

**Modified Enlarged 24pt**  
**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**Tuesday 11 June 2019 – Morning**

**GCSE (9–1) Mathematics**

**J560/06 Paper 6 (Higher Tier)**

**Time allowed: 1 hour 30 minutes  
plus your additional time allowance**

**YOU MAY USE:**

**a scientific or graphical calculator  
geometrical instruments  
tracing paper  
a model for question 18**

**Please write clearly in black ink.**

**Centre number**

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**Candidate number**

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**First name(s)** \_\_\_\_\_

**Last name** \_\_\_\_\_

**READ INSTRUCTIONS OVERLEAF**



# **INSTRUCTIONS**

**Use black ink. You may use an HB pencil for graphs and diagrams.**

**Answer ALL the questions.**

**Read each question carefully before you start to write your answer.**

**Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.**

**Write your answer to each question in the space provided. Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).**

# **INFORMATION**

**The total mark for this paper is 100.**

**The marks for each question are shown in brackets [ ].**

**Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.**

**Answer ALL the questions.**

- 1 A grain of salt weighs  $6.48 \times 10^{-5}$  kg on average.**

**A packet contains 0.35 kg of salt.**

- (a) Use this information to calculate the number of grains of salt in the packet.**

**(a) \_\_\_\_\_ [2]**

**(b) Explain why your answer to part (a) is unlikely to be the actual number of grains of salt in the packet.**

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**[1]**

**2 Tom researches the weights of plant seeds.**

**One poppy seed weighs  $3 \times 10^{-4}$  grams.**

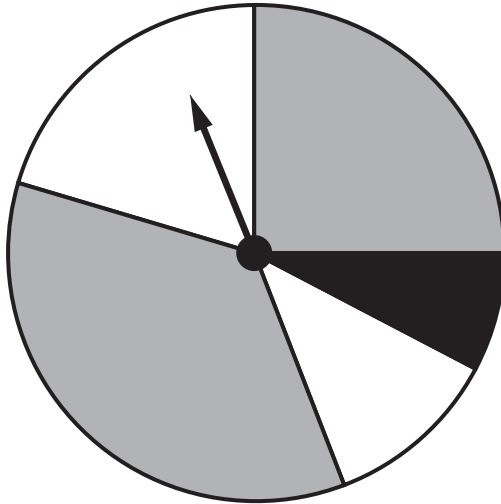
**250 pumpkin seeds weigh 21 grams.**

**One sesame seed weighs  $3.64 \times 10^{-6}$  kilograms.**

**Write the three types of seed in order according to the weight of one seed. Write the lightest type of seed first. You must show how you decide.**

\_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ **[4]**  
lightest

- 3 (a) This spinner has two grey sections, two white sections and one black section.**



