

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
General Certificate of Secondary Education
MATHEMATICS SYLLABUS A

1962/5

PAPER 5 (Higher Tier)

Tuesday **7 JUNE 2005** Afternoon 2 hours

Candidates answer on the question paper.

Additional materials:

Geometrical instruments

Tracing paper (optional)

Candidate Name	Centre Number	Candidate Number												
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> </tr> </table>							<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> </tr> </table>						

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Show your working. Marks may be given for working that shows that you know how to solve the problem even if you get the answer wrong.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.



WARNING

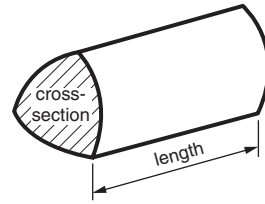
You are not allowed to use a calculator in this paper.

FOR EXAMINER'S USE

This question paper consists of 18 printed pages and 2 blank pages.

Formulae Sheet: Higher Tier

Volume of prism = (area of cross-section) x length

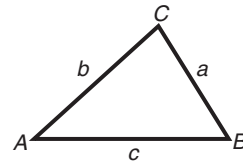


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

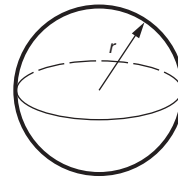
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2} ab \sin C$



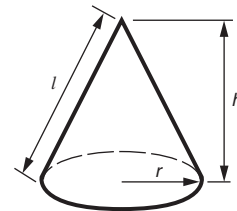
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

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



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- 1 (a) A box contains 120 cubes.
Some of the cubes are black, the rest are white.
The black cubes and white cubes are in the ratio 2 : 3.
Calculate the number of black cubes and the number of white cubes in the box.

.....

.....

.....

(a) black cubes _____

white cubes _____ [3]

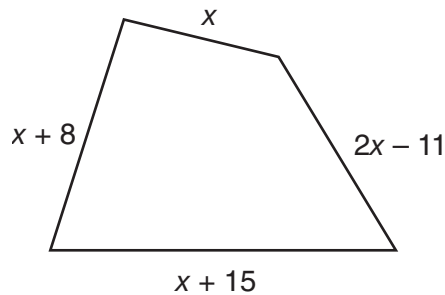
- (b) Another box also contains black cubes and white cubes in the ratio 2 : 3.
There are 160 black cubes.
How many white cubes are there?

.....

.....

(b) _____ [2]

- 2 All the lengths in this question are in centimetres.



The perimeter of the quadrilateral is 87 cm.
Write down an equation and solve it to find x .

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[3]

- 3 (a) List the integer values of n for

$$3 \leq n < 8.$$

.....

(a) _____ [2]

- (b) Here are the first four terms of a sequence.

5 9 13 17

Which one of the expressions below gives the n th term of this sequence?
Explain your choice.

$n + 4$ $3n + 2$ $4n + 1$

.....

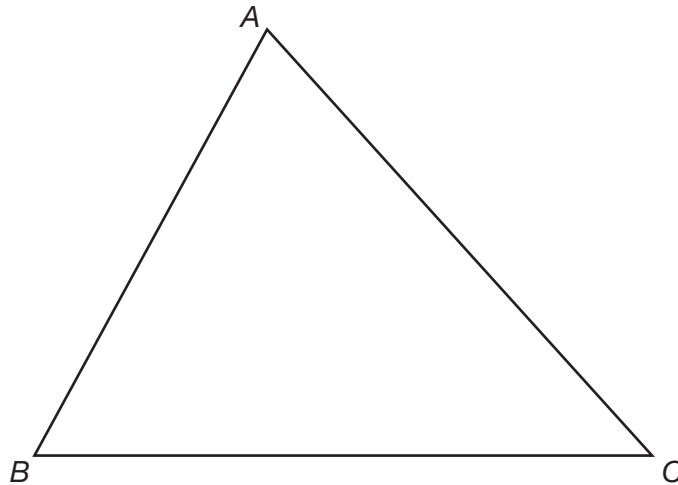
.....

.....

