Pharmacy Technician Program

Math Entrance Exam Study Guide
Practice Math Packet

This packet is designed to help prepare you for the Pharmacy Technician Math Entrance Exam. The key has been included to allow the student to check their work and to assist in the practice process.

Taking and passing the Pharmacy Technician Math Entrance Exam is the second step in applying to the program. You can complete this step as soon as an exam date is available. You do not need to wait for the Informational Meeting or the application to become available. You need to pass the exam with a 60% or higher. Perspective students are allow one re-take, 60 days after you have taken the first exam.

Are You Ready?

Once you are ready to take the Math Entrance Exam visit our website to RSVP for the next Exam.

Pharmacy Technician Website:
https://www.mjc.edu/instruction/teched/workforcedev/pharmacy_technician.php

When taking the actual Math Entrance Exam you will:

1. Need to provide a photo ID
2. The exam has 30 math problems
3. You will have 90 minutes to complete the exam
4. You may use a calculator but not the one found on your phone or electronic device
5. Textbooks, dictionaries or notes are NOT allowed

RSVP for the next Math Entrance Exam as soon as possible to ensure that you can retake the test if necessary.
No individual re-takes will be scheduled.

For additional information or if you have any questions, please call (209) 575-7889 or email medinam@yosemite.edu

Fractions are difficult for many to understand, but any knowledge gaps here will create big problems down the road. A fraction represents a number of parts written as one number over another with a line in between. Fractions are the same as division, $\frac{3}{4}$ is equal to 3 divided by 4, which is also equal to three fourths of a whole. The top number in any fraction is called the numerator, while the bottom number is called the denominator. The numerator gives the parts out of the denominator of a whole that we have. $\frac{4}{5}$ has a numerator of 4 and a denominator of 5, it represents four fifths of a whole (or 80%). Fractions can also be greater than 1 or negative.

$\frac{7}{3}$ is equal to $2\frac{1}{3}$, or two and one third. When you break fractions out into whole number (2) and fractional parts $\frac{1}{3}$) you get a mixed number ($2\frac{1}{3}$). While mixed numbers can be easier to interpret they make computations like multiplication more difficult so it is better to work with the pure fractions (like $\frac{7}{3}$) instead. Here are a few examples of conversions between mixed numbers and pure fractions:

$$\frac{5}{4} = 1\frac{1}{4}$$
$$\frac{9}{2} = 4\frac{1}{2}$$
$$\frac{12}{5} = 2\frac{2}{5}$$

Some examples of negative fractions are:

$$-\frac{2}{7},\ \frac{-22}{3},\ \frac{6}{-13}$$

The negative sign can come before the fraction, in the numerator, or in the denominator, but we'll usually stick with the first two cases.

Multiplying Fractions

This is the easiest computation to do with fractions. To multiply two fractions you simply multiply the numerators to get a new numerator, then multiply the denominators to get a new denominator; combine these for your new fraction. Example:

$$\frac{3}{5} \cdot \frac{4}{7} = \frac{3 \cdot 4}{5 \cdot 7} = \frac{12}{35}$$

Sometimes you'll be able simplify the resulting fraction by dividing out numbers that factor into both the numerator and denominator. For example:

$$\frac{3}{6} = \frac{3 \cdot 1}{3 \cdot 2} = \frac{1}{2}$$

The last example was simplified by dividing three out of both the numerator and denominator. Here's another example of multiplication and simplification:

$$\frac{5}{8} \cdot \frac{6}{9} = \frac{5 \cdot 6}{8 \cdot 9} = \frac{30}{72} = \frac{6 \cdot 5}{6 \cdot 12} = \frac{5}{12}$$

Negative and larger fractions follow the same rules.

$$\frac{-3}{7} \cdot \frac{15}{4} = \frac{-3 \cdot 15}{7 \cdot 4} = -\frac{45}{28}$$

Dividing Fractions

To divide one fraction by another, follow this rule: flip the fraction you're dividing by (switch the numerator and denominator) then multiply the flipped fraction by the other. Example:

$$\frac{1}{2} / \frac{1}{3} = \frac{1}{2} \cdot \frac{3}{1} = \frac{3}{2}$$

If that didn't demonstrate the technique well enough, here is another example:

$$\frac{11}{16}/\frac{3}{4} = \frac{11}{16}\cdot\frac{4}{3} = \frac{44}{48} = \frac{4\cdot 11}{4\cdot 12} = \frac{11}{12}$$

Again, don't let negative numbers throw you off:

$$\frac{6}{5}/\frac{-1}{3} = \frac{6}{5}\cdot\frac{-3}{1} = \frac{-18}{5}$$

When multiplying or dividing two fractions, your answer isn't always a fraction:

$$\frac{4}{9}/\frac{-2}{9} = \frac{4}{9}\cdot\frac{-9}{2} = -2$$

Can you see all the cancellations that led to the previous answer?