**Vlad says**

**The probability of the spinner landing on black is  $\frac{1}{5}$ .**

**Explain why Vlad is not correct.**

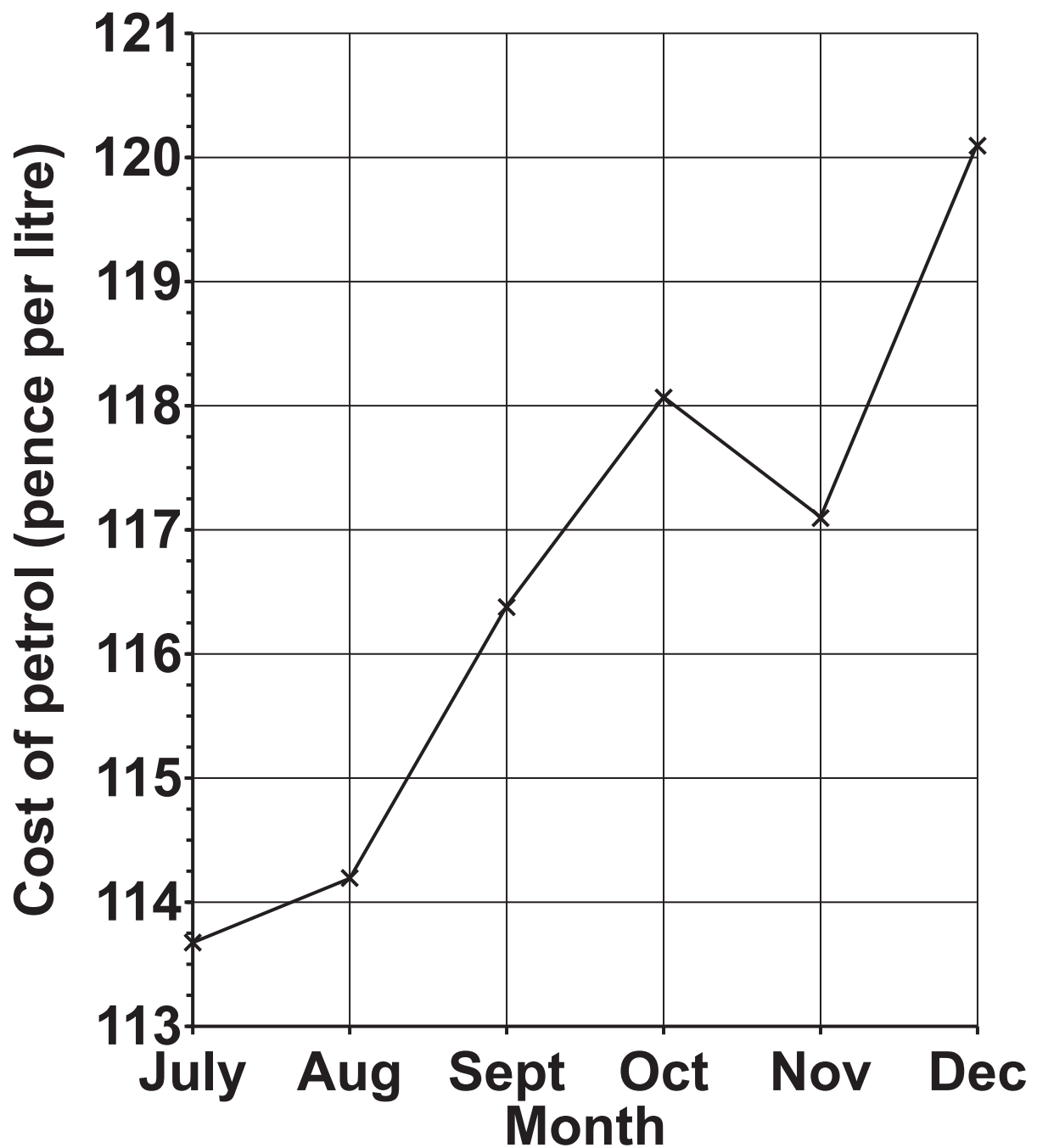
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**[1]**

- (b) The graph opposite shows the cost of a litre of petrol for the last six months of 2017.**



**Explain why this graph is misleading.**

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[1]