_____ because _____

_____ [2]

4



- (a) Using ruler and compasses, construct

(i) the perpendicular bisector of AB , [2]

(ii) the bisector of angle ABC . [2]

- (b) D is any point which satisfies the following conditions:

it is inside the triangle ABC ,
it is on the bisector of angle ABC ,
it is nearer to A than B .

Indicate clearly on the diagram all the possible positions for D . [1]

- 5 (a) Work out the reciprocal of $\frac{1}{2}$.

.....
.....

(a) _____ [1]

- (b) Write 60 as a product of prime factors.

.....
.....
.....

(b) _____ [2]

- (c) Work out $3\frac{1}{2} \times 1\frac{3}{5}$.

Give your answer as a mixed number.

.....
.....
.....
.....
.....
.....

(c) _____ [3]

6 (a) Simplify.

(i) $p^2 \times p^7$

.....

(a)(i) _____ [1]

(ii) $\frac{t^8}{t^3}$

.....

(ii) _____ [1]

(iii) $\frac{3f^3 \times 4f}{2f^2}$

.....

.....

(iii) _____ [2]

(b) Multiply out the brackets and simplify your answer.

$$(x - 4)(x + 2)$$

.....

.....

.....

(b) _____ [2]

(c) x^3 $x^{0.5}$ $\frac{1}{x}$

Write these in ascending order when

(i) $x > 1$,

.....

.....

(c)(i) _____ [1]

(ii) $0 < x < 1$.

.....

.....

(ii) _____ [1]

- 7 The maximum temperature at a Mediterranean holiday resort was recorded each day for 100 days one summer.

The table below shows the distribution of temperatures.

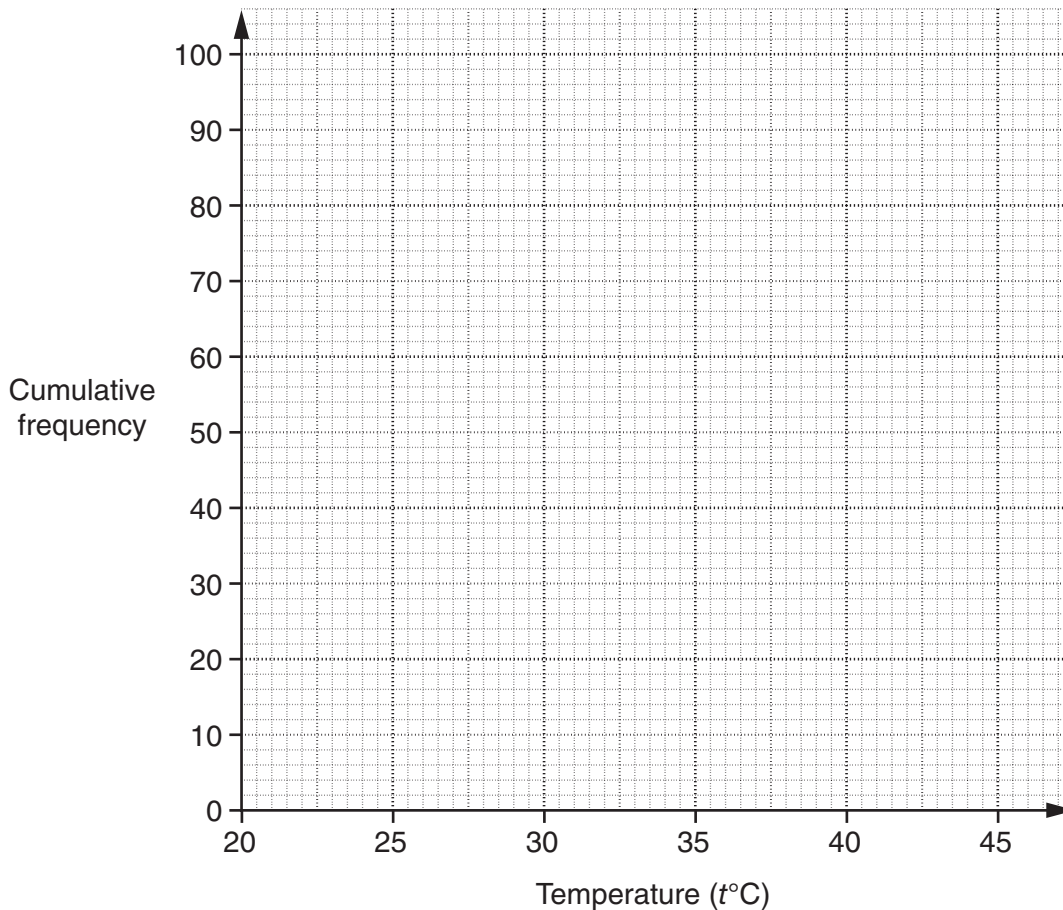
Temperature ($t^{\circ}\text{C}$)	$20 < t \leq 25$	$25 < t \leq 30$	$30 < t \leq 35$	$35 < t \leq 40$	$40 < t \leq 45$
Frequency	12	24	37	21	6

