

First Name	
Last Name	
Date	
Total Marks	/ 100 marks

MathsMadeEasy

GCSE Mathematics
Calculator
Higher Tier
Free Practice Set 3
1 hour 45 minutes



Answers at:

<http://www.mathsmadeeasy.co.uk/gcsemathspapers-free.htm>

Instructions

Write your name and other details in the boxes above.

Answer all the questions

Take π to be 3.142

Information

Marks are shown in brackets for each question (2)

Calculators may be used

Advice

Don't spend too long on one question

Show all your working in calculations for full marks

You will get marks for method even if your answer is incorrect

Leave a question until later if you cannot answer it

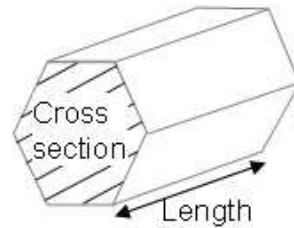
Materials needed for examination

Ruler marked in centimetres and millimetres,
protractor, compasses, pen, pencil, rubber
Tracing paper may be used

Dedicated to my Mother-in Law, Kath (1915-2008)

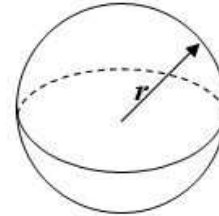
Formulae sheet — Higher tier

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



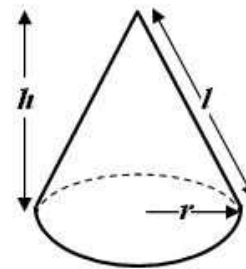
Volume of sphere = $\frac{4}{3} \pi r^3$

Surface area of sphere = $4\pi r^2$



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

Curved surface area of cone = $\pi r l$

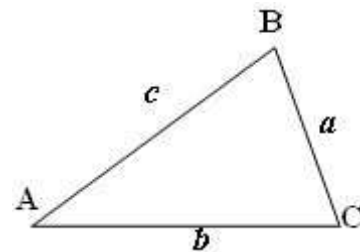


In any triangle ABC

Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$

Area of a triangle = $\frac{1}{2} ab \sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Authors Note

Every possible effort has been made to ensure that everything in this paper is accurate and the author cannot accept responsibility for any errors.

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Question	Type of question	Marks
1	Prime Factor tree - LCM	4
2	3-D co-ordinates and Pythagoras	5
3	Money calculation	3
4	Ratios, Compound Interest	5
5	Probability	4
6	Trial and Improvement	4
7	Algebra expand, factorise, substitution, dots	8
8	Algebra – perimeter of shape, quadratic	5
9	Calculation – reverse sale price	3
10	Sequence	3
11	Trigonometry	3
12	Exponents/powers	5
13	Simultaneous equations	2
14	Surds	3
15	Cosine rule. speed, area triangle	6
16	Bounds	6
17	Simultaneous equations by plotting	3
18	Circle theorem	5
19	Rational Equations	4
20	Histogram	4
21	Quadratic equation	4
22	Volumes – cone, density	5
23	Cone volume	4
24	Area of Sector	2

Answer ALL questions.

**Write your answers in the spaces provided.
Do NOT use a Calculator**

You must write down all stages in your working.

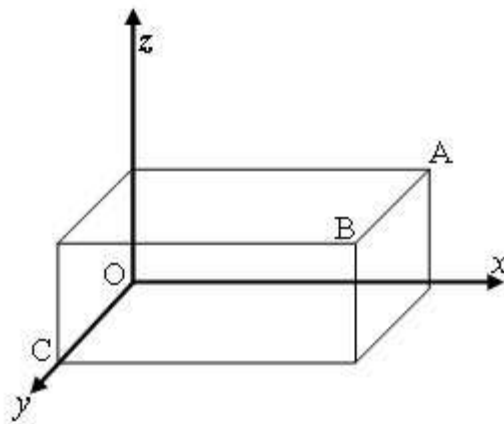
1. a) Draw a prime factor tree for 168 and 40

(2)

b) Using your prime factor tree or otherwise work out the Lowest Common Multiple for 168 and 40

.....
(2)

2. A cuboid lies on the co-ordinate axes.



Distances in cm
Not drawn accurately

The point B has co-ordinates (7, 3, 4)

a) What are the co-ordinates of the point A

.....
(1)

b) What are the co-ordinates of the point C

.....
(1)

c) What is the distance between A and C correct to 1 decimal place

.....cm
(3)

3. Jane paid £10.56 for five mp3 downloads and two CDs
If six mp3 downloads cost £7.68 how much is it for one CD.

.....
(3)

4. a) Kath gives her three grandchildren, Laura, Matthew and Nathan £1000 in the ratio of 1:2:5.
How much does Nathan get?

