

## Practice Examination

### GCSE Mathematics

### Higher Tier

### Non-calculator paper

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Name .....

Class .....

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#### TIME ALLOWED

1 hour 30 minutes

#### INSTRUCTIONS TO CANDIDATES

- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- You are **NOT** permitted to use a calculator in this paper.
- Do all rough work in this book.

#### INFORMATION FOR CANDIDATES

- The number of marks is given in brackets at the end of each question or part question on the Question Paper.
- You are reminded of the need for clear presentation in your answers.
- The total number of marks for this paper is **80**.
- All the questions on this paper have been chosen to be “non-calculator” questions. In this respect, the topics it includes may not fully reflect the balance or mix of topics tested on a typical paper.

Question	Mark	out of
1		1
2		1
3		1
4		1
5		3
6		5
7		3
8		3
9		4
10		3
11		2
12		6
13		3
14		2
15		3
16		4
17		3
18		4
19		3
20		3
21		5
22		4
23		4
24		5
25		4
Total		80

Answer **all** questions in the spaces provided

1  $p = 2q.$

What is the ratio  $3p : q$  in its simplest form?

Circle your answer.

[1 mark]

3 : 2

1 : 2

6 : 1

3 : 1

2 Which of the following is **not** equivalent to a recurring decimal ?

Circle your answer.

[1 mark]

$\frac{14}{15}$

$\frac{24}{25}$

$\frac{34}{35}$

$\frac{44}{45}$

3 Which of the following is a solution of the equation  $x^4 = 9$  ?

Circle your answer.

[1 mark]

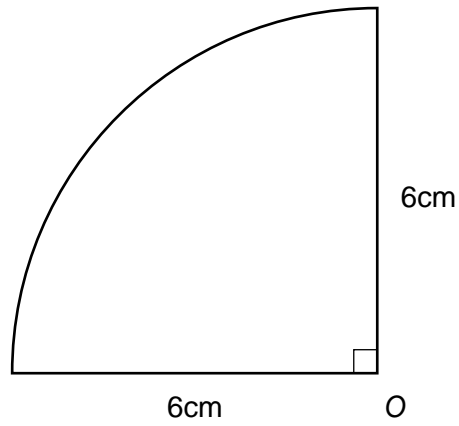
1

$\sqrt{3}$

$2\frac{1}{4}$

3

4



The diagram shows a sector of a circle with centre  $O$ .

What is its area?

Circle your answer.

[1 mark]

$6\pi \text{ cm}^2$

$9\pi \text{ cm}^2$

$12\pi \text{ cm}^2$

$36\pi \text{ cm}^2$

5

Evaluate  $5\frac{1}{3} \div 3\frac{3}{7}$

Give your answer as a mixed number in its simplest form.

[3 marks]

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Answer \_\_\_\_\_

6

Chris sees these two offers for a rail ticket he wants to purchase.

**Friendly Fares**

Knutsford - Dewsbury and return

**£22.40**

plus booking fee of 5%

**Travel Savers**

Knutsford - Dewsbury and return

**£21.00**

plus booking fee of 12%

Compare the two offers.

Tick a box.

'Friendly Fares' is cheaper than 'Travel Savers'.

'Travel Savers' is cheaper than 'Friendly Fares'.

The cost for 'Friendly Fares' and 'Travel Savers' is the same.

You **must** show how you find your answer.

**[5 marks]**

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7 Obtain an estimate for the value of

$$\frac{\sqrt{167.38} + 14.92}{0.48}$$

[3 marks]

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Answer \_\_\_\_\_

8 You are told that  $248 \times 137 = 33\,976$

8 (a) Write down the value of  $339.76 \div 0.248$

[1 mark]

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Answer \_\_\_\_\_

8 (b) Find the value of  $248 \times 14.7$

[2 marks]

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Answer \_\_\_\_\_

9 The table gives information about some English counties.

Name of county	Area (in acres)
Bedfordshire	$2.98 \times 10^5$
Essex	$9.79 \times 10^5$
Norfolk	$1.23 \times 10^6$
Rutland	$9.75 \times 10^4$
Somerset	$1.02 \times 10^6$
Yorkshire	$3.69 \times 10^6$

9 (a) The area of which county is about 4 times that of Bedfordshire?

