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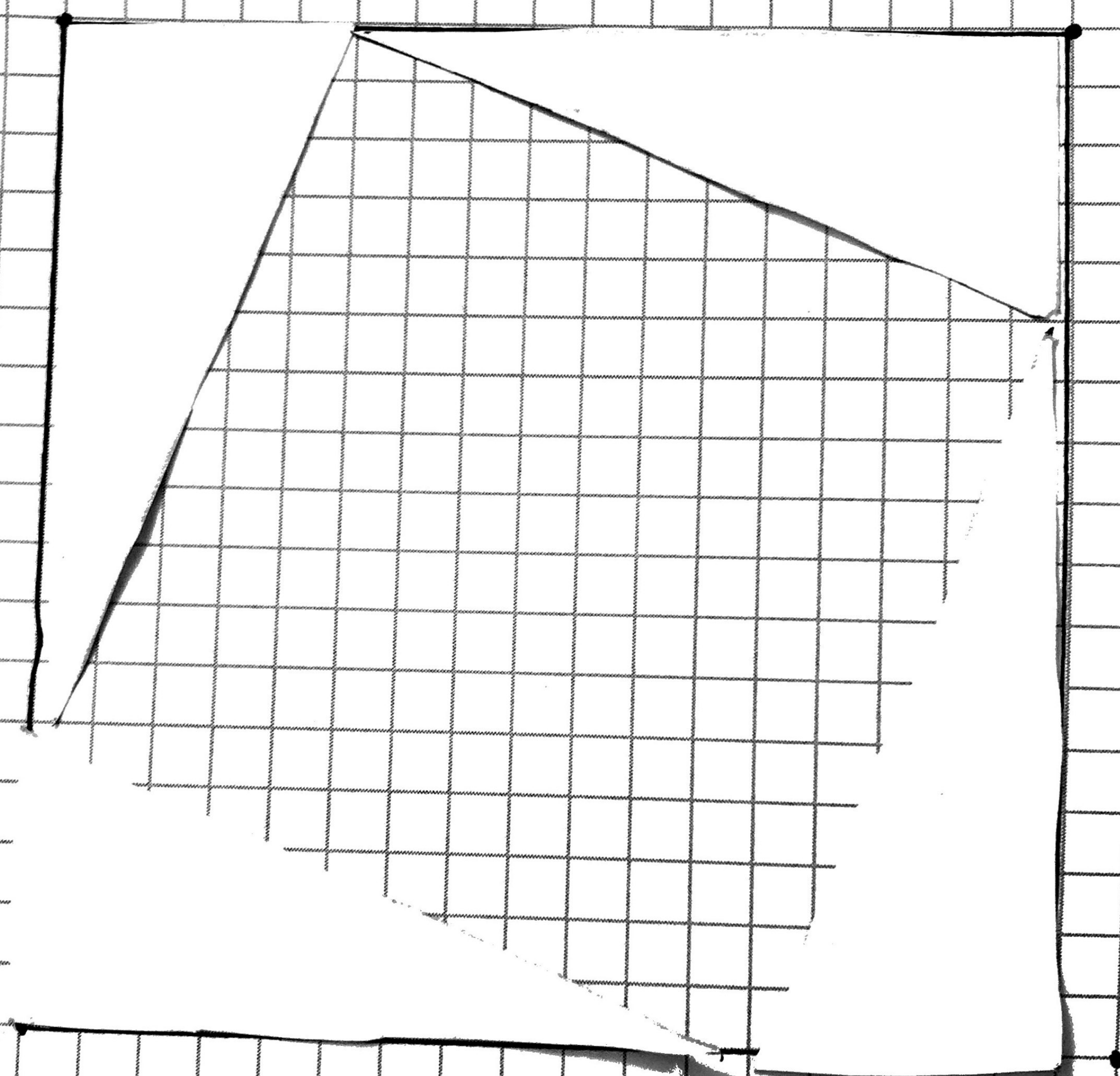
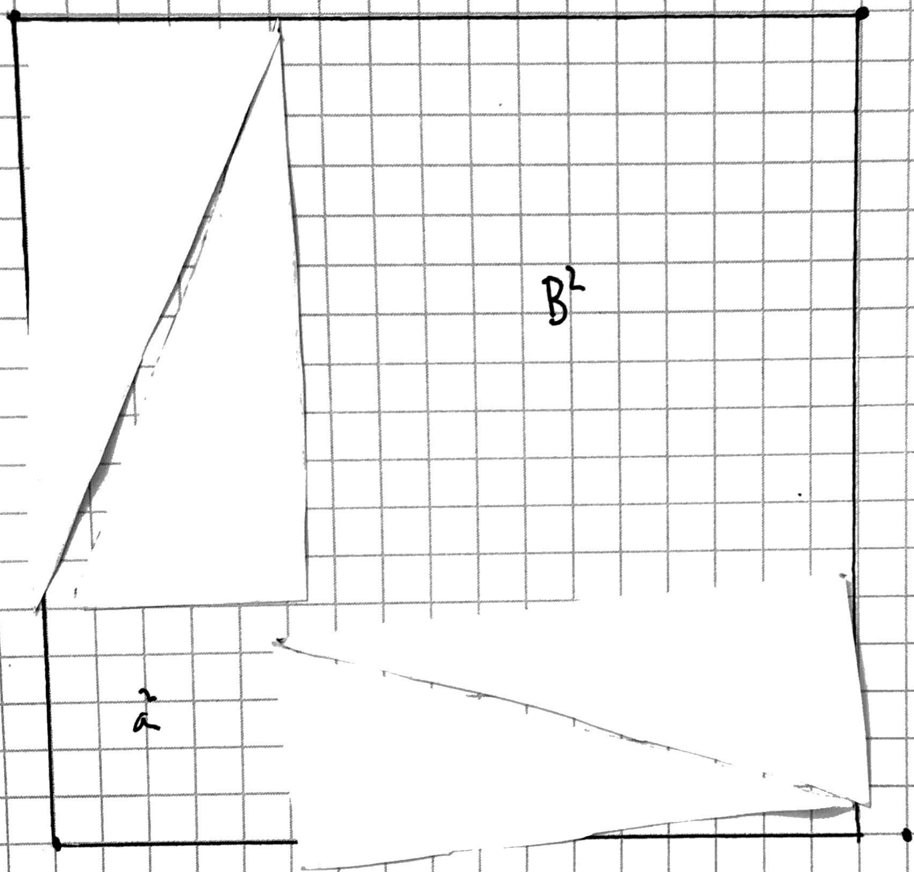
Bp443

