Junior High Math League

Sample Questions by Meet and Topic

Meet 5

Aug 2-7:22 PM

Meet 5

5.1 Solving Systems of Linear Equations

5.2 Operations with Polynomials

5.3 The Pythagorean Theorem

5.4 Surface Area and Volume of 3-D Figures

5.5 Simple Probability and the Counting Principle

5.6 Transformations in the Coordinate Plane

Aug 2-7:23 PM

5.1 Solving Systems of Linear Equations

_____5. What is the point of intersection of $2x+3y=7$ and $5y=3x-1$?

Oct 22-9:49 PM

5.1 Solving Systems of Linear Equations

_____1. Find the two points where $y=|x-4|$ and $y=\frac{2}{3}x-2$ intersect. Leave the

_____ coordinates as improper fractions or integers.

Oct 22-9:49 PM

5.1 Solving Systems of Linear Equations

_____6. What is the area of a parallelogram formed by $y = 1, y = x + 3, y = 5,$ and $y = x - 3$?

Oct 22-9:49 PM

5.1 Solving Systems of Linear Equations

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Oct 22-9:49 PM

5.1 Solving Systems of Linear Equations

_____5. If I would like a line with a slope of $-\frac{1}{2}$ to intersect $y = 2x - 5$, where $x = 2$, what would be the equation of that line in slope-intercept form?

Oct 22-9:49 PM

5.2 Operations with Polynomials

_____1. Simplify: $(3x^2 + 4x - 7) - 2(x^2 - 2x + 3)$.

Oct 22-9:49 PM

5.2 Operations with Polynomials

_____2. Simplify and write in descending order: $14+3\left(x^2-2\right)-4(5+3x)-\left(x^2+3\right)$

Oct 22-9:49 PM

5.2 Operations with Polynomials

_____3. Write as a trinomial in descending order: $(2x+7)(9x-4)$.

Oct 22-9:49 PM

5.2 Operations with Polynomials

_____3. Simplify: $\frac{x^2-4}{x+2}$

Oct 22-9:49 PM

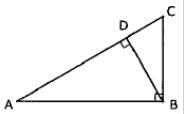
5.2 Operations with Polynomials

_____2. Simplify $\frac{x^2+2x-24}{x-4}$.

Oct 22-9:49 PM

5.3 The Pythagorean Theorem

_____1. In right triangle *ABC*, *BD* is an altitude. If *AC*=2" and *BC*=1", what is the length of *BD*?



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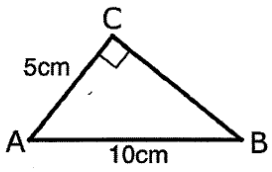
5.3 The Pythagorean Theorem

_____2. What is the length of the diagonal of a square of side length $2\sqrt{15}$ m, in simplified radical form?

Oct 22-9:49 PM

5.3 The Pythagorean Theorem

_____5. What is the exact value of the area of right triangle *ABC*?



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5.3 The Pythagorean Theorem

_____4. What is the area of a triangle formed by $x = 1, y = {}^{-}2$, and $y = x$?

Oct 22-9:49 PM

5.3 The Pythagorean Theorem

_____2. If (4, 0) and (0, 5) are two vertices of an isosceles right triangle, how many right triangles can this be true of?

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____2. What is the surface area of a cube with an edge of one half inch?

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____7. What is the surface area of a cylinder with a circumference of 10π in., and a height of 8 in.? Answer in terms of π.

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____10. If the total surface area of a cube is 384 cm^2, what is the length of one edge?

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____2. If the edges of a cube add up to 36 m, what is the volume?

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____5. Three tennis balls just fit in a cylindrical can. If each tennis ball is 2.5 inches in diameter, what is the volume of the can? Leave π as π, and round the decimal multiplier to the nearest tenth.

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____5. If the 3 base edges of a tetrahedron are 8 cm and the height is 6 cm, what is the volume? Leave in simplified radical form.

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____4. If the volume of a sphere is $\frac{32\pi}{3}\text{cm}^3$, what is the diameter?

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

_____10. Marcus made the basket 16 times and missed the basket 9 times in the basketball game. What is the probability that he will make the basket on his next try?

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

_____3. Sandy decorated her holiday tree with 10 red, 15 silver, and 5 green glass ornaments. Her little brother, Roger, pulled the tree over and only one ornament broke. What is the probability it was red?

