

Junior High Math League

Sample Questions by Meet and Topic

Meet 3:

3.1 Using Exponents

3.2 Writing Equivalent Expressions

3.3 Dimensional Analysis (Unit Conversion)

3.4 Solving More Complex One-Variable
Equations

3.5 Solving Inequalities

3.6 Angle Relationships

(All sample questions were taken from previous JH Math League meets. Please contact Bill Theisen at btheisen@isd2899.k12.mn.us with any questions regarding the sample questions and answers.)

3.1 Using Exponents - Questions

1) Simplify and write with only positive exponents:

$$\frac{4x^{-2}y}{16x^{-3}y^3}$$

2) Solve:

$$2^3 \cdot 4^{-1}$$

3) Solve:

$$2^3 \cdot 4^{-1} \cdot 8^{-2} \cdot 16^2 \cdot 32^{-1}$$

4) What is 36,800,000 divided by 2×10^{-4} in scientific notation?

5) Simplify:

$$\left(\frac{4a^{-3}bc^5}{b^2c} \right)^{-1}$$

6) Write the product of four thousandths and three tenths in scientific notation.

3.1 Using Exponents - Answers

1) Simplify and write with only positive exponents:

$$\frac{4x^{-2}y}{16x^{-3}y^3}$$

Answer: $\frac{x}{4y^2}$

2) Solve:

$$2^3 \cdot 4^{-1}$$

2

3) Solve:

$$2^3 \cdot 4^{-1} \cdot 8^{-2} \cdot 16^2 \cdot 32^{-1}$$

1/4

4) What is 36,800,000 divided by 2×10^{-4} in scientific notation?

$1.84 \cdot 10^{11}$

5) Simplify:

$$\left(\frac{4a^{-3}bc^5}{b^2c} \right)^{-1}$$

Answer: $\frac{a^3b}{4c^4}$

6) Write the product of four thousandths and three tenths in scientific notation.

$1.2 \cdot 10^{-3}$

3.2 Writing Equivalent Expressions - Questions

1) Simplify:

$$3(x + 2) - 4(x - 5)$$

2) Simplify:

$$3(x - 2) + 8x - 2(x + 4)$$

3) Simplify:

$$3(x - 1)(4 + x) + 10$$

4) Simplify:

$$3(x + 4) - 2(8 + x) + 10 - x(x + 3)$$

5) Simplify:

$$2x - (3x + 7) + 4(x - 9) - 1$$

3.2 Writing Equivalent Expressions - Answers

1) Simplify:

$$3(x+2) - 4(x-5)$$

$$\mathbf{-x + 26}$$

2) Simplify:

$$3(x-2) + 8x - 2(x+4)$$

$$\mathbf{9x - 14}$$

3) Simplify:

$$3(x-1)(4+x) + 10$$

$$\mathbf{3x^2 + 9x - 2}$$

4) Simplify:

$$3(x+4) - 2(8+x) + 10 - x(x+3)$$

$$\mathbf{-x^2 - 2x + 6}$$

5) Simplify:

$$2x - (3x+7) + 4(x-9) - 1$$

$$\mathbf{3x - 44}$$

3.3 Dimensional Analysis (Unit Conversion) - Questions

- 1) How many centimeters are in the sum of 115 mm, 20 cm, and 1 m?
- 2) In Canada the speed limit is posted in km/hr. If six tenths of a mile is one kilometer, what speed is 90 km/hr in miles per hour?
- 3) How many meters is half a millimeter?
- 4) How many minutes are there from 12:48 PM until 2:06 PM?
- 5) If one quart, one pint, and one cup of water are poured from one gallon, how much is left?
- 6) Martha's quilt needed 75 squares of green material. Each square was 6 inches on a side. If a bolt of fabric is 44 inches wide, what length of fabric is needed, rounding up to the nearest $\frac{1}{4}$ of a yard?
- 7) It is now four times as long since noon as it will be until 1 PM. What time is it?
- 8) A bald eagle flies at a maximum speed of 75 miles per hour. A wild turkey flies at a maximum speed of 1,600 yards per minute. At maximum speed, how many more feet does the bald eagle fly than the turkey in 30 seconds?

3.3 Dimensional Analysis (Unit Conversion) - Answers

1) How many centimeters are in the sum of 115 mm, 20 cm, and 1 m?

131.5 cm

2) In Canada the speed limit is posted in km/hr. If six tenths of a mile is one kilometer, what speed is 90 km/hr in miles per hour?