[2 marks]

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Answer \_\_\_\_\_

9 (b) The areas of which two counties are closest to each other?

[2 marks]

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Answer \_\_\_\_\_ and \_\_\_\_\_

**10** Write the number 120 as a product of prime factors.

Give your answer in index form.

**[3 marks]**

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Answer \_\_\_\_\_

**11** Find the two consecutive integers  $m$  and  $n$  that make this statement true:

$$m < \sqrt{250} < n$$

**[2 marks]**

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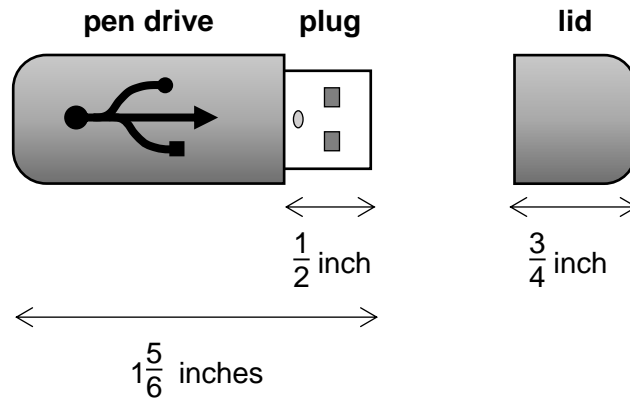
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Answer  $m =$  \_\_\_\_\_ and  $n =$  \_\_\_\_\_

12 (a)



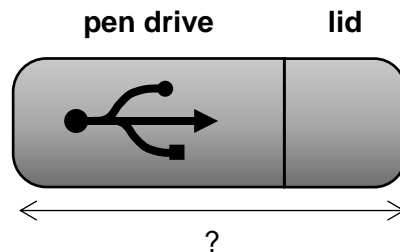
The diagram shows a pen drive and its lid. On one end of the pen drive is a plug.

Together the pen drive and the plug are  $1\frac{5}{6}$  inches in length.

The length of the plug is  $\frac{1}{2}$  inch.

The length of the lid is  $\frac{3}{4}$  inch.

The plug slots inside the lid for protection.  
When it is in place, the lid completely covers the plug, as shown in the diagram.



Find the total length of the pen drive and the lid when the lid is in place.

Give your answer, as a mixed number, in its simplest form.

[4 marks]

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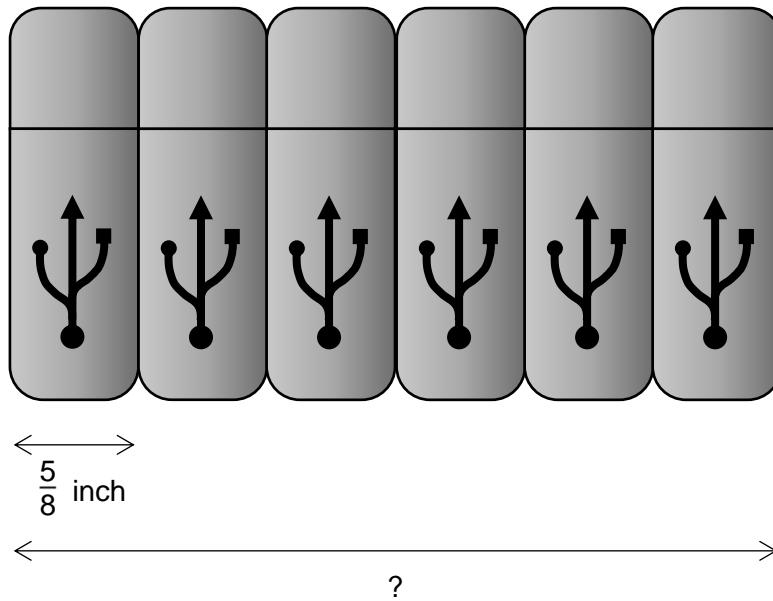
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Answer \_\_\_\_\_ inches



12 (b)



Pen drives are sold in packs of 6 as shown in the diagram.

