

Arithmetic Review

The arithmetic portion of the Accuplacer Placement test consists of seventeen multiple choice questions. These questions will measure skills in computation of whole numbers, fractions, decimals, and percentages and will include simple geometry and application problems. Use of calculators is not permitted. Scrap paper will be provided and must be turned in at the end of the testing session. Please make certain that your cell phone is turned off during the testing session.

ORDER OF OPERATIONS WITH WHOLE NUMBERS

Solving problems with several operations requires doing each step in the correct order. The procedure is:

- 1) Do all operations inside parentheses, brackets, and braces
- 2) Do all exponents and square roots
- 3) Do all multiplication and division from left to right
- 4) Do all addition and subtraction from left to right

$$\begin{aligned} &2(6-4)^2 + 10 \\ &2(2)^2 + 10 \\ &2(4) + 10 \\ &8 + 10 \\ &18 \end{aligned}$$

ADD AND SUBTRACT UNLIKE FRACTIONS

You have probably heard the expression, "That's like comparing apples and oranges." When someone uses this expression, he is implying that the items or ideas being discussed are different. If there is a bowl containing seven apples and six oranges, you could say that there are thirteen pieces of fruit in the bowl. Using the common label of fruit is similar to using a common denominator for adding, subtracting, and comparing fractions. The term *least common denominator* refers to the smallest number that has all of the denominators as factors.

$\frac{1}{4} + \frac{1}{3}$ In order to solve this problem, we need to have a common denominator.

The denominators (the bottom numbers of fractions) are three and four. The smallest number that has both three and four as factors is twelve. Before we add, we must change these fractions to equivalent fractions with denominators of twelve. *Equivalent fractions* are numbers that have the same value.

$$\frac{1}{2} = \frac{2}{4} = \frac{5}{10} = \frac{16}{32} \quad \text{All of these fractions have the same value.}$$

$$\frac{1}{4} = \frac{3}{12} \quad \text{and} \quad \frac{1}{3} = \frac{4}{12}$$

Once we have changed the original fractions to equivalent fractions with the same denominators, we add the numerators (the top numbers of fractions) and keep the same denominator.

$$\frac{3}{12} + \frac{4}{12} = \frac{7}{12}$$

The method is the same despite the number of fractions being added.

$\frac{3}{4} + \frac{3}{16} + \frac{3}{8}$ The least common denominator for this set is sixteen. Before we add, we will change them to equivalent fractions with a denominator of sixteen.

$\frac{3}{4} = \frac{12}{16}$ and $\frac{3}{8} = \frac{6}{16}$ Since $\frac{3}{16}$ already has the needed denominator, it will remain the same.

$\frac{12}{16} + \frac{3}{16} + \frac{6}{16} = \frac{21}{16}$ The number $\frac{21}{16}$ is considered an improper fraction because the numerator is larger than the denominator. To change this to a mixed number, divide the denominator into the numerator. The quotient becomes the whole number, the remainder becomes the new numerator, and the denominator stays the same.

$$\text{Therefore } \frac{21}{16} = 1\frac{5}{16}$$

Follow the same procedure for subtracting fractions.

$\frac{7}{10} - \frac{1}{5}$ Once you have determined that the least common denominator (LCD) is ten,

change $\frac{1}{5}$ to the equivalent fraction $\frac{2}{10}$

$\frac{7}{10} - \frac{2}{10} = \frac{5}{10}$ The fraction $\frac{5}{10}$ should be reduced to the equivalent fraction $\frac{1}{2}$.

All fractional answers on the CPT exam are in reduced form.

MULTIPLYING AND DIVIDING FRACTIONS

Common denominators are not required for multiplying and dividing fractions. To multiply fractions, multiply the numerators and write the result as the new numerator, multiply the denominators and write the result as the new denominator, and reduce if needed.

$$\frac{1}{3} \times \frac{2}{5} = \frac{2}{15}$$

To divide fractions, multiply the dividend by the reciprocal of the divisor.

To work this problem, $\frac{1}{3} \div \frac{1}{2}$ rewrite as a multiplication problem $\frac{1}{3} \times \frac{2}{1}$ and multiply

using the method described above. $\frac{1}{3} \times \frac{2}{1} = \frac{2}{3}$

Before multiplying and dividing mixed numbers, change the numbers to improper fractions by multiplying the whole number by the denominator and adding the numerator to get the new numerator. The denominator remains the same. $1\frac{1}{4} \times 3$ is rewritten as

$\frac{5}{4} \times \frac{3}{1}$, which results in the improper fraction $\frac{15}{4}$. This could be changed to the

equivalent mixed number $3\frac{3}{4}$, by dividing the denominator (bottom number) into the numerator (top number).

