EXAM PAPERS PRACTICE

GCSE Edexcel Math
1MA1
Rounding & Estimation

Answers

"We will help you to achieve A Star "

Answer 1

Work out an estimate for $\frac{31 \times 9.87}{0.509}$

1 SIG. FIG.

$\frac{31 \times 9.87}{0.509} \approx \frac{30 \times 10}{0.5}$

$\div 0.5$ IS SAME AS $\times 2$

$= 300 \times 2$

$= 600$

Answer 2

Competition
a prize every 2014 seconds

In a competition, a prize is won every 2014 seconds.

Work out an estimate for the number of prizes won in 24 hours.
You must show your working.

ESTIMATION IN CALCULATIONS

GENERAL RULE:
ROUND THINGS TO 1 SIG FIG.

$$\text{NO OF PRIZES} = \frac{\text{NO OF SECS IN 24HRS}}{2014}$$

$$= \frac{24 \times 60 \times 60}{2014}$$

ESTIMATION →

$$\simeq \frac{20 \times 60 \times 60}{2000}$$

$$\simeq 6 \times 6$$

$$\simeq 36$$

Answer 3

(b) Give evidence to show whether your answer to (a) is an underestimate or an overestimate.

ROUNDED MASS OF JUPITER UP AND SO WE HAVE AN OVERESTIMATE.

Answer 4

Margaret has some goats.
The goats produce an average total of 21.7 litres of milk per day for 280 days.
Margaret sells the milk in $\frac{1}{2}$ litre bottles.

1 sig fig FOR EACH NUMBER

Work out an estimate for the total number of bottles that Margaret will be able to fill with the milk.

You must show clearly how you got your estimate.

NUMBER OF BOTTLES = AMOUNT OF MILK / VOLUME OF BOTTLE

BOTTLES = $\frac{21.7 \times 280}{1/2}$

2.217×280

$\simeq 2 \times 20 \times 300$

$\simeq 12000$

"DIVIDING BY $\frac{1}{2}$ IS MULTIPLYING BY 2"

Answer 5

The mass of Jupiter is 1.899×10^{27} kg.
The mass of Saturn is 0.3 times the mass of Jupiter.

(a) Work out an estimate for the mass of Saturn.
Give your answer in standard form.

MASS OF JUPITER = 1.899×10^{27} kg
$= 2 \times 10^{27}$ kg

MASS OF SATURN = $0.3 \times 2 \times 10^{27}$
$= 0.6 \times 10^{27}$ kg
$= 0.6 \times 10 \times 10^{26}$
$= 6 \times 10^{26}$ kg

ESTIMATION IN CALCULATIONS

GENERAL RULE:
ROUND THINGS TO 1 SIG FIG.

STANDARD FORM

- ONE NON-ZERO NUMBER BEFORE THE DECIMAL POINT
- $\times 10^{?}$
  - ? IS POSITIVE FOR NUMBERS > 1
  - ? IS NEGATIVE FOR NUMBERS < 1
  - ? IS THE NUMBER OF TIMES YOU HAVE TO "MOVE" THE DECIMAL POINT

Answer 6

Sanders has a water tank for storing rainwater.

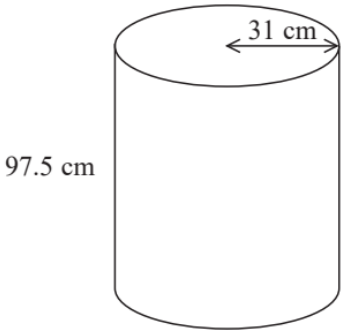


Diagram **NOT** accurately drawn

The tank is in the shape of a cylinder.
The radius of the cylinder is 31 cm.
The height of the cylinder is 97.5 cm.

The tank is full of water.

Work out an estimate for the volume of water in the tank.
Give your answer in litres.
You must show your working.

Use 1000 cm^3 = 1 litre.

$\pi = 3.14159...$

$V = \pi \times 31^2 \times 97.5$

$V \simeq 3 \times (30)^2 \times 100$

$\simeq 3 \times 900 \times 100$

$= 2700 \times 100$

$= 270000\ cm^3$ $\div 1000$

$= 270$ LITRES

ESTIMATION IN CALCULATIONS

GENERAL RULE: ROUND THINGS TO 1 SIG FIG.