**4 Sophie is organising a raffle.**

**Each raffle ticket costs 50p.**

**She sells 400 tickets.**

**The probability that a ticket, chosen at random, wins a prize is 0.1.**

**Each winning ticket receives a prize worth £3.**

**Sophie says**

**I expect the raffle to make over £100 profit.**



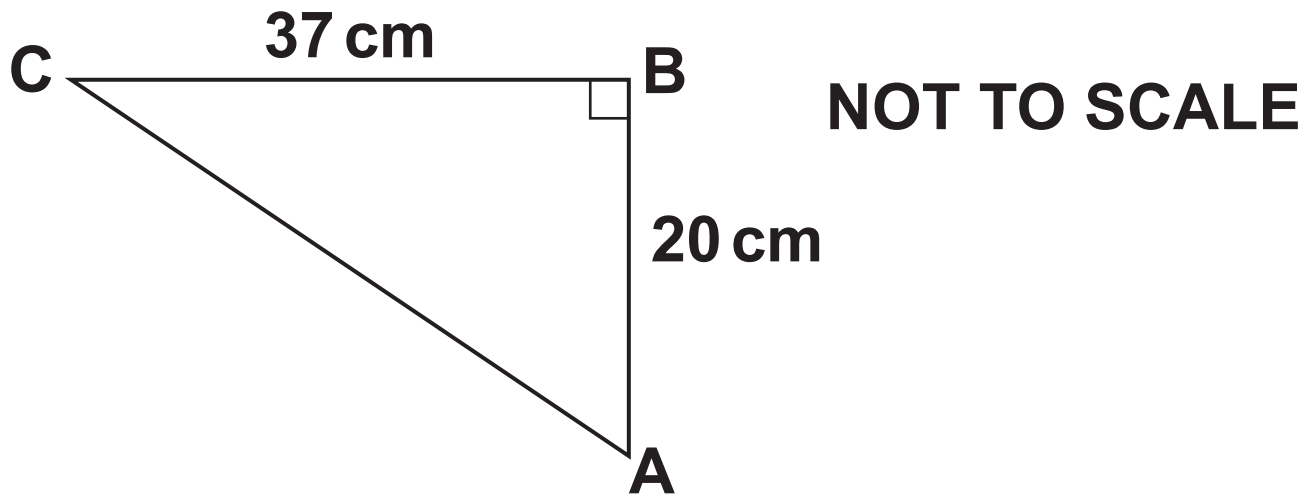
**Show that Sophie is wrong.**

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**[4]**

- 5 ABC is a right-angled triangle.  
AB = 20 cm and BC = 37 cm.



Calculate angle BAC.

\_\_\_\_\_ ° [3]

**6 A bag contains some counters.**

**There are 300 counters in the bag.**

**There are only red, white and blue counters in the bag.**

**The probability of picking a blue counter is  $\frac{23}{50}$ .**

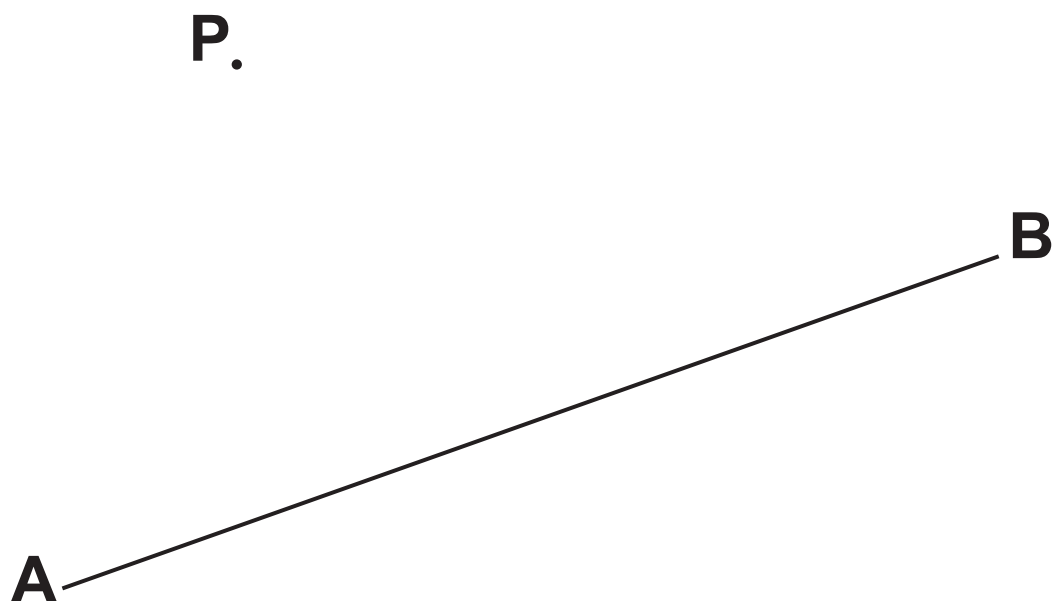
**The ratio of red counters to white counters is 2 : 1.**

