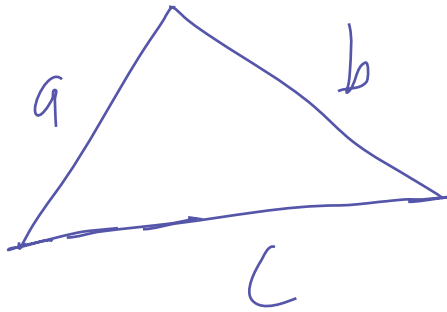


# Triangle Inequality Theorem:

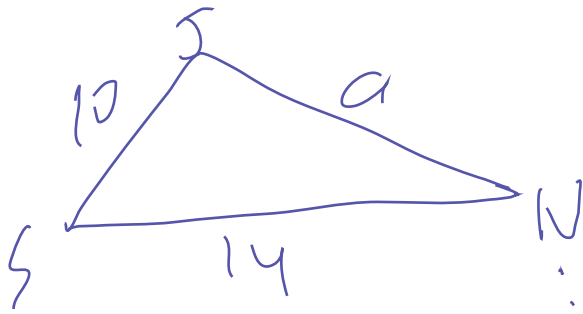


$$\begin{aligned} a+b &> c \\ a-b &< c \end{aligned}$$

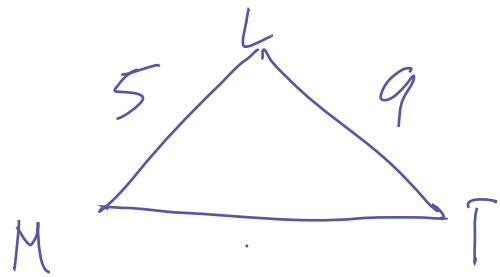
The sum of any two sides of a triangle must be greater ~~than~~ than the third side.

The difference between any two sides of a triangle must be smaller than the third side.

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$$4 < a < 24$$



$$4 < m < 14$$

# Exponent Laws:

$$a^m \cdot a^n = a^{m+n}$$

$$2^3 \cdot 2^2 = 2^5$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$\frac{3^8}{3^5} = 3^{8-5} = 3^3$$

$$(a^m)^n = a^{m \cdot n}$$

$$(2^3)^2 = 2^6$$



$$5^4 + 5^4 + 5^4 + 5^4 + 5^4 = 5(5^4) = 5^{1+4} = 5^5$$

$$\begin{aligned} & \hookrightarrow 3^6 \cdot 27^2 \\ & \quad \quad \quad \downarrow \\ & 3^6 \cdot (3^3)^2 \\ & 3^6 \cdot 3^6 = \boxed{3^{12}} \end{aligned}$$

$$\begin{aligned} 3^6 \cdot 3^2 &= 3^8 \\ 27 &= 3^3 \\ & \quad \quad \quad \swarrow \quad \searrow \\ & \quad \quad \quad 3 \cdot 3 \\ & \quad \quad \quad \swarrow \quad \searrow \\ & 3 \cdot 3 \end{aligned}$$

$$a^{-m} = \frac{1}{a^m}$$

$$6^{-2} = \frac{1}{6^2} = \frac{1}{36}$$

$$a^{m/n} = \sqrt[n]{a^m} =$$

$$10^{2/3} = \sqrt[3]{10^2} = \boxed{\sqrt[3]{100}}$$

$$\sqrt{5} + \sqrt{10} \neq \sqrt{15}$$

$$\sqrt{50}$$
$$\sqrt{25} \cdot \sqrt{2}$$

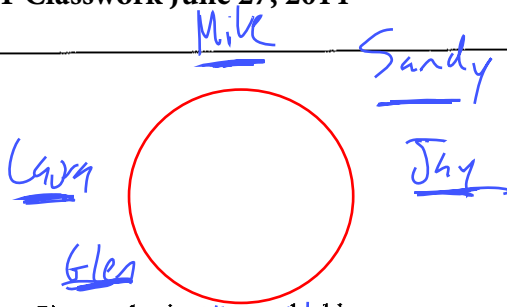
$$5\sqrt{2}$$

$$\sqrt{200}$$
$$\sqrt{100} \cdot \sqrt{2}$$

$$10\sqrt{2}$$

### Trains Meeting Question:

Train A travels from Chicago to New York at 60 miles per hour. Train B travels from New York to Chicago at 50 miles per hour. The distance from Chicago to New York is 1400 miles. If the trains start traveling at the same time, how long does it take for the two trains to meet and how far away from New York do the two trains meet?



**PRACTICE QUIZ**

Sequencing

There are five salespeople in a car dealership: Mike, Frank, Stacey, Carl, and Dennis. In the first quarter of the year, their sales were as follows:

- 1) Mike sold more cars than Frank sold.
- 2) Frank sold fewer cars than Stacey sold.
- 3) Carl sold more cars than Dennis sold.
- 4) Dennis and Stacey sold exactly the same number of cars.

1. If the statements above are true, which of the following **must** also be true?

- A. Mike sold more cars than Stacey sold.
- B. Carl sold more cars than Mike sold.
- C. Dennis sold fewer cars than Mike sold.
- D. Carl sold more cars than Frank sold.
- E. Dennis sold fewer cars than Frank sold.

(A) (B) (C) (D) (E)

There are two books on a desk.

- 1) One book is a biology textbook, and the other book is a mystery novel.
- 2) The biology textbook has a soft cover.
- 3) One book is required reading.
- 4) One book has a hard cover and is a new book.
- 5) The book that is not new is required reading.

2. Which of the following **must** be true, based on the information above?

- F. The biology textbook is new.
- G. The biology textbook has a hard cover.
- H. The hardcover book is not new.
- J. The softcover book is not new.
- K. The mystery novel is required reading.

(F) (G) (H) (J) (K)

Six people sit at a round table.

- 1) Sandy is sitting between Mike and Jay.
- 2) Agnes is sitting across from Mike.
- 3) Glen is next to Laura and across from Sandy.

3. All of the following **must** be true **except**:

- A. Agnes is next to Glen.
- B. Laura is directly opposite Jay.
- C. Sandy is directly opposite Laura.
- D. Agnes is next to Jay.
- E. Mike is next to Laura.