ADD AND SUBTRACTION OF DECIMALS

To add and subtract numbers containing decimals, line up the decimals and add or subtract as you would whole numbers.

$$1.2 + 3.44 + 6.208 + 4.7 = 15.548 \quad \text{and} \quad 16.025 - 1.43 = 14.595$$

MULTIPLYING DECIMALS

To multiply numbers that contain decimals, first multiply as you would with whole numbers. Then count the number of places to the right of the decimal in each number and counting from the right of the answer, move the decimal that number of places to the left. Add zeros (to the left) if needed to obtain the correct number of decimal places. Ex. Multiply $0.1 \times 0.1 = 0.01$

To solve this problem 1.34×6.5 , first multiply as you would if there were no decimals, which would give the result 8710. Then count the number of places to the right of the decimal in both of the original numbers—two in 1.34 and one in 6.5 for a total of three.

Then starting at the right of the answer (to the right of the zero), count three places to the left. The decimal will be between the 8 and the 7, for a final answer of 8.710

DIVIDING DECIMALS

To divide numbers containing decimals, make the divisor into a whole number by moving the decimal to the right. In the problem $0.54 \div 1.8$, 0.54 is the dividend and 1.8 is the divisor. Change 1.8 to a whole number by moving the decimal one place to the right. Then before dividing, move the decimal in the dividend the same number of places. Add zeros, if necessary. In this case, 0.54 becomes 5.4. When you write it as a division problem, there should be no decimal left in the divisor. Then write the decimal for the quotient (answer) above the position of the decimal in the dividend.

First write $0.54 \div 1.8$ as $1.8 \overline{)0.54}$. Next rewrite 1.8 as a whole number by moving the decimal one place to the right, and move the decimal in 0.54 the same number of places

$18 \overline{)05.4}$. Then write the decimal for the quotient directly above where it is in the dividend

and divide as you would divide whole numbers. $18 \overline{)05.4}^{0.3}$

Follow the same procedure for this example: $58.24 \div 1.12$. Rewrite as $1.12 \overline{)58.24}$

Move the decimal in the divisor two places to the right, and move the decimal in the dividend the same number of places. Then write the decimal in the quotient directly above the decimal in the dividend and divide following the method for whole

numbers: $112 \overline{)5824}^{52}$. To check your answer, multiply the quotient by the divisor and the result should be the dividend. $1.12 \times 52 = 58.24$

ROUNDING NUMBERS

To correctly round numbers, you will need to know the rules for rounding and the place values of numbers. The numbers to the left of the decimal are whole numbers.

1,234,506.789. In this number the six is in the ones place, the zero is in the tens place, the five is in the hundreds place, the four is in the thousands place, the three is in the ten-thousands place, the two is in the hundred-thousands place, and the one is in the millions place. To the right of the decimal, the seven is in the tenths place, the eight is in the hundredths place, and the nine is in the thousandths place. The number would be read as, "One million, two hundred thirty-four thousand, five hundred six, and seven hundred eighty-nine thousandths."

The rules for rounding are:

- 1) Locate the place to be rounded to
- 2) Look at the number in the place to the right of the place to be rounded to
- 3) If that number is five or larger, add one to the place to be rounded to. If that number is four or smaller, the number to be rounded to stays the same.
- 4) Write the rounded number by rewriting all the digits to the left of the place being rounded to and the digit in the rounded place. Change the numbers to the right of the place being round to into zeros.

To round this number 1,234,506.789 to the nearest hundredths place:

- 1) Determine that 8 is the number in the hundredths place
- 2) Note that the number to the right (9) is larger than five
- 3) Add one to the place being rounded to ($8 + 1 = 9$)
- 4) Rewrite as: 1,234,506.79

To round this number 1,234,506.789 to the nearest hundreds place:

Determine that the number in the hundreds place is five and the number to the right is zero, which is smaller than five. Rewrite as 1,234, 500

PERCENTS

The percent symbol represents one one hundredth, which can be written $\frac{1}{100}$ or 0.01.

To change a number from a percent to a decimal, move the decimal point two places to the left (the result of multiplying by 0.01) and rewrite without the percent symbol. To change a number from a decimal to a percent, move the decimal point two places to the right (the result of multiplying by 100) and rewrite with the percent symbol.

$$50\% = 0.50$$

$$23\% = 0.23$$

To change a percent to a fraction, first change it to a decimal, and then rewrite is as a

fraction. $50\% = 0.50 = \frac{50}{100}$ which reduces to $\frac{1}{2}$

$$23\% = 0.23 = \frac{23}{100}$$

GEOMETRY

The formulas for the perimeter and area of rectangles are $P = 2l + 2w$ and $A = l \times w$ where l represents the length and w represents the width. These formulas would be used to solve the following example problems.