Adding and Subtracting Fractions

To add or subtract two fractions they must have matching denominators. If two fractions have common denominators, you can add or subtract them by simply adding of subtracting the numerators to create a new fraction. You won't always begin with this luxury of equal denominators so you'll often need to rescale one or both of your fractions. Observe that:

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12} = \frac{11}{33}$$

Whenever you multiply (or divide) both the numerator and denominator of a fraction by the same number, you create an equal fraction written with different numbers. To better understand this, think of a pizza cut into 8 equal slices. If you eat 4 of the 8 slices you've eaten $\frac{4}{8}$ of the pizza, which is equal to $\frac{4\cdot 1}{4\cdot 2} = \frac{1}{2}$ of the pizza. Think of $\frac{4}{8}$ as a rescaled, but equivalent fraction to $\frac{1}{2}$.

You will usually need to rescale both fractions to find common denominators before you can add or subtract them. Example:

$$\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$$

In the above example we found the common denominator of 6 for our two fractions. We converted the first fraction by multiplying its numerator and denominator by 3. We converted the second fraction by multiplication both the top and bottom by 2. This gave us two rescaled fractions with equal denominators. At this point the addition becomes easy: add the numerators and leave the denominator alone.

Like we did above, you can always find common denominators by multiplying the top and bottom of each fraction by the denominator of the opposing fraction. Example:

However, this method will sometimes lead you to work with much bigger numbers than you need to:

The following could have been solved more easily if we found a smaller common denominator:

$$\frac{9}{16} - \frac{5}{8} = \frac{9}{16} - \frac{5\cdot 2}{8\cdot 2} = \frac{9}{16} - \frac{10}{16} = -\frac{1}{16}$$

If you can see a simpler way to reach common denominators you can save time by avoiding the first approach, but when in doubt, just go that route.

Practice Questions - Fractions

Solve and reduce to lowest terms.

1.) $\frac{3}{4} \cdot \frac{1}{4}$

2.) $\frac{4}{3} \cdot \frac{3}{16}$

3.) $-\frac{2}{7} \cdot -\frac{4}{5}$

4.) $\frac{-3}{4} \cdot \frac{4}{5}$

5.) $\frac{3}{4} / \frac{1}{4}$

7.) $\frac{-3}{8} / \frac{-2}{3}$

8.) $\frac{-2}{5} / \frac{1}{6}$

9.) $\frac{3}{4} + \frac{1}{4}$

10.) $\frac{-3}{5} + \frac{7}{10}$

11.) $\frac{7}{10} - \frac{3}{5}$

12.) $\frac{3}{4} - \frac{5}{4}$

13.) $\frac{11}{5} - \frac{5}{3}$

14.) $\frac{-2}{7} - \frac{-4}{3}$

ANSWERS - Fractions

1.) $\frac{3}{4} \cdot \frac{1}{4} = \frac{3 \cdot 1}{4 \cdot 4} = \frac{3}{16}$

2.) $\frac{4}{3} \cdot \frac{3}{16} = \frac{12}{48} = \frac{1}{4}$

3.) $-\frac{2}{7} \cdot -\frac{4}{5} = \frac{8}{35}$

4.) $\frac{-3}{4} \cdot \frac{4}{5} = \frac{-12}{20} = -\frac{3}{5}$

5.) $\frac{3}{4} / \frac{1}{4} = \frac{3}{4} \cdot \frac{4}{1} = \frac{12}{4} = 3$

6.) $\frac{-3}{8} / \frac{-2}{3} = \frac{-3}{8} \cdot \frac{-3}{2} = \frac{9}{16}$

7.) $\frac{-2}{5} / \frac{1}{6} = \frac{-2}{5} \cdot 6 = -\frac{12}{5} \text{ or } -2\frac{2}{5}$

8.) $\frac{3}{4} + \frac{1}{4} = \frac{3+1}{4} = \frac{4}{4} = 1$

9.) $\frac{-3}{5} + \frac{7}{10} = \frac{-3 \cdot 2}{5 \cdot 2} + \frac{7}{10} = \frac{-6}{10} + \frac{7}{10} = \frac{1}{10}$

