Spheres of diameter 10cm are packed into a cuboid $40 \times 30 \times 20\ cm^3$

How many fit in, and how much space is empty

Number of spheres $4 \times 3 \times 2 = 24$

Empty space = Vol of cuboid − Vol of 24 spheres

$= 40 \times 30 \times 20 - 24 \times \frac{4}{3} \pi \times 5^3$

$24000 - 12566$

$= 11434\ cm^3$

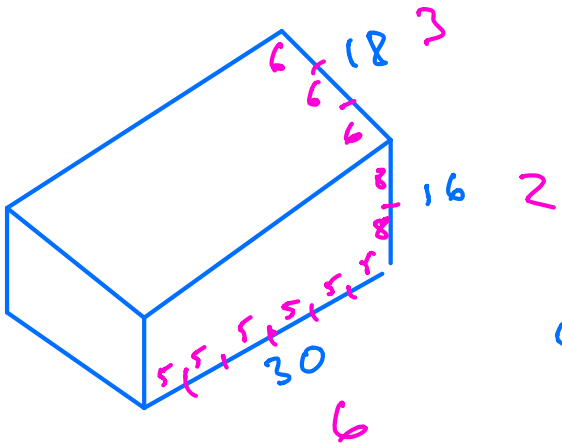
What percentage of the cuboid space is empty?

$$\frac{11434}{24000} \times 100 = 47.6\ \%$$

Exercise

1) How many cuboids 8cm x 6cm x 5cm could fit in a cuboid box 16cm x 30cm x 18cm

How much wasted space?



$6 \times 2 \times 3 = 36$

No wasted space

Check vol of box

$= 16 \times 30 \times 18 = 8640\text{cm}^3$ ✓

Vol of cuboids $= 36 \times 8 \times 6 \times 5 = 8640\text{cm}^3$

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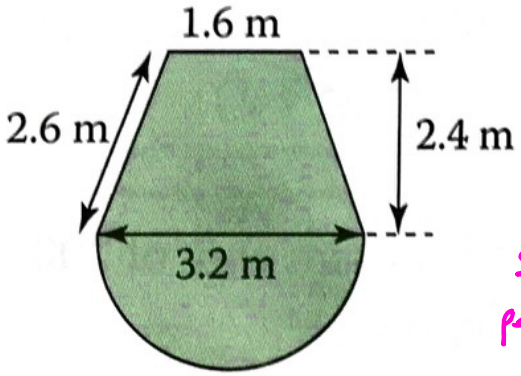
5 The diagram shows the dimensions of a flowerbed in Yusuf's garden.



a Yusuf says that 12 metres of edging will be enough to go around the flowerbed. Is Yusuf correct? Show your working.

a)

Semi-circle perimeter $= \frac{2\pi r}{2}$

$= \pi r$

$= 1.6\pi$

$= 5.0\text{ m}$

Perimeter

$= 2.6 + 1.6 + 2.6 + 5.0$

$= 11.8\text{ m}$

So 12 m is enough

b Yusuf also wants to buy fertiliser to feed the flowers six times in the summer. He uses 35 grams per square metre each time. Is a 2 kilogram bag of fertiliser enough? Explain your answer

b) Area $\frac{\pi r^2}{2} + \frac{1}{2}(a+b)h$

$= \frac{\pi \times 1.6^2}{2} + \frac{1}{2}(3.2+1.6) \times 2.4 = 9.781\text{m}^2$

Fertilizer required = $6 \times 35 \times 9.781$

$= 2054\text{ g}$

so 2kg bag not enough

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1 A circular helipad (for landing a helicopter) has a radius of 14 m. The cost of building the helipad is £85 per square metre.
Is £50 000 enough? Explain your answer.

2 A flowerbed in the park is semicircular.
It has a radius of 2 m.

Percy the park keeper wants to plant flowers that each need an area of 0.3 m^2.

a How many of these flowers can Percy plant in the flowerbed?

b What space does he have left?

1) Cost $= \pi r^2 \times 85$

$= \pi \times 14^2 \times 85 = £52,339$

so £50000 is not enough

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2) Area of bed $= \frac{\pi r^2}{2} = \frac{\pi \times 2^2}{2} = 2\pi$

Number of flowers $= \frac{2\pi}{0.3} = 20.94$

so 20 flowers

$$\text{Space left} = 2\pi - 20 \times 0.3$$

$$= 0.283 \text{ m}^2$$