



Preliminary Planning Sheet Grade 8 – Scary Reunion

Domain(s)

Geometry

Standard(s)

8.G.B.8

Mathematical Practices

MP.1 MP.2 MP.4 MP.6

Major Underlying Mathematical Concepts

- Solving for unknowns in equations
- Pythagorean Theorem
- Finding and applying unit rates

Problem Solving Strategies

- Pythagorean Theorem
- Area model

Formal Mathematical Language and Symbolic Notation

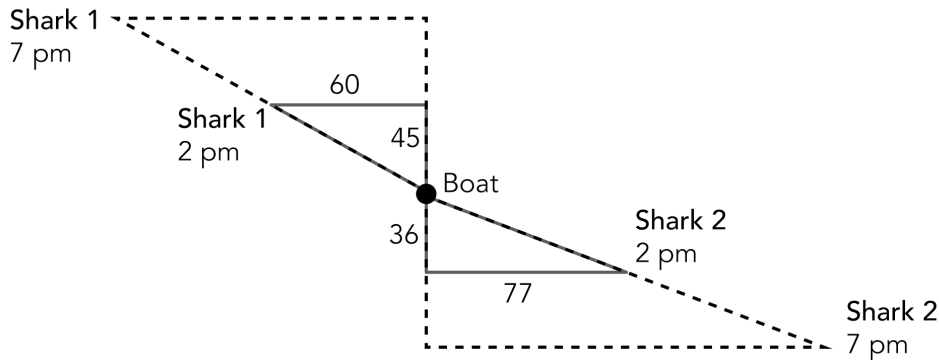
- Constant rate
- Unit rate
- Perfect square
- Right triangle
- Legs
- Hypotenuse
- Pythagorean Theorem
- Substitution
- Pythagorean triple
- Square root
- Exponent
- Sum

Possible Solution(s)

The research vessel needs to travel 30 miles per hour to be in the same location as Shark 1 or 34 miles per hour to be in the same location as Shark 2 at 7 p.m.

Students may use a variety of strategies and solution paths to determine how far each shark is from the boat at 2 p.m. and how fast the vessel needs to travel to reach the sharks at 7 p.m. and how fast the vessel needs to travel to reach the sharks at 7 p.m.

The solution below is based on each shark's given location and the time they travel in 5 hours. Their location at 7 p.m. (10 hours) could also be used instead and is just double the distances for 5 hours.



Shark 1 traveled 75 miles in 5 hours.
Shark 2 traveled 85 miles in 5 hours.

Distance from the Boat to each Shark's Location

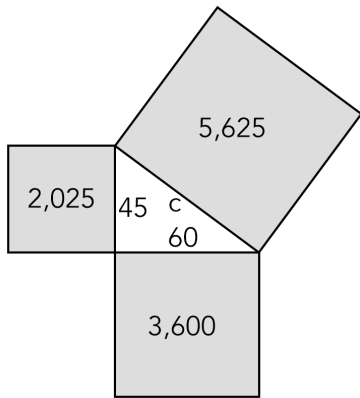
Apply the Pythagorean Theorem

Shark 1
 $a^2 + b^2 = c^2$
 $60^2 + 45^2 = c^2$
 $3,600 + 2,025 = c^2$
 $5,625 = c^2$
 $c = \sqrt{5,625} = 75$ miles

Shark 2
 $a^2 + b^2 = c^2$
 $36^2 + 77^2 = c^2$
 $1,296 + 5,929 = c^2$
 $7,225 = c^2$
 $c = \sqrt{7,225} = 85$ miles

Area Model of the Pythagorean Theorem

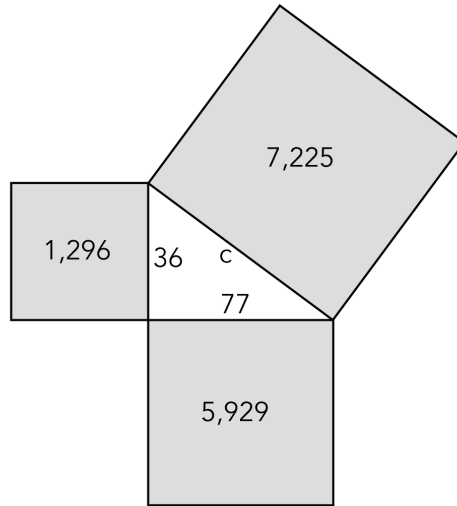
Shark 1



$$3,600 + 2,025 = 5,625$$

$$c = \sqrt{5,625} = 75 \text{ miles}$$

Shark 2



$$1,296 + 5,929 = 7,225$$

$$c = \sqrt{7,225} = 85 \text{ miles}$$

Speed of the Research Vessel

The sharks will travel for another 5 hours at their current rate. This means the vessel needs to travel twice as fast as the sharks to catch up to them.

