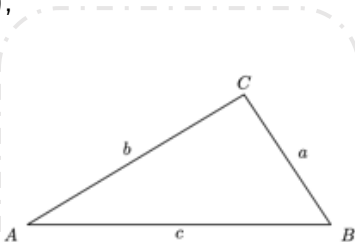


Primitive Recognition

Problem: In $\triangle ABC$, suppose $\angle C = 3\angle A$, $a = 27$, and $c = 48$. What is the value of b ?

[asy]

```
pair A=origin, B=(14,0),
    C=(10,6);
draw(A--B--C--cycle);
label("$A$", A, SW);
label("$B$", B, SE);
label("$C$", C, N);
```



...
[/asy]

visualize

Answer: 35

Problem: Older television screens have an aspect ratio of 4 : 3, meaning the width is to the height as 4 is to 3 ...

[asy]

```
filldraw((0,0)--(8,0)
--(8,1)--(0,1)
--cycle, grey, black);
filldraw((0,5)
--(8,5)--(8,1)
--(8,5)
--(0,5)
--cycle, grey, black);
```



visualize

Answer: 2.7

Local Relation Composition

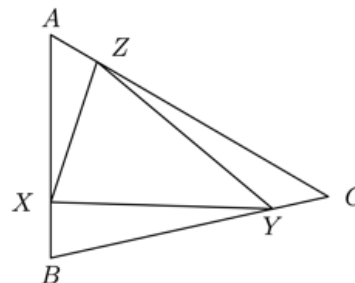
Problem: Let $\triangle ABC$ have area 240 . Points X , Y , and Z ...such that $\frac{AX}{BX} = 3$, $\frac{BY}{CY} = 4$ and $\frac{CZ}{AZ} = 5$. Find the area of $\triangle XYZ$.

[asy]

```
pair A=(0,15),B=(0,-5),C=(25,0.5),X=origin,
```

```
...
label("$A$",A,N);
label("$B$",B,S);
label("$C$",C,E);
```

...
[/asy]



visualize

Answer: 122

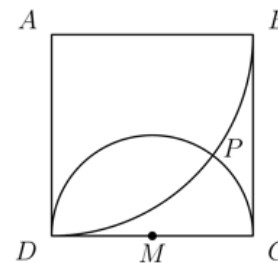
Problem: Square $ABCD$ has side length 4, and M is the midpoint of \overline{CD} ... What is the distance from P to \overline{AD} ?

[asy]

```
draw(Circle((2,0),2));
draw(Circle((0,4),4));
filldraw(Circle((2,0),
0.07));
```

```
...
label("$M$", (2,0), S);
label("$P$", (3.6, 1.4), N);
```

[/asy]



visualize

Answer: $\frac{16}{5}$

Global Abstract Integration

Problem: The pattern in the figure below continues inward infinitely. The base of the largest triangle is 1 , ...Find the total shaded area.

[asy]

```
pen blu = rgb(0,112,191);
real r=sqrt(3);
fill((8,0)--(0,8r)--(-8,0)
--cycle, blu);
fill((0,0)--(4,4r)--(-4,4r)
--cycle, white);
```

...
[/asy]



visualize

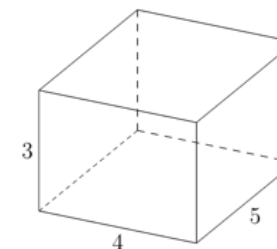
Answer: $\frac{\sqrt{3}}{5}$

Problem: The centers of the faces of the right rectangular prism shown below are connected to form an octahedron. What is the volume of this octahedron?

[asy]

```
draw((0,0,0)--(0,0,3),
dashed);
draw((0,0,0)--(0,4,0),
dashed);
draw((0,0,0)--(5,0,0),
```

...
[/asy]



visualize

Answer: 10