

First Name	
Last Name	
Date	
Total Marks	/ 100 marks

MathsMadeEasy

GCSE Mathematics
Calculator
Higher Tier
Free Practice Set 6
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

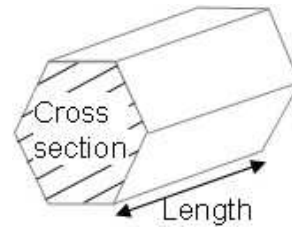
Don't spend too long on one question
Show all your working in calculations for full marks
You will get marks for method even if your answer is incorrect
Leave a question until later if you cannot answer it

Materials needed for examination

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

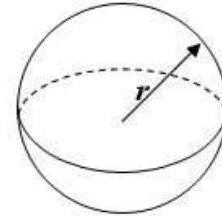
Formulae sheet — Higher tier

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



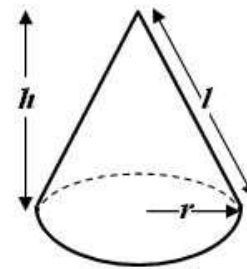
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

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

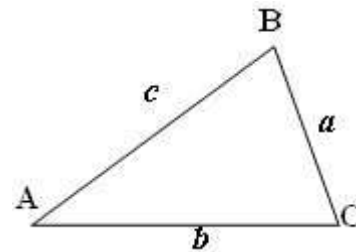


In any triangle ABC

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.

Apart from any fair dealing for the purposes of research or private study as permitted under the Copyright, Designs and Patents Act 1988, this paper may only be reproduced, stored or transmitted in any form or by any means with the prior permission in writing of the author, or in the case of reprographic reproduction in accordance with the terms and licence by the CLA. Enquiries concerning reproduction outside these terms should be sent to the author.

The right of David Weeks to be identified as the author of this work has been asserted by him in accordance with the Copyright, Designs and Patents Act 1988.

Question	Type of question	Marks
1	Algebra – simplify, expand, factorise	11
2	Shapes - Perimeter	4
3	Number calculation	3
4	Trial and Improvement	4
5	Trigonometry	2
6	Money calculation/ conversion/ units	8
7	Prime number tree, LCM, HCF	6
8	Table & Pie Chart	4
9	3D Pythagoras	3
10	Equation circle, co-ordinates	5
11	Best buy calculation	2
12	Sequence	2
13	Box plot	4
14	Exponents/powers	4
15	Calculation of mean	3
16	Cosine rule	3
17	Circle theorem	5
18	Quadratic formula	3
19	Compound interest	3
20	Probability	4
21	Proof Congruence	2
22	Volumes – cuboid, sphere, cylinder	5
23	Bounds	3
24	Surds	7

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. a) Expand and Simplify $(y + 7)(y + 3)$

.....
(2)

b) Simplify $2a^2 \times a$

.....
(1)

c) Factorise $y^2 - 8y - 48$

.....
(2)

d) Simplify $\frac{16 a^2 b^3 c^4 d^2}{4 a b^3 c^5 d}$

.....
(2)

e) Simplify $(3 a^2)^4$

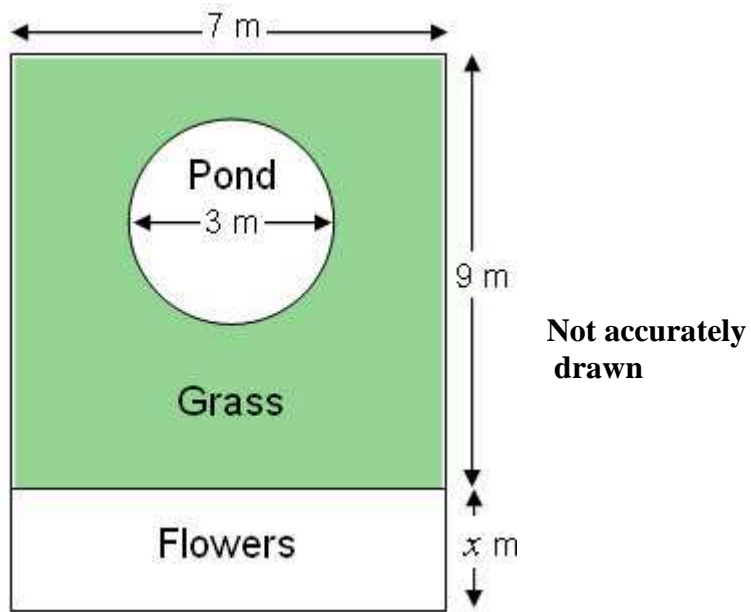
.....
(2)