(A) (B) (C) (D) (E)

Matching  
B<sub>1</sub>

+ biology  
+ soft cover  
→ not new  
→ required

B<sub>2</sub>

→ mystery  
→ hard cover  
→ new book

C  
S  
M  
F  
C  
D  
C  
M  
S  
D = S  
D  
most cars

Session 3

$$\frac{1}{4} = 0.\overline{1}$$

$$\frac{2}{4} = 0.\overline{2}$$

$$\frac{3}{4} = \frac{1}{3} = 0.\overline{3}$$

$$\frac{4}{4} = 0.\overline{4}$$

$$\frac{5}{4} = 0.\overline{5}$$

$$\frac{6}{4} = \frac{2}{3} = 0.\overline{6}$$

$$\frac{7}{4} = 0.\overline{7}$$

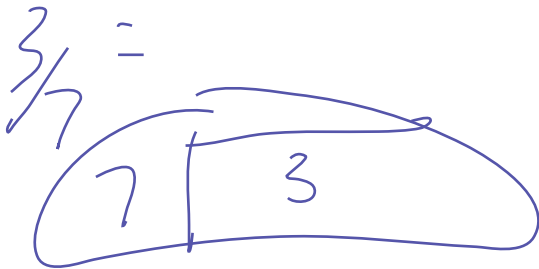
$$\frac{8}{4} = 0.\overline{8}$$

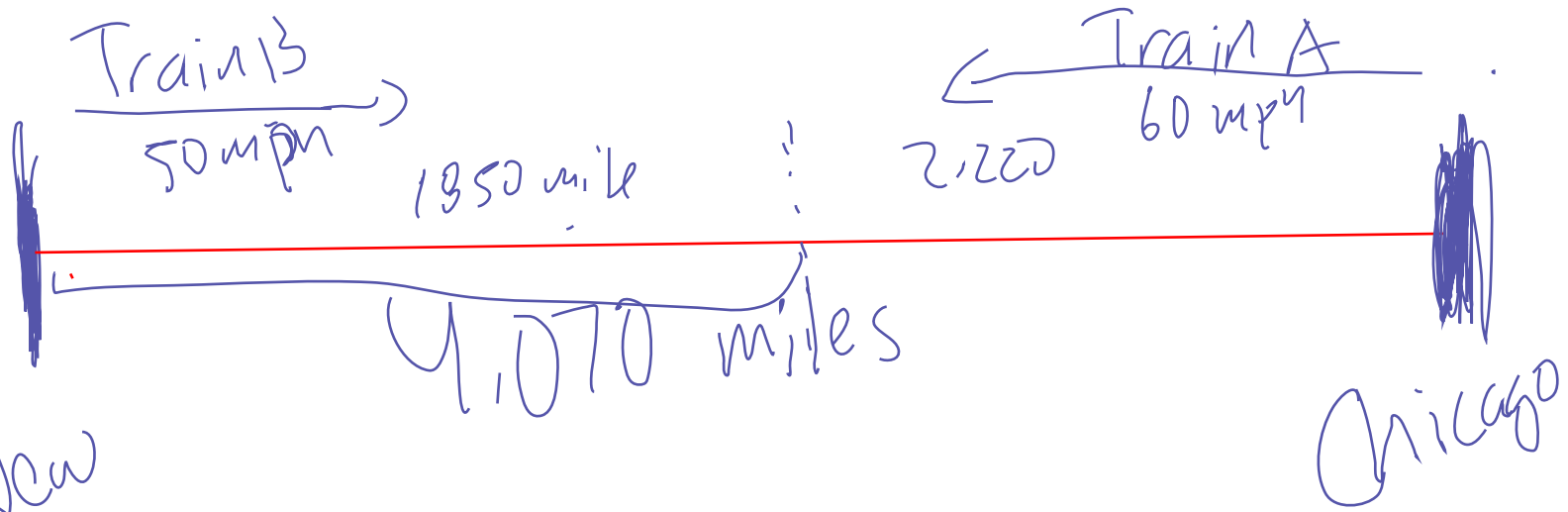
$$\frac{9}{4} = 1$$

$$\frac{10}{4} = 0.10 = 1.\overline{1}$$

$$\frac{11}{4}$$

$$\frac{10}{4} = \frac{2}{4} = 2.\overline{2}$$





$$\text{Train A } 50 \text{ mph} + \text{Train B } 60 \text{ mph} = \text{Combined Rate } 110 \text{ mph}$$

$$\text{time} = \left( \frac{\text{distance}}{\text{rate}} \right) \times \text{time}$$

$$\frac{\text{distance}}{\text{rate}} = \text{time}$$

$$\frac{\text{rate} \cdot \text{time}}{\text{rate}} = \frac{\text{distance}}{\text{rate}}$$

$$\frac{4,070 \text{ miles}}{110 \text{ miles/hr}}$$

$$= 37 \text{ hours}$$

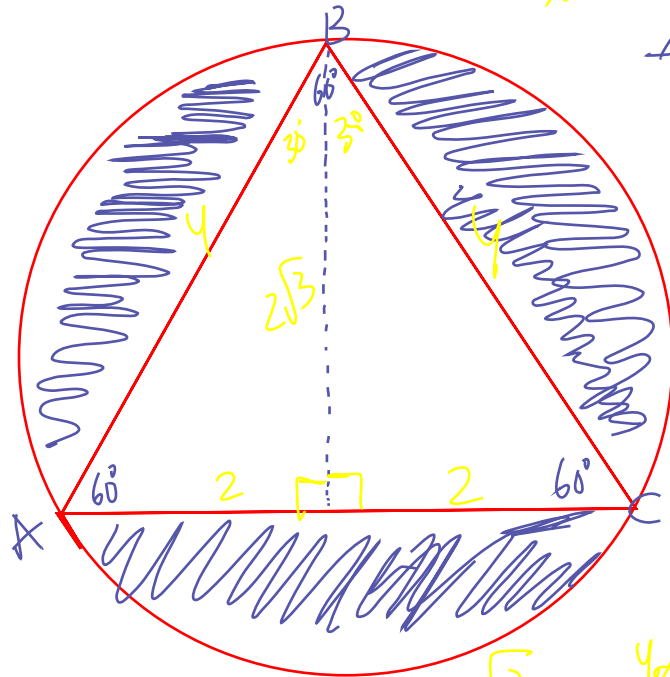
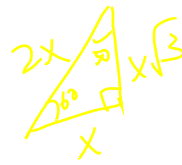
LCM and GCF



$$\text{GCF: } 2 \cdot 3 \cdot 3 \cdot 3$$

$$\text{LCM: } 2 \cdot 3 \cdot 3 \cdot 3 \cdot 5 \cdot 5 \cdot 7$$

# Shaded Region Problem Set:



$\triangle ABC$  is an equilateral triangle with side 4.

The diameter of this circle is 6.

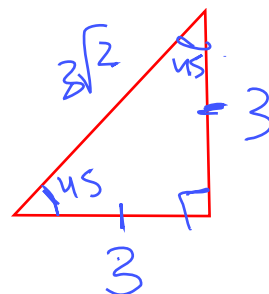
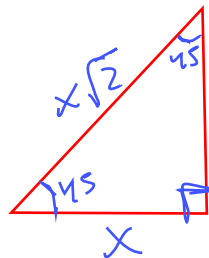
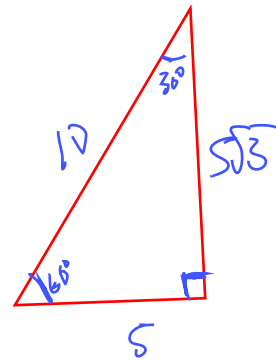
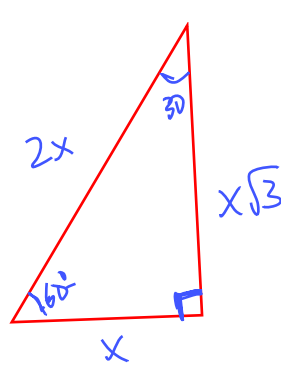
Find the area of the shaded region.

$$A_{\text{circle}} = \pi r^2 = \pi (3)^2 = 9\pi$$

$$A_{\triangle} = \frac{b \cdot h}{2} = \frac{4 \cdot 2\sqrt{3}}{2} = 4\sqrt{3}$$

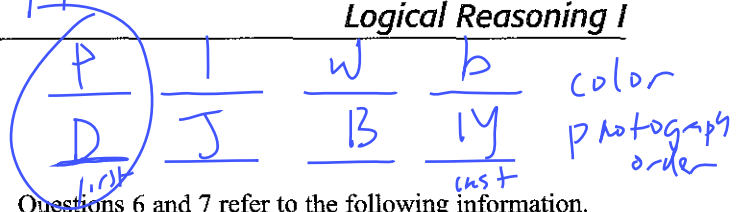
$$A_{\text{shaded region}} = A_{\text{total image}} - A_{\text{unshaded region}} = 9\pi - 4\sqrt{3}$$

6:17



Logical Reasoning I

M → b DJ B M  
 D → P \*  
 J → l B → W



Questions 4 and 5 refer to the following information.