- (a) Complete the cumulative frequency table.

Temperature ($t^{\circ}\text{C}$)	$t \leq 25$	$t \leq 30$	$t \leq 35$	$t \leq 40$	$t \leq 45$
Cumulative frequency	12				

[1]

- (b) On the grid below draw a cumulative frequency diagram.



[3]

- (c) Use your graph to find the median temperature.

(c) _____ $^{\circ}\text{C}$ [1]

- (d) Use your graph to estimate the number of days with a maximum temperature of 38°C or less.

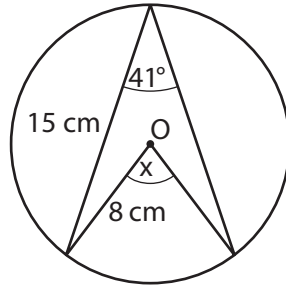
(d) _____ [1]

- 8 (a) A company puts a logo on the cars it makes.

An image has been removed due to third party copyright restrictions

Details: An image of a car

The diagram shows the logo for cars. O is the centre of the circle.

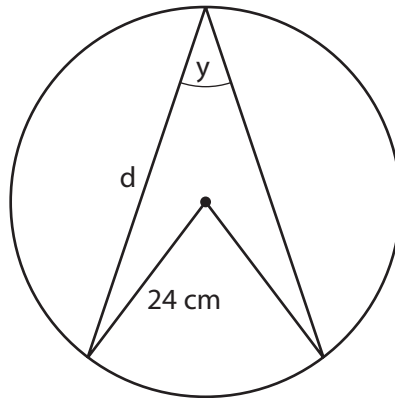


NOT TO SCALE

Find angle x .
Give a reason for your answer.

$x = \underline{\hspace{2cm}}^\circ$ because $\underline{\hspace{10cm}}$
 $\underline{\hspace{10cm}}$ [2]

- (b) The company uses an enlargement of the logo on lorries that it makes.



NOT TO SCALE

- (i) What is the size of angle y ?

(b)(i) $\underline{\hspace{2cm}}^\circ$ [1]

- (ii) Work out the length d .

.....

(ii) $\underline{\hspace{2cm}}$ cm [3]

- 9 (a) Write 3.85×10^4 as an ordinary number.

.....

(a) _____ [1]

- (b) Write 0.0079 in standard form.

.....

(b) _____ [1]

- (c) Work out $(4 \times 10^6)^2$.

Give your answer in standard form.

.....

