

**2007
MATHCOUNTS STATE
COMPETITION**

SPRINT ROUND

1. In the figure, the largest circle has a radius of six meters. Five congruent smaller circles are placed as shown lined up in east-to-west and north-to-south orientations. We are asked to find the radius of one of the smaller circles.



The radius of the large circle is 6. Thus, the diameter of the large circle is $6 \times 2 = 12$. The diameter runs through the 3 congruent smaller circles lined up in the east-to-west orientation. This means that the diameter of each circle is

$\frac{12}{3} = 4$. The radius is just half that, or 2. **Ans.**

2. Two identical CDs cost a total of \$28. This means that one CD costs $\frac{1}{2} \times 28 = 14$. And 5 CDs must cost $5 \times 14 = 70$ **Ans.**

3. Alexandra played 15 games of Skee Ball for \$11.25. She earned either 2 tickets or 4 tickets for playing each game and after playing the 15 games had a total of 40 tickets. We are asked to find out how many games she played where she earned 4 tickets.
- Let x = the number of games she played where she got 4 tickets.
Let y = the number of games she played where she got 2 tickets.
- $$\begin{array}{ll} x + y = 15 & \text{Eq. 1} \\ 4x + 2y = 40 & \text{Eq. 2} \\ 4x + 4y = 60 & \text{Eq. 3 = Eq. 1} \cdot 4 \\ 2y = 20 & \text{Eq. 3 - Eq. 2} \\ y = 10 & \\ x = 15 - y = 15 - 10 = 5 & \\ 5 & \text{Ans.} \end{array}$$

4. In parallelogram PQRS, the measure of angle P is five times the measure of angle Q. A parallelogram has two sets of opposite parallel lines. The angles opposite each other are the same.



The sum of angle P and angle Q must be 180° . Let x = angle Q. Then, $5x$ = angle P.
 $5x + x = 180$
 $6x = 180$
 $x = 30$
 $5x = 150$
 Angle R = Angle P = 150 **Ans.**

5. Two right triangles have equal areas. The first triangle has a height of 5 cm and a corresponding base of 8 cm.

That means that its area is $\frac{1}{2} \times 5 \times 8 = 20$

The second triangle has a side of length 20. We know that its area is also 20 but we don't know its height. Let h = the height of the second triangle.

$20 = \frac{1}{2} \times 20 \times h$
 $20 = 10h$
 $h = 2$ **Ans.**

6. In a class, 12 students are girls out of a total of 30 students. Therefore, $30 - 12 = 18$ students are boys. 6 more boys join the class for a new total of $18 + 6 = 24$ boys. The fraction of the class that is now boys is:

$\frac{24}{30 + 6} = \frac{24}{36} = \frac{2}{3}$ **Ans.**

7. The distance from the earth to the moon is approximately 2.4×10^5 miles. A satellite crosses the shortest path between the earth and the moon at a distance of 240 miles from the earth. We are asked to find the fraction of the distance from the earth to the moon that the satellite's distance from the earth is at this point.

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RD Boyd



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