In the code below, (1) each letter represents the same word in all four sentences, (2) each word is represented by only one letter, and (3) in any given sentence, the letters may or may not be presented in the same order as the words.

B Q O F X means  
 "Oaks turn brown each autumn."

R G Y E B means  
 "Maples are red every autumn."

O H B S W means  
 "Birches turn yellow in autumn."

D J Z T E means  
 "Pines are green all winter."

4. Which word is represented by E?

- F. maples
- G. pines
- H. green
- J. are
- K. Cannot be determined from the information given.

(F G H J K)

5. Which letter represents autumn?

- A. X
- B. B
- C. Y
- D. O
- E. Cannot be determined from the information given.

(A B C D E)

Questions 6 and 7 refer to the following information.

At a school, four female students are waiting for their school photographs to be taken, one at a time. The girls wear dresses that are blue, lavender, pink, and white.

- 1) Danielle is not wearing white.
- 2) Joanne is wearing the lavender dress.
- 3) Beth is photographed immediately after Joanne.
- 4) Melanie, who is wearing the blue dress, is photographed after Beth.
- 5) The girl wearing lavender is photographed after the girl wearing pink.

6. The girl wearing the white dress is in which position?

- F. first
- G. second
- H. third
- J. fourth
- K. Cannot be determined from the information given.

(F G H J K)

7. Which color is Danielle wearing?

- A. pink
- B. lavender
- C. blue
- D. white
- E. Cannot be determined from the information given.

(A B C D E)

Session 3



Session 3

7. Lydia is filling soda machines with soda. Each machine should get 25 cans. If she has 140 sodas and fills all but the last machine to capacity, how many sodas will go into the last machine?

- A. 5
- B. 10
- C. 15
- D. 25
- E. 40

Handwritten calculation for Question 7:  $140 \div 25 = 5 \text{ R } 15$ . The remainder 15 is circled, and the letter C is circled below the options.

8. What is the least common multiple of 8 and 9?

- F. 16
- G. 17
- H. 18
- J. 64
- K. 72

Handwritten calculation for Question 8:  $8 \times 9 = 72$ . The letter K is circled below the options.

9. What is the greatest common factor of:

- $2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5$
- $2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \cdot 7$
- A. 2
- B.  $2 \cdot 3$
- C.  $2 \cdot 2 \cdot 3 \cdot 3$
- D.  $2 \cdot 3 \cdot 5 \cdot 7$
- E.  $2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \cdot 5 \cdot 7$

Handwritten calculation for Question 9:  $2 \cdot 2 \cdot 3 \cdot 3$  is circled. The letter C is circled below the options.

10.  $5.5555 \times 10^5$  is equal to which of the following numbers?

- F. 55,555
- G.  $55,555 \times 100$
- H.  $555 \times 55$
- J.  $555 \times 555$
- K. 555,550

Handwritten calculation for Question 10:  $5.5555 \times 10^5 = 555,550$ . The letter K is circled below the options.

11. When  $x = 2$ , which is the value of  $(x^2 - 2x - 3)^2 - 4x$ ?

- A. 1
- B. 5
- C. 9
- D. 13
- E. 17

Handwritten calculation for Question 11:  $(2^2 - 2(2) - 3)^2 - 4(2) = (4 - 4 - 3)^2 - 8 = (-3)^2 - 8 = 9 - 8 = 1$ . The letter A is circled below the options.

Session 3 Homework

Session 3

2.  $(3 + \frac{1}{2})^2 =$

F.  $3\frac{1}{4}$

G.  $9\frac{1}{4}$

H.  $9\frac{1}{2}$

J.  $12\frac{1}{4}$

K.  $40\frac{1}{2}$

$(6\frac{1}{2} + 1\frac{1}{2})^2$   
 $(7\frac{1}{2})^2 = \frac{49}{4} = 12\frac{1}{4}$

5.  $xy(\frac{x}{y} + \frac{y}{x}) =$

A.  $xy$

B.  $x + y$

C.  $x^2 + y^2$

D.  $x^2 + \frac{y}{x}$

E.  $\frac{x^2 + y^2}{xy}$

$xy \left[ \frac{x^2}{xy} + \frac{y^2}{xy} \right]$   
 $xy \left[ \frac{x^2 + y^2}{xy} \right]$   
 $x^2 + y^2$

(F)(G)(H)(J)(K)

(A)(B)(C)(D)(E)

3.  $\frac{4}{9} \times \frac{1}{2} + \frac{5}{3} \div \frac{3}{4} =$

A.  $\frac{12}{21}$

B.  $\frac{2}{3}$

C.  $\frac{104}{81}$

D.  $\frac{22}{9}$

E.  $\frac{69}{17}$

PEMDAS  
 $\frac{4}{18} + \frac{5}{3} \cdot \frac{4}{3}$   
 $\frac{4}{18} + \frac{20}{9}$   
 $\frac{2}{9} + \frac{20}{9} = \frac{22}{9}$

$\frac{5}{7} \times \frac{1}{3} =$

$\frac{5}{3} \left( \frac{1}{6} + \frac{2}{5} \right) = \frac{5}{6}$

F.  $\frac{17}{126}$

G.  $\frac{50}{119}$

H.  $\frac{85}{42}$

J.  $\frac{25}{7}$

K.  $\frac{215}{42}$

$\frac{5}{21} \div \frac{17}{30}$   
 $\frac{5}{21} \times \frac{30}{17} =$

$\frac{5 \cdot 30}{21 \cdot 17} = \frac{50}{119}$

(A)(B)(C)(D)(E)

(F)(G)(H)(J)(K)

4.  $\left(\frac{1}{2} + \frac{1}{5}\right)\left(\frac{1}{6} + \frac{1}{10}\right) =$

F.  $\frac{1}{28}$

G.  $\frac{14}{75}$

H.  $\frac{1}{5}$

J.  $\frac{11}{50}$

K.  $\frac{19}{30}$

(F)(G)(H)(J)(K)

2.  $\left(3 + \frac{1}{2}\right)^2 =$

F.  $3\frac{1}{4}$

G.  $9\frac{1}{4}$

H.  $9\frac{1}{2}$

J.  $12\frac{1}{4}$

K.  $40\frac{1}{2}$

(F)(G)(H)(J)(K)

