| Centre Number | Candidate Number | Name |
| :--- | :--- | :--- |

## CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

## MATHEMATICS

## Paper 1

May/June 2003
1 hour
Candidates answer on the Question Paper.
Additional Materials: Electronic calculator Geometrical instruments Mathematical tables (optional) Tracing paper (optional)

## READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer all questions.
If working is needed for any question it must be shown below that question.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56 .
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For $\pi$, use either your calculator value or 3.142.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

1 Work out $\sqrt{7.1^{3}+2.9^{3}}$, giving
(a) your full calculator display,

$$
\begin{equation*}
\sqrt{7.1^{3}+2.9^{3}}=\sqrt{382.3} \tag{1}
\end{equation*}
$$

Answer (a)...........................
(b) your answer to 2 decimal places.
Answer (b)................

2 The diagram shows how the water level of a river went down during a drought.


The measurements are in metres.
(a) By how many metres did the water level go down?

$$
\text { Level goes from } 1 \text { to }-2.5 \text { metres }
$$

$$
1-(-2.5)=3.5
$$

Answer (a)
3.5
(b) A heavy rainfall followed the drought and the water level went up by 1.6 metres.

What was the water level after the rainfall?

$$
-2.5+1.6
$$

Answer (b)......................
3 (a) Write in order of size, smallest first
$0.68=\frac{68}{100}$
$0.68, \frac{33}{50}$,
$67 \% . \quad 67 \%=\frac{67}{100}$
$\frac{33}{50}=\frac{66}{100}$
Answer (a) $\frac{\frac{33}{50}}{50} \ldots \ldots \ldots$ < $\quad 67 \% \ldots \ldots$ <.........68.
(b) Convert 0.68 into a fraction in its lowest terms.

4 Mahesh and Jayraj share $\$ 72$ in the ratio 7:5.
How much does Mahesh receive?
$\$ 72$ in the ratio $7: 5$
$7+5=12$ parts
1 part $=72 \div 12=6$
Mahesh receives 7 parts which is $7 \times 6$
Answer \$............

5 The population of a city is 550000 .
It is expected that this population will increase by $42 \%$ by the year 2008.
Calculate the expected population in 2008.

$$
42 \% \text { of } 550000
$$

$$
=42 \div 100 \times 550000
$$

$$
=231000
$$

Expected population in 2008

$$
\begin{aligned}
&=550000+231000 \\
&=781000 \quad \text { Answer } \ldots \ldots \ldots \ldots \ldots . . .
\end{aligned}
$$

6 Areeg goes to a bank to change $\$ 100$ into riyals.
The bank takes $\$ 2.40$ and then changes the rest of the money at a rate of $\$ 1=3.75$ riyals.
How much does Areeg receive in riyals?

```
$100 - $2.40 = $97.60
    Since $$= 3.75 Riyals
        $97.60=3.75\times97.60=366
```

7 Write down the value of $\left(1 \frac{1}{2}\right)^{-2}$ as a fraction.

$$
\begin{aligned}
& \left(1 \frac{1}{2}\right)^{-2}=1 /\left(1 \frac{1}{2}\right)^{2} \\
& =1 /\left(\frac{3}{2}\right)^{2} \\
& \quad=1 /\left(\frac{9}{4}\right) \quad=\frac{4}{9}
\end{aligned}
$$

$$
\text { Answer .... } \frac{4}{9}
$$

8 (a)

$$
y=4 u v-3 v
$$

Find the value of $y$ when $u=-3$ and $v=2$.

$$
\begin{aligned}
y & =4 u v-3 v \\
=4 & \times(-3) \times 2-3 \times 2 \\
& =-24-6=-30
\end{aligned}
$$

$$
\begin{equation*}
\text { Answer (a) } y=\ldots-30 \tag{1}
\end{equation*}
$$

(b) Factorise $4 u v-3 v$.

$$
\begin{equation*}
4 u v-3 v=v(4 u-3) \quad \text { Answer }(b) \ldots(4 u-3) \tag{1}
\end{equation*}
$$

9 Solve the equation

$$
\begin{gathered}
x+4=3(2-x) . \\
x+4=3(2-x) \\
x+4=6-3 x \\
x+3 x=6-4 \\
4 x=2 \\
x=\frac{1}{2} \text { or } 0.5
\end{gathered}
$$

$$
\begin{equation*}
\text { Answer } x=\ldots . \frac{1}{2} \text { or } 0.5 \tag{3}
\end{equation*}
$$

