

Surname \_\_\_\_\_

Forename(s) \_\_\_\_\_

Candidate signature \_\_\_\_\_

I declare this is my own work.

## GCSE MATHEMATICS

# H

Higher Tier

Paper 1 Non-Calculator

Shadow paper based on 2020 question paper

Time allowed: 1 hour 30 minutes

### Materials

For this paper you must have:

- mathematical instruments.



You must **not** use a calculator.

### Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
<b>TOTAL</b>	

### Advice

In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

Do not write  
outside the  
box

1 Circle the fraction that is equivalent to 3.75

[1 mark]

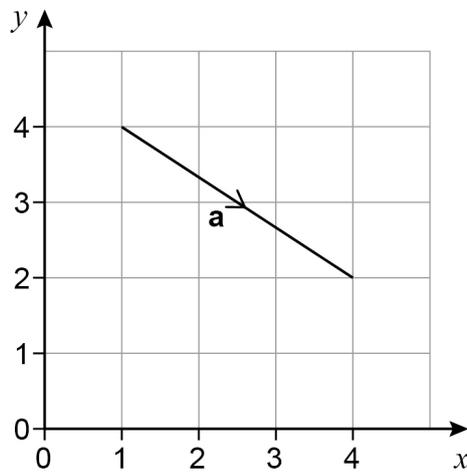
$$\frac{15}{4}$$

$$\frac{19}{4}$$

$$\frac{21}{4}$$

$$\frac{23}{4}$$

2 Here is vector **a**.



Circle the column vector that represents  $2\mathbf{a}$ .

[1 mark]

$$\begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} -6 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 6 \\ -4 \end{pmatrix}$$

$$\begin{pmatrix} -6 \\ -4 \end{pmatrix}$$

3 Which one of these is a square number **and** a cube number?  
Circle your answer.

[1 mark]

27

64

100

144

4

Circle the reciprocal of  $-6$ 

[1 mark]

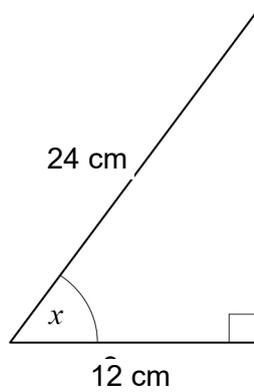
$$\frac{6}{5}$$

$$\frac{1}{6}$$

$$-\frac{1}{6}$$

$$-\frac{6}{5}$$

5

Use trigonometry to work out the size of angle  $x$ .Not drawn  
accurately

[2 marks]

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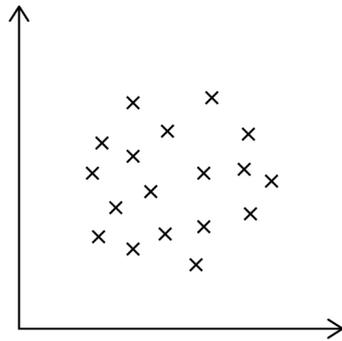
Answer \_\_\_\_\_ degrees

Turn over ►

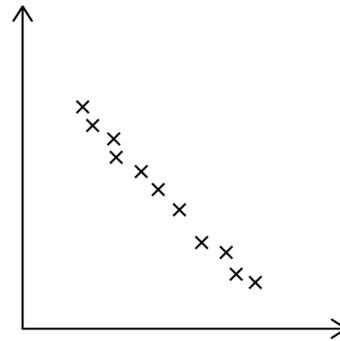
6

A and B are scatter graphs.

Graph A



Graph B



What type of correlation is shown by each graph?

Choose from

Weak positive  
Strong positive  
Weak negative  
Strong negative  
No correlation

**[2 marks]**

Graph A \_\_\_\_\_

Graph B \_\_\_\_\_

7 Here is some information about 80 people who play in bands.

15 are singers but not guitar players.

25% are neither a singer nor a guitar player.

$\frac{1}{3}$  of the guitar players are also singers.

