Challenge 2

December 2025

RAQ

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Information and guidance

- You are permitted access to any calculator for this challenge.
- Give all answers in **decimal form** correct to **one decimal place**.
- Write your answers in the spaces provided on this paper.
- Read each question carefully before answering it.
- Check your answers at the end of each question.
- The difficulty of each task is indicated by stars.
- Each correct answer awards 1 point.
- The maximum score for this challenge is **12 points**.

BEGINNING OF CHALLENGE

1. Daniel visits a store.
He buys exactly enough paint to fill three buckets to their maximum volume.
After filling them, he pours 300mL out of each bucket.
The total paint left in the three buckets is exactly enough to fill one empty bucket to its maximum volume.

Find out how much paint Daniel bought. ★☆☆☆☆

Answer:

2. A bag contains red, blue and green marbles.
One third of the marbles are red.
There are 4 more red marbles than blue marbles.
There are twice as many green marbles as blue marbles.

Find out how many marbles are in the bag. ★★☆☆☆

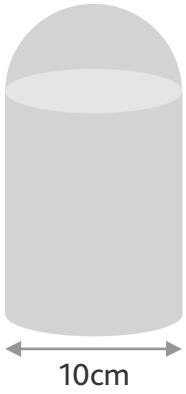
Answer:

3. David wants to drink between 150mL and 250mL of water.
His fridge contains a 1L bottle of water.
The bottle's volume decreases linearly from 8am until it is empty at 10pm.

a. Find out the time interval, in minutes, during which David can drink straight from the bottle, emptying it. ★★☆☆☆

Answer:

The bottle is modelled as a cylinder and a hemisphere of diameter 10cm shown below.



The bottle is placed upright on a table.
David fills the bottle until it is three-quarters full.

b. Find out the volume of water in the hemisphere. ★★★☆☆

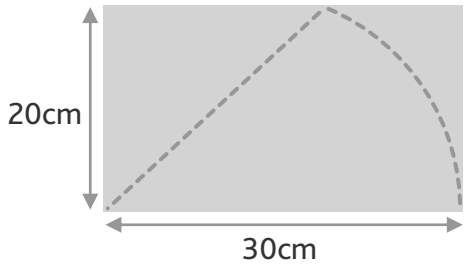
Answer:

4. In 1 AD, the world population was 200 million.
In 2000 AD, the world population reached 6 billion.
There were 80 generations between 1 AD and 2000 AD.
The population increases by the same factor each generation.

Find out how many births there are in the 81st generation. ★★★☆☆

Answer:

5. Tyler cuts out a sector of radius 30cm from the piece of paper shown below.



He throws away the rest of the paper.

Find out the percentage of paper wasted. ★★★☆☆

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6. Jake is writing words on a blank page.
He uses a pen that has 1mL of ink.
Every line he draws has a height of 0.01mm.
When there is 0.3mL of ink left, the width of every line decreases linearly from 0.4mm to 0.2mm after which the ink runs out.

a. Find out how many metres of line he can write. ★★★☆☆

Answer:

The first letter he wrote on the page is modelled as two three-quarter circles shown below.



b. Find out what percentage of ink the letter used up. ★★☆☆☆

Answer:

7. Lucas takes part in a race.
For the first 800m, he runs $3ms^{-1}$ faster than in the last 400m.
He finishes the race in 130s.

Find out his speed for the first 800m. ★★★★☆

Answer:

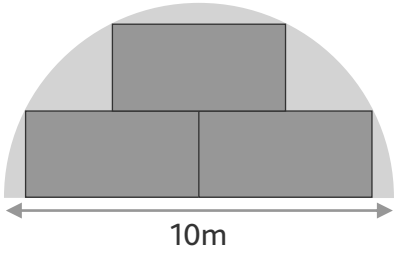
8. Sophie carries a 5m long straight stick.
She manages to fit it across the longest span of a regular octagonal window frame.

Find out the area of glass needed to fill the window. ★★★★☆

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9. Three identical rectangular blocks of wood are stored in a container.
The cross-section of the container is shown below.



Find out the percentage of free space left in the container. ★★★★★

Answer:

10. A car is at rest on a 2m one-way road.
The width of the car is the same as the road.
The car is 50m away from where a pedestrian will cross.
It accelerates from rest at $3ms^{-2}$ to a random integer speed between $15ms^{-1}$ and $20ms^{-1}$ inclusive.
A pedestrian begins crossing the road at a random time between 0 and 5 seconds from when the car starts accelerating.
The pedestrian walks straight across the road at $1ms^{-1}$.

Find out the probability of no collision. ★★★★★

Answer:

END OF CHALLENGE

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