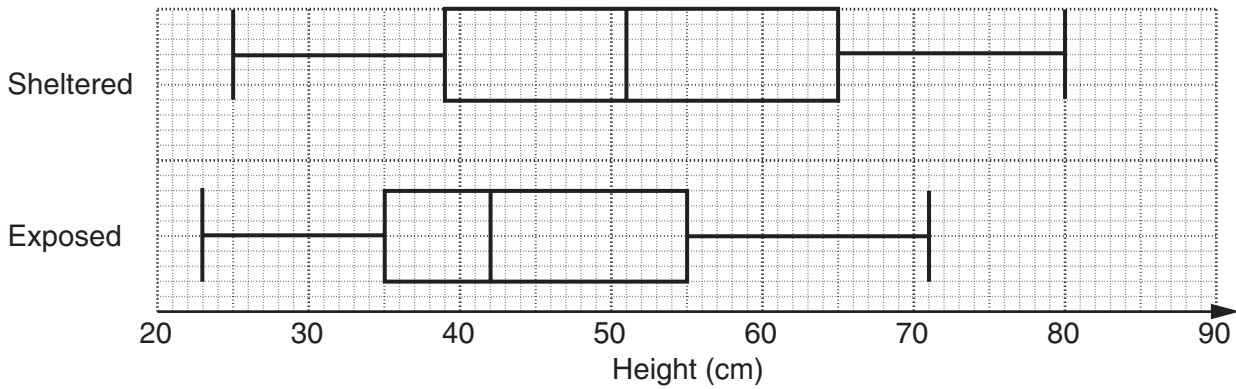
.....

.....

.....

(c) _____ [2]

10 (a) A certain species of plant grows in two locations, one sheltered and the other exposed. The two box plots below show the distributions of heights in the two locations.



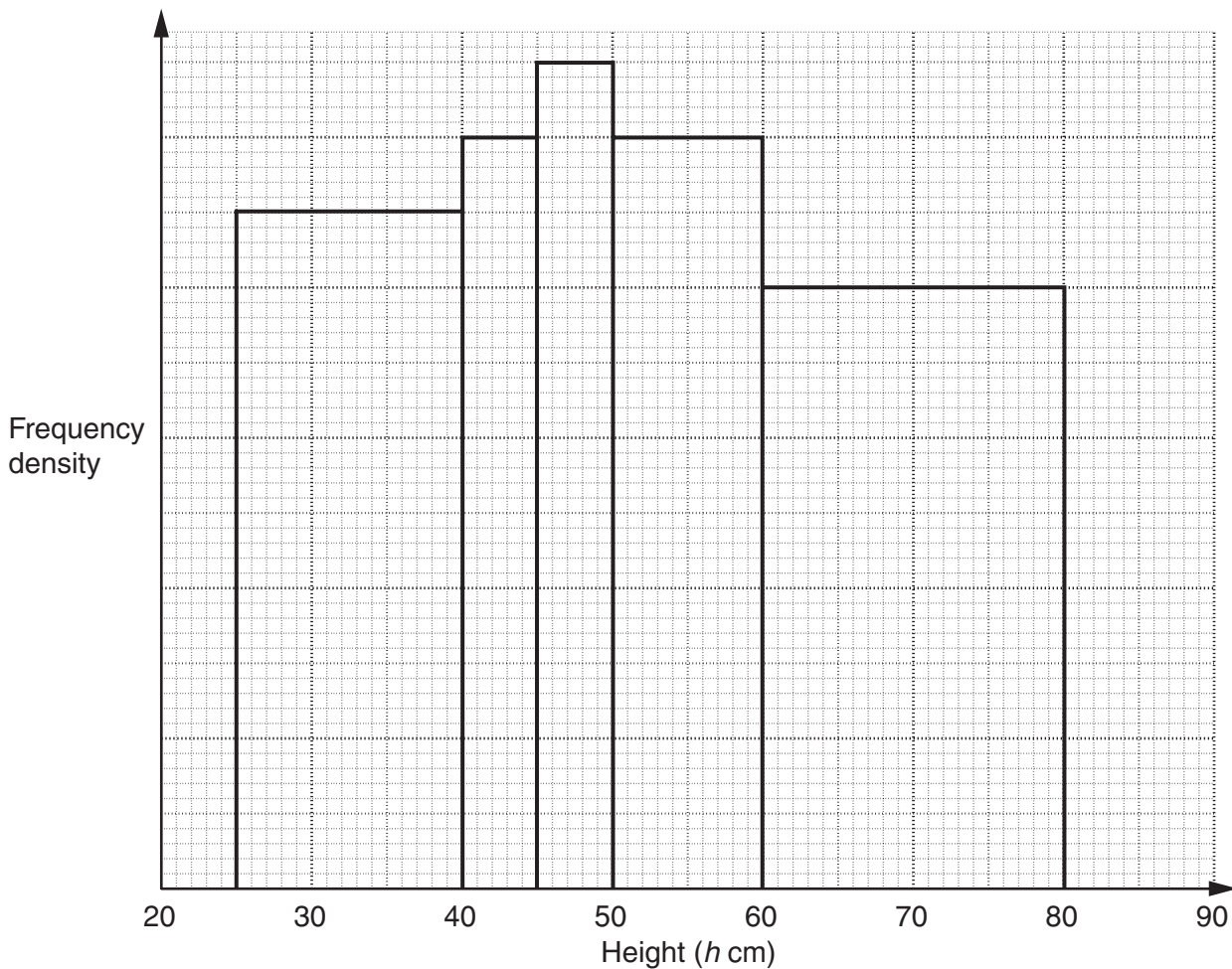
Make two comparisons between the heights in the two locations.