Each pen drive is  $\frac{5}{8}$  inch wide.

What is the total width of 6 pen drives?

Give your answer, as a mixed number, in its simplest form.

[2 marks]

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Answer \_\_\_\_\_ inches

**13 (a)** Find the value of  $6^{-2}$

**[1 mark]**

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Answer \_\_\_\_\_

**13 (b)** Find the value of  $27^{\frac{4}{3}}$

**[2 marks]**

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Answer \_\_\_\_\_

**14**  $\frac{5}{8}$  of a number is 255.

What is the number?

**[2 marks]**

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Answer \_\_\_\_\_

**15** Give your answers to question **15** in standard form

You are given that  $a = 9 \times 10^{20}$

**15 (a)** Find the value of  $\frac{a}{2}$

**[1 mark]**

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Answer \_\_\_\_\_

**15 (b)** Find the value of  $a^3$

**[1 mark]**

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Answer \_\_\_\_\_

**15 (c)** Find the value of  $\sqrt{a}$

**[1 mark]**

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Answer \_\_\_\_\_

**16** In a geometric sequence,

the 1st term is 2

the 3rd term is 6

**16 (a)** What two numbers could be the 4th term of the sequence?

**[3 marks]**

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Answer \_\_\_\_\_ or \_\_\_\_\_

**16 (b)** What is the 7th term of the sequence?

**[1 mark]**

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Answer \_\_\_\_\_

17 60 balls, numbered from 1 to 60 inclusive, are placed in a bag.

Balls are then drawn out of the bag at random, and **not** replaced in the bag.

Find the probability that the first 6 balls to be drawn do not include those numbered 30 or 60

Give your answer as a fraction, in its simplest form.

**[3 marks]**

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Answer \_\_\_\_\_

18



The area of rectangle  $M$  is double that of rectangle  $N$ .

The lengths of the sides of rectangle  $M$  are  $x$  cm and  $(x + 2)$  cm.

The lengths of the sides of rectangle  $N$  are  $2$  cm and  $(x + 1)$  cm.

18 (a) Obtain an equation for  $x$

Give your answer in the form  $x^2 + bx + c = 0$

[2 marks]

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Answer \_\_\_\_\_

18 (b) Hence find the value of  $x$

Give your solution in the form  $p + \sqrt{q}$  where  $p$  and  $q$  are integers.

[2 marks]

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Answer \_\_\_\_\_

19 Express the recurring decimal  $0.2\dot{7}$  as a fraction.

Give your answer in its simplest form.

[3 marks]

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Answer \_\_\_\_\_

20 Amy's book says that  $\sin(75^\circ) = \frac{\sqrt{6} + \sqrt{2}}{4}$

Bob's book says that  $\sin(75^\circ) = \frac{1}{\sqrt{6} - \sqrt{2}}$

Prove that  $\frac{1}{\sqrt{6} - \sqrt{2}}$  is equivalent to  $\frac{\sqrt{6} + \sqrt{2}}{4}$

[3 marks]

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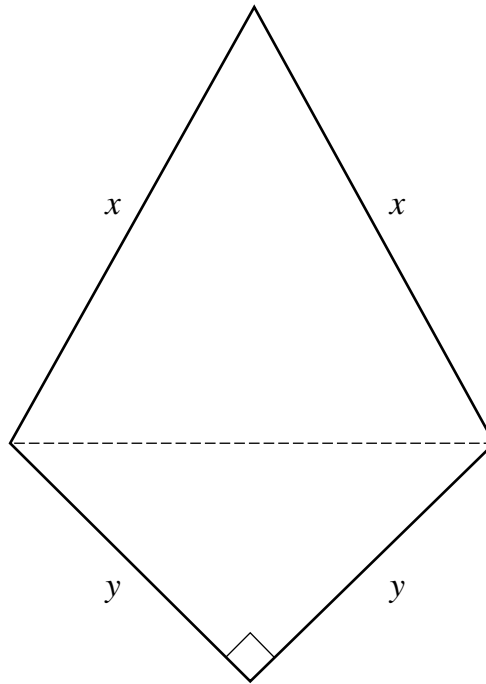
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A kite is made by joining a right angled isosceles triangle to an equilateral triangle, as shown in the diagram.

