

## 2003 SIA Youth Scholarship Exam

Disclaimer: The following questions were reconstructed based on memory.

### Instructions

There are a total of 22 questions of varying length and marks<sup>1</sup>. Space has been provided for each question<sup>2</sup>. All answers are to be written down in the space provided with appropriate working. Time given for the exam is **2 hours**.

1. Find mean height of the plants.

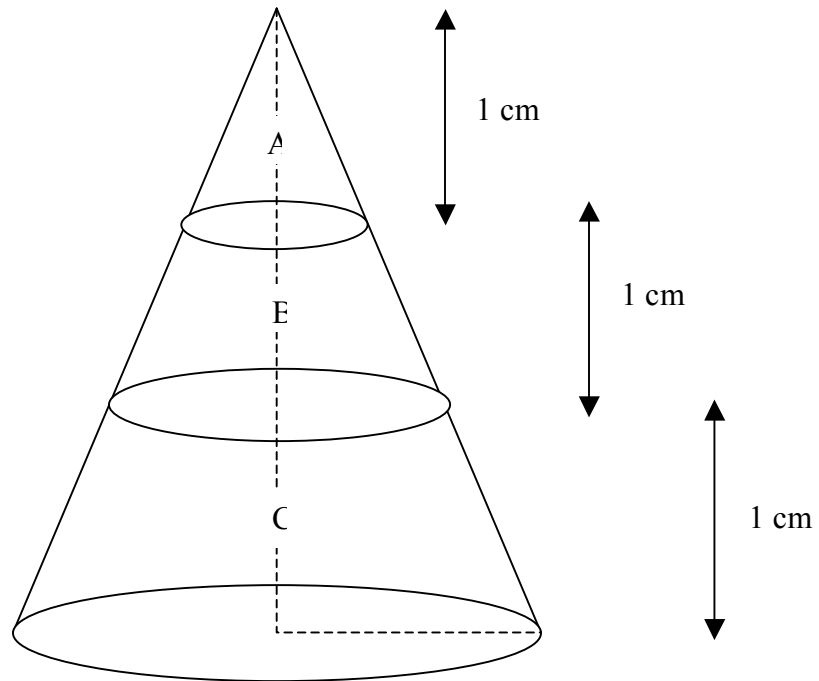
Height (in cm)	$40 < x \leq 50$	$50 < x \leq 60$	$60 < x \leq 70$
Number of plants	5	8	7

2. Factorize:  $4(x^2 - 9) - 4x + 12$ .
3. A box contains 2 black balls, 4 red balls and 6 green balls. First one ball is randomly taken out from the box and is kept out. After that a second ball is taken out. Find
- The probability that both the balls are red.
  - The probability that at least one will be black.
4. In a co-ordinate plane, there are 2 points A and B. A has co-ordinates (2,5) and B has co-ordinates (-6,-1). Through the mid-point of AB, a line  $l$  perpendicular to AB is drawn.
- Find the equation of the line  $l$ .
  - A point C with co-ordinates  $(1, k)$  lies on this line where  $k$  is a real number. Find  $k$ .
  - Find the ratio of AC/AB in the form of  $1:n^{(1/2)}$ .

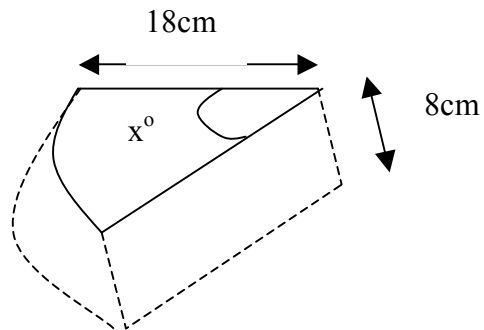
<sup>1</sup> This sample paper however contains only 17 questions out of the 22 questions in the real examination.

<sup>2</sup> Space has not been provided in this sample paper.

5. Following is a cone of height 3 cm. It is split up into three regions A, B and C which are labeled in the figure. Find the ratio of the volume of B and C.