10 There are approximately 500000 grains of wheat in a 2 kilogram bag.
(a) Calculate the mass of one grain in grams.

$$
\begin{aligned}
2 \mathrm{~kg} & =2000 \mathrm{~g} \\
2000 & \div 500000 \\
& =0.004
\end{aligned}
$$

Answer (a) .....0.0.4. .g
(b) Write your answer to part (a) in standard form.

$$
0.004=4 \times 10^{-3}
$$

Answer (b) $\ldots .4 \times 10^{-3}$

11 Solve the simultaneous equations

$$
\begin{aligned}
3 a+2 b & =7, \\
a-2 b & =5 .
\end{aligned}
$$

$$
\begin{array}{r}
3 a+2 b=7 \\
a-2 b=5
\end{array}
$$

Adding the equations,
$3 a+a+2 b-2 b=7+5$
$4 a=12$
$a=12 / 4$
$a=3$
Substituting $a=3$ in $3 a+2 b=7$,
$3 \times 3+2 b=7$
$9+2 b=7$
$2 b=-2$
$b=-1$

$$
\begin{aligned}
& \text { Answer } a= \\
& b= \\
& -1
\end{aligned}
$$

12 The diagram shows a pole of length $l$ centimetres.

(a) Hassan says that $l=88.2$.

Round this to the nearest whole number.

$$
\begin{equation*}
\text { Answer (a) } l=\ldots 88 \text {. } \tag{1}
\end{equation*}
$$

(b) In fact the pole has a length 86 cm , to the nearest centimetre.

Complete the statement about $l$.

$$
\begin{equation*}
\text { Answer (b) .85.5.......... } \leqslant l<\ldots 86.5 \ldots \ldots \tag{2}
\end{equation*}
$$

13 On a journey a bus takes 35 minutes to travel the first 10 kilometres.
It then travels a further 20 kilometres in the next 40 minutes.
(a) The bus started the journey at 1850 .

At what time did it complete the journey?
The Journey ends 75 minutes later.
75 minutes is 1 hour 15 minutes
1 hour 15 minutes after 1850 is 2005

$$
\begin{equation*}
\text { Answer (a)....20 } 05 \tag{1}
\end{equation*}
$$

(b) Calculate the average speed of the whole journey in
(i) kilometres/minute,

Average speed $=(30 \div 75) \mathrm{km}$ per minute

$$
=0.4
$$

(ii) kilometres/hour.

$$
0.4 \times 60=24
$$

14 Show all your working for the following calculations.
The answers are given so it is only your working that will be given marks.
(a)

$$
\frac{1}{2}+\frac{2}{3}=1 \frac{1}{6}
$$

Answer (a)

$$
\begin{gather*}
\frac{1}{2}=\frac{3}{6} \text { and } \frac{2}{3}=\frac{4}{6} \\
\frac{3}{6}+\frac{4}{6}=\frac{7}{6} \\
\frac{7}{6}=\frac{1}{6} \tag{2}
\end{gather*}
$$

(b) $1 \frac{1}{5} \times 1 \frac{3}{4}=2 \frac{1}{10}$.

Answer (b) $\quad 1 \frac{1}{5}=\frac{6}{5}$ and $1 \frac{3}{4}=\frac{7}{4}$

$$
\frac{6}{5} \times \frac{7}{4}=(6 \times 7) /(5 \times 4) \quad=\frac{42}{20}=2 \frac{2}{20}=2 \frac{1}{10}
$$

15 The diagram shows a square of side 8 cm and four congruent triangles of height 7 cm .

(a) Calculate
(i) the area of one triangle,

$$
\begin{align*}
\text { Area } & \left.=\frac{1}{2} \text { (base } \times \text { height }\right)  \tag{2}\\
& =0.5 \times 8 \times 7=28
\end{align*}
$$

Answer (a)(i)
28 .. $\mathrm{cm}^{2}$
(ii) the area of the whole shape.

Area of the square $=8 \times 8$
Whole area $=4 \times 28+8 \times 8$

$$
=176
$$

Answer (a)(ii) .............................
(b) The shape is the net of a solid.

