

# GCSE Mathematics Practice Tests: Set 7

## Paper 3F (Calculator)

**Time: 1 hour 30 minutes**

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used.**
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**



### Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

Percentages

1. 35% of the students at a school walk to school.

Work out the percentage of the students who do **not** walk to school.

$$\text{Total} = 100\% \mid 100\% - 35\% = \underline{65\%}$$

.....% <sup>65</sup>

(Total for Question 1 is 1 mark)

2. Here is a list of numbers.

10    21    28    36    43

Types of Number

Which of these is a square number?

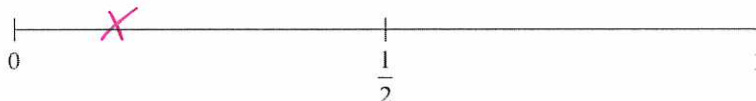
↓  
1, 4, 9, 16, 25, 36, 49 etc

..... <sup>36</sup>

(Total for Question 2 is 1 mark)

- 3.

Probability Scale



On the probability scale above, mark with a cross (x), the probability that a fair ordinary dice will land on a 6.

"1 out of 6" =  $\frac{1}{6}$

(Total for Question 3 is 1 mark)

Converting FDP.

4. Write  $\frac{3}{10}$  as a decimal. USE YOUR CALCULATOR

0.3

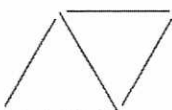
(Total for Question 4 is 1 mark)

5. Here are some patterns made from sticks.

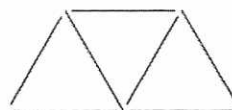
Number Patterns



Pattern number 1



Pattern number 2



Pattern number 3

- (a) Complete the table.

Pattern number	1	2	3	4	5
Number of sticks	3	5	7	9	11

*Handwritten annotations: Red arrows pointing right with '+2' below each transition between columns.*

(2)

- (b) How many sticks make Pattern number 15?

$$15 \times 2 = 30$$
$$30 + 1 = 31$$

31

(1)

Maria wants to work out how many sticks make Pattern number 50

- (c) Write down a method she can use.

Multiply 50 by 2 then add 1

(1)

Sam says that he will not be able to make a pattern with 80 sticks

- (d) Is Sam correct?  
You must give a reason for your answer.

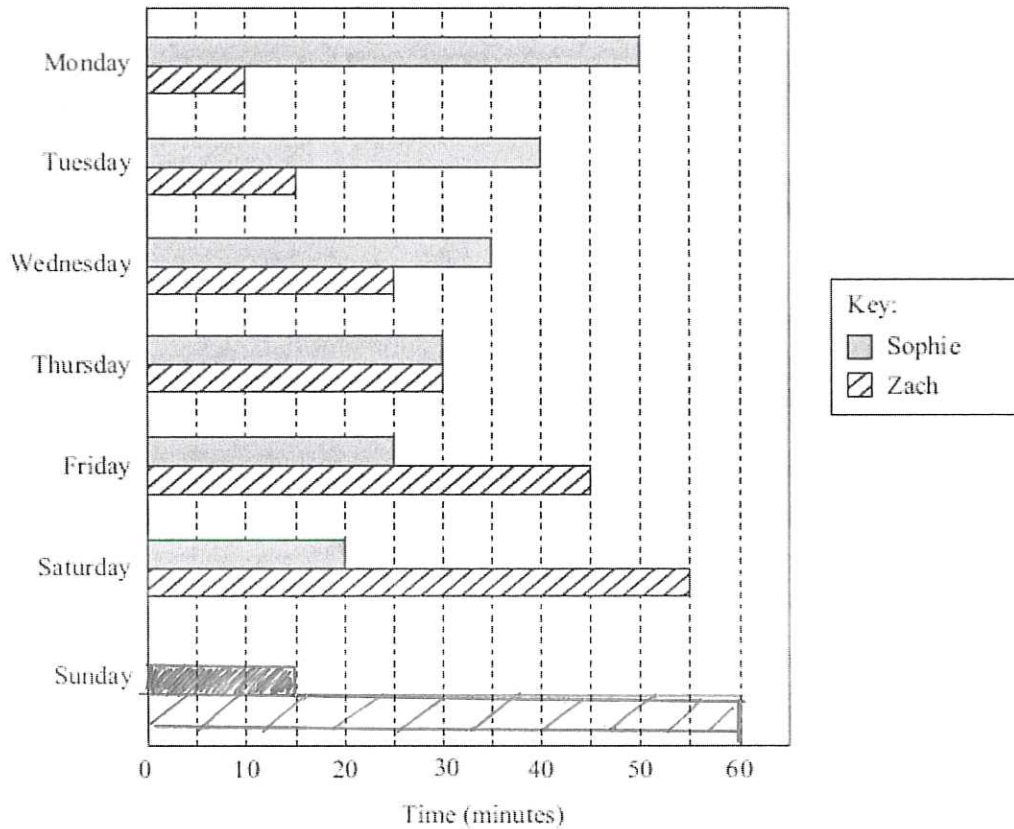
Yes Sam is correct since all numbers of sticks are odd but 80 is even.