£.....
(2)

- b) Kath invests the rest of her money, in the Bank.
She gets 3.6% compound interest per year on £4000.
How much will she have after 2 years.

£.....
(3)

5. There are 21 coloured buttons in a bag

- 6 buttons are blue
- 10 buttons are green
- 4 buttons are red.
- 1 black button

If you take two buttons at random from the bag *without replacement*

What is the probability that you pick

a) Two red buttons

.....
(2)

b) A blue button and a green button

.....
(2)

6. The equation

$$x^3 - 7x = 4$$

Has a solution between 2 and 3.

Using trial and improvement find the solution to 1 decimal place.

Show all your working.

$$x = \dots\dots\dots$$

(4)

7. a) Factorise $2y^2 + 4y$

.....
(1)

b) Expand $6x(x^2 - 2y)$

.....
(1)

c) Factorise $y^2 - 4y - 21$

.....
(2)

d) $c = 1.2(a - b^2)$

Find the value of c when $a = 3$ and $b = 4$

$c =$
(2)

e) Factorise fully $4y^2 - 4$

.....
(2)

8.

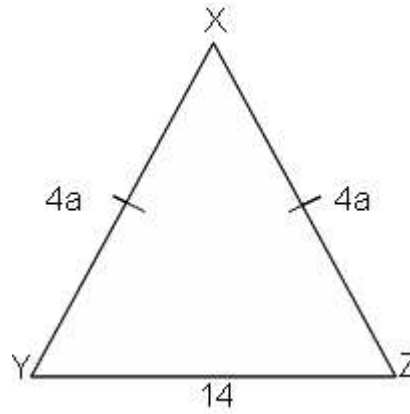


Diagram NOT
drawn accurately

In the diagram, above shows an isosceles triangle XYZ with measurements in centimetres.
 $XY = 4a$
 $XZ = 4a$
 $YZ = 14$

a) Find an expression in terms of a , for the *Perimeter* of the triangle in its simplest form

.....
(2)

b) If the perimeter of the triangle is a^2 , calculate a , correct to 1 decimal point.

.....
(3)

9. Laura paid £78 for an mp3 player in a sale with 35% off the original price. How much was the mp3 player originally?

Sale
35% off original price

10. The first four terms in a sequence are:

.....
(3)

a)

-3 1 5 9

Write an expression for the nth term of the sequence

.....
(1)

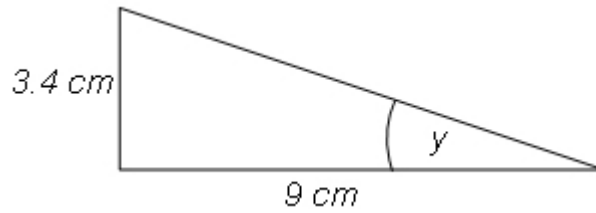
b)

3 6 11 18

Write an expression for the nth term of the sequence

.....
(2)

11.



What is the size of angle y in this triangle?
Give your answer to 3 significant figures.

.....⁰
(3)

12. a) Simplify 2^0

.....
(1)

b) Simplify 2^{-3}

.....
(1)

c) Simplify $(27)^{\frac{2}{3}}$

.....
(2)

d) Simplify $2^{\frac{1}{2}} \times 2^{\frac{3}{2}}$

.....
(1)

13. Solve the simultaneous equations

$$\begin{aligned}6x - 4y &= 21 \\12x + 12y &= 12\end{aligned}$$

$x = \dots\dots\dots$

$y = \dots\dots\dots$

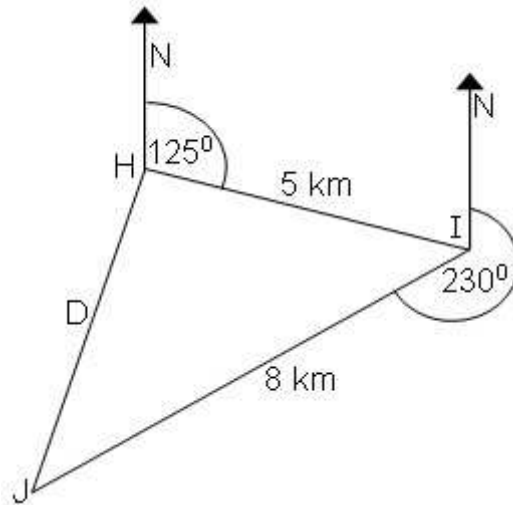
(2)

14. Express $\frac{5}{3 + \sqrt{8}}$ in the form $a + b\sqrt{2}$

$\dots\dots\dots$

(3)

15. A man starts at home H and runs for 5 km on a bearing of 125° to I
 He then runs for 8 km on a bearing of 230° for 8km to J
 He then runs home in a total time of 1 hour and nine minutes.