f) $x = 5.1(a^2 - b^2)$

Find the value of x when $a = 6$ and $b = 7$

$x =$
(2)

2. The diagram below shows a plan of a rectangular garden with measurements in metres. There is a circular pond and an area for flowers.



- a) Work out the area of the circular pond to 2 decimal places

.....
(1)

- b) Express the perimeter of the garden in terms of x .
Give your answer in its simplest form.

.....
(1)

- c) The perimeter of the garden is 40 metres.
Find the value of x .

$x =$
(2)

3. Laura bought 25 cups and 8 plates.
The total cost was £35.07.
Each plate cost £1.79.
Find the cost of each cup.



£
(3)

4. The equation

$$x^3 - 4x = 9$$

has a solution between 2 and 3

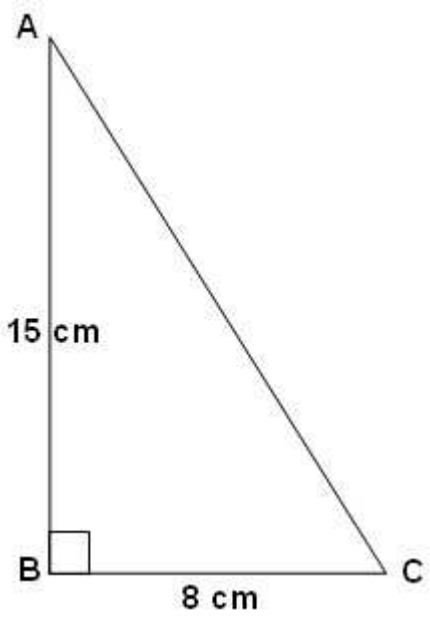
Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.

$x = \dots\dots\dots$ (4)

5. ABC is a right angled triangle with side AB = 15 and side BC = 8 cm



a) Work out the angle BAC. Give your answer to 1 decimal place.

.....⁰
(2)

6. Zack went to Zambia.

He changed £250 into Zambian Kwacha (ZMK)
The exchange rate was £1 = ZMK 7280

a) How many Zambian Kwacha will he get?

ZMK.....
(2)

When he came home she changed 152,750 ZMK back to pounds
The exchange rate was now £1 = ZMK 7380

b) How many pounds did he get?
Give your answer to the nearest pence.

£.....
(2)

c) Before 1971 the UK currency was in pounds, shillings and pennies (£ s d)

1 shilling = 12 pennies
1 pound = 20 shillings.

Convert 268 pennies into pounds, shillings and old pence.

poundsshillingspennies... ..
(2)

d) Convert 2.1 m^3 to cm^3

.....
(2)

7. a) Draw a prime number tree for 112 and 70

b) Using your prime factor tree or otherwise work out the Highest Common Factor for 112 and 70 (2)

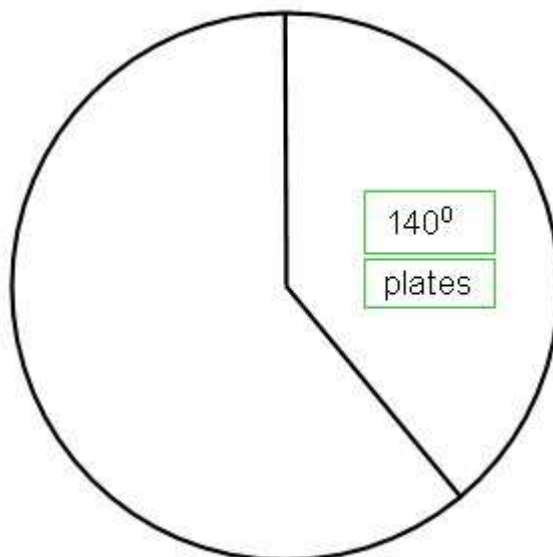
.....
c) Using your prime factor tree or otherwise work out the Lowest Common Multiple for 112 and 70 (2)