(1)

(Total for Question 6 is 5 marks)

## Bar Charts

6. The dual bar chart shows information about the amount of time Sophie and Zach spent on the Internet on each of 6 days last week.



On one of these days, Sophie and Zach spent the same amount of time on the Internet.

- (a) Which day?

Thursday

(1)

On Sunday, Sophie spent 15 minutes on the Internet and Zach spent 60 minutes on the Internet.

- (b) Complete the dual bar chart.

Remember the key!

(2)

(Total for Question 6 is 3 marks)

## Linear Sequences

7. Here are the first four terms of a number sequence.

6      10      14      18

- (a) The number 101 is **not** a term in this sequence.  
Explain why.

Because all numbers in the sequence are even  
and 101 is odd.

(1)

- (b) Write an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

②      ← 4  
6      10      14      18  
      →      →      →  
      +4    +4    +4

$4n+2$

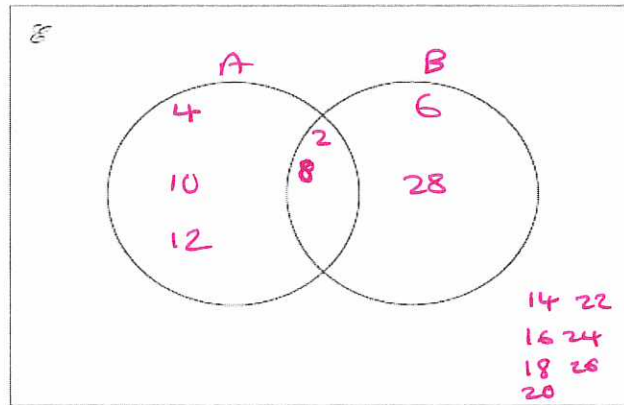
(2)

(Total for Question 7 is 3 marks)

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## Venn Diagrams

8.



$\mathcal{E} = \{\text{even numbers less than } 30\} = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28\}$   
 $A = \{2, 4, 8, 10, 12\}$   
 $B = \{2, 6, 8, 28\}$

(a) Complete the Venn diagram to represent this information.

(2)

A number is chosen at random from the universal set.

(b) What is the probability that the number is in the set  $A \cap B$ ?

Numbers in  $A \cap B = 2$

Numbers Total = 14

$\therefore P(A \cap B) = \frac{2}{14}$

.....  
(2)

**(Total for Question 8 is 4 marks)**

## Expanding and Simplifying

9. (a) Simplify  $3(4x + 2) - 2(3x + 1)$

$$\begin{array}{l|l} \text{Expand} & 12x + 6 - 6x - 2 \\ \text{Collect} & \underline{6x + 4} \\ & \dots\dots\dots 6x + 4 \end{array} \quad (1)$$