3.  $\frac{4}{9} \times \frac{1}{2} + \frac{5}{3} \div \frac{3}{4} =$

A.  $\frac{12}{21}$

B.  $\frac{2}{3}$

C.  $\frac{104}{81}$

D.  $\frac{22}{9}$

E.  $\frac{69}{17}$

(A)(B)(C)(D)(E)

4.  $\left(\frac{1}{2} + \frac{1}{5}\right)\left(\frac{1}{6} + \frac{1}{10}\right) =$

F.  $\frac{1}{28}$

G.  $\frac{14}{75}$

H.  $\frac{1}{5}$

J.  $\frac{11}{50}$

K.  $\frac{19}{30}$

(F)(G)(H)(J)(K)

5.  $xy\left(\frac{x}{y} + \frac{y}{x}\right) =$

A.  $xy$

B.  $x + y$

C.  $x^2 + y^2$

D.  $x^2 + \frac{y}{x}$

E.  $\frac{x^2 + y^2}{xy}$

(A)(B)(C)(D)(E)

6.  $\frac{\frac{5}{7} \times \frac{1}{3}}{\frac{1}{6} + \frac{2}{5}} =$

F.  $\frac{17}{126}$

G.  $\frac{50}{119}$

H.  $\frac{85}{42}$

J.  $\frac{25}{7}$

K.  $\frac{215}{42}$

(F)(G)(H)(J)(K)

7.  $\frac{1 \times \frac{1}{6}}{1 \div \frac{1}{6}} =$

$\frac{1/6}{1/6}$   $1 \div 1/6$   
 $1 \times 6 = 6$

A.  $\frac{1}{36}$

B.  $\frac{1}{6}$

C. 1

D. 6

E. 36

(A)(B)(C)(D)(E)

10.  $\frac{1}{\left(\frac{3}{5}\right)^2 + \frac{3}{5}} =$

F.  $\frac{25}{36}$

G.  $\frac{24}{25}$

H.  $\frac{25}{24}$

J.  $\frac{12}{5}$

K.  $\frac{36}{25}$

(F)(G)(H)(J)(K)

8.  $5 \left( \frac{5}{2} - \frac{5}{4} \right) =$

$5 - 5/2 + 5/4$   
 $5 - (10/4 - 5/4)$

F.  $\frac{5}{4}$

G.  $\frac{5}{2}$

H.  $\frac{15}{4}$

J.  $\frac{15}{2}$

K.  $\frac{25}{4}$

$5 - 5/4 = 15/4$

(F)(G)(H)(J)(K)

9.  $1 \div \left(\frac{2}{3}\right)^2 =$

$1 \div 4/9$   
 $1 \times 9/4 = 9/4$

A.  $\frac{4}{9}$

B.  $\frac{2}{3}$

C.  $\frac{3}{4}$

D.  $\frac{4}{3}$

E.  $\frac{9}{4}$

(A)(B)(C)(D)(E)

**FRACTIONS/DECIMALS/PERCENTAGES**

Answers and explanations can be found on page 174.

1. What is  $\frac{3}{8}$  expressed as a percent and as a decimal?

2.  $0.\bar{7}$  is equivalent to what fraction and what percent (rounded to the nearest integer)?

$7/9 \rightarrow 78\%$

3. Express 0.38 as a fraction. What is it as a percent?

4.  $12\frac{1}{2}\%$  is equivalent to what fraction? What is it as a decimal?

5.  $\frac{13}{4}$  is equivalent to what decimal number and what percent?

6. What is 540% as a decimal number and as an improper fraction?

7.  $0.\bar{16}$  is equivalent to what fraction and what percent (rounded to the nearest integer)?

## Session 3 Homework

8. What is  $\frac{17}{50}$  expressed as a percent and as a decimal?

9. What is  $\frac{13}{20}$  expressed as a percent and as a decimal?

10. 95% is equivalent to what fraction and what decimal?

11. Express  $\frac{7}{4}$  as a decimal. What is it as a percent?

12.  $2\bar{6}$  is equivalent to what improper fraction and what percent (rounded to the nearest integer)?

*Uob. 660% 267%*

### ARITHMETIC REMAINDER

Answers and explanations can be found on page 174.

1. Fernando has 338 photographs. If he can fit 4 photographs per page in his photo album, how many photographs will be on the last page of the album if every other page is filled?

- A. 1
- B. 2
- C. 3
- D. 84
- E. 85

*Handwritten work for problem 1:*  

$$\begin{array}{r} 4 \overline{) 338} \\ \underline{8} \phantom{0} \\ 4 \phantom{0} \\ \underline{4} \phantom{0} \\ 0 \phantom{0} \\ \underline{0} \phantom{0} \\ 0 \phantom{0} \\ \underline{0} \phantom{0} \\ 0 \phantom{0} \end{array}$$
 The remainder is 2. The answer is B.

(A) (B) (C) (D) (E)

2. Taisha is counting votes from a school election. There were 3 candidates running for treasurer, and students either voted for 1 of those 3 or they didn't vote at all. If there are 420 students in the school and half of them voted for Marcus, one-third of them voted for Mary, and one-seventh voted for Edward, how many students did not vote?

- F. 10
- G. 20
- H. 42
- J. 105
- K. 140

(F) (G) (H) (J) (K)

3. There are 357 people attending a school play. Assuming that all but one row of seats in the theater is completely full and that each row fits 24 people, how many rows of seats are there in the theater?

- A. 10
- B. 14
- C. 15
- D. 19
- E. 20

(A) (B) (C) (D) (E)

4. Gavroche has 897 trading cards. He wants to buy enough small boxes to hold all of his current collection and the 200 additional cards he plans to buy this year. If each box holds 40 cards, how many boxes should he buy?

- F. 22
- G. 23
- H. 27
- J. 28
- K. 30

(F) (G) (H) (J) (K)

5. Ella is stuffing envelopes. She has 48 red pages, 25 white pages, and 84 blue pages. If she needs to put 2 red pages, 1 white page, and 4 blue pages in every envelope to make it complete, how many complete envelopes can she make?

- A. 21
- B. 24
- C. 25
- D. 48
- E. 84

(A) (B) (C) (D) (E)

Session 3

**ROUNDING**

Answers and explanations can be found on page 176.

1. Which of the following is 0.807519 rounded to the nearest ten thousandths?
- A. 0.81
  - B. 0.808
  - C. 0.8076
  - D. 0.8075
  - E. 0.807

(A B C D E)

2. Which of the following is 10,695,559,992 rounded to the nearest million?
- F. 10,690,000,000
  - G. 10,695,000,000
  - H. 10,695,560,000
  - J. 10,696,000,000
  - K. 10,700,000,000

(F G H J K)

3. Which of the following is equivalent to the value of  $0.\bar{3}$  rounded to the nearest hundredth and multiplied by 10?
- A. 3.33
  - B. 3.30
  - C. 3.00
  - D. 1.33
  - E. 0.33

(A B C D E)

4. Which of the following is equivalent to 299,960,141 rounded to the nearest hundred thousand?
- F. 299,000,000
  - G. 299,900,000
  - H. 299,960,000
  - J. 299,999,000
  - K. 300,000,000

(F G H J K)

**SCIENTIFIC NOTATION**

Answers and explanations can be found on page 176.

