22

1 Pedro drove from Toulouse to Montpellier in 2 hours 42 minutes.
He drove at an average speed of 90 km/hour.

Janine drove from Toulouse to Montpellier along the same route as Pedro.
The journey took her 3 hours.

Work out Janine's average speed for the journey.

distance = speed x time

speed = distance / time

time taken = 2 hours 42 minutes

speed = 90 km/hour

distance from Toulouse to Montpellier:

$90 \text{ km/h} \times 2 \text{ hour} + \frac{42 \text{ minutes}}{60}$ ← convert minutes to hours

$= 90 \times 2.7$ (1)

$= 243 \text{ km}$ (1)

Janine's average speed:

$\frac{243 \text{ km}}{3 \text{ hours}}$ (1) $= 81 \text{ km/h}$ (1)

81 km/hour

(Total for Question 1 is 4 marks)

2 A box is put on a horizontal table.

The face of the box in contact with the table is a square of side 1.5 metres.
The pressure on the table due to the box is 34.8 newtons/m^2

Work out the force exerted by the box on the table.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Area = 1.5 m x 1.5 m
= 2.25 m^2 (1)

Pressure = 34.8 N/m^2

Force = pressure x area
= 34.8 x 2.25 (1)
= 78.3 N (1)

78.3 ..... newtons

(Total for Question 2 is 3 marks)

3 Platinum nuggets are in the shape of a solid cylinder.

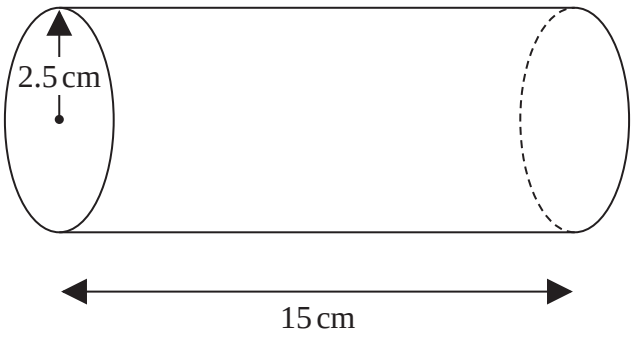

Diagram **NOT** accurately drawn

The radius of each cylinder is 2.5 cm.
The length of each cylinder is 15 cm.

The density of platinum is 21.5 g/cm^3

The greatest mass that Jacques can carry is 30 kg.

Can Jacques carry 5 platinum nuggets at the same time?
You must show all your working.

density = mass / volume

volume of cylinder = $\pi r^2 h$

Finding the volume of platinum nugget:

$\pi \times 2.5^2 \times 15 = 294.52 \text{ cm}^3$ (1)

Finding mass of a platinum nugget:

$21.5 \text{ g/cm}^3 = \frac{\text{mass}}{294.52 \text{ cm}^3}$ (1)

$\text{mass} = 294.52 \text{ cm}^3 \times 21.5 \text{ g/cm}^3$ (1)

$= 6332.27 \text{ g} \div 1000$ ← convert g to kg

$= 6.33227 \text{ kg}$

×1000 kg ⇄ g ÷1000

Finding mass of 5 platinum nuggets:

$5 \times 6.33227 \text{ kg} = 31.661 \text{ kg} > 30 \text{ kg}$ (1)

∴ No. Jacques cannot carry 5 platinum nuggets at a time. (1)

(Total for Question 3 is 5 marks)

4 Change a speed of 81 kilometres per hour to a speed in metres per second.

$\frac{81\ \text{km}}{\text{h}} \times \frac{1000\ \text{m}}{1\ \text{km}} \times \frac{1\ \text{h}}{60 \times 60\ \text{s}}$ (1)

$= \frac{81\,000}{3600}$ (1)

$= 22.5$ (1)

22.5 metres per second

(Total for Question 4 is 3 marks)