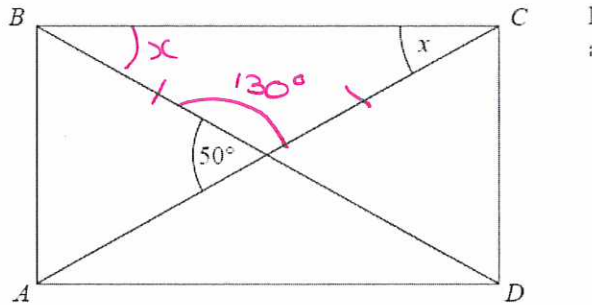
- (b) Simplify  $(a^4)^5$

$$\begin{array}{l|l} (a^m)^n = a^{m \times n} & (a^4)^5 = a^{4 \times 5} = \underline{a^{20}} \\ & \dots\dots\dots a^{20} \end{array} \quad (1)$$

(Total for Question 9 is 2 marks)

## Angles in 2D Shapes

10.  $ABCD$  is a rectangle.



$AC$  and  $BD$  are straight lines.  
The angle between  $AC$  and  $BD$  is  $50^\circ$ .  
Work out the size of the angle marked  $x$ .

$$180^\circ - 50^\circ = 130^\circ$$

$$130^\circ + x + x = 180^\circ$$

$$130^\circ + 2x = 180^\circ$$

$$2x = 50^\circ$$

$$\underline{\underline{x = 25^\circ}}$$

Angles in a straight line =  $180^\circ$

Base angles of isosceles  $\Delta$  are equal  
and Angles in a triangle =  $180^\circ$

collect

$$(-130^\circ)$$

$$(\div 2)$$

..... 25 .....

(Total for Question 10 is 3 marks)



## Standard Form

11. (a) Write  $4.7 \times 10^{-1}$  as an ordinary number.

0.47

(1)

- (b) Work out the value of  $(2.4 \times 10^3) \times (9.5 \times 10^5)$   
Give your answer in standard form. *USE YOUR CALCULATOR*

$$(2.4 \times 10^3) \times (9.5 \times 10^5) = 2280000000$$

LOTS OF ZEROS... MAYBE NOT...

<u>SPLIT</u>	$2.4 \times 9.5 = 22.8$
	$10^3 \times 10^5 = 10^8$
<u>COMBINE</u>	$= 22.8 \times 10^8$
STANDARD FORM:	$= \underline{\underline{2.28 \times 10^9}}$

$2.28 \times 10^9$   
.....  
(2)

(Total for Question 11 is 3 marks)

12. The ratio of the number of boys to the number of girls in a school is 4:5  
There are 60 girls in the school.

*Ratio and Proportion*

Work out the total number of students in the school.

Girls in parts = 5	5 parts = 60 people
(÷5)	1 part = 12 people
Boys in parts = 4	4 parts = 48 people
Total people	$60 + 48 = \underline{\underline{108}}$

108

(Total for Question 12 is 3 marks)

## Ratio and Proportion

13. The ratio of Mark's age to Reeta's age is 3 : 5  
Mark's age is 24 years.

(a) Work out Reeta's age.

$$\begin{array}{l|l} \text{Mark's part} = 3 & 3 \text{ parts} = 24 \\ (\div 3) & 1 \text{ part} = 8 \\ \text{Reeta} = 5 \text{ parts} & 5 \text{ parts} = \underline{\underline{40}} \end{array}$$

..... 40 years  
(2)

The ratio of John's age to Zahra's age is 1 : 4  
The sum of their ages is 45 years.

(b) Work out Zahra's age.

$$\begin{array}{l|l} \text{Total parts} & 1+4 = 5 \text{ parts} \\ \text{Total Ages} & = 45 \text{ years} \\ & 5 \text{ parts} = 45 \text{ years} \\ (\div 5) & 1 \text{ part} = 9 \text{ years} \\ \text{Zahra} = 4 \text{ parts} & 4 \text{ parts} = \underline{\underline{36}} \text{ years} \end{array}$$

..... 36 years  
(2)