Write down the special name for this solid.

In the diagram $A B$ is the diameter of a circle, centre $O$. The length of $A B$ is 12 cm .


NOT TO
SCALE
(a) Write down the size of angle $A P B$.

Answer (a) Angle $A P B=$ $\qquad$
$90^{\circ}$
(b) Angle $P A B=40^{\circ}$.

Calculate the length of $P B$.

$$
\begin{gathered}
\sin 40^{\circ}=P B \times 12 \\
P B=12 \sin 40^{\circ} \\
P B=7.71
\end{gathered}
$$

(c) Calculate the area of the circle.

$$
\begin{aligned}
& \text { Radius }=6 \mathrm{~cm} \\
& \begin{aligned}
\text { Area } & =\pi \times(\text { radius })^{2} \\
& =\pi \times 6^{2}=
\end{aligned} 1133
\end{aligned}
$$



NOT TO
SCALE

A straight road between $P$ and $Q$ is shown in the diagram.
$R$ is the point south of $P$ and east of $Q$.
$P R=8.3 \mathrm{~km}$ and $Q R=4.8 \mathrm{~km}$.

## Calculate

(a) the length of the road $P Q$,

$$
\begin{aligned}
P Q^{2} & =4.8^{2}+8.3^{2} \\
& =9.93 \\
P Q & =\sqrt{91.93} \\
& =9.59
\end{aligned}
$$

Answer (a) .................9......km
(b) the bearing of $Q$ from $P$.

$$
\begin{aligned}
\text { Tan } Q P R & =4.8 \div 8.3 \\
& =0.578313253 \\
\text { Angle QPR } & =30.0^{\circ} \\
\text { Bearing of } Q \text { from } P & =180+30 \\
& =210^{\circ} \quad \text { Answer (b) } \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . . . . . . . . . . . . . . . . . ~
\end{aligned} 1 .
$$



In the diagram the lines $A B$ and $C D$ are parallel.
The lines $A D$ and $B C$ intersect at $X$.
Angle $X D C=35^{\circ}$ and angle $C X D=120^{\circ}$.
(a) (i) Write down the size of angle $B A X$.

$$
\begin{equation*}
\text { Answer(a)(i) Angle } B A X=\ldots \ldots \ldots \ldots \ldots \ldots \ldots \tag{1}
\end{equation*}
$$

(ii) Write down the size of angle $A B X$.

Answer(a)(ii) Angle $A B X=$ $\qquad$
(b) Complete the statement

Triangle $A X B$ is $\qquad$ similar to triangle $D X C$.
(c) $A B=8.3 \mathrm{~cm}, B X=5.5 \mathrm{~cm}$ and $C D=16.6 \mathrm{~cm}$.

Calculate the length of $C X$.

$$
\begin{aligned}
& \text { For similar triangles } C D / A B=C X / B X \\
& 16.6 / 8.3=C X / 5.5 \\
& C X=(16.6 \times 5.5) / 8.3 \\
& C X=11
\end{aligned}
$$

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# Summary of Comments on IGCSE Mathematics Paper 1 June 2003 

## Page: 2

Q1(a) It is better to work out $7.1^{3}+2.9^{3}$ first on the calculator but leave the answer on the calculator. Then do $\sqrt{ }$ ANS $=$ Beware of working out $\left(\sqrt{ } 7.1^{3}\right)+2.9^{3}$

Q1(b) Cut off after the second figure from the decimal point. (If the third figure is 5 or above increase the second figure by 1) Do not confuse with 2 significant figures, which would be 20 .

Q2(a) The answer could be observed from the diagram or done as a calculation with directed numbers as shown.

Q2(b) Using the calculator and set -2.5 , add 1.6. Be careful to add rather than subtract.

Q3(a) Alternatively all could be changed into decimals or percentages but they need to be in the same form to compare. The original forms should be in the answer space.

Q3(b) Make sure that the fraction is fully cancelled and not just to $\frac{34}{50}$.

## Page: 3

Q4 To divide an amount in a given ratio always add the numbers in the ratio and divide into the total amount.
Be careful not to do the common error of working out $72 \div 7$ or even $72 \div 5$.

Q5 Alternatively an increase of $42 \%$ means the new population will be $142 \%$ of the original.
Finding $142 \div 100 \times 550000$ will lead directly to the correct answer.