- a) Work out how far away (D) from home he is, correct to one decimal place

.....km
 (2)

- b) Calculate his average speed in km per hour to one decimal place.

.....km/hr
 (2)

- c) Calculate the area of the triangle HIJ
Give your answer correct to three significant figures.

.....km²
(2)

16. Cyril walks 50 metres in a time of 35.6 seconds

The distance of 50 metres was measured to the nearest metre.
The time of 35.6 seconds was measured to the nearest tenth of a second.

- a) What is the upper bound for the distance of 50 metres

..... m
(1)

- b) What is the lower bound for the time of 35.6 seconds

.....seconds
(1)

- c) Calculate the upper bound for Cyril's average speed
Show all the figures on your calculator display

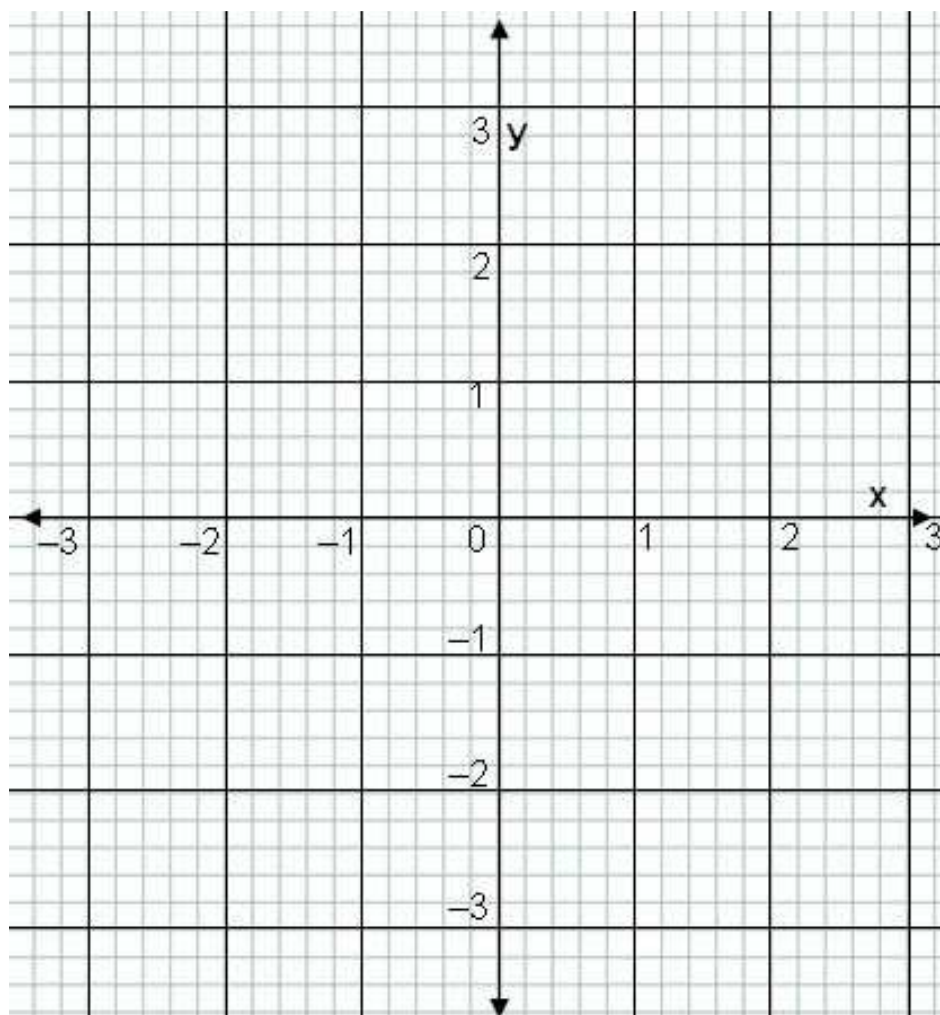
.....metres per second
(2)

- d) Calculate the lower bound for Cyril's average speed
Show all the figures on your calculator display