Two of its sides have length  $x$ , two have sides of length  $y$ .

21 (a) What is the ratio  $x : y$  ?

Circle your answer.

[1 mark]

2 : 1

2 :  $\sqrt{3}$

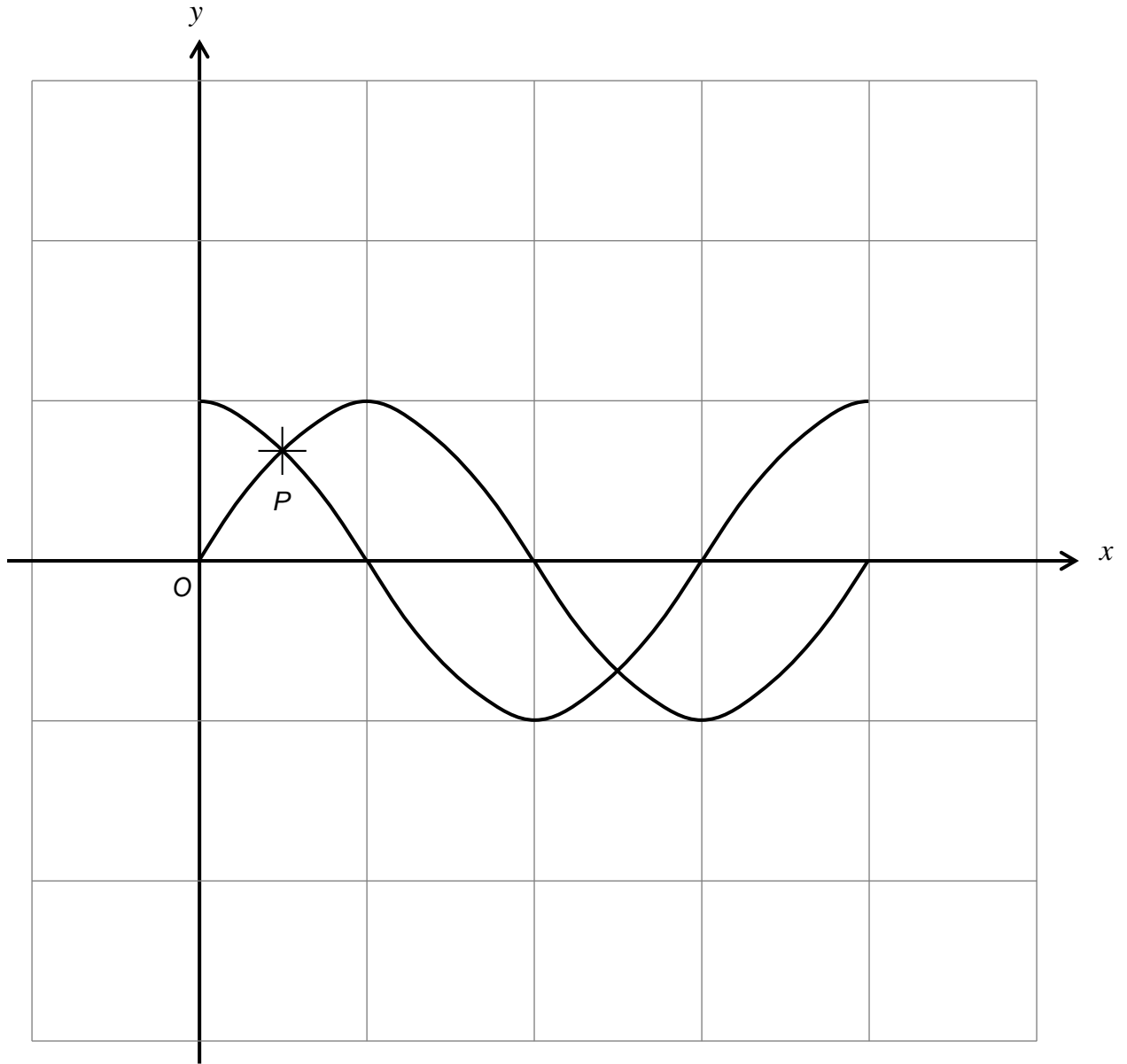
1 :  $\sqrt{2}$

1 : 1





- 22 The diagram shows part of the graph of  $y = \cos x^\circ$  and part of the graph of  $y = \sin x^\circ$ .  
One of the points at which the graphs intersect is labelled  $P$ .



**22 (a)** What is the  $x$  co-ordinate of point  $P$ ?

Circle your answer.

**[1 mark]**

30

45

60

90

**22 (b)** The graphs of  $y = \cos x^\circ$  and  $y = \sin x^\circ$  intersect at some other points.

Which of these is the  $x$  co-ordinate of another of their points of intersection?

Circle your answer.

**[1 mark]**

405

420

435

450

**22 (c)** On the axes, draw a sketch of the graph of  $y = \cos x^\circ - 1$ .

**[2 marks]**

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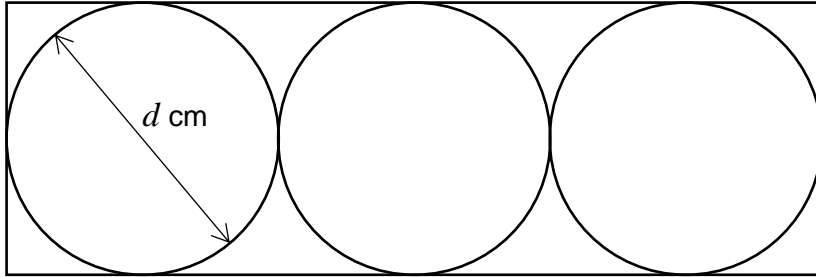