OR

Shark 1

75 miles \div 5 hours = 15 miles per hour

15 mph \times 10 hours = 150 miles

Vessel speed: 150 miles \div 5 hours = 30 miles per hour

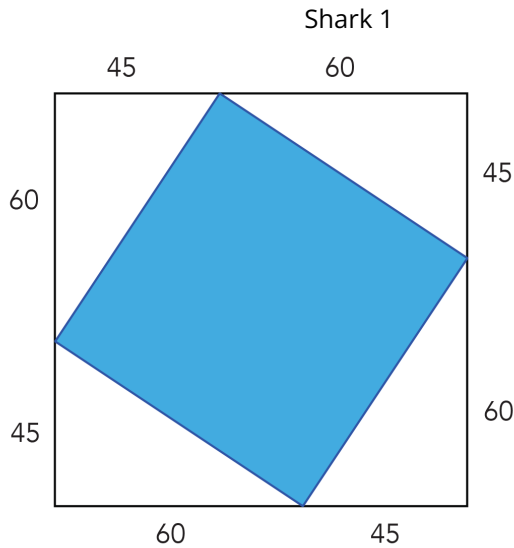
Shark 2

85 miles \div 5 hours = 17 miles per hour

17 mph \times 10 hours = 170 miles

Vessel speed: 170 miles \div 5 hours = 34 miles per hour

Surround and Subtract Area



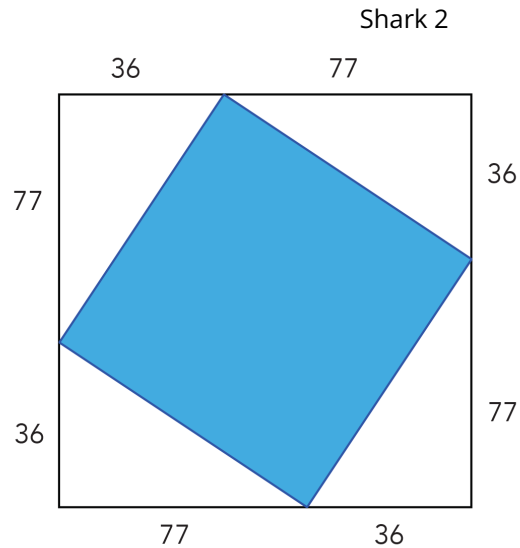
Area of Large Square:
 $105 \cdot 105 = 11,025$ square miles

Area of Each Triangle:
 $(45 \cdot 60) \div 2 = 1,350$ square miles

Area of all 4 Triangles:
 $1,350 \cdot 4 = 5,400$ square miles

Area of Hypotenuse Square (shaded area):
 $11,025 - 5,400 = 5,625$ square miles

Side Length of Hypotenuse Square (c) = $\sqrt{5,625} = 75$ miles



Area of Large Square:
 $113 \cdot 113 = 12,769$ square miles

Area of Each Triangle:
 $(36 \cdot 77) \div 2 = 1,386$ square miles

Area of all 4 Triangles:
 $1,386 \cdot 4 = 5,544$ square miles

Area of Hypotenuse Square (shaded area):
 $12,769 - 5,544 = 7,225$ square miles

Side Length of Hypotenuse Square (c) = $\sqrt{7,225} = 85$ miles

Possible Connections

Below are some examples of mathematical connections. Your students may discover some that are not on this list.

- The marine biologist would have to travel 4 mph faster to catch up with Shark 2 than they do to catch up with Shark 1.
- Shark 2 will travel 20 miles more than Shark 1 in 10 hours.
- If Shark 1 did not move from 2 p.m. to 7 p.m., then the marine biologist would only have to travel 75 miles and travel 15 mph.
- Shark 2 is traveling approximately 1.13 times faster than Shark 1.
- If the marine biologist traveled at a rate of 35 mph, then they would be 25 miles ahead of the shark at 7 p.m.
- Solve more than one way to verify the answer.
- Relate to a similar task and state a math link.