Q6 Remember to subtract the $\$ 2.40$ first. Then take care not to divide instead of multiply by 3.75 .
Check if the answer is sensible. Should the amount in riyals be more or less than the dollars?

Q7 The rule is $x^{-n}=1 / x^{n}$. Using the calculator sequence $[1.5]\left[y^{x}\right][+/-][2][=]$ gives $0.44444 \ldots$, which would earn 1 mark but still needs changing into a fraction.

Q8(a) Show the calculation before working out on the calculator. Careful use of the calculator will eliminate the problem of handling negative quantities. [4][x][+/-][3][x][2][-][3][x][2][=]

Q8(b) Look for the common factor, $v$, and put it outside the bracket. Check the factorising by expanding the answer to get back to the original expression.

## Page: 4

Q9 Expand the bracket, then add $3 x$ to both sides and subtract 4 from both sides. Finally divide by 4.
Take care not to follow $4 x=2$ by $x=2$.

Q10(a) $1 \mathrm{~kg}=1000 \mathrm{~g}$. Take care to divide by 500000 and not do $500000 \div 2000$ (or 2). Division can result in answers that are less than 1.

Q10(b) Standard form is $a \times 10^{n}$. ' $a$ ' is always from 1 to any value less than 10. ' $n$ ' is a whole number, positive for large values (greater than 10) and negative for small values (less than 1).

Q11 Alternatively multiply the second equation by 3 and subtract to eliminate ' $a$ '. Check the answers by substituting them into the other equation to see if they give the correct value.

$$
a-2 b=5 \text { gives } 3-2 \times(-1)=3+2=5
$$

## Page: 5

Q12(a) As it is a whole number asked for do not write 88.0 as this would indicate rounding to 1 decimal place.

Q12(b) Do not be tempted to put the upper limit as 86.4 or 86.49 or even 86.49999...The < rather than $\leq$ sign allows the upper limit to be the halfway value without the confusion of rounding up.

Q13(a) In a 24-hour clock time do not include the words hours or minutes. It can be written as 8.05 pm but why do extra work which is easy to get wrong?

Q13(b) Average speed $=$ Total distance $\div$ Total time
Usually part (i) leads onto part (ii) but alternatively part (ii) could be done by working out $30 \div 1.25$
A very common error is to think that there are 100 minutes in 1 hour!

## Page: 6

Q14(a) To add fractions they must have a common denominator. Then just add the numerators. Very clear step-by-step working is essential when the answer is given.

Q14(b) Multiplying of fractions can only be done with the mixed number written as an improper fraction. Then multiply the numerators and multiply the denominators. Change back to a mixed number and cancel if necessary.

Q15(a)(i) The half is often missed out in the area of the triangle formula.
(ii) A square has equal sides, so the area is the side multiplied by itself. (Not the side multiplied by 4 which gives the perimeter).

Q15(b) Square-based pyramid is correct but only 1 mark so pyramid is adequate.

## Page: 7

Q16(a) Angle in a semicircle is a right angle. Drawings are usually not to scale if calculations are asked for. In those cases do not measure any angles; they will be wrong. This triangle may look close to isosceles but do not be deceived.

Q16(b) Make sure your calculator is set in degree mode, not rads or grads.
Trig ratios must be learned, they are not given.

Q16(c) Remember to halve the diameter to find the radius, which is essential for area.
If the accuracy is not specified give three significant figures. More will not be penalised but less may well be.

## Page: 8

Q17(a) Use Pythagoras to find the longest side so square and add. Keep the value from squaring and adding in the calculator for finding the square root.

Q17(b) Bearings are measured from the north in a clockwise direction. Hence Q from P must be $180^{\circ}$ added to angle QPR.
QPR can be calculated using sine or cosine once $P Q$ is known but safer to use the values given rather than the one worked in part (a).

## Page: 9

Q18(a)(i) Alternate angles (angles enclosed in a letter $z$ ) are equal
(ii) $180-(120+35)$ from angles sum of triangle and angle AXB $=$ $120^{\circ}$ (opposite angles)

Q18(b) Triangles the same shape (equal angles) but different size are similar.
Do not confuse with congruent which is identical in shape and size.

Q18(c) This can also be done by the sine rule for triangles without right angles but that is not in the core level syllabus.