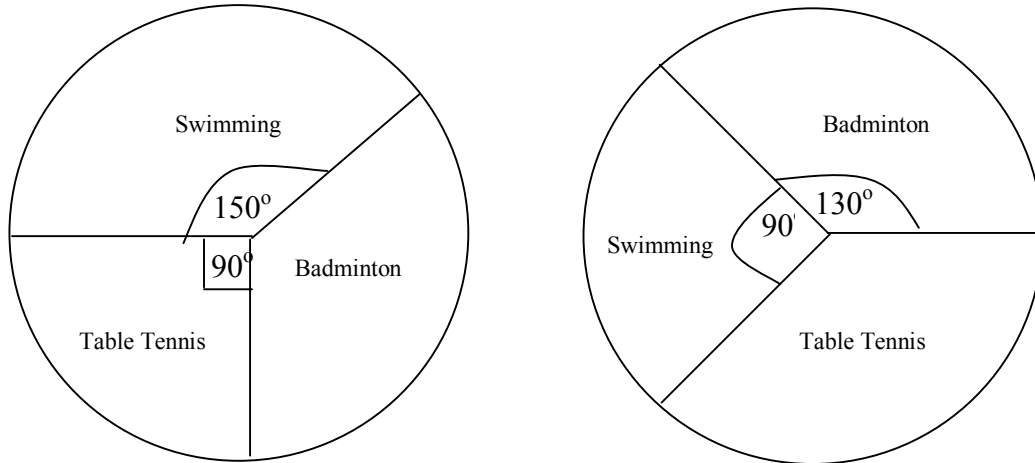


6. A slice is cut out from a cylinder of radius 18 cm and height  $h$ . as shown in the figure.

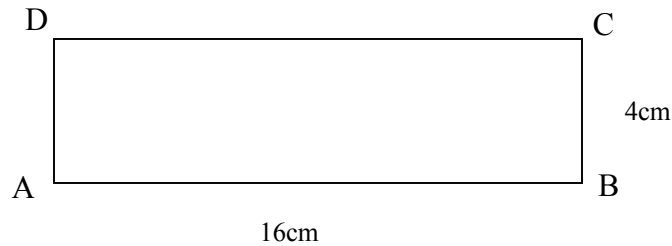


- a) If volume of sliced portion is equal to  $72\pi$ , find angle  $x$  in degrees.  
 b) Find the surface area of this sliced portion.

7. All the boys and girls in a school have joined only one of the three sports: Swimming, Table Tennis and Badminton. The following pie charts show the composition of boys and girls involved in these activities. The boys and girls in the school are in the ratio 3:2.

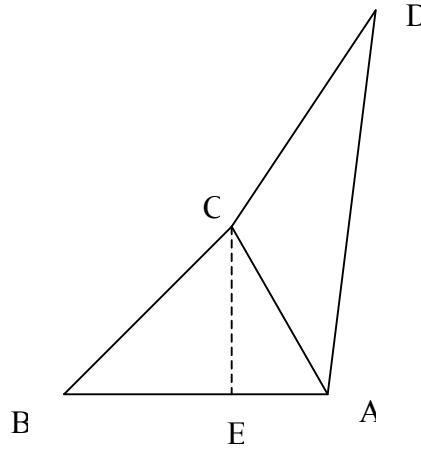


- a) Find angle of sector of students participating in Table Tennis in the whole school?  
 b) If the total number of students in swimming is 228, then find the total number of students in Badminton?
8. As shown in the figure, there is a rectangle ABCD of dimensions 16 cm and 4cm.



- A point P is inside the rectangle such that  $PB < PC$  and  $\text{angle PDA} > \text{angle PDC}$ .
- a) Find the region where P can lie and shade that in the above figure.  
 b) Find the area of that region.

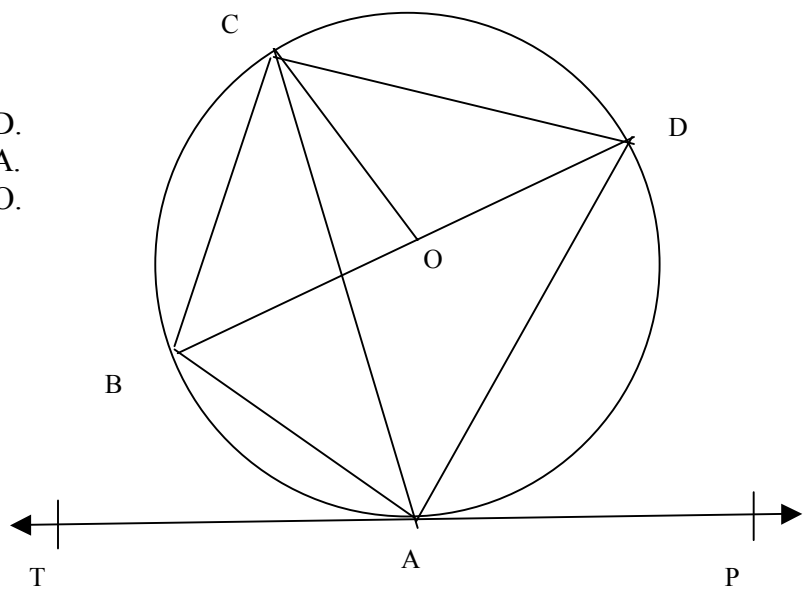
9. In the following figure,  $BC=8\text{cm}$ ,  $CD=12\text{cm}$ ,  $AB=10\text{cm}$  and angle  $BCA$  is a right angle.  $CE$  is also perpendicular to  $AB$ .



- a) Find the value of  $CE$ .
- b) If area of triangle  $ACD$  is equal to  $18\text{cm}^2$ , find angle  $ACD$ .

