



# EXAM PAPERS PRACTICE

GCSE OCR Math J560

Rounding and  
estimation

Answers

*"We will help you to  
achieve A Star "*



**Answer 1**

**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.

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

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

ESTIMATION →  $\approx \frac{20 \times 60 \times 60}{2000}$

$$\approx 6 \times 6$$

$$\approx \underline{\underline{36}}$$



**Answer 2**

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.

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.

$$\text{NUMBER OF BOTTLES} = \frac{\text{AMOUNT OF MILK}}{\text{VOLUME OF BOTTLE}}$$

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

$$\approx 2 \times 20 \times 300$$

$$\approx \underline{\underline{12000}}$$

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



**Answer 3**

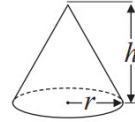
A cone has a volume of  $98 \text{ cm}^3$ .  
The radius of the cone is  $5.13 \text{ cm}$ .

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

1 sig fig:

$$V = \frac{1}{3} \times \pi \times r^2 \times h$$
$$98 = \frac{1}{3} \times \pi \times 5.13^2 \times h$$
$$100 = \frac{1}{3} \times 3 \times 5^2 \times h$$
$$\frac{100}{25} = \frac{25h}{25}$$
$$\underline{\underline{4 = h}}$$

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



ESTIMATION IN  
CALCULATIONS

GENERAL RULE:  
ROUND THINGS  
TO 1 SIG FIG.



**Answer 4**

The mass of Jupiter is  $1.899 \times 10^{27}$  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.

$$\begin{aligned} \text{MASS OF JUPITER} &= 1.899 \times 10^{27} \text{ kg} \\ &= 2 \times 10^{27} \text{ kg} \end{aligned}$$

$$\begin{aligned} \text{MASS OF SATURN} &= 0.3 \times 2 \times 10^{27} \\ &= 0.6 \times 10^{27} \text{ kg} \\ &= 0.6 \times 10 \times 10^{26} \\ &= \underline{\underline{6 \times 10^{26} \text{ kg}}} \end{aligned}$$

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 5**

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 6**

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

1 SIG. FIG.

$$\begin{aligned} \frac{31 \times 9.87}{0.509} &\approx \frac{30 \times 10}{0.5} \\ &= 300 \times 2 \\ &= \underline{\underline{600}} \end{aligned}$$

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



**Answer 7**

A cycle race across America is 3069.25 miles in length.

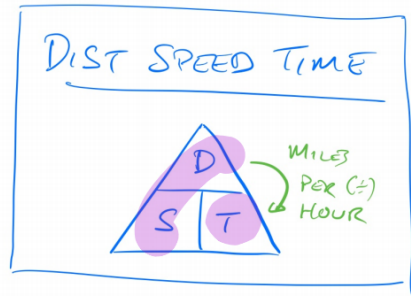
Juan knows his average speed for his previous races is 15.12 miles per hour.  
For the next race across America he will cycle for 8 hours per day.

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

DISTANCE  $\approx$  3000 MILES  
AVE SPEED  $\approx$  15 MPH } 8  
120 MP DAY

$$\begin{aligned} \text{TIME} &= \frac{\text{DIST}}{\text{SPEED}} \\ &= \frac{3000}{120} \\ &= \frac{3 \times 1000}{8 \times 15} \\ &= \underline{25 \text{ DAYS}} \end{aligned}$$

$$\begin{array}{l} 15 \times \\ \hline 1 \times 15 \\ 2 \times 30 \\ 4 \times 60 \\ 8 \times 120 \end{array}$$



ESTIMATION IN CALCULATIONS

GENERAL RULE:  
ROUND THINGS  
TO 1 SIG FIG.





**Answer 8**

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

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

$$\text{No OF Atoms} = \frac{\text{TOTAL MASS}}{\text{MASS OF 1 ATOMS}}$$

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

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

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

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

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

$$\approx \underline{\underline{2.5 \times 10^{24} \text{ ATOMS}}}$$

ESTIMATION IN CALCULATIONS

GENERAL RULE:  
ROUND THINGS  
TO 1 SIG FIG.

$$1 \text{ kg} = 1000 \text{ g}$$

INDICES

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



**Answer 9**

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

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

$$\approx \sqrt{5 + 14}$$

$$\approx \sqrt{19}$$

$$\approx \underline{4.3}$$

SQUARES

$$4^2 = 16$$

$$5^2 = 25$$

A REASONABLE GUESS

ESTIMATION IN  
CALCULATIONS

GENERAL RULE:  
ROUND THINGS  
TO 1 SIG FIG.

**Answer 10**

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)?

$$16.27 \approx 20 \text{ MPH}$$

SO SPEED INCREASES

AND FEWER DAYS NECESSARY



## Answer 11

Sanders has a water tank for storing rainwater.

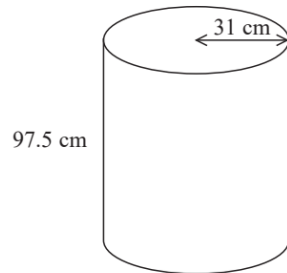


Diagram NOT accurately drawn

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  $1000 \text{ cm}^3 = 1 \text{ litre}$ .

$$\begin{aligned} V &= \pi \times 31^2 \times 97.5 \\ V &\approx 3 \times (30)^2 \times 100 \\ &\approx 3 \times 900 \times 100 \\ &= 2700 \times 100 \\ &= 270000 \text{ cm}^3 \\ &= \underline{\underline{270 \text{ litres}}} \end{aligned}$$

ESTIMATION IN CALCULATIONS  
GENERAL RULE:  
ROUND THINGS  
TO 1 SIG FIG.

CYLINDER

$$V = \pi r^2 h$$
$$CSA = 2\pi r h$$

$3^2 = 9$   
 $30^2 = 30 \times 30 = 900$