1. Which of the following is equivalent to  $2.02 \times 10^4$ ?
- A. 202
  - B. 2,020
  - C. 2,200
  - D. 20,200
  - E. 202,000
- (A B C D E)
2. Which of the following is equivalent to  $3.14 \times 10^{-2}$ ?
- F. 314
  - G. 31.4
  - H. 0.314
  - J. 0.0314
  - K. 0.00314
- (F G H J K)

3. Which of the following is  $\frac{27}{100}$  expressed in scientific notation?
- A.  $2.7 \times 10^2$
  - B.  $0.27 \times 10^1$
  - C.  $2.7 \times 10^{-1}$
  - D.  $2.7 \times 10^{-2}$
  - E.  $0.27 \times 10^{-2}$

(A B C D E)

4. Express  $945,100 \times 10^{-2}$  in scientific notation.
- F.  $0.9451 \times 10^2$
  - G.  $0.9451 \times 10^3$
  - H.  $9.451 \times 10^{-3}$
  - J.  $9.451 \times 10^3$
  - K.  $94.51 \times 10^2$

(F G H J K)

Session 3

# Session 3 Homework

## ABSOLUTE VALUE

Answers and explanations can be found on page 177.

1. When  $x = \frac{1}{2}$ , which is the value of  $\frac{|-4x|}{|-3x|+2}$ ?

- A.  $-\frac{4}{7}$
- B.  $\frac{2}{7}$
- C.  $\frac{4}{7}$
- D. 4
- E. 7

Handwritten work for Question 1:  $\frac{|-4(\frac{1}{2})|}{|-3(\frac{1}{2})|+2} = \frac{(2)}{(\frac{3.5}{2})} = \frac{4}{7}$

(A)(B)(C)(D)(E)

2.  $\frac{\frac{3}{|-2|}}{\frac{-4}{|-2|}}$

- F.  $-\frac{4}{3}$
- G.  $-\frac{3}{4}$
- H. 0
- J.  $\frac{3}{4}$
- K.  $\frac{4}{3}$

(F)(G)(H)(J)(K)

3.  $(|-5| \div 10) + -5 =$

- A.  $5\frac{1}{2}$
- B.  $4\frac{1}{2}$
- C.  $3\frac{1}{2}$
- D.  $-4\frac{1}{2}$
- E.  $-5\frac{1}{2}$

(A)(B)(C)(D)(E)

4.  $3|-2^2| + 3 =$

- F. 12
- G. 15
- H. 18
- J. 21
- K. 24

(F)(G)(H)(J)(K)

5. For  $x = -2$ , what does  $(2 - 2x)|-3x - 3| = ?$

- A. 9
- B. 15
- C. 18
- D. 24
- E. 27

Handwritten work for Question 5:  $(2 - 2(-2))|-3(-2) - 3| = (2 - (-4))|6 - 3| = (2 + 4)|3| = 6 \cdot 3 = 18$

(A)(B)(C)(D)(E)

6. When  $x = -1$ , which is the value of  $\frac{|-3x - x^2|}{3 + |-x|}$ ?

- F.  $\frac{1}{2}$
- G. 1
- H.  $1\frac{1}{2}$
- J. 2
- K.  $2\frac{1}{2}$

(F)(G)(H)(J)(K)

7.  $\left| \frac{-4}{-2} \right| + \left| \frac{-3}{2} \right| - \left| \frac{-5}{3} \right| =$

- A. 0
- B.  $1\frac{5}{6}$
- C.  $2\frac{5}{6}$
- D.  $5\frac{1}{6}$
- E.  $7\frac{5}{6}$

(A)(B)(C)(D)(E)

## CONSECUTIVE MULTIPLES

### The Challenge:

To calculate multiples of a given number, multiply the number by positive integers. To calculate consecutive multiples, multiply that number by positive integers that increase by 1 each time.

- A. List the three smallest multiples of both 6 and 8.

\_\_\_\_\_

- C. Five consecutive multiples of 3 yield a sum that equal to the product of 7 and 15. What are the multiples?

\_\_\_\_\_

- B. Four consecutive multiples of 6 yield a sum of 156. What are these multiples?

\_\_\_\_\_

### Questions

13. Three consecutive multiples of 7 have a sum of 84. What is the greatest of these numbers?

- A. 7  
B. 21  
C. 35  
D. 42  
E. 49

$(x) + (x+7) + (x+14) = 84$   
 $3x + 21 = 84$   
 $-21 \quad -21$   
 $3x = 63$   
 (A) (B) (C) (D) (E)

14. Three consecutive multiples of 4 have a sum of 220. What is the greatest of these numbers?

- F. 8  
G. 12  
H. 16  
J. 20  
K. 24

(F) (G) (H) (J)

15. Five consecutive multiples of 11 have a sum of 220. What is the greatest of these numbers?

- A. 22  
B. 33  
C. 44  
D. 55  
E. 66

$21 + 14 = 35$        $x = 21$   
 $(x) + (x+11) + (x+22) + (x+33) + (x+44) = 220$   
 $5x + 110 = 220$   
 $-110 \quad -110$   
 $5x = 110$   
 $x = 22$

### Remember:

Always set up an equation and write it down rather than trying to work it out in your head.

Session 4

7, 14, 21  
 $x \cdot 7 \quad x+14$

$5x = 110$   
 $x = 22$

$22 + 44 + 66$   
 $x = 22$



REVIEW

1. What is the value of  $3x(9 - 9x)$  when  $x = \frac{4}{3}$ ?

- A. -12
- B. -9
- C. 4
- D. 9
- E. 12

Handwritten work for Question 1:

$$3\left(\frac{4}{3}\right)\left[9 - 3\left(\frac{4}{3}\right)\right]$$

$$4(9 - 12)$$

$$4(-3) = -12$$

Answers circled: A, B, C, D, E

4. If  $\frac{2x}{5y} = 6$ , what is the value of  $y$ , in terms of  $x$ ?

- F.  $\frac{x}{15}$
- G.  $\frac{x}{2}$
- H.  $\frac{15}{x}$
- J.  $15x$
- K.  $\frac{30}{x}$

Handwritten work for Question 4:

$$\frac{2x}{5y} = 6$$

$$2x = 30y$$

$$\frac{2x}{30} = y$$

$$\frac{x}{15} = y$$

Answers circled: F, G, H, J, K

2. What is the value of  $a$  in the equation above?

- F.  $-\frac{23}{4}$
- G.  $-\frac{11}{4}$
- H.  $-\frac{1}{4}$
- J.  $\frac{1}{4}$
- K.  $\frac{23}{4}$

Handwritten work for Question 2:

$$\frac{11}{4} - a = 3$$

$$\frac{11}{4} - a = \frac{12}{4}$$

$$-\frac{11}{4} + a = \frac{12}{4} - \frac{11}{4}$$

$$a = \frac{1}{4}$$

Answers circled: F, G, H, J, K

5. The sum of four consecutive multiples of 5 is 230. What is the greatest of these numbers?

- A. 20
- B. 25
- C. 45
- D. 55
- E. 65

Handwritten work for Question 5:

$$x + x + 5 + x + 10 + x + 15 = 230$$

$$4x + 30 = 230$$

$$4x = 200$$

$$x = 50$$

Answers circled: A, B, C, D, E

6. Rachel is now 11 years old. Five years ago, Lily was twice as old as Rachel. How old is Lily now?

- F. 12
- G. 13
- H. 16
- J. 17
- K. 22

Handwritten work for Question 6:

$$L - 5 = 2(11 - 5)$$

$$L - 5 = 14$$

$$L = 19$$

Answers circled: F, G, H, J, K

3. What is the value of  $x$  in the equation  $10 = 5x - 5$ ?

- A. 1
- B. 2
- C. 3
- D. 5
- E. 7

Handwritten work for Question 3:

$$10 = 5x - 5$$

$$15 = 5x$$

$$3 = x$$

Answers circled: A, B, C, D, E

7. If  $n$  is an integer, which of the following MUST be odd?

- A.  $3n - 5$
- B.  $3n + 4$
- C.  $4n + 10$
- D.  $4n - 5$
- E.  $5n + 7$

Handwritten work for Question 7:

$$L - 5 = 12$$

$$L = 17$$

Answers circled: A, B, C, D, E

# Algebra I Practice

## EVALUATE EXPRESSION

Answers and explanations can be found on page 277.

