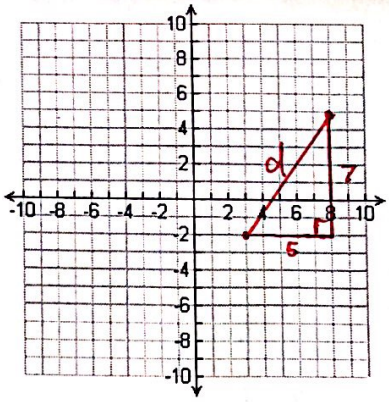
Extension Worksheet: Pythagorean Theorem Name: KEY

1) Find the distance between the points (3, -2) and (8, 5) two different ways: a) By plotting them on the grid to the right and drawing the triangle, and b) by using the Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. Make sure you get the same answer both ways.

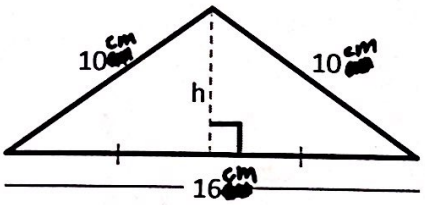
(x_1, y_1) (x_2, y_2)

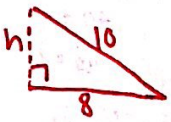


a) $5^2+7^2=d^2$
$25+49=d^2$
$\sqrt{74}=\sqrt{d^2}$
$8.6 \approx d$

b) $d=\sqrt{(8-3)^2+(5-{-2})^2}$
$d=\sqrt{5^2+7^2}$
$d=\sqrt{25+49}$
$d=\sqrt{74}$
$d \approx 8.6$

2) Remember, the area of a triangle is $A = \frac{1}{2}bh$, where **b** is the base of the triangle and **h** is the height. Use the Pythagorean Theorem to find the height of the triangle, then find the area.



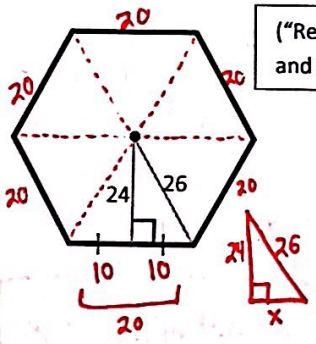


(6,8,10) → h = 6

$A = \frac{1}{2}bh$
$A = \frac{1}{2} \cdot 16 \cdot 6$
$A = \frac{1}{2} \cdot 96$
$A = 48$ cm²

3) a. Find the perimeter of the regular hexagon.

("Regular" means all sides and angles are congruent.)



$x^2+24^2=26^2$
$x^2+576=676$
$x^2=100$
$x=10$

OR

(5,12,13)
↓×2
(10,24,26)

Perimeter = 20·6
Perimeter = 120 units

3) b. Can you find the <u>area</u> of the hexagon? (The dot is the center of the hexagon. You can divide the whole shape into triangles and find the area of each one!)

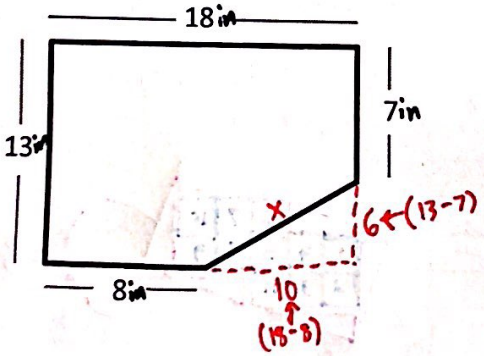
1 Triangle:

$A = \frac{1}{2} \cdot 20 \cdot 24$
$A = 240$

Hexagon = 6 Triangles

$A = 240 \cdot 6$
$A = 1440$ units²

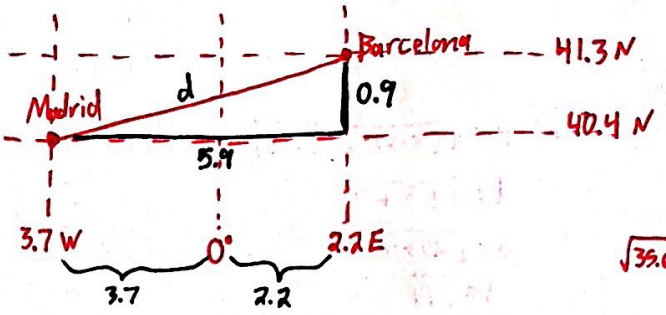
4) Can you find the perimeter of the shape? You will first have to figure out how to find the length of the diagonal side.