10.) $\frac{7}{10} - \frac{3}{5} = \frac{7}{10} - \frac{6}{10} = \frac{1}{10}$

11.) $\frac{3}{4} - \frac{5}{4} = \frac{-2}{4} = -\frac{1}{2}$

12.) $\frac{11}{5} - \frac{5}{3} = \frac{33}{15} - \frac{25}{15} = \frac{8}{15}$

13.) $\frac{-2}{7} - \frac{-4}{3} = \frac{-6}{21} + \frac{28}{21} = \frac{22}{21} \text{ or } 1\frac{1}{21}$

Decimals

Decimals are used to denote non-integer, 'partial' quantities. Decimals are directly related to fractions and percentages as shown below.

$$\frac{1}{2} = 0.5 = 1/2 = 50\%.$$

When working with decimals using a calculator, you can enter and treat them just like integers; the same rules of addition, subtraction, multiplication, and division all apply. Since calculators are permitted on the COMPASS Test, it is not necessary for you to practice multiplying and dividing decimal numbers by hand.
To convert a fraction into a decimal using your calculator just preform the division implied by the fraction. For example:

$$\frac{5}{8} = 5/8 = 0.625$$

One time-saving trick to know about decimals involves multiplying or dividing by powers of ten. If you multiply any number by 10, just move the decimal place once to the right. Examples:

$$123 \cdot 10 = 1,230 \qquad 315.87 \cdot 10 = 3,158.7$$

If you divide by 10, move the decimal place once to the left:

$$123/10 = 12.3 \qquad 315.87/10 = 31.587$$

If you multiply by 100, you are multiplying by 10 twice since $10 \cdot 10 = 100$, so you move the decimal place two spots to the right:

$$315.87 \cdot 100 = 31,587.$$

This rule applies when multiplying and dividing by any powers of ten (10,100,1000, 10000,…).
Because of the exclusive relationship 10 has to our base 10 numbering system, the decimal places are each referred to by their relationship to the powers of ten. For the number: 31.587, 5 is in the tenths place, 8 is in the hundredths place, and 7 is in the thousandths place.
If you were asked to round 31.587 to the nearest hundredth you would round it to 31.59. You essentially chop off everything past the hundredths place, and adjust the number in the hundredths place up 1 if the number in the thousandths place is greater than or equal to 5.

Practice Questions- Decimals

Use a calculator as needed. Round to the nearest hundredth.

Convert the following fractions to decimal numbers:

1.) $\frac{5}{7}$

2.) $\frac{7}{5}$

3.) $3\frac{3}{5}$

4.) $\frac{13}{4}$

Solve:

5.) $12.41 \cdot 3.5$

6.) $211.7/19.4$

7.) Paul has 12.75 cups of rice. His wife Susan brings home $2\frac{3}{4}$ cups from the store. They then eat 5.8 cups of rice during the week. How much rice do they have left?

8.) Mick buys 4 movie tickets for $7.25 each. He then buys 2 sodas for $3.50 each, 1 popcorn for $2.65, and 3 boxes of candy for $1.89 each. How much money has Mick spent?

ANSWERS - Decimals

1.) $\frac{5}{7} \approx 0.71$

2.) $\frac{7}{5} = 1.4$

3.) $3\frac{3}{5} = 3.6$

4.) $\frac{13}{4} = 3.25$

5.) $12.41 \cdot 3.5 \approx 43.44$

6.) $211.7/19.4 \approx 10.91$

7.) $12.75 + 2.75 - 5.8 = 9.7$

8.)
$$4 \cdot 7.25 + 2 \cdot 3.5 + 2.65 + 3 \cdot 1.89$$
$$= 29 + 7 + 2.65 + 5.67$$
$$= 44.32$$

Ratios / proportions

You've probably used **ratios/proportions** before while cooking. If you've made pancakes from a mix you might have had to following a recipe like: 2 Cups Mix per 1.5 Cups Water results in 8 Pancakes. With this recipe if you used 4 cups of mix, you'd need 3 cups of water, and would get a yield of 16 pancakes. You could make 4 pancakes by using 1 cup of mix and 3/4 of a cup of water.

The relationship between the ingredients is a ratio. A ratio is a comparison of two or more numbers. A proportion is an equation of ratios. We solved basic proportions to calculate the correct mixtures of ingredients needed to make 4 or 16 pancakes. The proportions we solved were based on the ingredient/results ratio of 2:1.5:8 (read: 2 to 1.5 to 8).