.....
(2)

8. Laura recorded the types of tableware she had in her crockery business. She had 90 items.

Tableware	Frequency	Angle
Plates	35	140
Cups & saucers	30	
Milk Jugs		44
Sugar bowls	14	

- a) Complete the table above (2)
- b) Draw an accurate pie chart to show this information. The first one has been done for you.

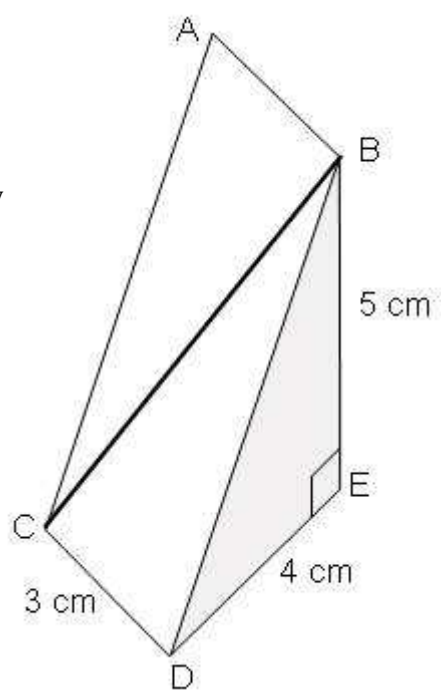


(2)

9. A cuboid is cut through four of its vertices, A, B, C and D, into two identical pieces.

The diagram below shows one of the pieces.

Not drawn
Accurately



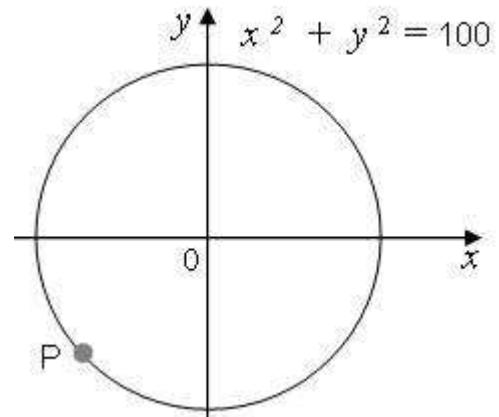
Find the length of the line **BC** to one decimal place

.....cm
(3)

10. The diagram shows a circle with centre (0, 0)

The circle has the equation:

$$x^2 + y^2 = 100$$



a) There are two points on the circumference of the circle with an **x-coordinate of 8**

What are the coordinates of these two points.

(8,) and (8,)
(2)

b) What is the **radius** of the circle?

.....
(1)

c) Point P is on the circumference of the circle.

Its **x-coordinate** is **equal** to its **y-coordinate**.

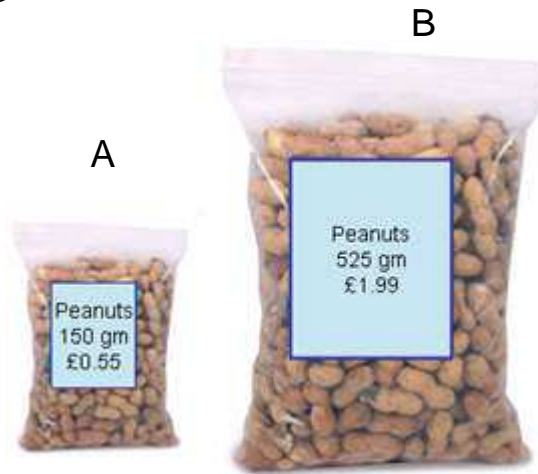
What are the coordinates of point P, correct to **1 decimal place**?