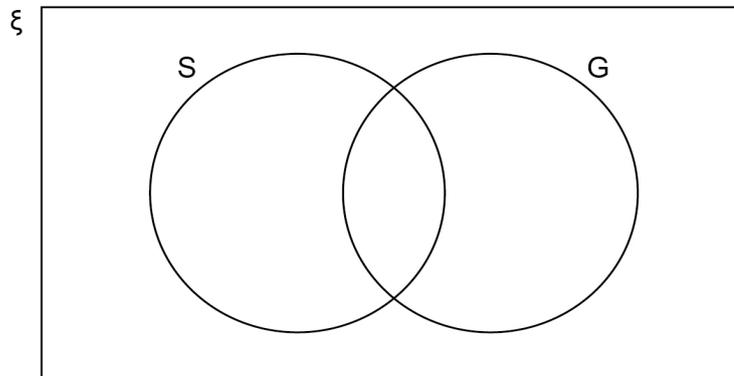
Complete this Venn diagram to represent the information.

[4 marks]

$\xi$  = 80 people who play in bands

S = singers

G = guitar players




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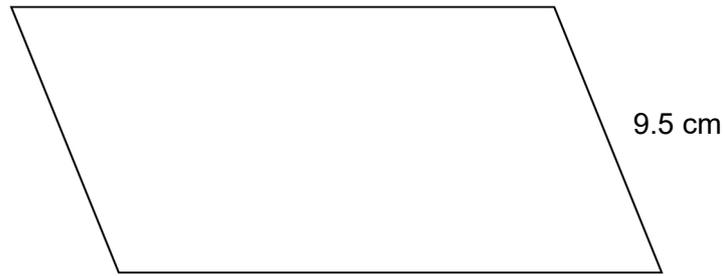


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- 8 The shorter side of a parallelogram has length 9.5 cm



Not drawn  
accurately

The length of the shorter side is  $\frac{1}{8}$  of the perimeter.

Work out the length of the longer side.

**[3 marks]**

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

- 9 (a) All the terms of a **geometric** progression are positive.  
The second and fourth terms are shown.

..... 9 ..... 81

Work out the first and third terms.

[2 marks]

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First term \_\_\_\_\_

Third term \_\_\_\_\_

- 9 (b) The first two terms of an **arithmetic** progression are shown.

$q$      $4q$     .....

The sum of the first three terms is 84

Work out the value of  $q$ .

[3 marks]

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Answer \_\_\_\_\_

10

The cost of a holiday is £3300

Rosanna pays a deposit followed by monthly payments, in the ratio

deposit : total of the monthly payments = 4 : 7

She makes 6 equal monthly payments.

Work out her monthly payment.

**[4 marks]**

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Answer £ \_\_\_\_\_

11 As a decimal  $\frac{13}{40} = 0.325$

Work out  $\frac{39}{400}$  as a decimal.

[2 marks]

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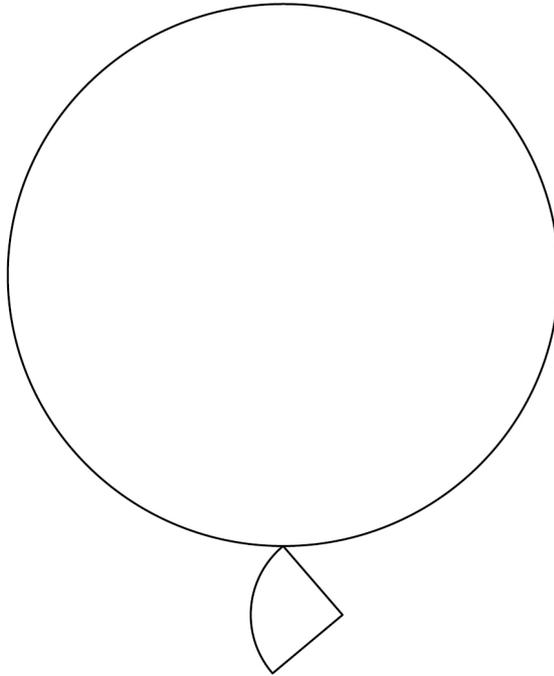
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Answer \_\_\_\_\_

Turn over for the next question

Turn over ►

- 12** Two wire shapes make an earring.  
The shapes are  
a circle with radius 36 mm  
and  
a quarter circle.



Not drawn  
accurately

radius of circle : radius of quarter circle = 9 : 2

- 12 (a)** Show that the radius of the quarter circle is 8 mm

**[1 mark]**

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**12 (b)** Work out the **total** length of the wire in the earring.

