Paper I

Section A – Foundation Questions (25%)

1. Sam weighs 42.6 kg, correct to the nearest $\frac{1}{5}$ kg. What are the lower limit and the upper limit of this measurement? (3 marks)

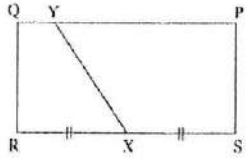
2. Simplify $\left(\frac{a^4b^{-2}}{a^{-3}b^0}\right)^{-1}$ and express your answer with positive indices. (3 marks)

3. a) Solve the following inequality and represent the solution graphically.
$\frac{3x+1}{5} \le \frac{2x-3}{8}$.

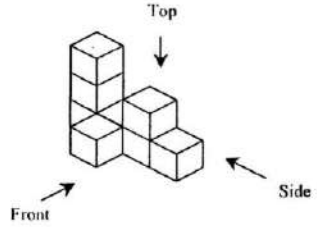
b) Find the largest integer that satisfies the given inequality. (4 marks)

4. Solve $\begin{cases} y = 3 - \frac{1}{2}x \\ x + 2y = 4 \end{cases}$ (3 marks)

5. In the figure, $PQRS$ is a rectangle. If X is the mid-point of RS and the ratio of the areas of $QRXY$ and $PSXY$ is 1 : 2, find $QY : PY$. (3 marks)

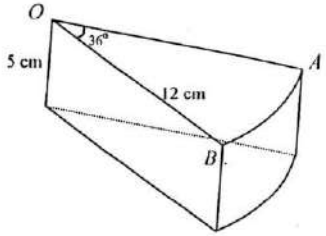


6. Draw the front, top and side views of the following object. (3 marks)



7. Kitty puts $500 000 in a bank as a one-year fixed deposit for 4 years. The annual interest rate for the first 3 years is 8% and that for the last year is 10%. If both the principal and interest will be put in the fixed deposit upon renewal, what is the total interest she will get after 4 years? (3 marks)
(Give the answer correct to nearest thousand dollars)

8. The figure shows a cake in which the top and the bottom sectors are the same. Find
   a) the area of sector OAB,
   b) the volume of the cake,
   c) the length of $\overset{\frown}{AB}$, (3 marks)



(Take $\pi = \frac{22}{7}$ and give the answers correct to 1 decimal place.)

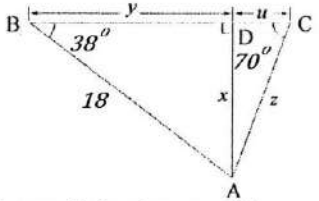
Section B – Short Questions (35%)

9. a) Simplify $\left(\frac{2\sqrt{11}+3\sqrt{3}}{\sqrt{11}-\sqrt{3}}\right)\left(\frac{\sqrt{11}+\sqrt{3}}{\sqrt{11}+\sqrt{3}}\right)$.

b) Solve $\sqrt{11}(y-2) = \sqrt{3}(y+3)$ and using (a) to simplify your answer. (4 marks)

(Leave your answers in surd form)

10. Find x, y, z and u in the figure.
(Give the answers correct to 2 decimal places.) (4 marks)



11. A restaurant provided five set lunches A, B, C, D and E for the customers. Their prices were \$15, \$20, \$25, \$30 and \$35 respectively. Because of the inflation, the restaurant should increase the price of each set lunch in order to maintain the profit rate. The new prices for set lunches A, B, C and D are \$18, \$22, \$28 and \$32 respectively while set lunch E is cancelled.
   (a) Find the original mean price of the set lunches.
   (b) Find the new mean price of the set lunches.
   (c) The restaurant owner claims that average price of the set lunches remains unchanged. Do you agree? Explain your answer. (3 marks)

12. The scores obtained in throwing a die and the corresponding frequencies are recorded in the following table.

Score	1	2	3	4	5	6
Frequency	6	9	10	7	6	x

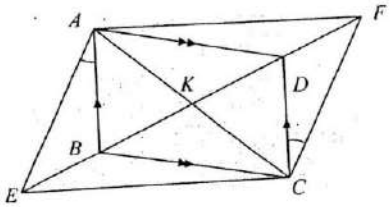
If the mean score is 3.68, find
   a) the value of x;
   b) the median of the scores;
   c) the mode of the scores. (5 marks)