10. Following is a circle with centre  $O$ . Straight line  $TAP$  is tangent to the circle. Angle  $BOC$  is  $58^\circ$  and angle  $BAC$  is  $41^\circ$ .

- a) Find angle  $CAD$ .
- b) Find angle  $CBA$ .
- c) Find angle  $ACO$ .



11. Ron has two accounts A and B. A has \$ $x$  which is subjected to 6% Simple Interest for four years. B has \$ $y$  which is subjected to 4% Simple Interest for 5 years. If the simple interest at the end of term of the accounts is the same, then find the ratio of  $x : y$ .

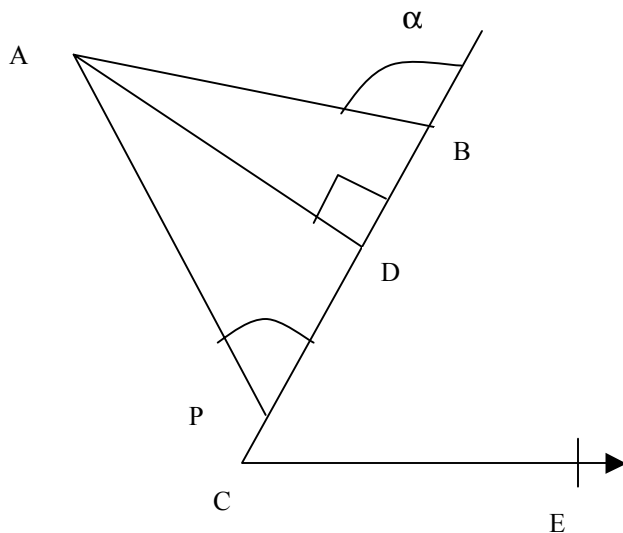
If the sum of Interest received after first year is \$324, find  $x$  and  $y$ .

12. Solve the following inequation for real values of  $x$ .

$$1 - x < x - 3 < 5 - x$$

13. ABCDE is a pentagon. Find the sum of all the enclosed angles of the pentagon. Do not use any formula without proving it first.

14. See the figure and the details for the question.



$$\begin{aligned} \angle PCE &= 25^\circ \\ \angle APB &= 30^\circ \\ \sin \alpha &= 0.75 \\ \tan 30^\circ &= 0.577 \\ \cos 30^\circ &= 0.866 \\ \sin 30^\circ &= 0.5 \\ AP &= 12\text{cm} \end{aligned}$$

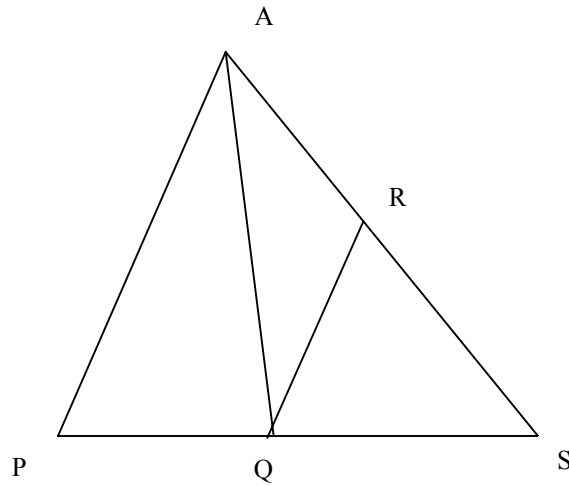
- Find elevation of A from point P.
- Find length PB.

15. Solve the set of simultaneous equations:

$$3x - 4y = -1;$$

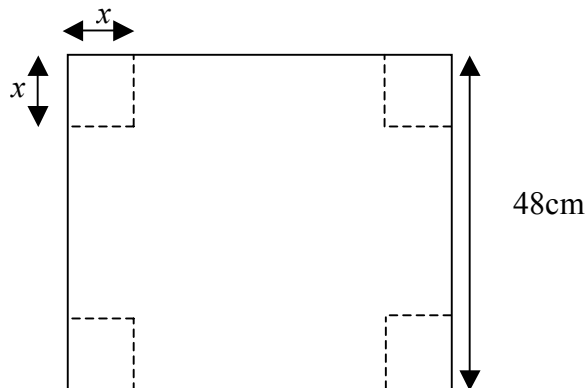
$$8x - 5y = 20.$$

16. In the following figure AP is parallel to QR. The line segments QS and PQ are in the ratio 3:2.



If the area of triangle QRS is equal to  $30\text{cm}^2$ ,

- a) Find the area of triangle PAQ.
  - b) Find  $\text{ar}\Delta QRS / \text{ar}(\text{trap } ARQP)$
17. There is a square of side 48 cm. From each corner of the square, another square of  $x$  cm is cut off as shown in the figure. The resultant object is then folded to form an open ended tray.



- a) Find base area and volume in terms of  $x$ . There is no need for further simplification.
- b) If base area of the tray is equal to  $1600\text{cm}^2$ , find the value of  $x$ .