**Calculate the number of red counters in the bag.**

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**[4]**

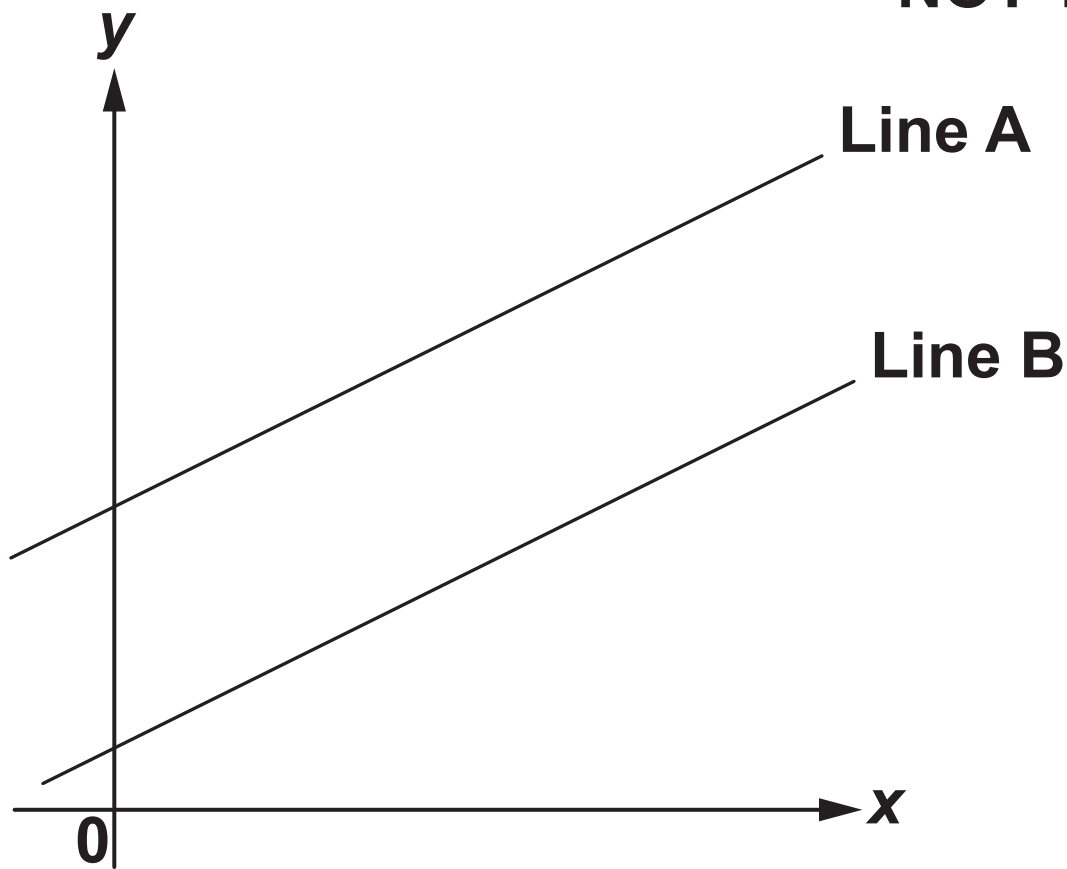
- 7 Construct the perpendicular from the point P to the line AB.  
Show all of your construction lines. [2]



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- 8 The graph shows two parallel lines, Line A and Line B.**

**NOT TO SCALE**



**Line A has equation  $y = 6x + 7$ .**

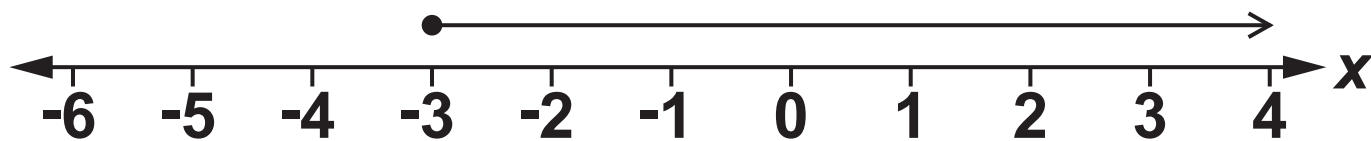
**Line B passes through the point  $(4, 26)$ .**

**Find the equation of Line B.**

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**[4]**

- 9 Martha's solution to the inequality  $8x + 5 \leq 3x - 10$  is shown on the number line.**





**Is her solution correct?  
Explain your reasoning.**

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**[4]**

- 10 In 2017, the value of a house increased by 4%.  
In 2018, the value of the house then decreased by 3%.