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

_____1. Michael has a 60% chance of making a free throw in basketball. What is the probability that he makes three free throws in a row?

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

1) There are 6 people in a race. In how many ways can they finish first, second or third ?

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

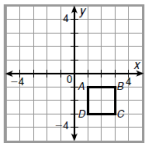
3) In Canada, postal codes consist of 6 characters -- three letters and three digits. Each postal code starts with a letter and alternates with a digit.
   a. How many postal codes are there ?
   b. How many start with the letter S ?
   c. How many start with the letter S and end in the digit 8 ?
   d. How many start with the letter S, digit 6 and NO letter or digit is repeated ?

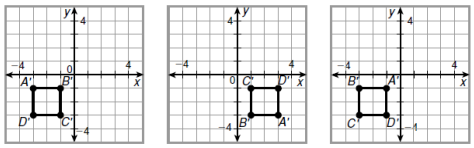
Oct 22-9:49 PM

5.6 Transformations in the Coordinate Plane

Use the figure for Exercises 1–3.

The figure in the plane at right shows the preimage in the transformation $ABCD \rightarrow A'B'C'D'$. Match the number of the image (below) with the name of the correct transformation.





1 2 3

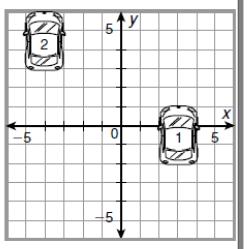
1. rotation _____ **2.** translation _____ **3.** reflection _____

Oct 22-9:49 PM

5.6 Transformations in the Coordinate Plane

Use the figure for Exercise 6.

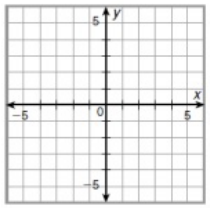
6. A parking garage attendant will make the most money when the maximum number of cars fits in the parking garage. To fit one more car in, the attendant moves a car from position 1 to position 2. Write a rule for this translation.



Oct 22-9:49 PM

5.6 Transformations in the Coordinate Plane

7. A figure has vertices at $X(-1, 1)$, $Y(-2, 3)$, and $Z(0, 4)$. Draw the image of XYZ after the translation $(x, y) \rightarrow (x, y - 2)$ and a 180° rotation around X.



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5.6 Transformations in the Coordinate Plane

Aug 2-7:23 PM

5.1 Solving Systems of Linear Equations

_____5. What is the point of intersection of $2x+3y=7$ and $5y=3x-1$?

Answer =

$(2,1)$ 5. $\left[3(2x+3y=7)+2\left(-3x+5y=^{-}1\right)\right]=\left[(6x+9y=21)+\left(-6x+10y=^{-}2\right)\right]=[19y=19],\quad y=1$

$2x+3(1)=7,\quad 2x=4,\quad x=2$

Oct 22-9:49 PM

5.1 Solving Systems of Linear Equations

_____1. Find the two points where $y=|x-4|$ and $y=\frac{2}{3}x-2$ intersect. Leave the

_____ coordinates as improper fractions or integers.

Answer =

$\left(\frac{18}{5},\frac{2}{5}\right)$ 1. $\frac{2}{3}x-2=-x+4,\frac{5}{3}x=6,x=\frac{18}{5},y=\frac{2}{5};\quad \frac{2}{3}x-2=x-4,-\frac{1}{3}x=-2,x=6,y=2$

$(6,2)$ (two points for each answer)

Oct 22-9:49 PM

5.1 Solving Systems of Linear Equations

_____6. What is the area of a parallelogram formed by $y = 1, y = x + 3, y = 5,$ and $y = x - 3$?

Answer =

24 units^2 6. When $y = 1, 1 = x + 3 \Rightarrow x = {}^-2, 1 = x - 3 \Rightarrow x = 4$. When $y = 5, 5 = x + 3 \Rightarrow x = 2, 5 = x - 3 \Rightarrow x = 8$. The vertices are $(-2,1),(4,1),(2,5),(8,5)$ so the base is $4 - {}^-2 = 6$ and the height is $5 - 1 = 4$. $A = 6 \bullet 4 = 24\text{units}^2$

Oct 22-9:49 PM

5.1 Solving Systems of Linear Equations

_____5. What is the intersection of $y = 3x + 4$ and $y = x - 2$?

Answer =

$({}^-3, {}^-5)$ 5. $3x + 4 = x - 2, 2x + 4 = -2, 2x = -6, x- = -3$ so $y = -3 - 2 = -5$

Oct 22-9:49 PM

5.1 Solving Systems of Linear Equations

_____5. If I would like a line with a slope of $-\frac{1}{2}$ to intersect $y = 2x - 5$, where $x = 2$, what would be the equation of that line in slope-intercept form?