CYLINDER

$V = \pi r^2 h$

$CSA = 2\pi rh$

$3^2 = 9$

$30^2 = 30 \times 30 = 900$

Answer 7

John uses a calculator to work out the height of the cone to 2 decimal places.

(b) Will your estimate be more than John's answer or less than John's answer? Give reasons for your answer.

TOP OF FRACTION ↑

BOTTOM OF FRACTION ↓

OUR FRACTION $\frac{100}{25}$ IS BIGGER

THAN JOHN'S ANSWER

Answer 8

Juan trains for the race.
The average speed he can cycle at increases.
It is now 16.27 miles per hour.

(b) How does this affect your answer to part (a)?

16.27 ≃ 20 MPH

SO SPEED INCREASES

AND FEWER DAYS NECESSARY

Answer 9

(b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

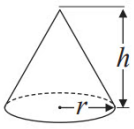
ROUNDED UP THE DENOMINATOR SO FRACTION IS SMALLER THAN IT SHOULD BE → UNDERESTIMATE

Answer 10

A cone has a volume of 98 cm^3.
The radius of the cone is 5.13 cm.

(a) Work out an estimate for the height of the cone.

Volume of cone $= \frac{1}{3}\pi r^2 h$



$V = \frac{1}{3} \times \pi \times r^2 \times h$

$98 = \frac{1}{3} \times \pi \times 5 \cdot 13^2 \times h$

1 SIG FIG:

$100 = \frac{1}{3} \times 3 \times 5^2 \times h$

$\frac{100}{25} = \frac{25h}{25}$

$4 = h$

ESTIMATION IN CALCULATIONS

GENERAL RULE:
ROUND THINGS TO 1 SIG FIG.

Answer 11

A cycle race across America is 3069.25 miles in length.

Juan knows his average speed for his previous races is 15.12 miles per hour.
For the next race across America he will cycle for 8 hours per day.

(a) Estimate how many days Juan will take to complete the race.

DISTANCE ≈ 3000 MILES

AVE SPEED ≈ 15 MPH

120 MP DAY ← ×8

TIME = DIST / SPEED

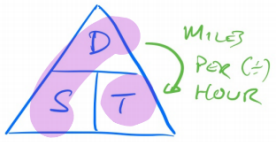
$= \frac{3000}{120}$

$= \frac{3 \times 100}{8 \times 4}^{25}$

= 25 DAYS

15×
1×: 15
2× 30
4× 60
8× 120

DIST SPEED TIME



ESTIMATION IN CALCULATIONS

GENERAL RULE:
ROUND THINGS TO 1 SIG FIG.

Answer 12

One uranium atom has a mass of 3.95×10^{-22} grams.

(a) Work out an estimate for the number of uranium atoms in 1 kg of uranium.

$$\text{No of Atoms} = \frac{\text{Total Mass}}{\text{Mass of 1 Atoms}}$$

$$\simeq \frac{1000}{4 \times 10^{-22}}$$

$$\simeq \frac{1 \times 10^{3}}{4 \times 10^{-22}}$$

$$\simeq 0.25 \times 10^{3-(-22)}$$

$$\simeq 0.25 \times 10^{25}$$

$$\simeq 0.25 \times 10 \times 10^{24}$$

$$\simeq 2.5 \times 10^{24} \text{ Atoms}$$

Estimation in Calculations

General Rule: Round things to 1 Sig Fig.

1 kg = 1000 g

Indices

$a^p \div a^q = a^{p-q}$

Answer 13

Work out an estimate for $\sqrt{4.98 + 2.16 \times 7.35}$

$\simeq \sqrt{5 + 2 \times 7}$

$\simeq \sqrt{5 + 14}$

$\simeq \sqrt{19}$

$\simeq 4.3$

A REASONABLE GUESS

SQUARES

$4^2 = 16$

$5^2 = 25$

ESTIMATION IN CALCULATIONS

GENERAL RULE:

ROUND THINGS TO 1 SIG FIG.