Teresa says

Over the two years the value of the house increased by exactly 1% because  $4 - 3 = 1$ .

**Show that Teresa is wrong.**

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**[6]**

**11 You are given that**

$$270 = 3^3 \times 2 \times 5 \quad \text{and} \quad 177147 = 3^{11}$$

**(a) (i) Find the lowest common multiple (LCM) of 270 and 177 147.**

**Give your answer using power notation and as an ordinary number.**

**(a)(i) using power notation**

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**as an ordinary number**

---

**[2]**

**(ii) Write 177 147 000 000 as a product of its prime factors.**

**(ii) \_\_\_\_\_ [3]**

**(b)  $3^n = 177147 \times 9^5$ .**

**Find the value of  $n$ .**

**(b)  $n =$  \_\_\_\_\_ **[3]****

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**12 Antonio rolls two fair six-sided dice and calculates the DIFFERENCE between the scores.**

**For example, if the two scores are 2 and 5 or 5 and 2 then the difference is 3.**

**(a) Complete the sample space diagram to show the possible outcomes from Antonio's dice. [2]**

		Dice 2					
		1	2	3	4	5	6
Dice 1	difference						
	1	0					
	2					3	
	3		1				
	4						
	5		3				
	6						



**(b) Antonio rolls the two dice three times.**

**Calculate the probability that he gets a difference of 1 on all three rolls.**

**Give your answer as a fraction in its lowest terms.**

**(b) \_\_\_\_\_ [4]**

**13 Prove that the mean of any four CONSECUTIVE even integers is an integer. Use the space below. [4]**

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**14 The length of the longest diagonal of a cube is 25 cm.**