Let's look at another ratio. Say a particular school wants to keep a student to teacher ratio of 55:2. This means the school wants to have 2 teachers for every 55 kids. Now let's assume 825 kids are enrolled in the school. How many teachers should the school have? To solve this we would use a proportion. Let the x represent the number of teachers needed for 825 kids to satisfy the 55:2 ratio. Then the following equation (which is a proportion) must be true.

$$\frac{55}{2} = \frac{825}{x}$$

We can solve the equation for x by 'cross multiplying' and dividing. 'Cross multiplying' involves multiplying the numerators of each side by the denominators of the opposing side, and then eliminating the denominators from both sides. For this equation that means multiplying 55 by x and 825 by 2, then wiping out the denominators. The next step to solving x is to isolate it on one side of the equation. We do this by diving both sides by 55, which leaves x alone on one side and gives the answer on the other side.

$$\frac{55}{2} = \frac{825}{x}$$
$$\rightarrow 55 \cdot x = 825 \cdot 2$$
$$\rightarrow 55x = 1650$$
$$\rightarrow x = \frac{1650}{55} = 30$$

Solving the proportion tells us that the school would need 30 teachers to handle the 825 students.

Here's another example to help clarify the process: Suppose a call center likes to staff 3 employees for every 200 calls they receive in a day. The call center has been handling around 1000 calls each day with 15 employees, but the center is taking on more business and expects to soon be receiving about 1600 calls per day. How many more employees will the call center need to handle this increase in daily volume?

One way to solve this is to observe that the call center expects to be handling 600 more calls per day. We can then set up and solve the following proportion:

$$\frac{x}{600} = \frac{3}{200}$$
$$\rightarrow 200x = 1800$$
$$\rightarrow x = 9$$

Hence, the center would need to hire 9 more employees to handle the increased call volume.

One more example: Recall the formula: (rate)x(time)=(distance). Now say while driving on the freeway at a certain speed you travelled 250 miles in 4 hours. At the same speed, how long will it take you to travel 575 miles?

Again, we solve using a proportion:

$$\frac{250}{4} = \frac{575}{x}$$
$$\rightarrow 250 \cdot x = 575 \cdot 4$$
$$\rightarrow x = \frac{575 \cdot 4}{250} = 9.2$$

And solving for x we learn that at this speed it would take 9.2 hours to travel 575 miles. (You could have also solved that the speed is 62.5 mph, but it is not necessary to do so).

Practice Questions - Ratios / proportions

Solve for x or for the given quantity.

1.) $\frac{5}{12} = \frac{x}{108}$

2.) $\frac{270}{5} = \frac{450}{x}$

3.) $\frac{x}{80} = \frac{3}{4}$

4.) $\frac{10}{x} = \frac{8}{25}$

5.) At a certain speed you travel 320 miles in 4.5 hours. At the same speed, how far would you travel in 7 hours?

6.) If a restaurant likes to keep a ratio of 3 waiters per 42 seated guests, how many waiters should the restaurant have on staff for a night where crowds of 112 seated guests are expected?

7.) A caterer usually bakes 4 cakes per 90 guests. How many cakes should the caterer bake for a party with 225 guests?

8.) A recipe calls for 2 cups of sugar for every 5 cups of flour. If 12 cups of flour are used, how many cups of sugar are needed?

ANSWERS - Ratios / proportions

1.) $\frac{5}{12} = \frac{x}{108} \rightarrow 5 \cdot 108 = x \cdot 12 \rightarrow x = \frac{5 \cdot 108}{12} = 45$

2.) $\frac{270}{5} = \frac{450}{x} \rightarrow 270 \cdot x = 450 \cdot 5 \rightarrow x = \frac{450 \cdot 5}{270} = 8\frac{1}{3} \approx 8.33$

3.) $\frac{x}{80} = \frac{3}{4} \rightarrow 4x = 3 \cdot 80 \rightarrow x = 240/4 = 60$

4.) $\frac{10}{x} = \frac{8}{25} \rightarrow 250 = 8x \rightarrow x = 250/8 = 31.25$

5.) $\frac{320}{4.5} = \frac{x}{7} \rightarrow 320 \cdot 7 = x \cdot 4.5 \rightarrow x = \frac{320 \cdot 7}{4.5} \approx 498 \text{ miles}$

6.) $\frac{3}{42} = \frac{x}{112} \rightarrow 3 \cdot 112 = x \cdot 42 \rightarrow x = \frac{3 \cdot 112}{42} = 8 \text{ waiters}$

7.) $\frac{4}{90} = \frac{x}{225} \rightarrow 4 \cdot 225 = x \cdot 90 \rightarrow x = \frac{4 \cdot 225}{90} = 10 \text{ cakes}$

8.) $\frac{2}{5} = \frac{x}{12} \rightarrow 2 \cdot 12 = x \cdot 5 \rightarrow x = \frac{2 \cdot 12}{5} = 4.8 \text{ cups of sugar}$