Answer =

$y = -\frac{1}{2}x$ or $y = -0.5x$

5. $y = 2x - 5$ so $y = 2(2) - 5 = -1$ and the point of intersection is $(2, -1)$

$y - {}^{-}1 = -\frac{1}{2}(x - 2), \quad y + 1 = -\frac{1}{2}x + 1, \quad y = -\frac{1}{2}x$

Oct 22-9:49 PM

5.2 Operations with Polynomials

_____1. Simplify: $(3x^2 + 4x - 7) - 2(x^2 - 2x + 3)$.

Answer =

$x^2 + 8x - 13$ 1. $3x^2 + 4x - 7 - 2x^2 + 4x - 6 = x^2 + 8x - 13$

Oct 22-9:49 PM

5.2 Operations with Polynomials

_____2. Simplify and write in descending order: $14+3\left(x^2-2\right)-4(5+3x)-\left(x^2+3\right)$

Answer =

$2x^2-12x-15$ 2. $14+3x^2-6-20-12x-x^2-3=2x^2-12x-15$

Oct 22-9:49 PM

5.2 Operations with Polynomials

_____3. Write as a trinomial in descending order: $(2x+7)(9x-4)$.

Answer =

$18x^2+55x-28$ 3. $18x^2-8x+63x-28=18x^2+55x-28$

Oct 22-9:49 PM

5.2 Operations with Polynomials

_____3. Simplify: $\frac{x^2-4}{x+2}$

Answer =

$x-2$ 3. $\frac{x^2-4}{x+2}=\frac{\cancel{(x+2)}(x-2)}{\cancel{(x+2)}}=(x-2)$

Oct 22-9:49 PM

5.2 Operations with Polynomials

_____2. Simplify $\frac{x^2+2x-24}{x-4}$.

Answer =

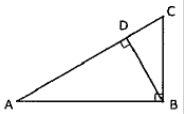
$x+6$ 2. $\frac{x^2+2x-24}{x-4}=\frac{(x-4)(x+6)}{x-4}=x+6$ or

$$\begin{array}{r} x+6 \\ x-4\overline{)\,x^2+2x-24} \\ \underline{-(x^2-4x)} \\ 6x-24 \\ \underline{-(6x-24)} \end{array}$$

Oct 22-9:49 PM

5.3 The Pythagorean Theorem

_____1. In right triangle *ABC*, *BD* is an altitude. If *AC*=2" and *BC*=1", what is the length of *BD*?



Answer =

$\frac{\sqrt{3}}{2}$ in.

_____1.

If $AC = 2"$, $BC = 1"$, then $AB = \sqrt{4-1} = \sqrt{3}"$. $\Delta ABC \sim \Delta BDC$ so $\frac{AB}{AC} = \frac{BD}{BC}$, $\frac{\sqrt{3}}{2} = \frac{x}{1}$, $x = \frac{\sqrt{3}}{2}"$

Oct 22-9:49 PM

5.3 The Pythagorean Theorem

_____2. What is the length of the diagonal of a square of side length $2\sqrt{15}$ m, in simplified radical form?

Answer =

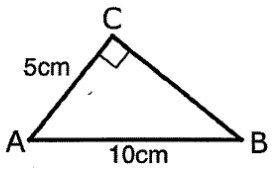
$2\sqrt{30}$ m

_____2. $\sqrt{\left(2\sqrt{15}\right)^2 + \left(2\sqrt{15}\right)^2} = \sqrt{4 \bullet 15 + 4 \bullet 15} = \sqrt{120} = 2\sqrt{30}$