**Calculate the total surface area of the cube.**

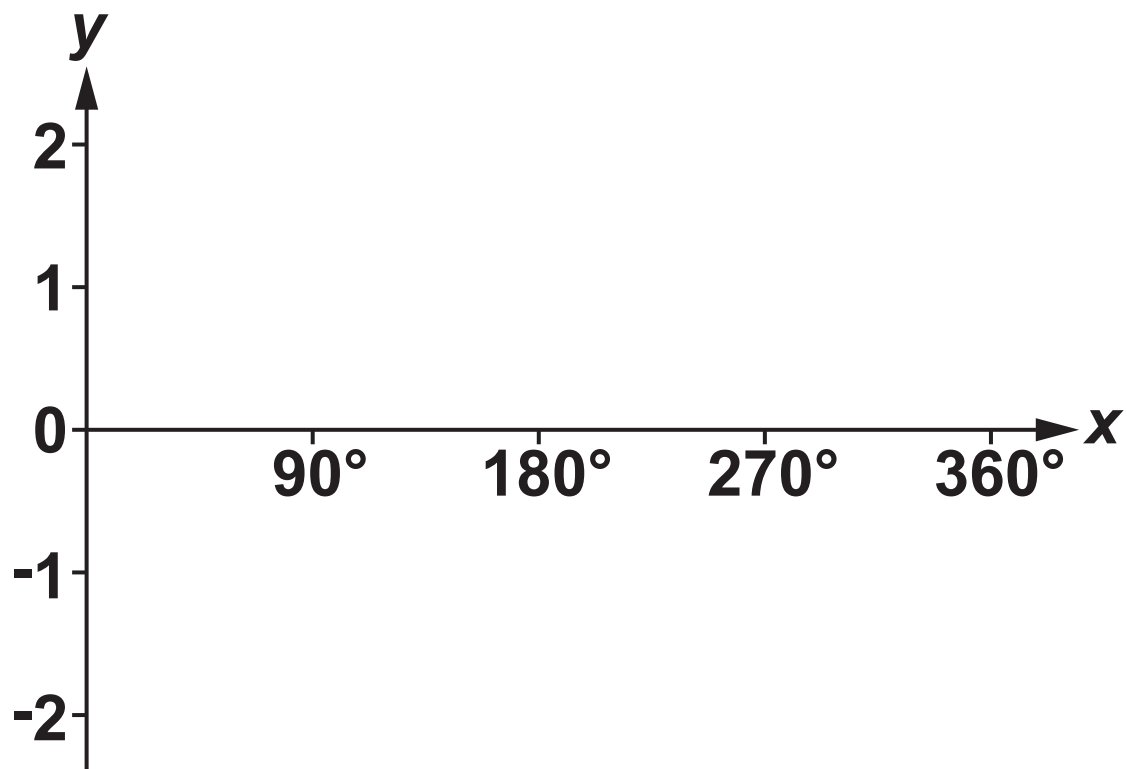
\_\_\_\_\_  $\text{cm}^2$  [5]  
**28**

**15 Solve by factorisation.**

$$5x^2 + 7x + 2 = 0$$

$$x = \underline{\hspace{2cm}} \text{ or } x = \underline{\hspace{2cm}} [3]$$

**16 Sketch the graph of**  
 **$y = -\sin x$  for  $0^\circ \leq x \leq 360^\circ$ . [3]**



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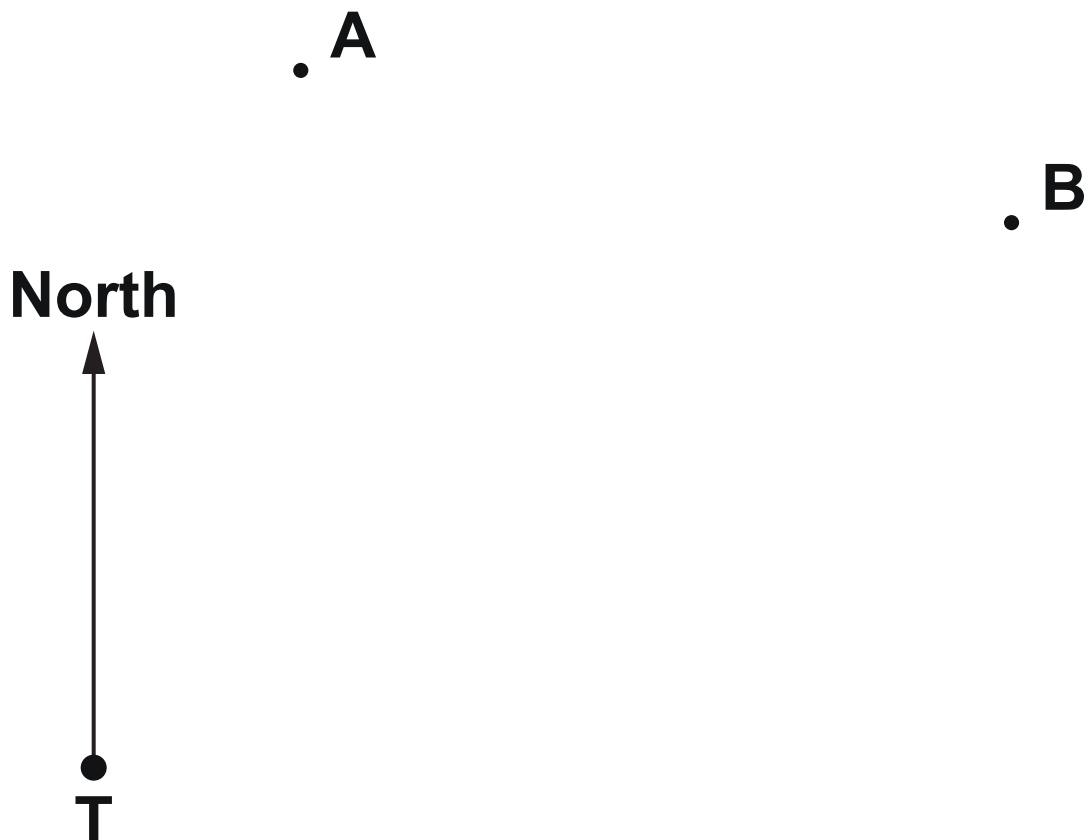
**17 T is a radar tower.  
A and B are two aircraft.**

