It has  $27 \times 4 = 108$  calories from carbohydrates.

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

It has  $6 \times 4 = 24$  calories from protein.

**2.** We find the total calories by adding up the calories from fat, carbohydrates, and protein. This total is 150. Then we divide the 24 calories from protein by the 150 total calories (and use RIP LOP) to get an answer of about **16%**.

**3.** A man's BMR = (weight  $\times$  4.55) + (height  $\times$  15.88) – (age  $\times$  5) – 161  
=  $(111 \times 4.55) + (61 \times 15.88) - (60 \times 5) - 161 \approx 1,013$  calories per day.

**4.** The DCI for a minimally active man is BMR  $\times$  1.55  $\approx 1,570$  calories per day.

**5.** A woman's BMR = (weight  $\times$  4.55) + (height  $\times$  15.88) – (age  $\times$  5) + 5  
=  $(117 \times 4.55) + (68 \times 15.88) - (62 \times 5) + 5 \approx 1,307$  calories per day.

**6.** The DCI for a very active woman is BMR  $\times$  1.82  $\approx 2,379$  calories per day.

**7.**  $0.09 \times 117 \text{ pounds} \times 230 \text{ minutes} \approx 2,422$  calories, equivalent to about 48 York Peppermint Pattie mini-size candies.

**8.** Our friend's maximum safe heart rate =  $220 - \text{age} = 220 - 62 = 158$  beats per minute. The upper limit for aerobic exercise = maximum safe heart rate  $\times$  0.85  $\approx 134$  beats per minute. The lower limit for aerobic exercise = maximum safe heart rate  $\times$  0.5  $\approx 79$  beats per minute

**9.** We scale up the recipe by  $195 \text{ desired servings} \div 27 \text{ recipe servings} \approx 7.22$ .

So  $6 \text{ pounds} \times 7.22 \text{ scale factor} \div 0.75 \text{ yield percent} \approx 57.8$  pounds of Red Blossom Leeks.

**10.**  $57.8 \text{ pounds} \times \$0.57 \text{ per pound} \approx \$32.75$ .

**11.** Replace 1 gallon with 16 cups. Then use a proportion.

If 16 cups weigh 8.4 pounds, how much will 19.5 cups weigh?

$19.5 \times 8.4 \div 16 \approx 10.2$  pounds.

**12.** There are 16 tablespoons in a cup. So we multiply the 0.6 by 16.

$0.6 \times 16 \approx 10$  tablespoons.

So our final answer is **3 cups and 10 tablespoons**.

**13.** First we divide to switch to tablespoons.

16 tsp ÷ 3 tsp per Tbsp = 5.33 Tbsp.

Then we multiply the decimal amount by 3 to go backwards and change it back to teaspoons.

$0.33 \times 3 = 1$  teaspoons.

So our final answer is **5 tablespoons and 1 teaspoons**.

**14.** The sum of the six numbers is 360. The mean is  $360 \div 6 = 60$ .

**15.** The sorted numbers are: 1, 21, 27, 50, 99, 162, so the median is the average of 27 and 50, which is **38.5**.

**16.** Use the simple interest formula.

$$I = P \times r \times t = \$4,848 \times 0.26 \times (135 \div 365) = \mathbf{\$466.2}.$$

**17.** Use the simple interest formula.

$$I = P \times r \times t = \$21.14 = \$848 \times r \times (35 \div 365)$$

We can isolate the rate by dividing by \$848 and then dividing by  $(35 \div 365)$ .

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.

$$\text{change} \div \text{original} = (0.22 \times \text{principal}) \div (1.22 \times \text{principal}) = 0.22 \div 1.22 \approx$$

**18.03%**.

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

$$\text{For the first account, } \$4,000 \times (1 + 0.005)^{168} = \$9,246.10.$$

For the second account,  $\$9,246.10 \times (1 + 0.0009615384615384616)^{1820} =$   
**\$53,162.89**.

**20.** The Amortization Table value for 30 years and 5% is \$5.36 per thousand dollars of loan. We divide  $\$1,025 \div \$5.36 \approx 191$  thousands of loan, so a **\$191,000** loan.

**21.** Over the 30 years Gertrude will pay  $\$1,025 \times 12 \times 30 = \mathbf{\$369,000}$ .

**22.** The amount of interest is thus  $\$369,000 - \$191,000 = \mathbf{\$178,000}$ .

**23.** We use the sum of annuity due formula to find out that Cindy has saved **\$49,395.12** at the end of the first 12 years. Then we use the compound interest formula to find that 38 years later the final amount is **\$1,305,843**.

**24.** The second row is

2	\$3256.66	\$710.00	\$2546.66	\$57.30	\$2603.96
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The fifth row is

5	\$1254.17	\$710.00	\$544.17	\$12.24	\$556.41
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The total interest is **\$211.41**.

**25.** The store should use a retail selling price of  $\$25 \times (1 + 0.21) = \mathbf{\$30.25}$  for that item.

**26.** The store should find a wholesale cost of  $\$679 \times (1 - 0.3) = \mathbf{\$475.30}$  to stock that item.

**27.** After the first discount 65% of the original price remains. After the second discount 86% of that reduced price remains. So the final sale price is  $\$34 \times 0.65 \times 0.86 = \mathbf{\$19.01}$ .

**28.** The *desired profit method* has a cost per plate of  $(\text{food cost} + \text{labor cost} + \text{other costs}) \times \text{scale factor} \div \text{servings} = (\$39 + \$35 + \$18) \times 1.14 \div 7 = \mathbf{\$14.98}$ .

**29.** The *food cost percentage method* has a cost per plate of  $\text{food cost} \div \text{scale factor} \div \text{servings} = \$39 \div 0.30 \div 7 = \mathbf{\$18.57}$ .

**30.** There are 33 ways to roll 4 or more on two dice. So we write can probability as the fraction  $\frac{33}{36}$ , or as the rounded percentage **92%**.

**31.** There are 33 ways to roll 4 or more on two dice, so there are  $36 - 33 = 3$  ways this might not happen. The odds are **33 to 3**. We can reduce the odds and say **11 to 1**.

**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	55%	20%	11
Homework	75%	19%	14.25
Midterm #1	65%	9%	5.85
Midterm #2	65%	12%	7.8
Final	?? %	40%	
			Total: 38.90

Since she wants an overall grade of 74% in the class, the final exam needs an expected value of  $74 - 38.90 = 35.10$ , which requires a final exam score of **88%**

**33.** To earn a final exam score of 88% on a test that has 45 questions will require **40 correct problems**.