Oct 22-9:49 PM

5.3 The Pythagorean Theorem

_____5. What is the exact value of the area of right triangle *ABC*?



Answer =

$\frac{25\sqrt{3}}{2}\text{cm}^2$

5. $BC = \sqrt{10^2 - 5^2} = \sqrt{75} = 5\sqrt{3}$, $Area = \frac{1}{2}bh = \frac{1}{2} \bullet 5 \bullet 5\sqrt{3} = \frac{25\sqrt{3}}{2}\text{cm}^2$

Oct 22-9:49 PM

5.3 The Pythagorean Theorem

_____4. What is the area of a triangle formed by $x = 1, y = {}^{-}2$, and $y = x$?

Answer =

$\frac{9}{2}\text{units}^2$ or $4\frac{1}{2}\text{units}^2$

4. The vertices are at (1,-2), (1,1) and (-2,-2), so the base is $|-2-1| = 3$, height is $|1-{}^{-}2| = 3$, $\text{Area} = \frac{1}{2} \bullet 3 \bullet 3 = \frac{9}{2}$

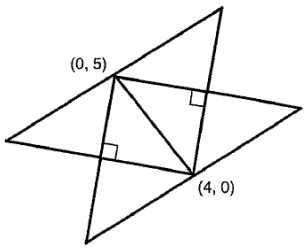
Oct 22-9:49 PM

5.3 The Pythagorean Theorem

_____2. If (4, 0) and (0, 5) are two vertices of an isosceles right triangle, how many right triangles can this be true of?

Answer =

6 2. Two with the points the ends of the hypotenuse, and four with the points being the ends of ends of a leg.



Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____2. What is the surface area of a cube with an edge of one half inch?

Answer =

$\frac{3}{2}$ sq. in. or $\frac{3}{2}$ in^2. 2. $S.A. = 6 \bullet \frac{1}{2} \bullet \frac{1}{2} = \frac{3}{2}$ sq. in.

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____7. What is the surface area of a cylinder with a circumference of 10π in., and a height of 8 in.? Answer in terms of π.

Answer =

130π sq.in. (or 130π in.^{2})

7. If $C = 10\pi, r = 5$ and $A = 25\pi$ for one circle.

$S.A. = 2(25\pi) + 10\pi \bullet 8 = 50\pi + 80\pi = 130\pi$

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____10. If the total surface area of a cube is 384 cm^2, what is the length of one edge?

Answer =

8 cm

10. $384 = 6 \bullet 64 = 6 \bullet 8^2$, edge = 8 cm

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____2. If the edges of a cube add up to 36 m, what is the volume?

Answer =

$27\ m^3$ 2. There are 12 edges to a cube, so $s = 36 \div 12 = 3$ and $V = 3^3$

Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____5. Three tennis balls just fit in a cylindrical can. If each tennis ball is 2.5 inches in diameter, what is the volume of the can? Leave π as π, and round the decimal multiplier to the nearest tenth.

Answer =

$11.7\pi\ in^3$ 5. The height is $3(2.5) = 7.5$ in . The base area is $\pi(1.25)^2 = 1.5625\ in^2$

$V = 1.5625\pi \bullet 7.5 = 11.71875\pi\ in^3$ ($1.56 \times 7.5 = 11.700$, but $1.6 \times 7.5 = 12.0$)

Oct 22-9:49 PM

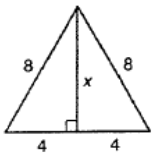
5.4 Surface Area and Volume of 3-D Figures

_____5. If the 3 base edges of a tetrahedron are 8 cm and the height is 6 cm, what is the volume? Leave in simplified radical form.

Answer =

$32\sqrt{3}$ cm^3 or $32\sqrt{3}$ cc

5. $V = \frac{1}{3} \bullet A \bullet h$. The area of the base triangle is $\frac{1}{2} \bullet 8 \bullet 4\sqrt{3} = 16\sqrt{3}$ since $x = 4\sqrt{3}$. So $V = \frac{1}{3} \bullet 16\sqrt{3} \bullet 6 = 32\sqrt{3}$ cm^3



Oct 22-9:49 PM

5.4 Surface Area and Volume of 3-D Figures

_____4. If the volume of a sphere is $\frac{32\pi}{3}$ cm^3, what is the diameter?

Answer =

4cm

4. $\frac{4}{3}\pi r^3 = \frac{32}{3}\pi = \frac{4}{3}\pi 8 = \frac{4}{3}\pi 2^3$ so $r = 2\text{cm}, d = 4\text{cm}$

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

_____10. Marcus made the basket 16 times and missed the basket 9 times in the basketball game. What is the probability that he will make the basket on his next try?