54 mph

3) How many meters is half a millimeter?

0.0005 m

4) How many minutes are there from 12:48 PM until 2:06 PM?

78 min.

5) If one quart, one pint, and one cup of water are poured from one gallon, how much is left?

2 qt 1 cup

6) Martha's quilt needed 75 squares of green material. Each square was 6 inches on a side. If a bolt of fabric is 44 inches wide, what length of fabric is needed, rounding up to the nearest $\frac{1}{4}$ of a yard?

2 yards

7) It is now four times as long since noon as it will be until 1 PM. What time is it?

12:48 PM

8) A bald eagle flies at a maximum speed of 75 miles per hour. A wild turkey flies at a maximum speed of 1,600 yards per minute. At maximum speed, how many more feet does the bald eagle fly than the turkey in 30 seconds?

900 ft

3.4 Solving More Complex One-Variable Equations - Questions

1) Solve for x :

$$3(x + 2) - 4(x - 5) = 10(x - 4)$$

2) Solve for x :

$$3(x - 2) = 8x - 2(x + 4)$$

3) Solve for x :

$$3(x - 1) - 2(4 + x) = 10$$

4) Solve for both values of x :

$$|2x - 1| = 5$$

5) Solve for x :

$$3x^2 = 147$$

6) Solve for x :

$$2x - (3x + 7) = 4(x - 9) - 1$$

3.4 Solving More Complex One-Variable Equations - Answers

1) Solve for x :

$$3(x + 2) - 4(x - 5) = 10(x - 4)$$

$$\mathbf{x = 6}$$

2) Solve for x :

$$3(x - 2) = 8x - 2(x + 4)$$

$$\mathbf{x = 2/3}$$

3) Solve for x :

$$3(x - 1) - 2(4 + x) = 10$$

$$\mathbf{x = 21}$$

4) Solve for both values of x :

$$|2x - 1| = 5$$

$$\mathbf{x = -2, 3}$$

5) Solve for x :

$$3x^2 = 147$$

$$\mathbf{x = -7, 7}$$

6) Solve for x :

$$2x - (3x + 7) = 4(x - 9) - 1$$

$$\mathbf{x = 6}$$

3.5 Solving Inequalities - Questions

1) Write as an inequality: x is at most three.

2) Graph all possible x values for:

$$|x - 3| \leq 2$$



3) Write the absolute value inequality for:

$$3 \leq x \leq 9$$

4) Solve for x :

$$3(x - 1) < -27$$

5) Solve for x :

$$-5x > 25$$

6) Solve for x :

$$3 - 2x > 9$$

7) Camden's family drives from Rochester to Ely, a total of 318 miles. The family car can travel between 20 and 30 miles per gallon of gas, inclusive. The gas tank holds 16 gallons. Write an inequality to express all possible numbers of gallons of gas, g , the trip could require.

8) Half a number, n , subtracted from 14 is at least 50. Write and solve an inequality to express all possible values of n .

3.5 Solving Inequalities - Answers

- 1) Write as an inequality: x is at most three.

$$x \leq 3$$

- 2) Graph all possible x values for:

$$|x - 3| \leq 2$$



- 3) Write the absolute value inequality for:

$$3 \leq x \leq 9$$

$$|x - 6| \leq 3$$

- 4) Solve for x :

$$3(x - 1) < -27$$

$$x < -8$$

- 5) Solve for x :

$$-5x > 25$$

$$x < -5$$

- 6) Solve for x :

$$3 - 2x > 9$$

$$x < -3$$

- 7) Camden's family drives from Rochester to Ely, a total of 318 miles. The family car can travel between 20 and 30 miles per gallon of gas, inclusive. The gas tank holds 16 gallons. Write an inequality to express all possible numbers of gallons of gas, g , the trip could require.

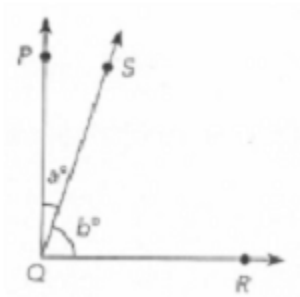
$$10.6 \leq g \leq 15.9$$

- 8) Half a number, n , subtracted from 14 is at least 50. Write and solve an inequality to express all possible values of n .