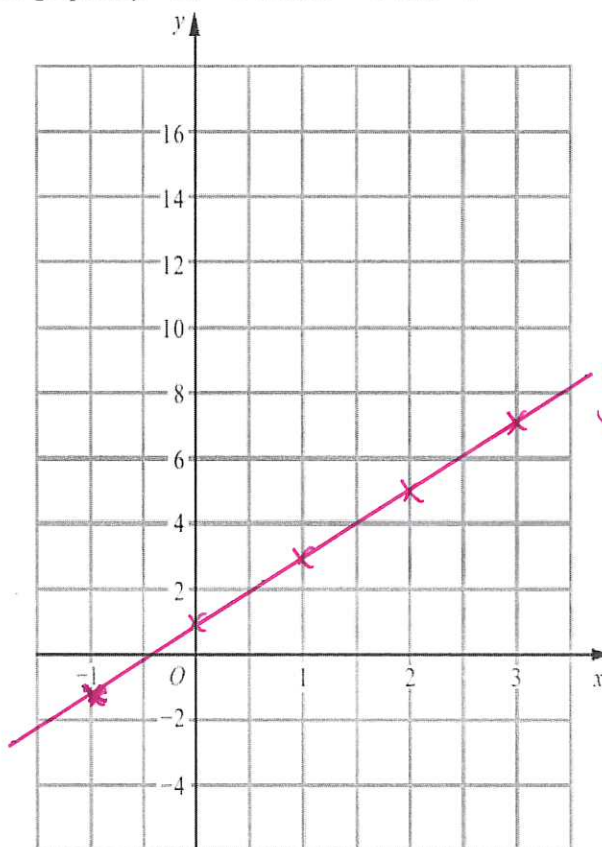
(Total for Question 13 is 4 marks)

# Plotting Straight Lines

x	-1	0	1	2	3
y	-1	1	3	5	7

← use pattern

14. On the grid, draw the graph of  $y = 2x + 1$  from  $x = -1$  to  $x = 3$



$x=0: y=2(0)+1=1$   
 $x=1: y=2(1)+1=3$   
 $x=2: y=2(2)+1=5$   
 $x=3: y=2(3)+1=7$

(Total for Question 14 is 3 marks)

15. Jane says,

Types of Number

“If you add any two different prime numbers the answer will always be an even number.”

Jim is wrong.  
Explain why.

e.g: 7 is prime . 3 is prime .  $7+3 = \text{even } \checkmark$   
 BUT: 7 is prime . 2 is prime .  $7+2 = 9 = \text{ODD. } \times$

(Total for Question 15 is 2 marks)

## Fractions of an Amount (Relative Frequency)

16. Here is part of an advert for a driving school.

8 out of 10 of the people we teach  
pass the driving test first time

Alison talked to 56 people who had been taught to drive by the driving school.  
43 of these people passed the driving test first time.

Does this support what is said in the advert?  
You must show how you get your answer.

$P(\text{pass}) = \text{"8 out of 10"} = \frac{8}{10}$

Relative Frequency  $56 \times \frac{8}{10} = 44.8$

Conclusion No, since the advert suggests at least 44 people should have passed.

(Total for Question 16 is 3 marks)

17. The price of all rail tickets increased by 5%.  
The price of a rail ticket from London to Ipswich increased by £2.30

Reverse Percentages

Work out the price of the ticket before the increase.

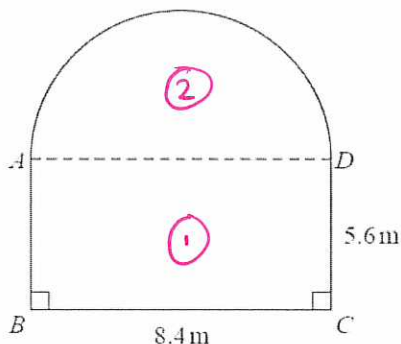
$$\begin{array}{l} (\div 5) \\ (\times 100) \end{array} \left| \begin{array}{l} 5\% = £2.30 \\ 1\% = £0.46 \\ 100\% = \underline{\underline{£46}} \end{array} \right.$$

£ 46 .....

(Total for Question 17 is 2 marks)

# Area of 2D Shapes (DIY Maths)

18. A garden is in the shape of a rectangle,  $ABCD$ , and a semicircle.  $AD$  is the diameter of the semicircle.



Carol is going to cover the garden with fertiliser.

A box of fertiliser costs £4.99

Carol has been told that one box of fertiliser will cover  $12 \text{ m}^2$  of garden.