- When  $x = 0$  and  $y = 0$ , what is the value of  $(3x - 6)(2x + y) + 5$ ?
- When  $x = 10$  and  $y = 20$ , what is the value of  $\frac{1}{2x^{23}y}$ ?
- When  $x = 75$  and  $y = 1$ , what is the value of  $\frac{x}{75} + \frac{1}{y}$ ?
- When  $x = 22$  and  $y = \frac{1}{4}$ , what is the value of  $x^2 - \sqrt{y}$ ?
- When  $x = 3$ ,  $y = 4$ , and  $z = 0$ , what is the value of  $\frac{3x + 2xy + 3y}{6z}$ ?
- When  $x = 1$ ,  $y = 2$ , and  $z = 3$ , what is the value of  $(x - 1)(y - 2)(z - 3)$ ?
- When  $x = 2$ ,  $y = 2$ , and  $z = 2$ , what is the value of  $3xy - 3xz + 3zy$ ?
- When  $x = 2$ ,  $y = 1$ , and  $z = 3$ , what is the value of  $15x^2 + 23y^{10} + z^4$ ?
- When  $x = 2$ , what is the value of  $x^5 - 3x^3 + 2x - 7$ ?
- When  $x = \frac{1}{2}$ , what is the value of  $3x^3$ ?
- When  $x = 20$ , what is the value of  $2x^2 - 15$ ?

12. For  $x = 8$  and  $y = 3$ , what is the value of

$$\frac{4}{2(y^2 - x)}$$

F.  $-\frac{5}{18}$

G.  $\frac{2}{16}$

H.  $\frac{1}{7}$

J.  $\frac{2}{5}$

K. 2

$\frac{4 \cdot 2}{2(3^2 - 8)} = \frac{2}{(9 - 8)} = \frac{2}{1} = 2$

(F)(G)(H)

13. For  $x = -\sqrt{10}$  and  $y = \sqrt{10}$ , what is the value of  $-5 \cdot |-x| \cdot |y|$ ?

A. -500

B. -50

C. 50

D. 100

E. 500

$-5 \cdot |(-\sqrt{10})| \cdot |\sqrt{10}| = -5 \cdot 10 = -50$

(A)(B)(C)

14. For  $x = 6$  and  $y = 3$ , what is the value of  $4 \cdot |-x| + -10 \cdot |y|$ ?

F. -54

G. -6

H. 6

J. 54

K. 108

$4 \cdot |-6| + -10 \cdot |3| = 24 + (-30) = -6$

(F)(G)(H)

15. For  $x = 1$  and  $y = 2$ , what is the value of  $4x^2 \cdot 3y + 5x$ ?

A. 29

B. 44

C. 54

D. 58

E. 486

(A)(B)(C)

Session 4

16. If  $x = 3$  and  $y = 7$ , then  $\frac{1}{x} + \frac{1}{y} =$

F.  $\frac{2}{21}$

G.  $\frac{1}{10}$

H.  $\frac{4}{21}$

J.  $\frac{8}{21}$

K.  $\frac{10}{21}$

(F)(G)(H)(J)(K)

17. If  $x = -4$  and  $y = 6$ , then  $x^2 + y + y^2 \cdot x =$

A. -232

B. -122

C. -72

D. 122

E. 166

(A)(B)(C)(D)(E)

18. When  $x = 2$  and  $y = 4$ , what is the value of  $(x + y) + (3x^2 - y)$ ?

F. 6

G. 8

H. 10

J. 12

K. 14

(F)(G)(H)(J)(K)

19. When  $x = -1$  and  $y = 3$ , what is the value of  $2x^2 + 3xy + y^2 + 5$ ?

A. -15

B. -11

C. 0

D. 7

E. 25

(A)(B)(C)(D)(E)

20. When  $x = 2$ ,  $y = 4$ , and  $z = 3$ , what is the value of  $2x^3 - 3y^2 + 6z$ ?

F. -14

G. 14

H. 34

J. 86

K. 110

(F)(G)(H)(J)(K)

21. When  $x = 4$ ,  $y = 2$ , and  $z = 3$ , what is the value of  $x^2 + 2y^2 + 3z^2 + 4$ ?

A. 33

B. 37

C. 45

D. 51

E. 55

(A)(B)(C)(D)(E)

22. When  $x = -2$ , what is the value of  $3x^3 - 2x^2 + 4x - 7$ ?

F. -63

G. -47

H. -31

J. -15

K. 1

(F)(G)(H)(J)(K)

## SOLVE EQUATIONS WITH ONE VARIABLE

Answers and explanations can be found on page 279.

1. Solve for  $x$  in the following equation:

$$x = \frac{1}{2}[(-8)^2 - 4]$$

A. -72

B. -34

C. 28

D. 30

E. 60

(A)(B)(C)(D)(E)

Session 4 Homework

2. Solve for  $x$  in the following equation:

$$|\sqrt{(-5)^2}| = x$$

- F. -25
- G. -5
- H. 0
- J. 1
- K. 5

(F)(G)(H)(J)(K)

3. Solve for  $x$  in the following equation:

$$\frac{2}{3} = \frac{x}{6}$$

- A. 1
- B. 2
- C. 4
- D. 8
- E. 18

(A)(B)(C)(D)(E)

4. Solve for  $x$  in the following equation:

$$x = -15(-7)$$

- F. -105
- G. -75
- H. -22
- J. 64
- K. 105

(F)(G)(H)(J)(K)

5. Solve for  $x$  in the following equation:

$$\frac{1}{2} \cdot \sqrt{x} = 4$$

- A. 4
- B. 8
- C. 12
- D. 16
- E. 64

(A)(B)(C)(D)(E)

6. Solve for  $x$  in the following equation:

$$2x = \frac{1}{2}(3 + 5^2)$$

- F. 3.5
- G. 7
- H. 8
- J. 14
- K. 28

(F)(G)(H)

7. Solve for  $x$  in the following equation:

$$x + 1 = \sqrt{81}, x \geq 0$$

- A. 8
- B. 9
- C.  $4\sqrt{10}$
- D. 10
- E. 82

(A)(B)(C)