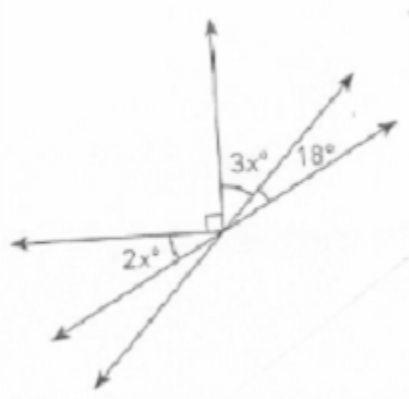
$$n \leq -72$$

3.6 Angle Relationships - Questions

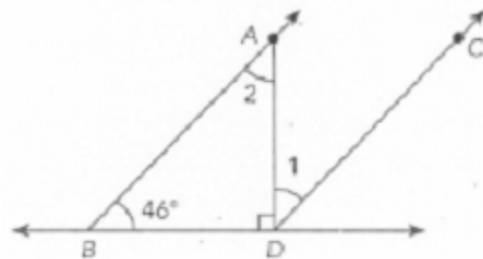
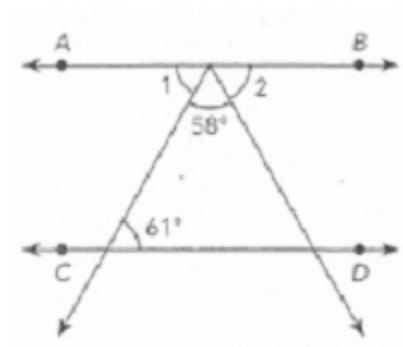
1) In the diagram, the ratio of a to b is 1:4. Find the values of a and b .



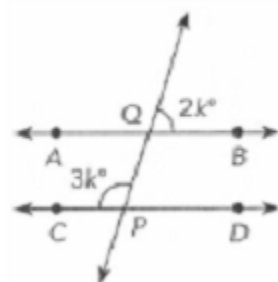
2) Find the value of x :



3) The horizontal lines are parallel. Find the measure of $L1$ in each figure:

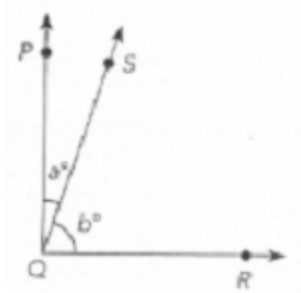


4) The horizontal lines are parallel. Find the value of k :



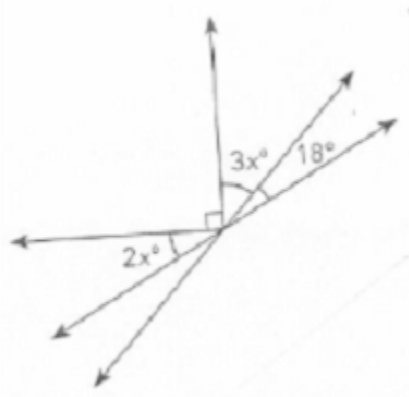
3.6 Angle Relationships - Answers

- 1) In the diagram, the ratio of a to b is 1:4. Find the values of a and b .



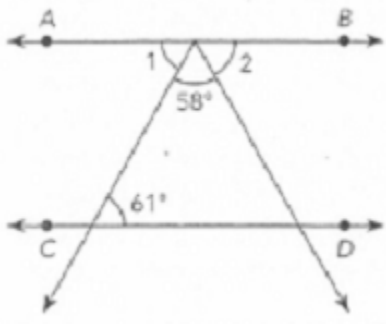
$$a = 18, b = 72$$

- 2) Find the value of x :

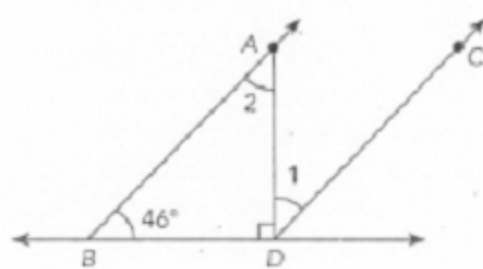


$$x = 14.4$$

- 3) Find the measure of $L1$ in each figure:

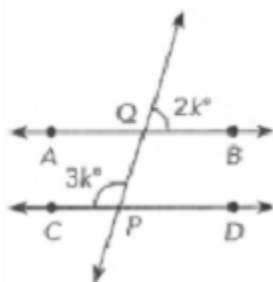


$$L1 = 61^\circ$$



$$L1 = 44^\circ$$

- 4) The horizontal lines in the figure are parallel. Find the value of k :



$$k = 36$$