Percentage

A **percentage** is a way of expressing a number as a fraction of 100. To convert any number into a percentage you would multiply the number by 100 and then add the '%' sign to the end. (Remember, when multiplying by 100, simply move the decimal place two spaces to the right).

$$\frac{8}{10} = .8 = 80\%$$

Since you multiply by 100 to convert a decimal number to a percentage, you divide by 100 to convert a percentage to a decimal number. For example, 74%=0.74 (dividing by 100 means you move the decimal place two spots to the left).
Can you calculate what 44% of 80 is? To do so you would first convert 44% to its decimal form of 0.44 and then multiply this by 80 to get the answer.

$$0.44 \cdot 80 = 35.2$$

Here's a slightly trickier question: if 80% of a class passes a test and 6 students fail the test, how many students are in the class?

To answer this question observe that since 80% passed then 20% failed, so 20% of the total class size is 6. We can let x denote the total class size and then set up a simple equation to solve.

$$0.2 \cdot x = 6 \rightarrow$$
$$x = 6/0.2 = 30$$

Solving the equations shows that the class has 30 students. The number of students that passed would be:

$$0.8 \cdot 30 = 24$$

Percentages are usually used for numbers between 0 and 1 (or between 0% and 100%), but it is possible to have more then 100% of something. For example if we earned $15,000 one year, then earned $40,000 the next year, our income would have increased by 167%.

$$\frac{40-15}{15} \approx 1.667 = 167\%$$

As in the previous example, percentages are often used to represent a change in something. Take the Super Bowl for example: 111 million people tuned in to watch Super Bowl 45 and 106.5 million watched Super Bowl 44. From these numbers we can calculate that viewership of the game grew by 4.23% between these years.
To calculate the percent change between two quantities divide the absolute change in quantities by the original quantity then multiply by 100 to get a percentage. The absolute change is equal to the second (newer) quantity minus the first (older) quantity.

$$(111 - 106.5)/106.5 \approx 0.0423 = 4.23\%$$

Notice that we do not need the 'million' to calculate the percentage change; it factors out of the equation:

$$\frac{111{,}000{,}000-106{,}500{,}000}{106{,}500{,}000} = \frac{111-106.5}{106.5} \cdot \frac{1{,}000{,}000}{1{,}000{,}000} = \frac{111-106.5}{106.5}$$

Percentage changes can also be negative. Say you bought a new car for $15,000. If you appraised the car two years later, it would likely have a much lower market value of say $11,500. The market value of the car would have changed by -23.33%.
Percentages don't always need to involve a change of something. Taxes are usually denoted in percentage terms. If sales tax in your state is 6%, how much tax would you pay on a $150 purchase?

$$150 \cdot 0.06 = 9$$

You would pay $9 in sales tax on the purchase.
Here is one last example: say you purchased an item on sale for 70% off. You paid $15 for the item (ignore tax). How much did the item originally cost?
Since you purchased the item for 70% off, you paid 30% of the original price. Letting x be the original price we have:

$$0.3 \cdot x = 15 \rightarrow$$
$$x = 15/0.3 = 50$$

So, the item originally cost $50.

Practice Questions - Percentage

Solve.
1.) 15% of 100

2.) 15% of 90

3.) 85% of 90

4.) What percent of 200 is 320?

5.) If 25% of a number is 13, then what is the number?

6.) If 30% of a number is 60, then what is the number?

7.) If a store sells 120 lamps one year, then 165 lamps the next year, by what percentage has their lamp sales increased by?

8.) If a movie ticket costs $8.00 one year, then $9.50 two years later, by what percentage has the ticket price increased by?

9.) If you spend $35 on a jacket during a 60% off clearance sale, what is the original price of the jacket? (ignore tax)

10.) Only 12% of the people who applied to a certain university were accepted. If 1,020 people were accepted to the university, how many applied?

ANSWERS - Percentage

1.) $0.15 \cdot 100 = 15$

2.) $0.15 \cdot 90 = 13.5$

3.) $0.85 \cdot 90 = 76.5 \text{ also observe: } 90 - 13.5 = 76.5$

4.) $320/200 = 1.6 = 160\%$

5.) $0.25 \cdot x = 13 \rightarrow x = 13/0.25 = 52$

6.) $0.30 \cdot x = 60 \rightarrow x = 60/0.3 = 200$

7.) $\frac{165-120}{120} = 0.375 = 37.5\%$

8.) $\frac{9.5-8}{8} = 0.1875 = 18.75\%$

9.) $0.4 \cdot x = \$35 \rightarrow x = \$35/0.4 = \$87.50$

10.) $0.12 \cdot x = 1,020 \rightarrow x = 1,020/0.12 = 8,500 \text{ applicants}$