HW5

1

A.)



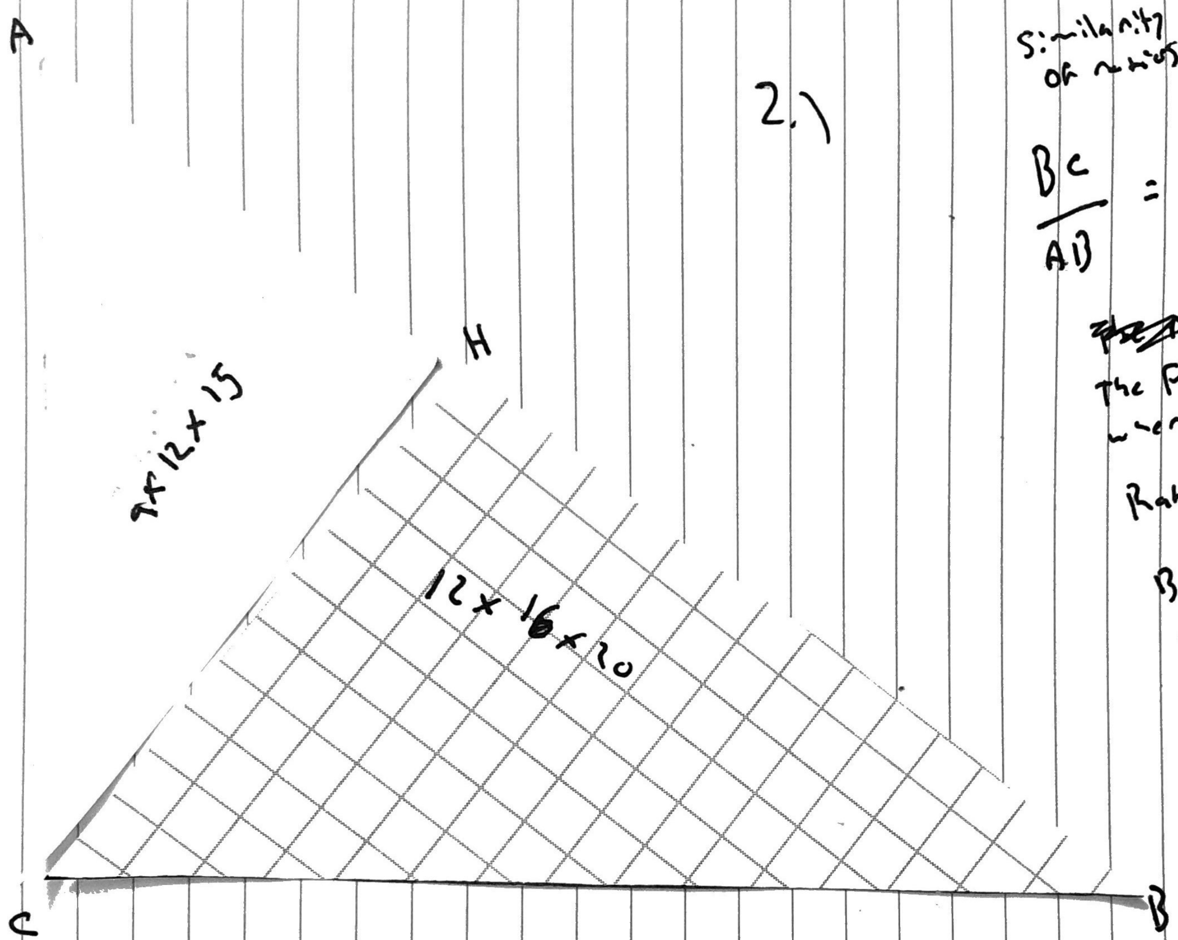


$a^2 + B^2$ = Same area as

The square formed by Hypote

Thus Proved

2.)



Similarity of Triangles leads to the equality of ratios of corresponding sides

$$\frac{BC}{AB} = \frac{BH}{BC} \quad \text{and} \quad \frac{AC}{AB} = \frac{AH}{AC}$$

~~Fraction~~ The First result equals cosines of θ whereas second equals sines

Ratios can be written as

$BC^2 = AB \times BH$ and $AC^2 = AB \times AH$

Summing equalities →

$BC^2 + AC^2 = AB \times BH + AB \times AH$

$= AB \times (AH + BH) = AB^2$

Thus

$BC^2 + AC^2 = AB^2$

Programiz

Python Online Compiler

3.) A.)

Learn Python App

main.py

Run

Shell

Clear

```python

def is_coprime(m,n):
    return math.gcd(m, n) == 1

def get_m_and_n(a, iscoprime_flag):
    tuples = []
    a2 = a
    for m in range(1,a2):
        for n in range(1,a2):
            if m*n==a and m<=n and iscoprime_flag==False:
                tuples.append([m,n])
            elif m*n==a and m<=n and iscoprime_flag==True:
                if is_coprime(m,n):
                    tuples.append([m,n])
    return tuples

def gen_tripples_with_known_a(tuples):
    S = []
    for tuple in tuples:
        m = tuple[1]
        n = tuple[0]
        S.append([120, m**2+n**2, m**2-n**2])
    return S

```

```
[[120, 904, 896], [120, 409, 391], [120, 241, 209], [120, 169, 119],
  [120, 136, 64]]
> These are a few of the pythagorean tripples where with a = 120. These
  are not nessesarily primal though some are