- (a) Work out the cost of buying enough fertiliser to cover the garden completely.

<p>① <math>A = L \times W</math></p> <p>② <math>A = \frac{\pi r^2}{2}</math></p> <p>Total Area</p> <p>Boxes of fertiliser needed:</p> <p>Cost of 9 fertiliser</p>	<p><math>A = 8.4 \text{ m} \times 5.6 \text{ m} = 47.04 \text{ m}^2</math></p> <p>radius = <math>\frac{8.4 \text{ m}}{2} = 4.2 \text{ m}</math></p> <p><math>\therefore A = \frac{\pi(4.2)^2}{2} = 55.417\dots = \text{ANS} \text{ m}^2</math></p> <p><math>A = 47.04 \text{ m}^2 + \text{ANS} \text{ m}^2 = 702.748\dots \text{ m}^2</math></p> <p><math>702.748\dots \text{ m}^2 \div 12 \text{ m}^2 = 58.562\dots \therefore 59 \text{ boxes needed}</math></p> <p><math>59 \times \pounds 4.99 = \pounds \underline{\underline{294.91}}</math></p>
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(5)

Carol finds out that one box of fertiliser will cover more than  $12 \text{ m}^2$  of garden.

- (b) Explain how this might affect the number of boxes she needs to buy.

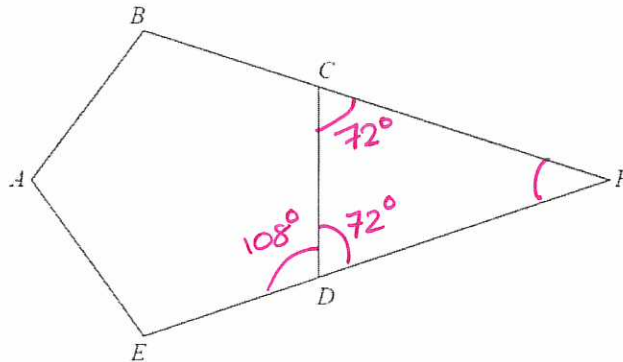
less area per box  $\therefore$  maybe more boxes.

(1)

(Total for Question 18 is 6 marks)

# Angles in Polygons

19.



$ABCDE$  is a regular pentagon.  
 $BCF$  and  $EDF$  are straight lines.

Work out the size of angle  $CFD$ .  
 You must show how you get your answer.

$$\hat{CDE} = 108^\circ$$

$$\hat{CDF} = 180^\circ - 108^\circ = 72^\circ$$

$$\hat{CDF} = \hat{DCF} = 72^\circ$$

$$\hat{CFD} = 180^\circ - 72^\circ - 72^\circ$$

$$= \underline{\underline{36^\circ}}$$

Angles in regular polygon =  $(n-2) \times 180 = (5-2) \times 180 = 540$   
 $\therefore$  Each interior =  $540 \div 5 = 108^\circ$

Angles on straight line =  $180^\circ$

Isosceles triangle

Angles in a triangle =  $180^\circ$ .

.....  
 36°

(Total for Question 19 is 3 marks)

20. Kim, Laura and Molly share £385

The ratio of the amount of money Kim gets to the amount of money Molly gets is 2 : 5  
Kim gets £105 less than Molly gets.

What percentage of the £385 does Laura get?

Difference in parts	$5 - 2 = 3 \text{ parts}$
Difference in £	£105
	$\therefore 3 \text{ parts} = £105$
( $\div 3$ )	$1 \text{ part} = £35$
Laura = Total - others	
(x2) Kim	$2 \text{ parts} = £70$
(x5) Molly	$5 \text{ parts} = £175$
Laura:	$£385 - £70 - £175 = £140$
Percentage of Total	$= \frac{140}{385} (\times 100)$
	$\dots\dots\dots 36.\dot{3}\dot{6} \dots\dots \%$
	$= 36.\dot{3}\dot{6} \%$

(Total for Question 20 is 4 marks)