$10^2+6^2=x^2$
$136=x^2$
$\sqrt{136}=x$
or
$11.7 \approx x$

$P = 8+13+18+7+\sqrt{136}$
$P \approx 57.7$ in

5) Madrid has a latitude of about 40.4° N and a longitude of about 3.7° W. Barcelona has a latitude of about 41.3°N and 2.2°E. At this latitude, each degree is about 46 miles. Based on this information, how far apart are Madrid and Barcelona?



$5.9^2+0.9^2=d^2$

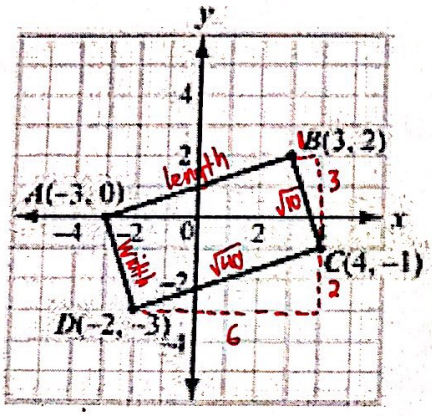
$35.62=d^2$

$\sqrt{35.62}=d$ (in degrees)

$6.0 \approx d$

$\sqrt{35.62} \cdot 46 \approx 274.5$ miles

6) Find the length and width of this rectangle. Then use these to find the area of the rectangle. (The answer should be a whole number. If you get a decimal, try calculating it again using exact square roots instead of rounded numbers!)



BC: $1^2+3^2=x^2$

$10=x^2$

$\sqrt{10}=x$

CD: $6^2+2^2=x^2$

$40=x^2$

$\sqrt{40}=x$

$BC+AD=\sqrt{10}$

$AB+CD=\sqrt{40}$

Area = length × width

$=\sqrt{10}\cdot\sqrt{40}$

$=\sqrt{400}$

$A=20$ units^2

7) Use the picture above. Bob and Jane left their house (point A) and drove directly to the gas station (point B), then drove from there to the grocery store (point C). When they were done shopping, they drove straight home (directly from point C back to point A). Suppose each square on the grid is 1 mile. How many miles **longer** was their original trip (A to B to C) than their return trip (C back to A)? Round to the nearest tenth of a mile.

AB + BC

$=\sqrt{40}+\sqrt{10}$

≈ 9.5 miles

C to A

$1^2+7^2=d^2$

$50=d^2$ $\quad d \approx 7.1$ miles

$9.5-7.1$

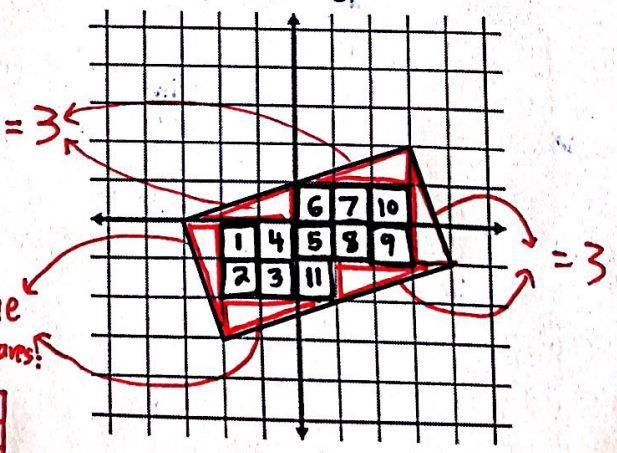
≈ 2.4 miles longer

8) **(bonus)** Below is another copy of the rectangle from #6. Count the squares inside the rectangle. For the "parts" of squares, try to rearrange them so that they fit together to make complete squares. Use the picture to give a visual explanation for why the area you calculated from #6 is right.

Full squares = 11

$11+3+3+3$

$= 20$ squares



These combine to make 3 squares!