**Brainstorm For *Bees* Portfolio**

**Central Problem:**

Do bees use the most efficient shape for their honeycombs?

Efficiency is defined as creating the most volume with the least surface area

And fitting all the parts together without wasted space (Tesselation).

**Main Mathematical Ideas**

Formulas for finding:

* + - * Volume,
      * Area,
      * Surface area,
      * Perimeter,
      * Pythagorean Theorem,
      * Trigonometry (sine, cosine, tangent).

**See "A Portfolio of Formulas" on the back page**

Efficiency: Creating the greatest space with the least materials

* + - Largest area with smallest fence (Corral)
    - Largest volume with smallest surface area (Cereal boxes)

Tessellation: (fitting shapes together)

**A Portfolio of Formulas**

**Sketch Shape Formula Explanation**

9

12

Rectangular Prism

**Volume** is the space inside a rectangular prism

LWH = V

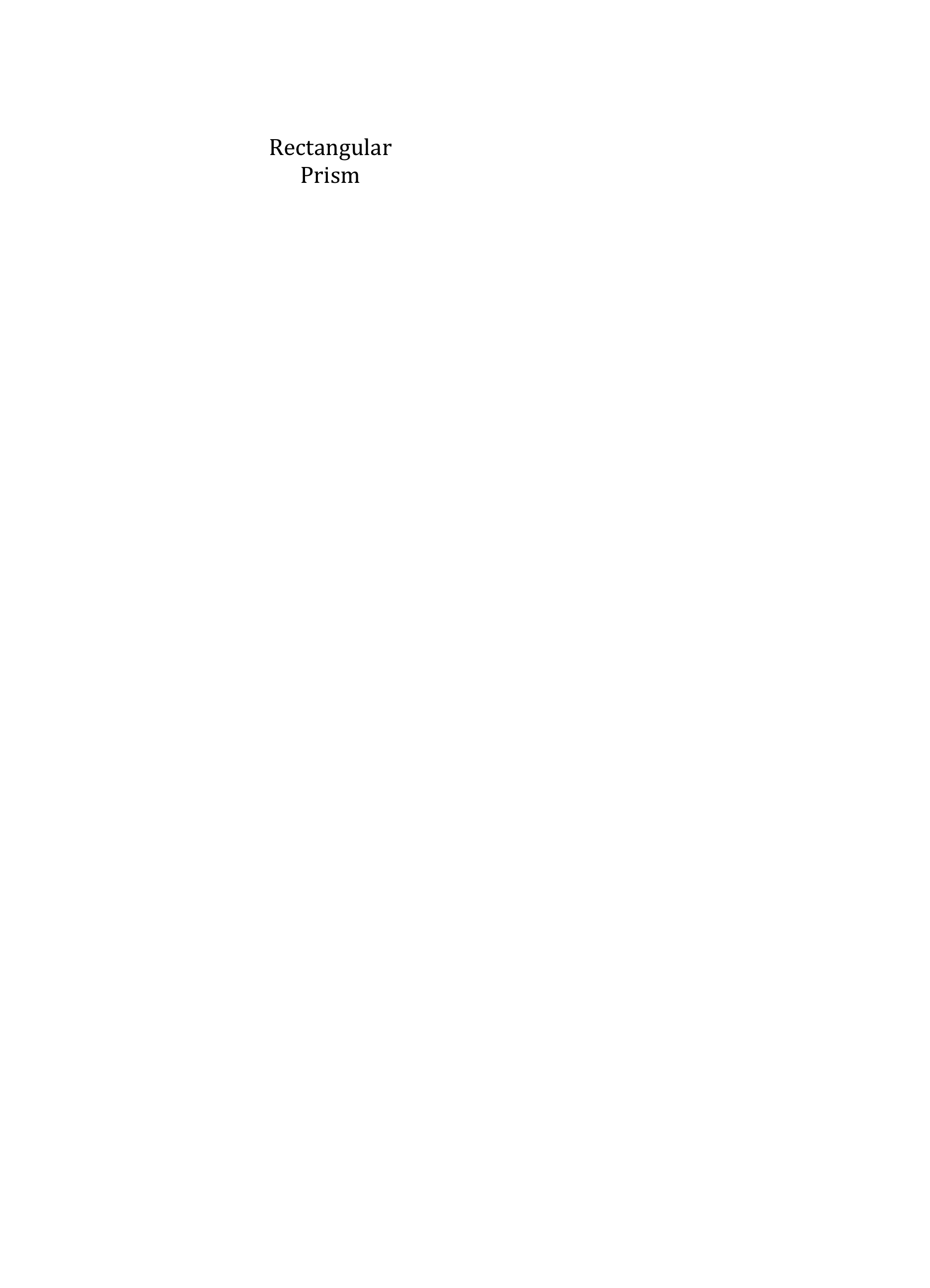
2(LH+LW=WH) = SA

**Surface Area** is the area of all the sides of a rectangular prism

6

**Area** is the space inside a rectangle

BH = A

Rectangle Prism

6

**Perimeter** is the space around a rectangle

2B + 2H = P

8

opposite

adjacent

Tangent = adjacent

opposite

Cosine = adjacent

hypotenuse

Sine = opposite

hypotenuse

Trigonometry of Triangles

**Trigonometry** uses the ratios of similar triangles to find the missing side of a right triangle.

hypotenuse

**The Area of a triangle** is the space inside. It's half a rectangle

1/2BH = A

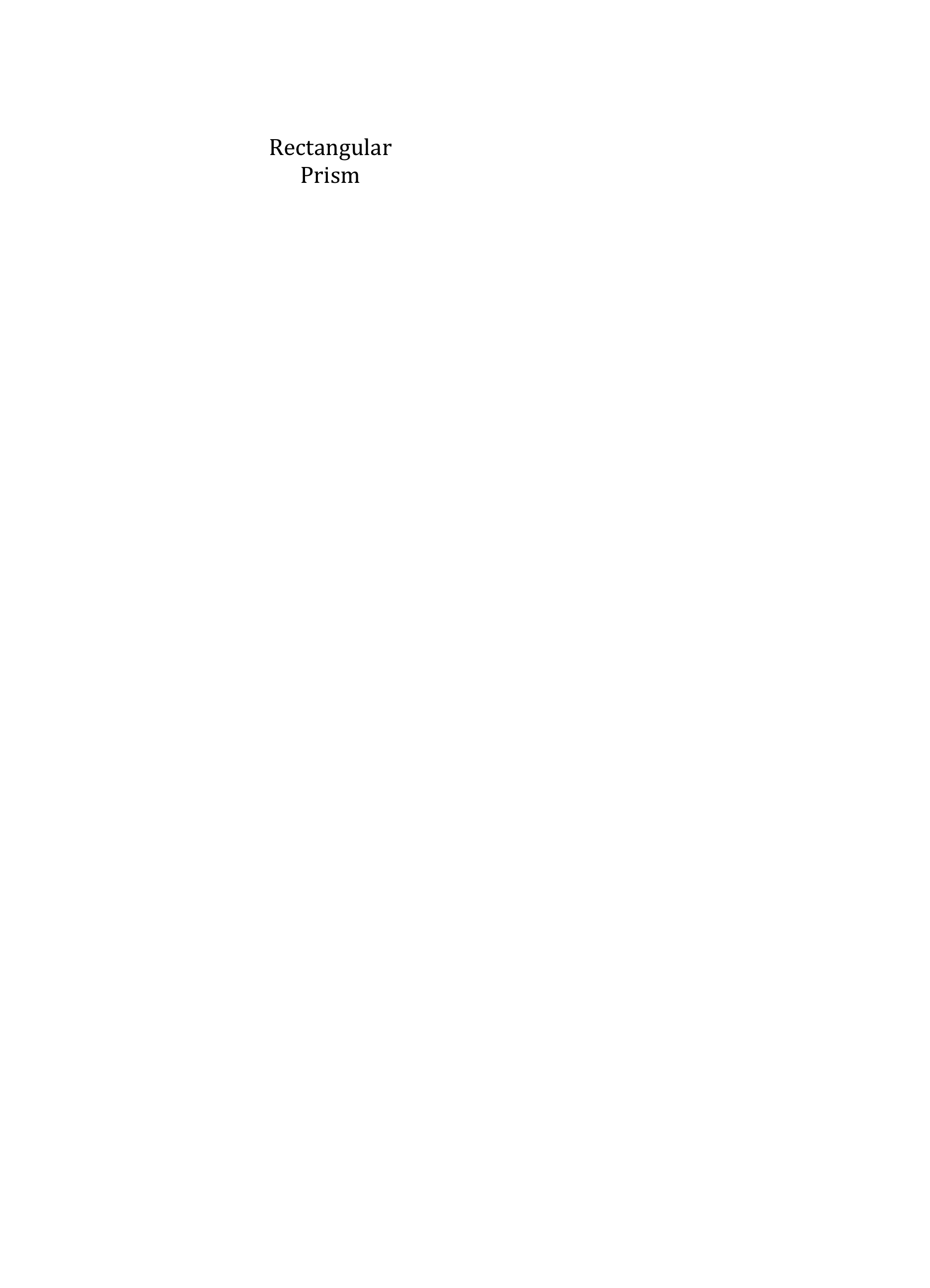
Triangle

h

b

**The Pythagorean Theorem**: for all right triangles, the shortest side squared, plus the next shortest sided squared will equal the longest side squared

a2 + b2 = c2

Right TrianglePrism

c

b

a