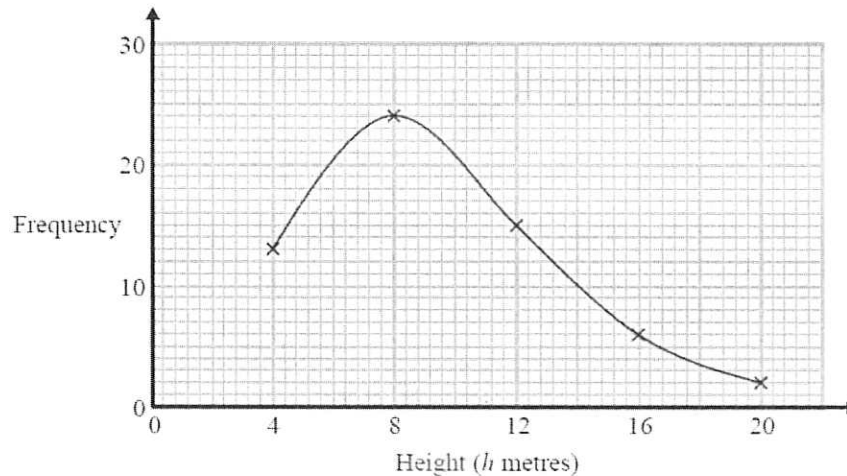
# Frequency Polygons

21. The table shows information about the heights of 60 trees.

Height ( $h$ metres)	Frequency
$0 < h \leq 4$	13
$4 < h \leq 8$	24
$8 < h \leq 12$	15
$12 < h \leq 16$	6
$16 < h \leq 20$	2

Midpoints  
↓

Jacob drew this frequency polygon for the information in the table. The frequency polygon is **not** correct.



Write down **two** things that are wrong with the frequency polygon.

1. Points are not plotted at midpoints of intervals
2. Points are joined with a curve instead of straight lines

(Total for Question 21 is 2 marks)



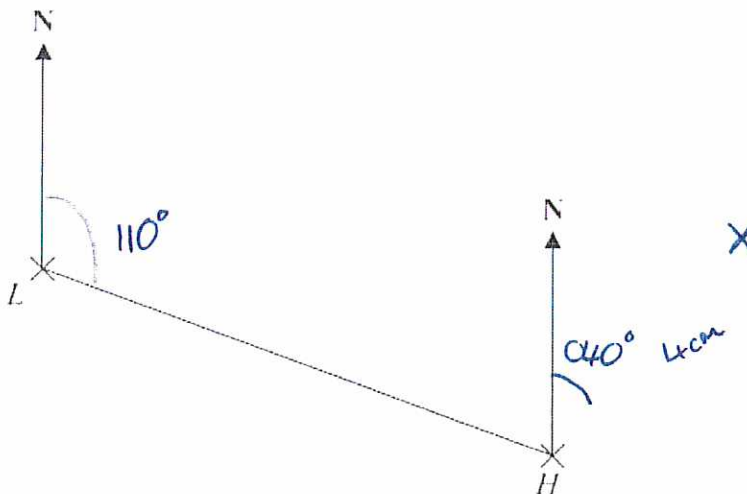
# Bearings and Scales

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. The diagram shows the position of a lighthouse  $L$  and a harbour  $H$ .



The scale of the diagram is 1 cm represents 5 km.

- (a) Work out the real distance between  $L$  and  $H$ .

$$\begin{array}{l} \times 7.5 \downarrow \\ 1 \text{ cm} : 5 \text{ km} \\ 7.5 \text{ cm} : 37.5 \text{ km} \end{array} \quad \downarrow \times 7.5$$

~~10~~ MARK SCHEME IS WRONG\*

..... 37.5 ..... km  
(1)

- (b) Measure the bearing of  $H$  from  $L$ .

START AT L.

..... 110 ..... °  
(1)

A boat  $B$  is 20 km from  $H$  on a bearing of  $040^\circ$ .

- (c) On the diagram, mark the position of boat  $B$  with a cross ( $\times$ ).  
Label it  $B$ .