1 _____

2 _____

_____ [2]

(b) At the sheltered location the heights of 100 plants were measured. The distribution of heights is shown in the histogram below.



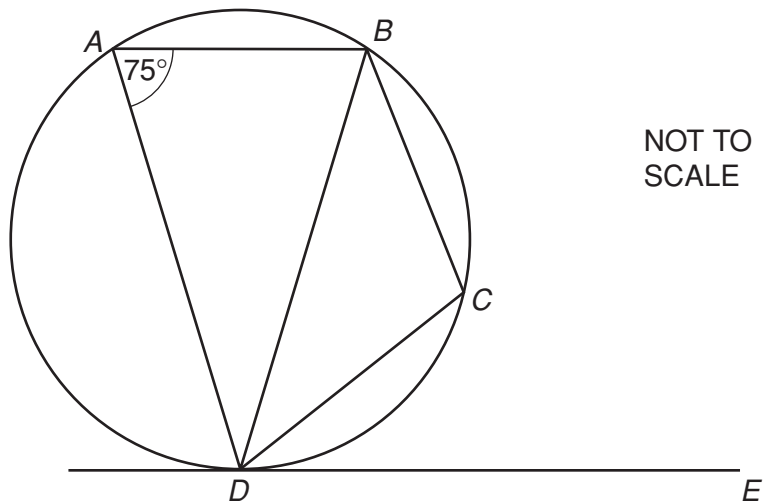
Complete the frequency table below.

.....

Height (h cm)	$25 < h \leq 40$	$40 < h \leq 45$	$45 < h \leq 50$	$50 < h \leq 60$	$60 < h \leq 80$
Frequency				20	

[3]

11



In the diagram, DE is a tangent to the circle.
 Angle $DAB = 75^\circ$.

Write down the size of each of these angles.
 In each case give a reason for your answer.

(a) Angle $BCD = \underline{\hspace{2cm}}$ because $\underline{\hspace{4cm}}$

 _____ [2]

(b) Angle $BDE = \underline{\hspace{2cm}}$ because $\underline{\hspace{4cm}}$

 _____ [2]

12 (a) Given that

$$x(5 - y) = 2(y + w)$$

express y in terms of x and w .

.....
.....
.....
.....

(a) $y =$ _____ [4]

(b) Factorise completely.

$$4x^2 - 36y^2$$

.....
.....
.....

(b) _____ [3]

(c) (i) Given that

$$\frac{x}{5x - 11} = \frac{2}{x}$$

show that $x^2 - 10x + 22 = 0$.

.....
.....
.....
.....
.....

[3]

(ii) Solve $x^2 - 10x + 22 = 0$.

