Task:

A woodworker has made four small toy airplanes and one large toy airplane and wants to paint them. All airplanes are exactly the same shape, and all are made of the same wood. The larger plane is twice as large in every dimension as one of the smaller planes.

i. The amount of paint required to paint the planes is directly proportional to the surface area. Will the amount of paint required for the single plane in case A be greater than, less than, or equal to the
amount of paint required for all four planes in case B?

ii. Will the weight of the single large plane be greater than, less than, or the same as the weight of the four small planes combined?

Solution:

i.

Small plane, dimensions:	Large plane, dimensions:
$x - length$	$2x - length$
$y - width$	$2y - width$
$z - height$	$2z - height$

Surface area, small:

S_{Small}

Surface area, large plane:

As the shapes of the large and the small plane are similar, $k = 2 \Rightarrow \frac{S_{Large}}{S_{Small}} = k^2 = 4$

$S_{Large} = 4S_{Small}$

If the small plane requires P, where P —the amount of paint,

The large plane requires $4P$

4 small panes require $4P$

4 small planes require the same amount of paint as 1 large plane

ii.

Volume, small:

V_{Small}

Volume, large:

As the shapes of the large and the small plane are similar, $k = 2 \Rightarrow \frac{V_{Large}}{V_{Small}} = k^3 = 8$

$V_{Large} = 8V_{Small}$

If the small plane weights G, where $G = pV_{Small}, p - density\ of\ wood$

The large plane weights $8G$

4 small panes weight $4G$

4 small planes weight less than 1 large plane

Answer:

i. 4 small planes require the same amount of paint as 1 large plane
ii. 4 small planes weight less than 1 large plane