Start at H.  $\times 4 \downarrow$   $1 \text{ cm} = 5 \text{ km}$   
4 cm : 20 km  $\uparrow \div 4$

(2)

(Total for Question 1 is 4 marks)

## Ratio and Proportion

2. A mixture of sugar and salt is in the ratio 3 : 2  
The weight of the mixture is 150 grams.

(a) Calculate the weight of sugar and the weight of salt in the mixture.

Sugar : Salt	3 + 2 = 5 parts
	5 parts = 150g
( $\div 5$ )	1 part = 30g
Sugar : Salt	3 : 2
(x20)	90 : 60

Sugar	90	.....g
Salt	60	.....g
		(3)

30 grams of sugar and 10 grams of salt are added to the mixture.

(b) Calculate the ratio of sugar to salt in the new mixture.

Sugar : Salt	90 : 60
(+30) (+10)	120 : 70
( $\div 10$ )	12 : 7

12 : 7	.....
	(2)

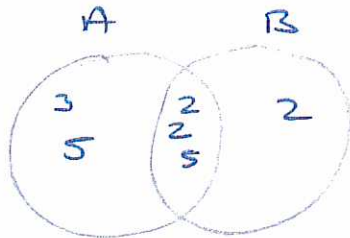
(Total for Question 2 is 5 marks)

# LCM HCF Venn Diagrams

3.  $A = 2^2 \times 3 \times 5^2$

$B = 2^3 \times 5$

(a) Find the Highest Common Factor (HCF) of  $A$  and  $B$ .



$A = \cancel{2} \times \cancel{2} \times \cancel{3} \times 5 \times \cancel{5}$   
 $B = \cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{5}$

HCF =  $2 \times 2 \times 5$   
 $= \underline{\underline{20}}$

(1)

(b) Find the Lowest Common Multiple (LCM) of  $A$  and  $B$ .

LCM =  $2 \times 2 \times 5 \times 3 \times 5 \times 2$   
 $= \underline{\underline{600}}$

600

(2)

(Total for Question 3 is 3 marks)

## Scatter Graphs

25. On a particular day, a scientist recorded the air temperature at 8 different heights above sea level. The scatter diagram shows the air temperature,  $y$  °C, at each of these heights,  $x$  km, above sea level.

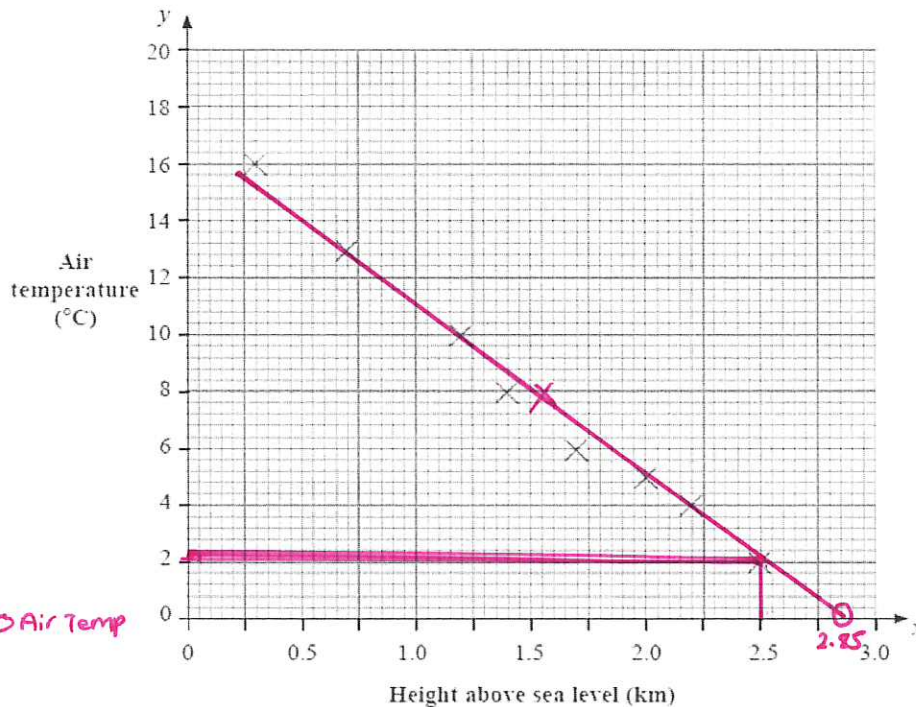
(a) Using the scatter diagram, write down the air temperature recorded at a height of 2.5 km above sea level.