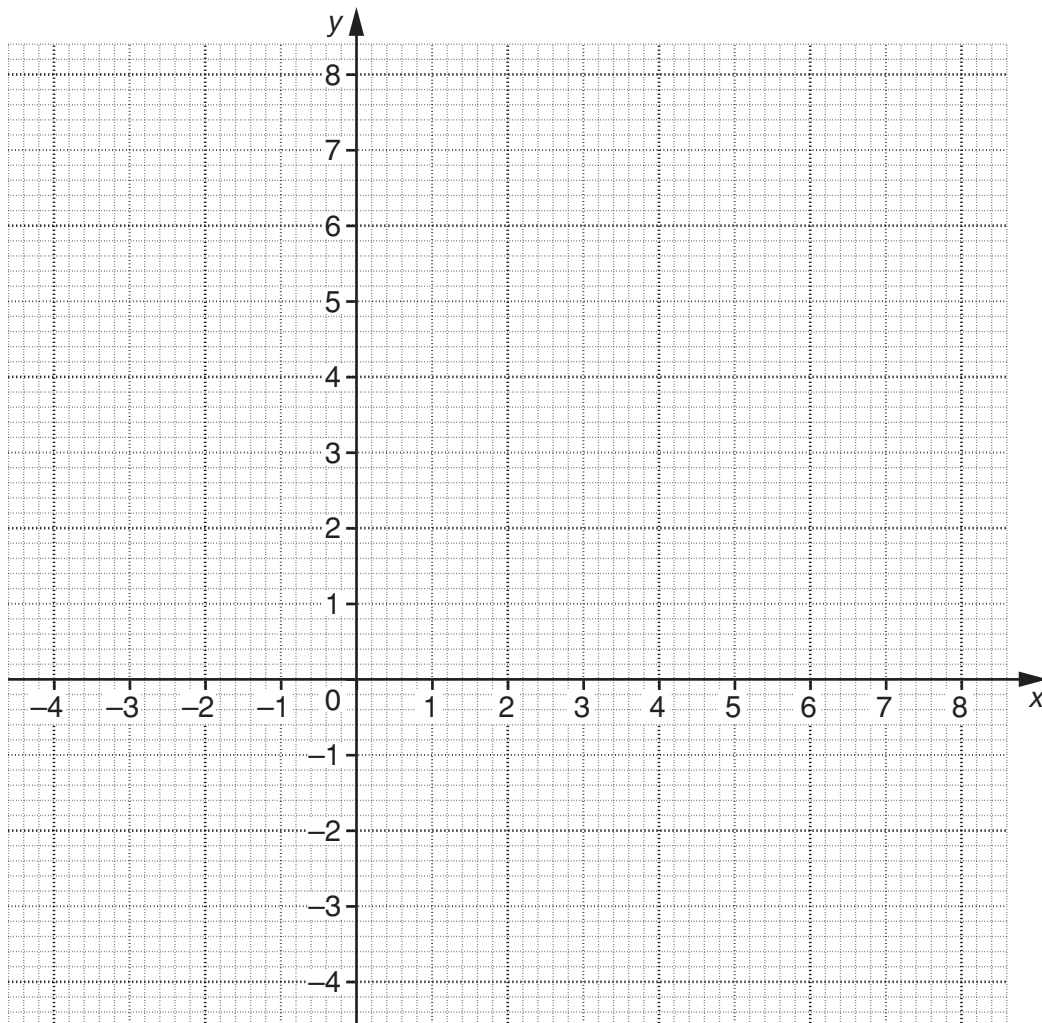
Express your solutions in the form $a \pm \sqrt{b}$ where a and b are integers.

.....
.....
.....
.....
.....

(ii) _____ [3]

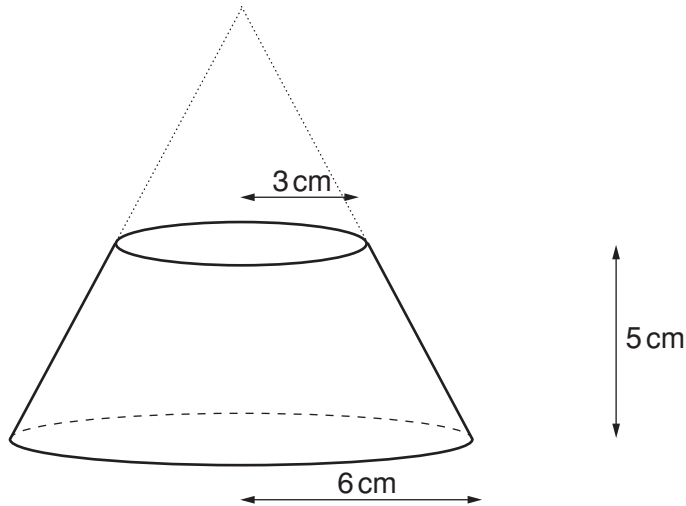
- 13 On the grid below indicate clearly the single region which satisfies all these three inequalities.