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Volume of a sphere =  $\frac{4}{3}\pi r^3$ , where  $r$  is the radius.

Three spherical tennis balls are packed tightly into a cylindrical container, as shown in the diagram.

There is no space between the balls and either the side or the ends of the cylinder.

The diameter of each ball is  $d$  cm.



Find the ratio of the volume of the cylinder that is filled with the tennis balls to the volume of empty space in the cylinder.

Give your answer in its simplest form.

[4 marks]

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Answer \_\_\_\_\_



25 (a) Give the value of  $\cos(45^\circ)$

Circle your answer.

[1 mark]

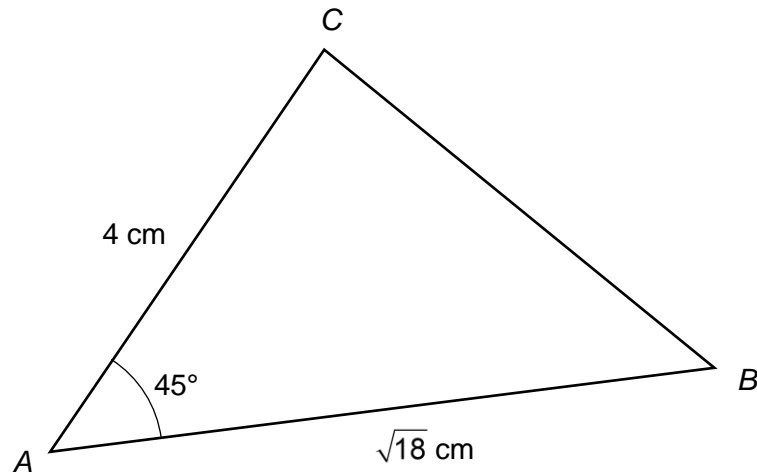
$\frac{1}{2}$

$\frac{1}{\sqrt{2}}$

$\frac{\sqrt{3}}{2}$

1

25 (b)



Find the length of  $BC$  giving your answer in surd form.

[3 marks]

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Answer \_\_\_\_\_ cm

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