A gardener wants to put a fence around his vegetable patch to prevent animals from eating his plants. The length of the garden is 40 feet and the width is 25 feet. How many feet of fence does he need to purchase?

$$P = 2l + 2w$$
$$P = 2(40) + 2(25)$$
$$P = 80 + 50$$
$$P = 130 \text{ feet}$$

A decorator wants to put new carpet in his office. The office measures 16 feet by 11 feet. How much carpet does he need to purchase?

$$A = l \times w$$
$$A = (16)(11)$$
$$A = 176 \text{ ft.}^2$$

ft^2 = square feet not 176^2

ARITHMETIC PRACTICE TEST

1) In a recent election, 51% of the voters were against a tax increase, 22% were for the tax increase, and the remaining voters were undecided. Write the number of undecided voters as a fraction.

- a) $\frac{73}{100}$
- b) $\frac{29}{100}$
- c) $\frac{27}{100}$
- d) $\frac{37}{100}$

2) A recipe calls for $\frac{3}{4}$ cup of sugar to make two dozen cookies. If you only wanted to make one dozen cookies, how much sugar should you use?

- a) $\frac{1}{12}$ cup
- b) $\frac{3}{8}$ cup
- c) $\frac{3}{2}$ cup
- d) $\frac{3}{6}$ cup

3) Michael walked $3\frac{1}{2}$ miles on Monday and $3\frac{1}{5}$ miles on Tuesday. How much farther did he walk on Monday than Tuesday?

- a) $\frac{1}{3}$ mile
- b) $\frac{1}{2}$ mile
- c) $\frac{3}{10}$ mile
- d) $\frac{1}{10}$ mile

4) Divide: $4.23 \div 9$

- a) 0.47
- b) 4.7
- c) 2.12
- d) 21.2

5) Divide $2\frac{1}{4} \div 1\frac{1}{8}$

- a) $1\frac{1}{2}$
- b) $2\frac{1}{2}$
- c) 2
- d) $1\frac{1}{4}$

- 6) Jennifer had \$182.17 in her checking account. After she wrote a check for \$11.72 to the water company and a check for \$81.40 to the electric company, how much did she have left in her checking account?
- a) \$89.05
 - b) \$100.77
 - c) \$90.05
 - d) \$90.99
- 7) A developer has decided to fence in a playground area. If the length of the playground is 70 yards and the width is 52 yards, how much fence does she need to purchase?
- a) 122 yards
 - b) 244 yards
 - c) 210 yards²
 - d) 3640 yards²
- 8) Marion Jones jumped 22 feet 9 inches at the Prefontaine Classic, and she jumped 22 feet 2 ½ inches during her trial for Olympic competition. How much longer was her previous long jump than her Olympic trial long jump?
- a) 5 ½ inches
 - b) 1 ½ inches
 - c) 7 ½ inches
 - d) 6 ½ inches
- 9) Cynthia's test scores in her BIO 110 class are 91, 92, 88, 100, 97, and 82. What is her current test average rounded to the nearest hundredth?
- a) 91.66
 - b) 91.67
 - c) 91.666
 - d) 91.667
- 10) The answer to this multiplication problem will be closest to which of these whole numbers? **5.03×0.92**
- a) 45
 - b) 5
 - c) 6
 - d) 7

11) Mrs. Sanford's monthly salary is \$1200. If she pays $\frac{1}{4}$ of that in taxes, what is her monthly take home pay?

- a) \$900
- b) \$300
- c) \$400
- d) \$450

12) At the last state council meeting, there were 15 people from the western region and 35 people from the eastern region. What percent of the attendees were from the western region?

- a) 15%
- b) 30%
- c) 35%
- d) 22.5%

13) Michael walked $3\frac{1}{2}$ miles on Monday and $3\frac{1}{5}$ miles on Tuesday. How far did he walk altogether?

- a) 6 miles
- b) $6\frac{6}{7}$ miles
- c) $6\frac{2}{10}$ miles
- d) $6\frac{7}{10}$ miles

14) A developer has decided to fence in a playground area. She decided to cover the ground with Astroturf. If the length of the playground is 70 yards and the width is 52 yards, how much Astroturf does she need to purchase?

- a) 122 yards
- b) 244 yards
- c) 210 yards²
- d) 3640 yards²

15) I recently traveled 225.5 miles using 11 gallons of gas. What was my average in miles per gallon?