8. Solve for  $x$  in the following equation:

$$x = \frac{1}{2} + \frac{1}{3} + \frac{1}{4}$$

- F. 1
- G.  $1\frac{1}{12}$
- H.  $1\frac{1}{6}$
- J.  $1\frac{1}{2}$

- K. 2

(F)(G)(H)

9. Solve for  $x$  in the following equation:

$$x + 2 = 14$$

- A. 12
- B. 14
- C. 16
- D. 17
- E. 20

(A)(B)(C)

Session 4

10. Solve for  $x$  in the following equation:

$$x = \frac{6}{7} + \frac{1}{14}$$

- F.  $\frac{1}{3}$
- G.  $\frac{1}{2}$
- H.  $\frac{13}{14}$
- J. 1
- K.  $1\frac{1}{13}$

(F G H J K)

11. Solve for  $x$  in the following equation:

$$x\sqrt{2} = \sqrt{32}$$

- A. 4
- B.  $4\sqrt{2}$
- C. 8
- D.  $8\sqrt{2}$
- E. 16

(A B C D E)

12. Solve for  $x$  in the following equation:

$$x = \frac{1}{2} \left( \frac{1}{4} \div \frac{2}{3} \right)$$

- F.  $\frac{1}{24}$
- G.  $\frac{1}{16}$
- H.  $\frac{1}{8}$
- J.  $\frac{3}{16}$
- K.  $\frac{1}{4}$

(F G H J K)

13. Solve for  $x$  in the following equation:

$$3x = \frac{3^2}{9}$$

- A.  $\frac{1}{9}$
- B.  $\frac{1}{3}$
- C. 1
- D. 3
- E. 9

(A B C D E)

14. Solve for  $x$  in the following equation:

$$\sqrt{x} = \left| 2 - \frac{\sqrt{18}}{\sqrt{2}} \right|$$

- F. -1
- G. 0
- H. 1
- J. 9
- K. 25

(F G H J K)

15. Solve for  $x$  in the following equation:

$$x = 2\sqrt{8} + \sqrt{2}$$

- A. 4
- B.  $2\sqrt{10}$
- C.  $5\sqrt{2}$
- D.  $9\sqrt{2}$
- E. 18

(A B C D E)

16. Alan and Bob are house painters. For every square foot Alan paints, Bob is able to paint  $\sqrt{2}$  square feet. If Alan painted  $200\sqrt{2}$  square feet, how many square feet did Bob paint?

- F. 200 sq ft
- G.  $200\sqrt{2}$  sq ft
- H. 400 sq ft
- J.  $400\sqrt{2}$  sq ft
- K. 800 sq ft

(F G H J K)

Session 4 Homework

17. Solve for  $x$  in the following equation:

$$x = \frac{1}{3}\sqrt{81}, x \geq 0$$

- A. 1
- B. 3
- C.  $3\sqrt{3}$
- D. 9
- E. 27

(A) (B) (C) (D) (E)

18. Solve for  $x$  in the following equation:

$$5x = 25$$

- F. 1
- G. 5
- H. 25
- J. 75
- K. 125

(F) (G) (H) (J) (K)

19. Solve for  $x$  in the following equation:

$$\frac{1}{3}x^3 = 2\frac{2}{3}$$

- A. 1
- B. 2
- C.  $\frac{6}{3\sqrt{3}}$
- D. 8
- E. 10

(A) (B) (C) (D) (E)

20. Solve for  $x$  in the following equation:

$$\left(\frac{x}{2}\right)^2 = 1, x > 0$$

- F. 1
- G.  $\sqrt{2}$
- H. 2
- J. 4
- K. 8

(F) (G) (H) (J) (K)

21. Solve for  $x$  in the following equation:

$$x = \frac{2}{3} + \frac{3}{5}$$

- A.  $\frac{1}{3}$
- B.  $\frac{5}{8}$
- C.  $\frac{13}{15}$
- D. 1
- E.  $1\frac{4}{15}$

(A) (B) (C) (D) (E)

22. If  $b = -3$ , what is the value of the expression  $3b^2 - b$ ?

- F. -30
- G. -24
- H. 0
- J. 24
- K. 30

(F) (G) (H) (J) (K)

23. If  $7\sqrt{x} + 4 = 25$ , what is the value of  $x$ ?

- A. 3
- B. 5
- C. 9
- D. 21
- E. 36

(A) (B) (C) (D) (E)

24. If  $m + 2$  is squared, the result is equal to 4 less  $m^2$ . What is the value of  $m$ ?

- F. -8
- G. -2
- H. 0
- J. 2
- K. 4

(F) (G) (H) (J) (K)

Session 4

25. If  $q \times 34 \times 36 \times 38 = 17 \times 18 \times 19$ , then what is the value of  $q$ ?

- A.  $\frac{1}{2}$
- B.  $\frac{1}{6}$
- C.  $\frac{1}{2}$
- D. 2
- E. 8

(A) (B) (C) (D) (E)

### SOLVE EQUATIONS WITH TWO VARIABLES

Answers and explanations can be found on page 282.

1. If  $\frac{1}{y} = x$  and  $x = 5$ , what is the value of  $y$ ?
2. If  $x + |y| = |-7|$ . If  $y = -3$ , what is the value of  $x$ ?
3. If  $xy = 50$  and  $y = 2x$  and  $x \geq 0$ , what is the value of  $x$ ?
4. If  $\frac{x}{y} = -10$  and  $y = -10$ , what does  $x$  equal?
5. If  $\frac{3y}{5x} = 6$  and  $x = 2$ , what is the value of  $y$ ?
6. For all positive values of  $y$ , if  $(2x)^2 = (3y)^2$  and  $x = 6$ , what is the value of  $y$ ?
7. If  $5x - y = x + 36$  and  $y = 2x$ ,  $x =$
8. If  $y = 2$  and  $x + 10 \div y = 15$ , what is the value of  $x$ ?
9. If  $\frac{5x}{6y} = 1$  and  $y = 10$ , what is the value of  $x$ ?

10.  $\left(\frac{1}{x}\right)\left(\frac{2}{y}\right) = \frac{1}{40}$  and  $x = 8$ . What is the value of  $y$ ?

11. If  $x^2 = -y + 2$  and  $x = 3$ , what is the value of  $y$ ?

12. For all positive values of  $x$ , if  $y = 5$  and  $(x - y)^2 = 144$ , what is the value of  $x$ ?

- F. -7
- G. 7
- H. 13
- J. 17
- K. 169

(F) (G) (H) (J) (K)

13. If  $3x - y = 2y + 36$  and  $y = 2$ , then  $x =$

- A. -10
- B.  $12\frac{2}{3}$
- C. 14
- D.  $15\frac{1}{3}$
- E.  $26\frac{2}{3}$

(A) (B) (C) (D) (E)

14. If  $x = 5$  and  $15 + x \div y = 25$ , what is the value of  $y$ ?

- F.  $\frac{1}{2}$
- G.  $\frac{4}{5}$
- H.  $\frac{5}{4}$
- J. 2
- K. 10

(F) (G) (H) (J) (K)

15. If  $\frac{9x}{4y} = 1$  and  $y = 18$ , what is the value of  $x$ ?

- A.  $\frac{1}{648}$
- B.  $\frac{1}{81}$
- C.  $\frac{9}{4}$
- D. 8
- E.  $40\frac{1}{2}$

(A)(B)(C)(D)(E)

16.  $\left(\frac{2}{x}\right)\left(\frac{1}{2y}\right) = \frac{1}{100}$  and  $x = 5$ . What is the value of  $y$ ?