$$y \geq \frac{1}{2}x \quad y \leq 2x + 4 \quad 5x + 2y \geq 10$$



[6]

14



The diagram shows a frustum of a cone.
The radius of the base is 6 cm.
The radius of the top is 3 cm.
The height of the frustum is 5 cm.

Calculate the volume of the frustum. Leave your answer as a multiple of π .
Give the units of your answer.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

_____ [5]

15

D E P E N D E N T

Dee chooses three cards at random from those above.

What is the probability that she chooses three cards that could be arranged to spell her name?

.....

.....

.....

.....

.....

.....

.....

.....

.....

_____ [4]

16 (a)

$$S = \frac{n^2(n+1)^2}{4}$$

(i) Find S when $n = 10$.

.....

(a)(i) _____ [1]

(ii) n is a positive integer.

Explain why the formula

$$S = \frac{n^2(n+1)^2}{4}$$

always gives a whole number answer for S whether n is odd or even.

 _____ [2]

(b)

$$T = \frac{n^2(n+1)(n+7)}{6}$$

$$S = \frac{n^2(n+1)^2}{4}$$

n is a positive integer.

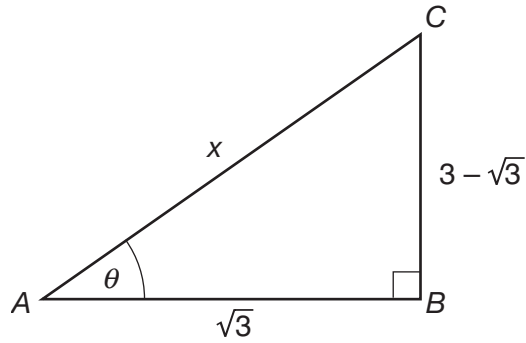
Use algebra to find the value of n when

$$T = S.$$

.....

(b) _____ [3]

17



NOT TO
SCALE

In the diagram angle ABC is a right-angle, $AB = \sqrt{3}\text{cm}$, $BC = 3 - \sqrt{3}\text{cm}$ and $AC = x\text{cm}$. Angle $BAC = \theta$.

Giving your answers in the form $a + b\sqrt{3}$, where a and b are integers,

find

(a) $\tan \theta$,

.....

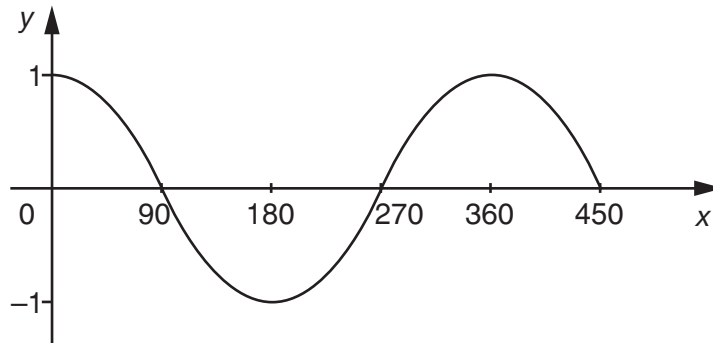
(a) _____ [2]

(b) x^2 .

.....

(b) _____ [3]

18 The diagram shows a sketch of the graph of $y = \cos x^\circ$ for $0 \leq x \leq 450$.



Given that $\cos 50^\circ = 0.643$, solve for $0 \leq x \leq 450$

(a) $\cos x^\circ = 0.643$,

.....

(a) _____ [3]

(b) $\cos x^\circ = -0.643$.

.....

(b) _____ [2]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.