P (.....,)
(2)

11. Peanuts comes in small bags and large bags.

A small bag of 150 grams costs £0.55

A large bag of 525 grams costs £1.99



Which bag is better value for money?

You **must** show working to explain your answer.

.....
(2)

12. a) The n th term for a sequence is given by

$$\frac{3n^2 - 3n + 6}{2}$$

What is the 5th term of this sequence?

.....
(1)

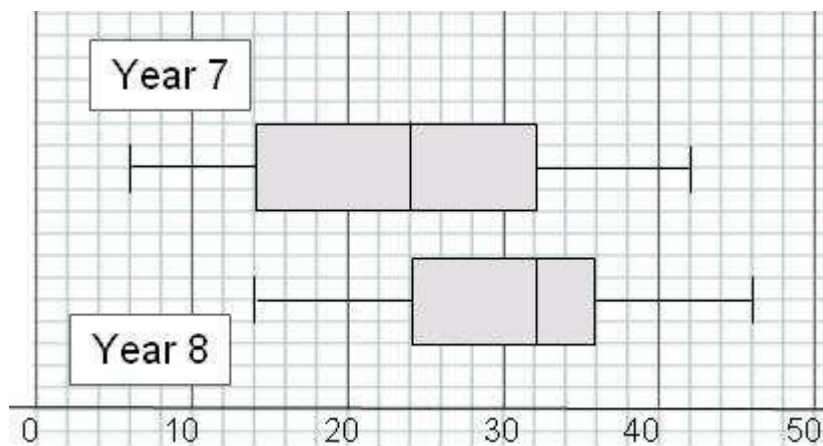
- b) The first four terms in a sequence are:

$$-1 \quad -4 \quad -7 \quad -10$$

Write an expression for the n th term of the sequence

.....
(1)

13. The box plots below show the marks in a test for pupils in Year 7 and Year 8.



a) What is the median value for year 7?

.....
(1)

b) What is the inter quartile range for year 8?

.....
(1)

c) In year 7 there were 124 students.
How many students got 32 marks or more in year 7?

.....
(2)

14. a) Simplify 4^0

.....
(1)

b) Simplify 4^{-4}

.....
(1)

c) Simplify $(16)^{\frac{3}{4}}$

.....
(2)

15. 120 batteries were tested to see how long they lasted.

The table below shows how long in hours the batteries lasted.

Time (t hours)	Frequency	
$0 < t \leq 6$	1	
$6 < t \leq 12$	12	
$12 < t \leq 18$	32	
$18 < t \leq 24$	52	
$24 < t \leq 30$	19	
$30 < t \leq 36$	4	

a) Work out an estimate for the mean time in hours that a battery lasts

.....hours
(3)

16.

