

Puzzle 1 <i>Clue 1</i> Write the area of the rectangle in terms of x .	Puzzle 1 <i>Clue 2</i> Write the area of the square in terms of x : $(x + 1)^2$.	Puzzle 1 <i>Clue 3</i> The areas are equal: $(x + 9)(x - 3) = (x + 1)^2$.	Puzzle 1 <i>Clue 4</i> Expand both sides. The x^2 terms cancel and leave $6x - 27 = 2x + 1$.
Puzzle 2 <i>Clue 1</i> The longest side is opposite the right angle: $x + 8$.	Puzzle 2 <i>Clue 2</i> Use Pythagoras: $x^2 + (x + 7)^2 = (x + 8)^2$.	Puzzle 2 <i>Clue 3</i> Expand and collect on one side: $x^2 - 2x - 15 = 0$.	Puzzle 2 <i>Clue 4</i> Factorise: $(x - 5)(x + 3) = 0$. A length cannot be negative. Now add the three sides.
Puzzle 3 <i>Clue 1</i> Use the ratio to give the sides a letter: $AB = 3k$ and $BC = 4k$.	Puzzle 3 <i>Clue 2</i> The area is $\frac{1}{2} \times AB \times BC$, so $\frac{1}{2} \times 3k \times 4k = 96$.	Puzzle 3 <i>Clue 3</i> $6k^2 = 96$, so $k = 4$: $AB = 12$ and $BC = 16$.	Puzzle 3 <i>Clue 4</i> Find AC with Pythagoras, then add the three sides.
Puzzle 4 <i>Clue 1</i> The shaded area is the big square take away the small square.	Puzzle 4 <i>Clue 2</i> $(x + 4)^2 - x^2 = 56$. The x^2 terms cancel.	Puzzle 4 <i>Clue 3</i> $8x + 16 = 56$, so $x = 5$ and the big square has sides of 9.	Puzzle 4 <i>Clue 4</i> Slide the two inside edges out to the corner: the perimeter is the same as the big square's.
Puzzle 5 <i>Clue 1</i> Volume of a cylinder = $\pi r^2 h$. Square all of the radius: $(2x)^2 = 4x^2$.	Puzzle 5 <i>Clue 2</i> The cylinder's volume is $12\pi x^3$.	Puzzle 5 <i>Clue 3</i> Call the cone's height h . Its volume is $\frac{1}{3} \pi (3x)^2 h = 3\pi x^2 h$.	Puzzle 5 <i>Clue 4</i> Set $3\pi x^2 h = 12\pi x^3$ and divide both sides by $3\pi x^2$.
Puzzle 6 <i>Clue 1</i> Write the area of the rectangle in terms of x : $2x(x + 1)$.	Puzzle 6 <i>Clue 2</i> The area is 40: $2x(x + 1) = 40$, so $x^2 + x - 20 = 0$.	Puzzle 6 <i>Clue 3</i> Factorise: $(x + 5)(x - 4) = 0$, so $x = 4$. The semicircle's radius is half of 8.	Puzzle 6 <i>Clue 4</i> Shaded area = the rectangle take away the semicircle: $40 - \frac{1}{2} \times \pi \times 4^2$.
Puzzle 7 <i>Clue 1</i> Use the ratio: $AB = k$, $BC = 2k$, $CD = 3k$. It is isosceles, so $AD = 2k$ too.	Puzzle 7 <i>Clue 2</i> The perimeter is $8k = 48$, so $k = 6$.	Puzzle 7 <i>Clue 3</i> Drop a height from A to CD . It lands 6 cm from D : half of $18 - 6$.	Puzzle 7 <i>Clue 4</i> $\text{Height}^2 = 12^2 - 6^2$. Then the area is $\frac{1}{2}(a + b)h$.
Puzzle 8 <i>Clue 1</i> AB is next to the 60° angle and AC is the hypotenuse: use $\cos 60^\circ = \frac{1}{2}$.	Puzzle 8 <i>Clue 2</i> $\frac{x+1}{x^2-1} = \frac{1}{2}$, so $x^2 - 1 = 2(x + 1)$.	Puzzle 8 <i>Clue 3</i> $x^2 - 2x - 3 = 0$, so $(x - 3)(x + 1) = 0$. $x = -1$ makes the sides 0.	Puzzle 8 <i>Clue 4</i> $AB = 4$ and $AC = 8$. Use Pythagoras for BC and simplify the surd.
Puzzle 9 <i>Clue 1</i> C is on the arc, so the angle at C is an angle in a semicircle: 90° .	Puzzle 9 <i>Clue 2</i> Use Pythagoras: $x^2 + (x + 2)^2 = 10^2$, so $x^2 + 2x - 48 = 0$.	Puzzle 9 <i>Clue 3</i> Factorise: $(x + 8)(x - 6) = 0$, so $x = 6$. The triangle's sides are 6 and 8.	Puzzle 9 <i>Clue 4</i> Shaded area = the semicircle take away the triangle: $\frac{1}{2} \times \pi \times 5^2 - \frac{1}{2} \times 6 \times 8$.
Puzzle 10 <i>Clue 1</i> The longest side is $2x$. Use Pythagoras.	Puzzle 10 <i>Clue 2</i> $x^2 + (x + 2)^2 = (2x)^2$ gives $x^2 - 2x - 2 = 0$.	Puzzle 10 <i>Clue 3</i> It does not factorise. Complete the square: $(x - 1)^2 = 3$.	Puzzle 10 <i>Clue 4</i> $x = 1 + \sqrt{3}$, as a length is positive. The perimeter is $x + (x + 2) + 2x = 4x + 2$.

Geometry Puzzles with Algebra *Team* _____

Puzzle	Minutes	Clues taken	Marks
1	4	1 2 3 4	
2	4	1 2 3 4	
3	5	1 2 3 4	
4	5	1 2 3 4	
5	5	1 2 3 4	
6	5	1 2 3 4	
7	6	1 2 3 4	
8	6	1 2 3 4	
9	6	1 2 3 4	
10	7	1 2 3 4	
Total			

5 marks a puzzle, 1 less for each clue. Solved after the time: 1 mark.

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