- a) 20.5 mpg
- b) 2.5 mpg
- c) 21.5 mpg
- d) 25 mpg

Arithmetic Answers and Solutions

1) **Answer: c**

Solution: Add together the number of voters that were against the tax increase and for the tax increase for a total of 73% of the voters that have already decided. Subtract this number from 100 to find the percentage of voters that have not decided. $100 - 73 = 27\%$ or $\frac{27}{100}$

2) **Answer: b**

Solution: Since you only want to make half of the recipe (one dozen is half of two dozen), you would multiply the amount of sugar by $\frac{1}{2}$.

$$\frac{3}{4} \times \frac{1}{2} = \frac{3}{8} \text{ cup}$$

3) **Answer: c**

Solution: The question asks how much farther indicating subtraction. We must find a common denominator among the fractions before subtracting. The LCD for 2 and 5 is 10. Then convert the mixed numbers to equivalent numbers with the same denominator. $3\frac{1}{2} = 3\frac{5}{10}$ and $3\frac{1}{5} = 3\frac{2}{10}$

Subtract the whole numbers, subtract the numerators, and keep the same denominator.

$$3\frac{5}{10} - 3\frac{2}{10} = \frac{3}{10} \text{ mile}$$

4) **Answer: a**

Solution: $4.23 \div 9$ should be rewritten as $9 \overline{)4.23}$, and the decimal should be written in the quotient directly above the decimal in the dividend. Then divide as

with whole numbers. $9 \overline{)4.23}$

5) **Answer: c**

Solution: First change the mixed numbers to improper fractions by multiplying the whole number by the denominator and adding the numerator to get the new numerator, and keep the same denominator. $2\frac{1}{4} = \frac{9}{4}$ and $1\frac{1}{8} = \frac{9}{8}$

Then divide by multiplying the dividend by the reciprocal of the divisor. $\frac{9}{4} \times \frac{8}{9} =$

$$\frac{72}{36}, \text{ which reduces to } 2.$$

6) **Answer: a**

Solution: Line up the decimals to subtract the value of both checks from the original amount in the checking account. $\$182.17 - 11.72 = \170.45 and $\$170.45 - 81.40 = \89.05

7) **Answer: b**

Solution: The perimeter of a polygon is found by adding all of the sides, or in the case of this rectangle using the formula $2l + 2w = P$.
 $2(70) + 2(52) = 244$ yards.

8) **Answer: d**

Before subtracting, find the common denominator of 2. Borrow 1 from the whole number 9, just as done when subtracting with whole numbers. The 1 becomes the fraction $\frac{2}{2}$. Now rewrite as $8\frac{2}{2} - 2\frac{1}{2}$. Subtract the whole numbers, subtract the numerators, and keep the same denominator.

9) **Answer: b**

Solution: To find the average of a set of numbers, add all of the numbers, in this case, the test scores, and divide by the number of items, in this case 6 tests.

$$91 + 92 + 88 + 100 + 97 + 82 = 550. \quad \begin{array}{r} 91.666 \\ 6 \overline{)550.000} \end{array}$$

To round to the nearest hundredth place, look to the thousandths place, determine that it is higher than four, and add one to the hundredths place.

10) **Answer: b**

To estimate the answer to this multiplication problem, round each factor to the nearest whole number. 5.03 rounds to 5 and 0.92 rounds to 1. Multiply these rounded numbers to estimate the product. $5 \times 1 = 5$.

11) **Answer: a**

Solution: To find out how much Mrs. Sanford pays in taxes each month, multiply her monthly salary by $\frac{1}{4}$. $\$1200 \times \frac{1}{4} = \frac{1200}{4}$, which reduces to \$300. To determine her monthly take home pay, subtract \$300 from her monthly salary. $\$1200 - \$300 = \$900$.

12) **Answer: b**

Solution: First establish the number of people that attended the meeting by adding together the numbers from each region. $15 + 35 = 50$. This means that 15 of the 50 people in attendance were from the western region. To write this as

a percentage, first write as a fraction. $\frac{15}{50}$. Change the fraction to a decimal by

dividing the denominator into the numerator. $50 \overline{)15.00}^{0.30}$ Then change the decimal to a percent by moving the decimal point two places to the right and adding the % symbol. $0.30 = 30\%$

13) **Answer: d**

Solution: Before adding, change these mixed numbers to equivalent numbers with the common denominator of 10.

$3\frac{1}{2} = 3\frac{5}{10}$ and $3\frac{1}{5} = 3\frac{2}{10}$ Then add the whole numbers, add the numerators, and keep the same denominator.

14) **Answer: d**

Solution: To find the area of a rectangle, multiply the length by the width and write the answer with square units.

15) **Answer: a**

Solution: Think of the word per as a clue word to signal division.

$$11 \overline{)225.5}^{20.5}$$