```

Programiz

Python Online Compiler

3)B)

Learn Python App

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Run

Shell

Clear

```python
def get_m_and_n(a, iscoprime_flag):
    tuples = []
    a2 = a
    for m in range(1,a2):
        for n in range(1,a2):
            if m*n==a and m<=n and iscoprime_flag==False:
                tuples.append([m,n])
            elif m*n==a and m<=n and iscoprime_flag==True:
                if is_coprime(m,n):
                    tuples.append([m,n])
    return tuples

def gen_tripples_with_known_a(tuples):
    S = []
    for tuple in tuples:
        m = tuple[1]
        n = tuple[0]
        S.append([120, m**2+n**2, m**2-n**2])
    return S

if __name__ == "__main__":
    # print(generate_tripples(10))
    tuples = get_m_and_n(60,True)
    print(gen_tripples_with_known_a(tuples))
```

```
[[120, 409, 391], [120, 241, 209], [120, 169, 119]]
> These are some of the unique primal pythagorean tripples
```

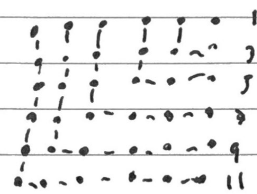
4.) Euclid's Proof

lemma: difference of squares of any 2 #s (that are consecutive) are always odd

$2^2 - 1^2 = 3$

$3^2 - 2^2 = 5$

$\vdots$



Geometric proof for infinite odd #s

Since perfect squares form a subset of odd #s, the fraction of infinity is also infinity, it follows that there must also be an infinite # of odd squares. As such there is also an infinite # of Pythagorean trillples!

5.) ~~[illegible]~~ Fermant

6.) Euler

7.) Fermant

8.) Andrew Wiles