Give your answer in the form  $a\pi + b$  where  $a$  and  $b$  are integers.

**[4 marks]**

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Answer \_\_\_\_\_ mm

**Turn over for the next question**

**Turn over ►**

**13 (a)**  $s$  and  $t$  are **positive** integers.

$(x + s)(x - t)$  is expanded and simplified.

The answer is  $x^2 + kx - 20$  where  $k$  is a positive integer.

Work out the **largest** possible value of  $k$ .

**[2 marks]**

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Answer \_\_\_\_\_

**13 (b)** Firoz tries to solve  $(x - 3)(x + 8) = 0$

Here is his working.

	$(x - 3) = 0$	or	$(x + 8) = 0$
Answer	$x = 3$	or	$x = 8$

Give a reason why his answer is wrong.

**[1 mark]**

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**14 (a)**  $c = 2^{10} \times 3 \times 5^6$

Work out  $15c$ .

Give your answer as a product of prime factors in index form.

**[2 marks]**

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Answer \_\_\_\_\_

**14 (b)**

$$3\sqrt{\frac{2^{10} \times 7^3}{2}}$$

Work out

Give your answer as an integer.

**[2 marks]**

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Answer \_\_\_\_\_

15  $\frac{1}{2}x = 3y$

Circle the ratio  $x : y$

[1 mark]

6 : 1

1 : 6

3 : 2

2 : 3

16 A sequence of numbers is formed by the iterative process

$$u_{n+1} = \frac{4}{u_n - 1} \quad u_1 = 6$$

Work out the values of  $u_2$  and  $u_3$

[2 marks]

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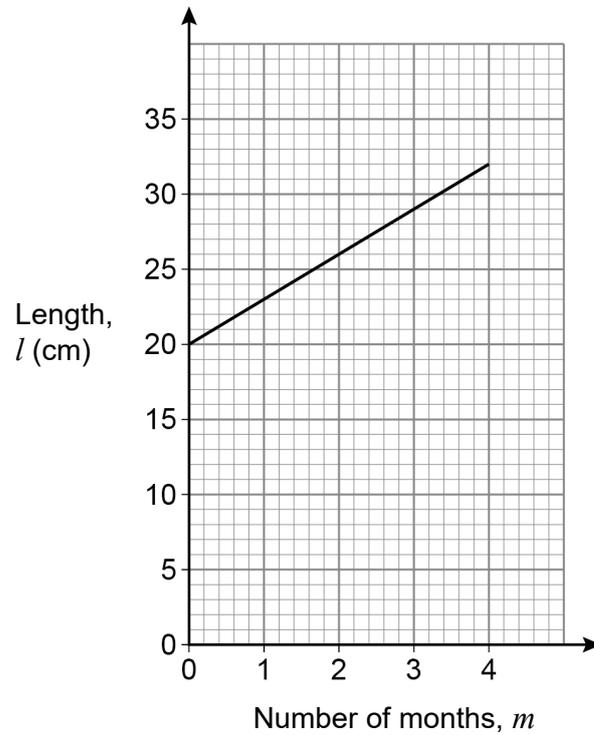
$$u_2 = \underline{\hspace{10cm}}$$

$$u_3 = \underline{\hspace{10cm}}$$

17

Janice buys a snake of length 20 cm

The graph shows how the length of the snake changes during the next 4 months.

Work out a formula for  $l$  in terms of  $m$ .**[3 marks]**


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Answer \_\_\_\_\_



19 Circle the expression that is equivalent to  $\frac{x}{2} + \frac{x}{10}$  [1 mark]

$$\frac{6x}{10}$$

$$\frac{2x}{12}$$

$$\frac{x}{20}$$

$$\frac{x^2}{20}$$

20 (a) Write down the value of  $4^0$  [1 mark]

Answer \_\_\_\_\_

20 (b) Work out the value of  $64^{\frac{2}{3}}$  [2 marks]

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Answer \_\_\_\_\_

**Turn over for the next question**

**Turn over ►**

21

Write these numbers in order of size.

$2^4$

$\frac{55}{3}$

15.5

$4\sqrt{18}$

Start with the smallest.