**At 3pm**

**aircraft A is 3250 km from T on a  
bearing of  $015^\circ$**

**aircraft B is 4960 km from T on a  
bearing of  $057^\circ$ .**

**NOT TO SCALE**





**(a) Aircraft A flies directly towards radar tower T at a speed of 890 km/h.**

**At what time will the aircraft pass over radar tower T?  
Give your answer to the nearest minute.**

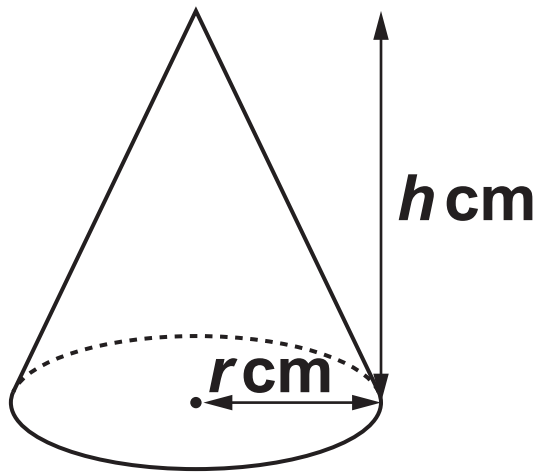
**(a) \_\_\_\_\_ [4]**

**(b) Calculate the distance that was between aircraft A and aircraft B at 3pm.**

**(b) \_\_\_\_\_ km [4]**

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- 18 A cone has radius  $r$  cm and height  $h$  cm.  
You may use the model to help you.



The height is three times the radius.  
The volume of the cone is  $2100 \text{ cm}^3$ .

Calculate the radius of the cone.

[The volume  $V$  of a cone with radius  $r$  and height  $h$  is  $V = \frac{1}{3}\pi r^2 h$ .]

\_\_\_\_\_ cm [4]

**19 The point  $(-5, 2)$  lies on the circumference of a circle, centre  $(0, 0)$ .**

**(a) Find the equation of the circle.**

**(a) \_\_\_\_\_ [4]**

**(b) Work out the gradient of the tangent to the circle at  $(-5, 2)$ .**

**(b) \_\_\_\_\_ [2]**

**20 (a) Show that the equation  $x^4 - x^2 - 9 = 0$  has a solution between  $x = 1$  and  $x = 2$ . Use the space below. [3]**



**(b) Find this solution correct to  
1 decimal place.  
SHOW YOUR WORKING.**

**(b)  $x =$  \_\_\_\_\_ [4]**

**21 Toy building bricks are available in two sizes, small and large. The small and large bricks are mathematically similar.**

**A small brick has volume  $8 \text{ cm}^3$  and width  $2.1 \text{ cm}$ .**

**A large brick has volume  $15.625 \text{ cm}^3$ .**

**Calculate the width of a large brick.**

**\_\_\_\_\_ cm [4]**

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- 22 At the start of 2018, the population of a town was 17 150.  
At the start of 2019, the population of the town was 16 807.**

**It is assumed that the population of the town is given by the formula**

$$**$P = ar^t$**$$

**where  $P$  is the population of the town  $t$  years after the start of 2018.**

**(a) Write down the value of  $a$ .**

**(a) \_\_\_\_\_ [1]**

**(b) Show that  $r = 0.98$ . Use the space below. [1]**

**(c) Show that the population is predicted to be less than 16 000 at the start of 2022. Use the space below. [2]**

**(d) Use the formula to work out what the population might have been at the start of 2017.**

**(d) \_\_\_\_\_ [2]**

**END OF QUESTION PAPER**

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