.....metres per second
(2)

17. Draw the graphs for these simultaneous equations and use them to find the solutions

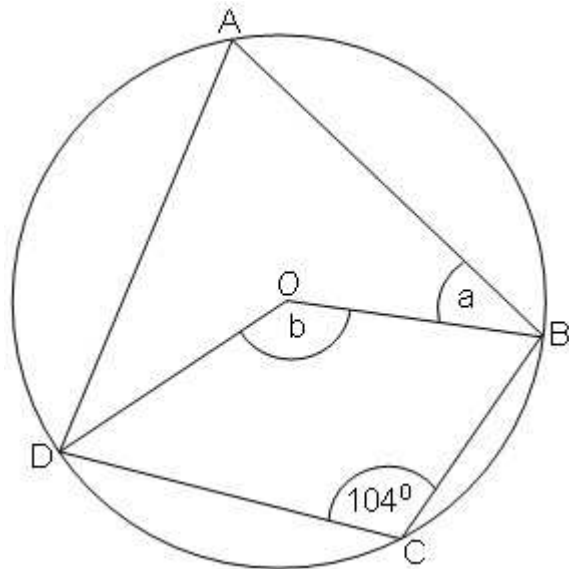
$$\begin{aligned}x^2 + y^2 &= 4 \\ y &= 2x + 1\end{aligned}$$



x..... and

y.....and
(3)

18. In the diagram O is the centre of the circle and $DCB = 104^\circ$
The shape ABOD is symmetrical



- a) Work out the value of angle b

.....⁰
(2)

- b) Explain how you got your answer

.....
.....
(1)

- c) Work out the value of angle a

.....⁰
(2)

19.

a) Solve the equation

$$\frac{x}{3} + \frac{2x}{4} = 5$$

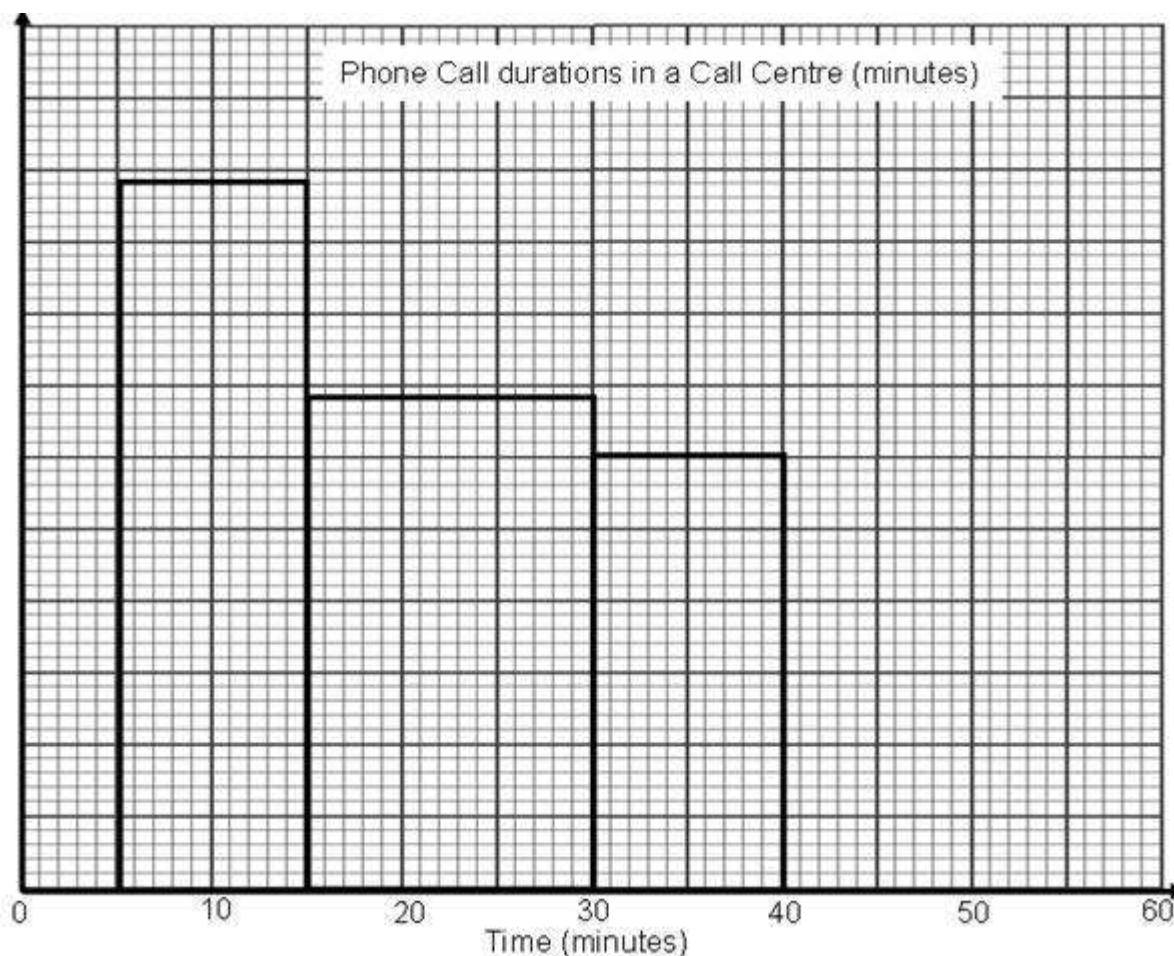
.....
(2)