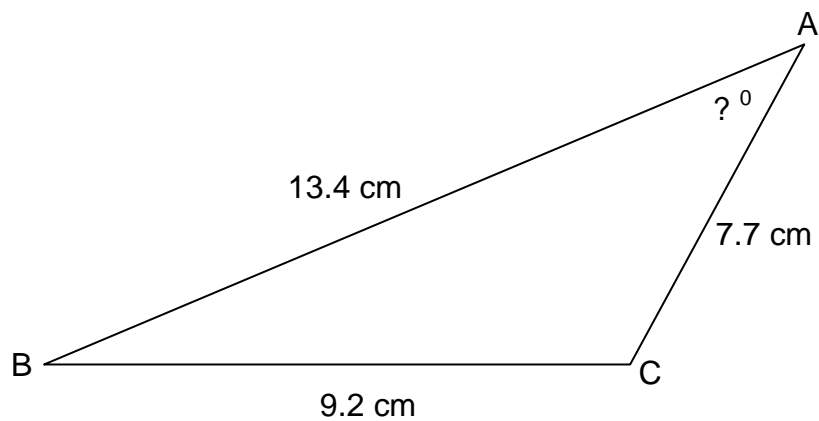


Diagram **NOT**
drawn accurately

ABC is a triangle

$AC = 7.7$ cm

$AB = 13.4$ cm

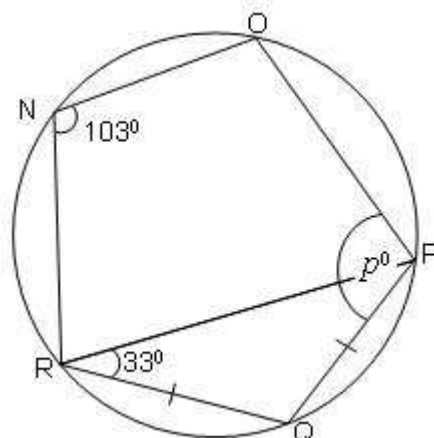
$BC = 9.2$ cm

Calculate angle BAC of the triangle.

Give your answer correct to 1 decimal place.

.....⁰
(3)

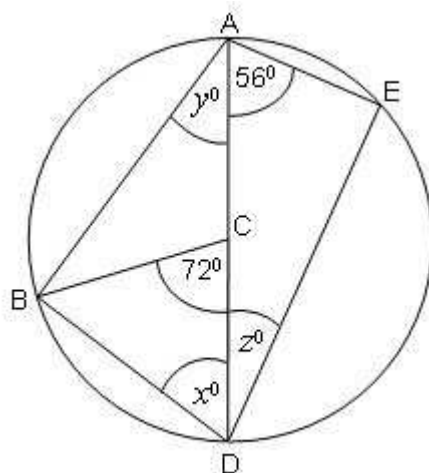
17. a) A five sided shape NOPQR is shown inside a circle.
 $\text{ONR} = 103^\circ$
 $\text{PRQ} = 33^\circ$



Work out the value of angle OPQ (p)

.....⁰
(2)

- b) A four sided shape ABDE is shown inside a circle.
 C is the centre of the circle.
 $\text{BCD} = 72^\circ$
 $\text{DAE} = 56^\circ$



Work out the value of angle x, y and z

$x = \dots\dots\dots y = \dots\dots\dots z = \dots\dots\dots$ ⁰
(3)

18. Solve $x^2 + 8x - 7 = 0$ using the quadratic formula

Give your answer correct to 2 significant figures

$x = \dots\dots\dots$ or $x = \dots\dots\dots$
(3)

19. The activity of a radioisotope falls by 2% every year. If the initial activity is 5,000 counts per minute what will it be after one hundred years?

Give your answer to 3 significant figures

$\dots\dots\dots$ counts
(3)

20. There are 10 coloured buttons in a bag

- 1 buttons is white
- 3 buttons are green
- 6 buttons are red.

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

What is the probability that you pick

a) Three red buttons

.....
(2)

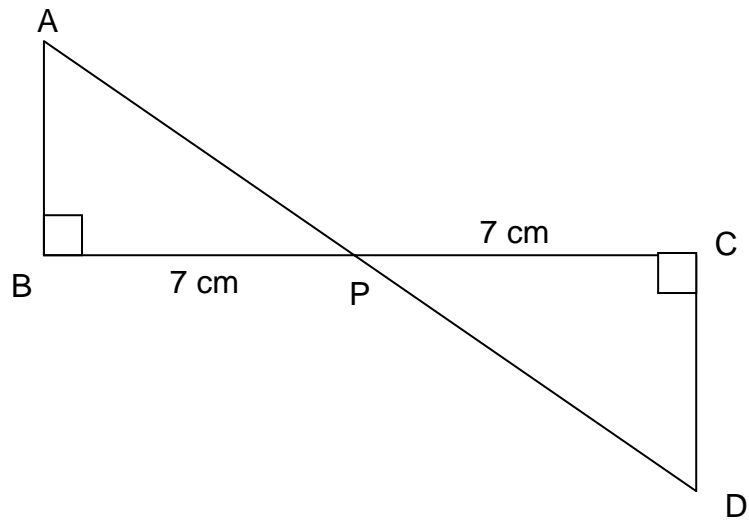
b) Another bag has 2 white, 3 green and 6 red buttons.