.....  $2 - 2.4$  °C  
(1)

(b) Describe the correlation between the air temperature and the height above sea level.

..... *Negative* .....  
(1)

**Air temperature at different heights above sea level**



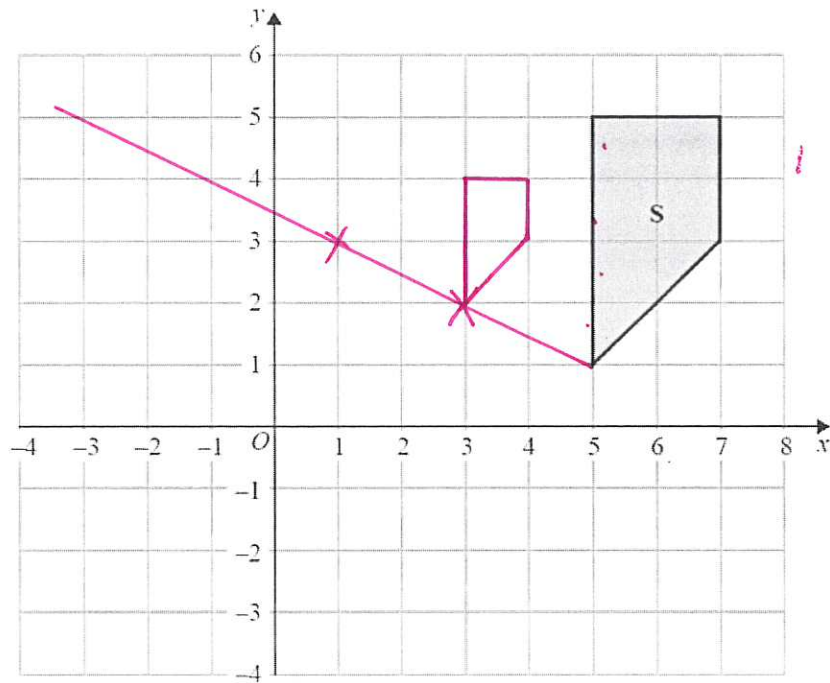
(c) On the scatter diagram, plot the point (1.5, 8) and draw a line of best fit through (1.5, 8).  
(2)

(d) Using your line of best fit, find an estimate of the height above sea level when the air temperature is 0°C.

.....  $2.85$  km  
(1)

**(Total for Question 25 is 5 marks)**

26.

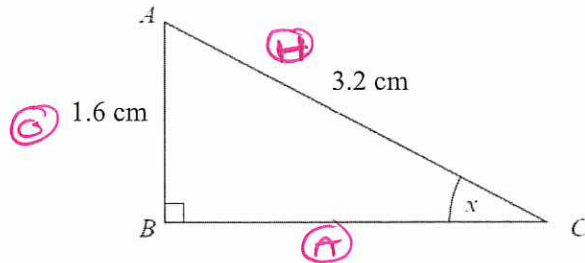


Enlarge shape S with scale factor  $\frac{1}{2}$  and centre (1, 3).

(Total for Question 26 is 2 marks)

By vectors:  $\begin{pmatrix} 4 \\ -2 \end{pmatrix} \times SF = \frac{1}{2} \quad \frac{1}{2} \begin{pmatrix} 4 \\ -2 \end{pmatrix} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

27.  $ABC$  is a right-angled triangle.



Work out the size of the angle marked  $x$ .

SOLICATIQA

$$\sin \theta = \frac{O}{H}$$

$$\sin x = \frac{1.6}{3.2}$$

$$\sin^{-1}\left(\frac{1.6}{3.2}\right) = x = \underline{\underline{30^\circ}}$$

Shift sin<sup>-1</sup>

..... 30 °

(Total for Question 27 is 2 marks)

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TOTAL FOR PAPER: 80 MARKS