**[2 marks]**

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Smallest \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Largest \_\_\_\_\_

**22 (a)**  $y$  is directly proportional to  $x^3$

$$y = 24 \quad \text{when} \quad x = 3$$

Work out an equation connecting  $y$  and  $x$ .

**[3 marks]**

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Answer \_\_\_\_\_

**22 (b)**  $m$  is inversely proportional to  $\sqrt{r}$

The value of  $r$  is divided by 4

Circle what happens to the value of  $m$ .

**[1 mark]**

$\times 2$

$\times 16$

$\div 2$

$\div 16$

**Turn over for the next question**

**Turn over ►**



24

 $x$  is an acute angle.

Which statement is true?

Tick **one** box.**[1 mark]**

$\sin x > 0 \text{ and } \cos x > 0$

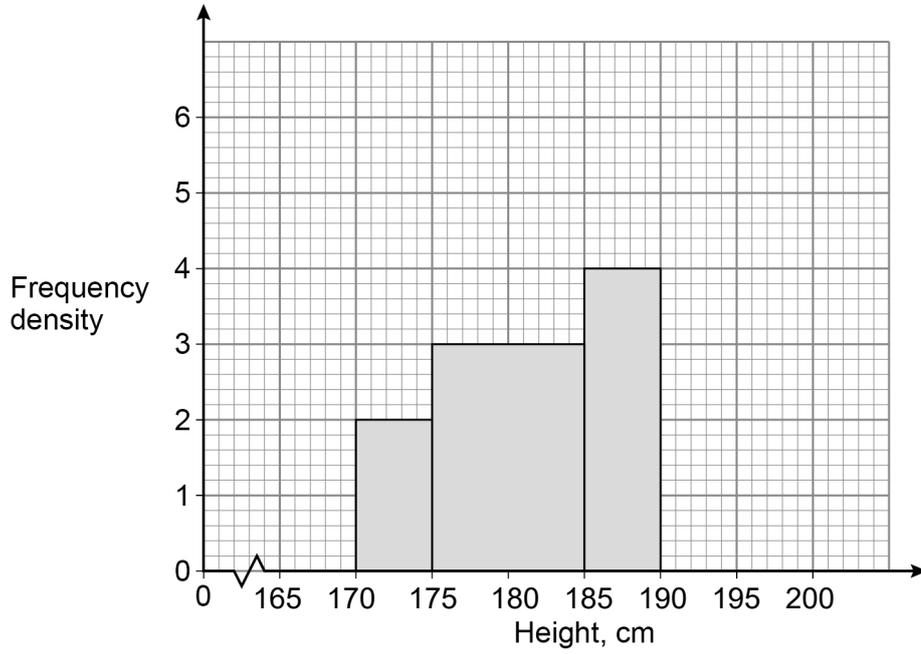
$\sin x > 0 \text{ and } \cos x < 0$

$\sin x < 0 \text{ and } \cos x > 0$

$\sin x < 0 \text{ and } \cos x < 0$

**Turn over for the next question****Turn over ►**

**25** A histogram is drawn to represent the heights of a sample of men.  
Three of the four bars are shown.  
The bar for  $190 \text{ cm} \leq \text{height} < 200 \text{ cm}$  is missing.



There are 84 men in the sample.

Complete the histogram.

**[4 marks]**

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**26 (a)** Show that  $\frac{33}{\sqrt{11}}$  can be written in the form  $a\sqrt{b}$  where  $a$  and  $b$  are integers.

**[2 marks]**

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**26 (b)** Work out  $3\sqrt{10} \times \sqrt{30} \times \sqrt{27}$   
Give your answer as an integer.

**[3 marks]**

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Answer \_\_\_\_\_

**Turn over for the next question**

**Turn over ►**

27 C and D are similar solid cylinders.

$$\text{base area of C : base area of D} = 16 : 9$$

Complete these ratios.

[2 marks]

curved surface area of C : curved surface area of D = \_\_\_\_\_ : \_\_\_\_\_

height of C : height of D = \_\_\_\_\_ : \_\_\_\_\_

28 Factorise fully  $225 - 9x^2$

[2 marks]

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Answer \_\_\_\_\_



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outside the  
box*

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ANSWER IN THE SPACES PROVIDED**

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