

Rewarding Learning

## General Certificate of Secondary Education

January 2011

## Mathematics



Module N6 Paper 1
(Non-calculator)

## Higher Tier

[GMN61]
FRIDAY 14 JANUARY 2011
$9.15 \mathrm{am}-10.30 \mathrm{am}$

## TIME

1 hour 15 minutes.

## INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer all fifteen questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You must not use a calculator for this paper.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 56 .
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You should have a ruler, compasses, set-square and protractor.
The Formula Sheet is on page 2.
$\square$

6510

| For Examiner's <br> use only |  |
| :---: | :---: |
| Question <br> Number | Marks |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |
| 11 |  |
| 12 |  |
| 13 |  |
| 14 |  |
| 15 |  |
| Total <br> Marks |  |

## Formula Sheet

Area of trapezium $=\frac{1}{2}(a+b) h$


Volume of prism $=$ area of cross section $\times$ length


## In any triangle $A B C$

Area of triangle $=\frac{1}{2} a b \sin C$
Sine rule: $\quad \frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$
Cosine rule: $a^{2}=b^{2}+c^{2}-2 b c \cos A$


Volume of sphere $=\frac{4}{3} \pi r^{3}$
Surface area of sphere $=4 \pi r^{2}$


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


## Quadratic equation:

The solutions of $a x^{2}+b x+c=0$, where $a \neq 0$, are given by
$x=\frac{-b \pm \sqrt{b^{2}-4 a c}}{2 a}$
$1 \quad E=\frac{2 A+5}{D-1} \quad$ Find the value of $E$ when $A=20$ and $D=-9$
$\qquad$

2 (a) Three solids are shown below.


A


B


C
(i) Which solid has exactly 2 planes of symmetry?

Answer $\qquad$
(ii) How many planes of symmetry has solid $\mathbf{A}$ ?

Answer $\qquad$
(b) A cross-section of solid $\mathbf{C}$ is drawn below.


Calculate the area of the cross-section.

Answer $\qquad$ $\mathrm{cm}^{2}$

3300 people each buy a ticket for a prize draw.
Each ticket costs 5p.
The probability of winning a prize of $£ 3$ is $\frac{1}{100}$ and the probability of winning a prize of 30 p is $\frac{1}{20}$. No other prizes can be won.

How much profit will the ticket seller make on the game?

Answer

4 Rewrite $5-x=3+y$ to make $x$ the subject.
Write the answer in its simplest form.

$$
\text { Answer } x=
$$

5 (a) Estimate the answer to $\frac{4.7 \times 20.1}{5.6-1.8}$
(b) Find the reciprocal of 2.2

Answer $\qquad$
(c) Given that $4.67 \times 634=2960.78$, find the value of
(i) $46.7 \times 0.634$

Answer $\qquad$
(ii) $296.078 \div 6340$

Answer $\qquad$

6 (a)

(i) Reflect triangle $\mathbf{A}$ in the line $y=1$. Label the new triangle $\mathbf{B}$.
(ii) Draw the image of $\mathbf{A}$ under a translation of $\binom{-2}{3}$.
Label the new triangle $\mathbf{C}$.
$\qquad$
(b) Describe fully the single transformation which maps kite $\mathbf{P}$ onto kite $\mathbf{Q}$.


Answer $\qquad$

7 Calculate the probability of getting a tail on tossing a coin and at the same time throwing an odd number on a dice.

Answer $\qquad$

8 (a) Simplify
(i) $m^{7} \div m^{3}$

Answer $\qquad$
(ii) $a^{5} \times a^{4}$

Answer
(iii) $\left(p^{6}\right)^{2}$

Answer
(b) Two numbers $a$ and $b$ are prime numbers.

By giving an example, show that the value for $a^{2}-b^{2}$ is not always even.

Answer
(c) Complete the identity

$$
(x+3)^{2} \equiv x^{2}+\ldots+9
$$



Only one of the following formulae could be used to calculate the volume of this egg.

$$
V=\frac{1}{6} \pi L W \quad V=\frac{1}{6} \pi(L+W) \quad V=\frac{1}{6} \pi L W^{2} \quad V=\frac{1}{6} \pi L^{2} W^{2}
$$

Which formula is correct? Explain your answer.

Formula $V=$ $\qquad$ because $\qquad$
$\qquad$

10 Solve the inequality $\quad 5 n-3 \geq 2 n-8$

Answer

11 The probability that Peter goes to school by car on any school day is 0.6 If he goes by car then the probability that he is late is 0.1
If he doesn't go to school by car then the probability that he is late is 0.4
(a) Use this information to complete the tree diagram below.

(b) Calculate the probability that on any school day Peter will be late for school.

Answer $\qquad$

12 (a) Express $\frac{1}{7}$ as a recurring decimal.

Answer
(b) Given that $p=\sqrt{5}$ and $q=\sqrt{20}$,
(i) find the value of $p^{2}$,

Answer $\qquad$ [1]
(ii) show that $(p+q)^{2}=45$.

13 Rearrange $t x+t c=c^{2}-c x$ to make $x$ the subject.
$\qquad$

14 A bag contains 6 red, 3 green and 3 yellow beads. Two beads are selected at random from the bag without replacement. Calculate the probability that both beads are red.

Answer

15 The diagram shows a quadrilateral OPQR .
$\overrightarrow{\mathrm{OR}}=\mathbf{a}$ and $\overrightarrow{\mathrm{OP}}=\mathbf{b}$
T is a point on OQ such that $\overrightarrow{\mathrm{OT}}=\frac{1}{3} \overrightarrow{\mathrm{OQ}}$
$\overrightarrow{P Q}=2 \overrightarrow{O R}$


What is the ratio PT : TR?
Show all your working.
$\qquad$

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