b) Solve the equation

$$\frac{2x}{x-3} + \frac{4}{x+1} = 1$$

.....
(3)

20. The table and histogram show information about the time of phone calls in a Call centre.



a) Use the histogram to complete the table

(2)

Time (t minutes)	Frequency
$0 < t \leq 5$	28
$5 < t \leq 15$	49
$15 < t \leq 30$	
$30 < t \leq 40$	
$45 < t \leq 60$	18

b) Use the table to complete the histogram

(2)

21 a) Factorise $4x^2 - 23x + 15$

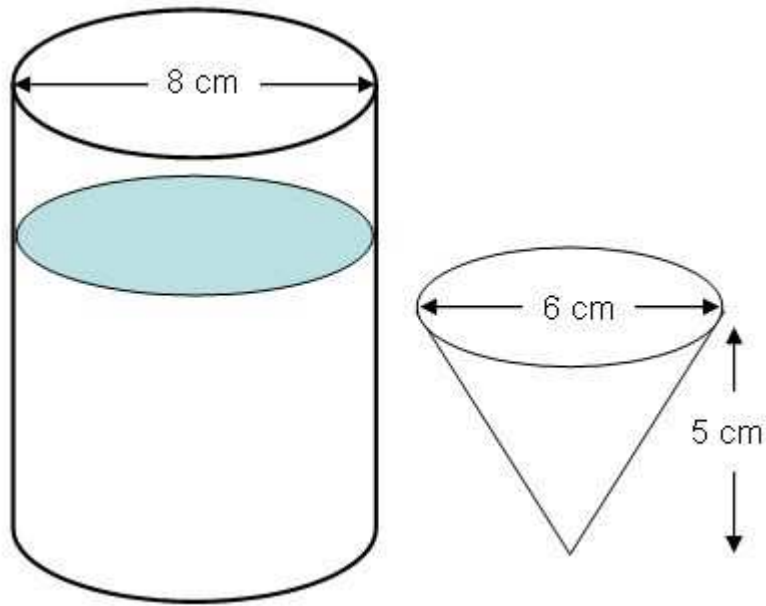
.....
(3)

b) Hence or otherwise solve $4x^2 - 23x + 15 = 0$

$x = \dots\dots\dots$ Or $x = \dots\dots\dots$

(1)

22.



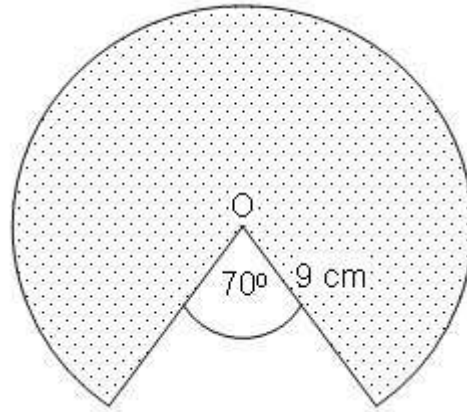
A cone with base diameter of 6cm and height 5cm is dropped into a cylinder of diameter 8 cm part filled with water.
Calculate the increase in the height of the water in the cylinder.
Leave your answer as a fraction in its simplest form.

.....
(3)

The density of water is 1 gram per cm^3 .
Calculate the mass of the water displaced by the cone.
Leave your answer in terms of π

.....
(2)

24.



A circular pizza with a radius of 9 cm has a slice of angle 70° removed. Calculate the area of the remaining pizza to 3 significant figures.

.....cm²
(2)

TOTAL FOR PAPER: 100 MARKS
END