- F.  $\frac{1}{20}$
- G.  $\frac{1}{10}$
- H. 10
- J. 20
- K. 100

(F)(G)(H)(J)(K)

17. If  $3x = xy - 5$  and  $y = 6$ , what is the value of  $x$ ?

- A.  $-\frac{5}{3}$
- B.  $-\frac{5}{9}$
- C.  $\frac{5}{9}$
- D.  $\frac{5}{3}$
- E.  $\frac{23}{6}$

(A)(B)(C)(D)(E)

18. If  $\frac{5}{x} - \frac{2}{y} = \frac{1}{6}$  and  $y = 3$ , what is the value of  $x$ ?

- F. -10
- G. 5
- H. 6
- J. 10
- K. 15

(F)(G)(H)(J)(K)

19.  $x = |-7| - |y|$ . If  $y = -3$ , what is the value of  $x$ ?

- A. -10
- B. -4
- C. 4
- D. 10
- E. 21

(A)(B)(C)(D)(E)

20.  $x + y = 35$  and  $y = -4$ . What is the value of  $x$ ?

- F. -39
- G. -31
- H. 31
- J. 39
- K. 120

(F)(G)(H)(J)(K)

21. If  $\frac{x}{y}$  is positive, which of the following must be true?

- A.  $x > 0$
- B.  $y > 0$
- C.  $xy > 0$
- D.  $x - y > 0$
- E.  $x + y > 0$

(A)(B)(C)(D)(E)

22. If  $\frac{x+y}{x} = 0$ , and  $y$  is a positive integer, what is the value of  $x$ ?

- F.  $-y$
- G. 0
- H.  $y$
- J.  $y^2$
- K.  $\frac{1}{y}$

(F)(G)(H)(J)(K)

**SOLVE EQUATIONS WITH ONE VARIABLE IN TERMS OF ANOTHER**

Answers and explanations can be found on page 2

1. If  $x = -y$ , what is the value of  $y$  in terms of  $x$ ?
2. If  $x = y^3 - 80$ , what is the value of  $y$  in terms of  $x$ ?



3. If  $x = 5y^2(1 - y) + 3 + 5y^3$ , what is the value of  $y$  in terms of  $x$ ?

4. If  $x = \frac{y^2}{y^3} + 1$ , what is the value of  $y$  in terms of  $x$ ?

5. If  $x = \frac{y}{17} + 13$ , what is the value of  $y$  in terms of  $x$ ?

6. If  $x = \frac{y^2 - 3}{14} + 2$ , what is the value of  $y$  in terms of  $x$ ?

7. If  $x = y + y + y + y + y$ , what is the value of  $y$  in terms of  $x$ ?

8. If  $x = \frac{3y - 2}{4}$ , what is the value of  $y$  in terms of  $x$ ?

F.  $\frac{4x + 8}{3}$

G.  $4x - 2$

H.  $\frac{4x}{3} + 2$

J.  $\frac{4x + 2}{3}$

K.  $\frac{4x - 2}{3}$

(F)(G)(H)(J)(K)

9. If  $x = \frac{6y}{5} - \frac{2y}{3}$ , what is the value of  $y$  in terms of  $x$ ?

A.  $\frac{5x}{4}$

B.  $\frac{15x}{4}$

C.  $\frac{15x}{8}$

D.  $\frac{9x}{4}$

E.  $\frac{36x}{15}$

(A)(B)(C)(D)(E)

10. If  $x = \frac{3y}{|-4|} + 6$ , what is the value of  $y$  in terms of  $x$ ?

F.  $\frac{4x}{3} - 6$

G.  $\frac{4}{3}x + 6$

H.  $-x - \frac{3}{2}$

J.  $2 - x$

K.  $-\frac{4}{3}(x - 6)$

(F)(G)(H)(J)(K)

11. If  $x = \frac{y^3}{3y^2} + \frac{y}{2}$ , what is the value of  $y$  in terms of  $x$ ?

A.  $\frac{6x}{5}$

B.  $\frac{6x}{3}$

C.  $\frac{8x}{5}$

D.  $\frac{12x}{5}$

E.  $4x$

(A)(B)(C)(D)(E)

12. If  $x = \sqrt{\frac{y^4}{16}}$ , what is the value of  $y$  in terms of  $x$ ?

F.  $2\sqrt{x}$

G.  $4\sqrt{x}$

H.  $\frac{\sqrt{x}}{2}$

J.  $\sqrt{2x}$

K.  $2x\sqrt{2x}$

(F)(G)(H)(J)(K)

13. If  $x = \frac{2}{y^2} + 2$ , what is the value of  $y$  in terms of  $x$ ?

- A.  $2\sqrt{\frac{2}{x-1}}$
- B.  $2\sqrt{\frac{2}{x-2}}$
- C.  $\sqrt{x} - 1$
- D.  $\sqrt{\frac{2}{x-2}}$
- E.  $\sqrt{\frac{2}{x+2}}$

(A) (B) (C) (D) (E)

14. If  $x = 5y + 2 - 3(y + 2)$ , what is the value of  $y$  in terms of  $x$ ?

- F.  $x + 2$
- G.  $x + 4$
- H.  $\frac{x+2}{2}$
- J.  $2x + 2$
- K.  $\frac{x+4}{2}$

(F) (G) (H) (J) (K)

15. If  $x = y + |-4| - |-5| + 6$ , what is the value of  $y$  in terms of  $x$ ?

- A.  $x - 3$
- B.  $x - 5$
- C.  $x + 3$
- D.  $3x - 5$
- E.  $3x - 3$

(A) (B) (C) (D) (E)

16. If  $x = \frac{6y}{5} - 8y - 3y + 9y$ , what is the value of  $y$  in terms of  $x$ ?

- F.  $\frac{5x}{4}$
- G.  $\frac{4x}{5}$
- H.  $\frac{16x}{5}$
- J.  $-\frac{5x}{4}$
- K.  $-5x - 4$

(F) (G) (H) (J) (K)

### ALGEBRAIC REMAINDER

Answers and explanations can be found on page 286.

1. When  $y$  is divided by 10, the remainder is 5. What will the remainder be if  $2y + 3$  is divided by 10?

- A. 1
- B. 3
- C. 5
- D. 7
- E. 10

(A) (B) (C) (D) (E)

2. When  $x$  is divided by 6, the remainder is 3. What will be the remainder if  $2x$  is divided by 6?

- F. 0
- G. 1
- H. 2
- J. 3

K. Cannot be determined from the information given.

(F) (G) (H) (J) (K)

3. When  $y$  is divided by 2, the remainder is 1. What will be the remainder if  $y + 1$  is divided by 4?

- A. 0
- B. 1
- C. 2
- D. 3

E. Cannot be determined from the information given.

(A) (B) (C) (D) (E)

4. When  $x$  is divided by 5, the remainder is 3. What will be the remainder if  $x + 3$  is divided by 5?

- F. 0
- G. 1
- H. 2
- J. 3

K. Cannot be determined from the information given.

(F) (G) (H) (J) (K)