Answer =

0.64 or 64%

10. $16+9=25$ shots at the basket. Probability is $\frac{16}{25}=\frac{64}{100}=0.64$

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

_____3. Sandy decorated her holiday tree with 10 red, 15 silver, and 5 green glass ornaments. Her little brother, Roger, pulled the tree over and only one ornament broke. What is the probability it was red?

Answer =

$\frac{1}{3}$ or $0.\overline{3}$ or $33\frac{1}{3}\%$

3. There are 30 ornaments and 10 are red, so $\frac{10}{30}=\frac{1}{3}$

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

_____ 1. Michael has a 60% chance of making a free throw in basketball. What is the probability that he makes three free throws in a row?

Answer =

0.216 or 21.6% 1. The probability of making the first shot and the second and the third is $0.6 \times 0.6 \times 0.6 = 0.216$

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

1) There are 6 people in a race. In how many ways can they finish first, second or third ?

Answer =

1)
3 decisions
3 blanks → 6 · 5 · 4 = 120

Any of the 6 people.

The runner who finishes first can't finish second.

Must be 4 runners left since first and second are picked.

Oct 22-9:49 PM

5.5 Simple Probability and the Counting Principle

3) In Canada, postal codes consist of 6 characters -- three letters and three digits. Each postal code starts with a letter and alternates with a digit.
   a. How many postal codes are there ?
   b. How many start with the letter S ?
   c. How many start with the letter S and end in the digit 8 ?
   d. How many start with the letter S, digit 6 and NO letter or digit is repeated ?

Answer =

3a) $26 \cdot 10 \cdot 26 \cdot 10 \cdot 26 \cdot 10 = 17{,}576{,}000$

3b) $1 \cdot 10 \cdot 26 \cdot 10 \cdot 26 \cdot 10 = 676{,}000$

3c) $1 \cdot 10 \cdot 26 \cdot 10 \cdot 26 \cdot 1 = 67{,}000$

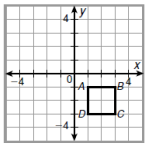
3d) $1 \cdot 1 \cdot 25 \cdot 9 \cdot 24 \cdot 8 = 43{,}200$

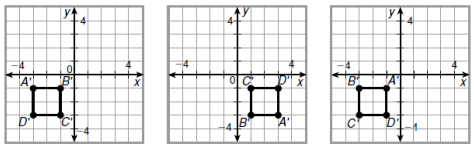
Oct 22-9:49 PM

5.6 Transformations in the Coordinate Plane

Use the figure for Exercises 1–3.

The figure in the plane at right shows the preimage in the transformation $ABCD \rightarrow A'B'C'D'$. Match the number of the image (below) with the name of the correct transformation.





1 2 3

1. rotation _____ **2.** translation _____ **3.** reflection _____

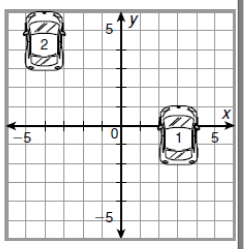
Answer =

1. rotation 2 **2.** translation 1 **3.** reflection 3

Oct 22-9:49 PM

5.6 Transformations in the Coordinate Plane

Use the figure for Exercise 6.



6. A parking garage attendant will make the most money when the maximum number of cars fits in the parking garage. To fit one more car in, the attendant moves a car from position 1 to position 2. Write a rule for this translation.

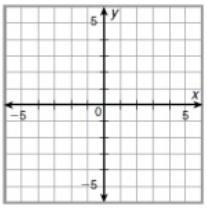
Answer =

6. $(x, y) \rightarrow (x - 7, y + 5)$

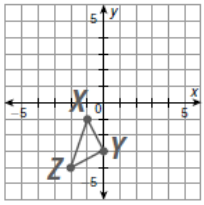
Oct 22-9:49 PM

5.6 Transformations in the Coordinate Plane

7. A figure has vertices at $X(-1, 1)$, $Y(-2, 3)$, and $Z(0, 4)$. Draw the image of XYZ after the translation $(x, y) \rightarrow (x, y - 2)$ and a 180° rotation around X.



Answer = **7.**



Oct 22-9:49 PM