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

What is the probability that you pick *No white* buttons

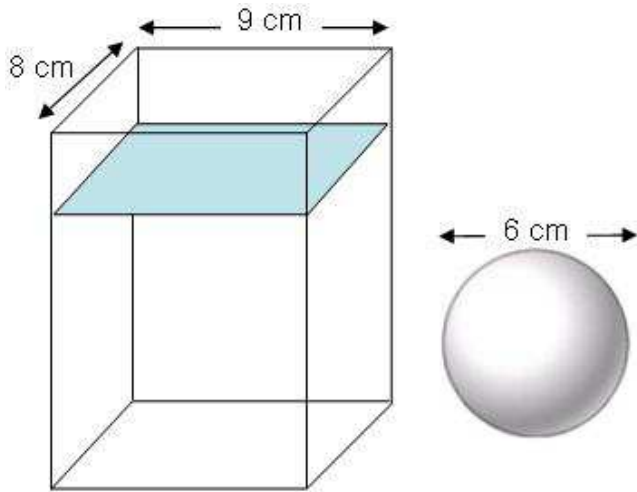
.....
(2)

21. Prove that triangle BAP is congruent to triangle CDP.



(2)

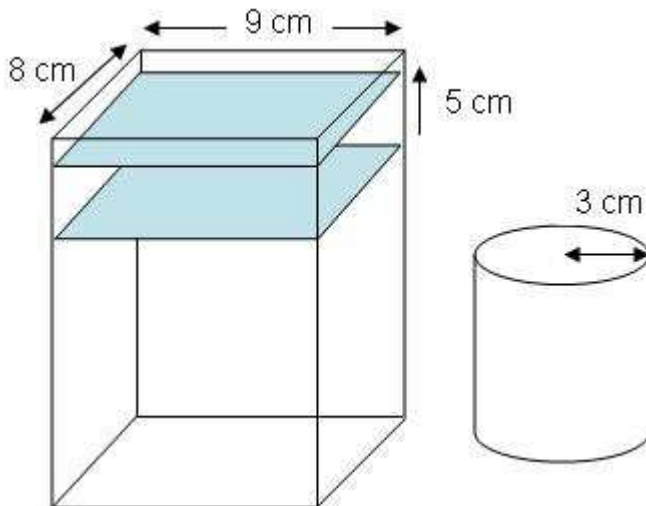
22. A sphere diameter of 6cm is dropped into a cuboid of width 8 cm and length 9 cm part filled with water.
 Calculate the *increase* in the height h of the water in the cuboid
 Leave your answer in terms of π .



Not drawn accurately

.....
 (3)

The sphere was removed and a cylinder of radius 3cm was dropped into the cuboid.
 The depth of water in the cuboid increased by 5 cm.
 Calculate the *height of the cylinder*. Leave your answer in terms of π .



Not drawn accurately

.....
 (2)

23. The resistance of an electrical component is given by:

$$\text{Resistance } R = \frac{\text{Voltage } V}{\text{Current } I}$$

The voltage $V = 34.4$ to three significant figures

The current $I = 2.5$ to one decimal place.

a) What is the upper bound for the voltage V

.....
(1)

b) Calculate the lower bound for the resistance R
Show all the figures on your calculator display

.....
(2)

24. Simplify the following, giving each answer in the form $a\sqrt{6}$

i) $4\sqrt{12} \times \sqrt{2}$

.....
(2)

ii) $\sqrt{600} + \sqrt{150}$

.....
(2)

iii) Express $\frac{26}{5 - \sqrt{12}}$ in the form $a + b\sqrt{3}$

.....
(3)

TOTAL FOR PAPER: 100 MARKS
END