13. The sides of triangle ΔABC are $AB = 7$, $BC = 5$ and $CA = 10 - \frac{5}{2}x$.
   a) Find the range of values of x.
   b) Is AB the longest side of ΔABC ? Explain briefly. (6 marks)

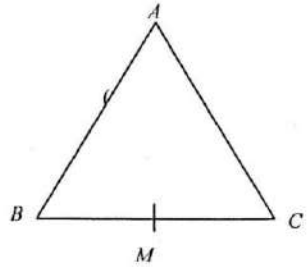
14. In the figure, $ABCD$ is a parallelogram. Given that $EBKDF$ is a straight line and $\angle BAE = \angle DCF$.

a) Show that $\Delta ABE \cong \Delta CDF$.

b) Show that $AECF$ is a parallelogram. (6 marks)



15. In the figure, ΔABC is an isosceles triangle such that $AB = AC$ and M is mid-point of BC. Show that othocentre, incentre, circumcentre and centriod are on AM.

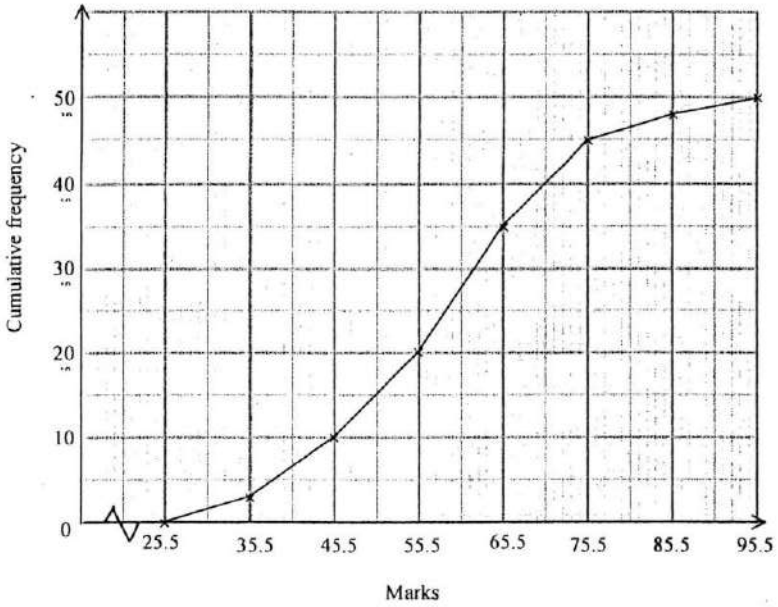


End of Section A and Section B

Section C [40 marks]

1. The cumulative frequency polygon below shows the marks of Mathematics Examination scored by a group of students.

Marks scored by a group of students in Mathematics Examination



(a) Complete the following frequency distribution table for the Mathematics marks. (2 marks)

Marks	26 –						
Frequency	3						2

(b) Find the mean mark of the Mathematics examination. (2 marks)

(c) Find the median mark of the Mathematics examination. (1 mark)

(d) For promotion to class A or B, school will use the weighted mean score. Students will be promoted to the class with a higher weighted mean score. The weight allotted to each subject for class A and B are given in the following table. Amy's marks are shown in the table and her Mathematics mark is equal to the upper class limit of the modal class in the frequency distribution table in (a). Which class will Amy be promoted to?

Subject	English	Chinese	Science	Humanities	Math
Weight for A	10	7	5	10	10
Weight for B	10	7	10	5	10
Amy's mark	67	78	79	66	

(4 marks)

2.

Salaries Tax on Net Chargeable Income by Progressive rates

Net chargeable income	Rate
On the first \$40 000	x%
On the next \$40 000	8%
On the next \$40 000	y%
On the remaining	17.5%

Table (1)

	Net chargeable income	Salaries tax
Mary	\$100 000	\$6 800
John	\$200 000	\$23 400

Table (2)

(a) Table (1) shows the progressive rates for calculating the salaries tax in the current year in a city. Table (2) shows the net chargeable incomes and salaries taxes payable by Mary and John in the current year. Find the values of x and y. (5 marks)

(b) Salaries tax payable by a tax payer is either calculated at progressive rates given in table (1) on his net chargeable income or at standard rate on his total annual income (before deduction of the sum of all allowances), whichever is the lower. Given that the standard rate for the current year is 15%.

(Net chargeable income = Total annual income – sum of all allowances.)

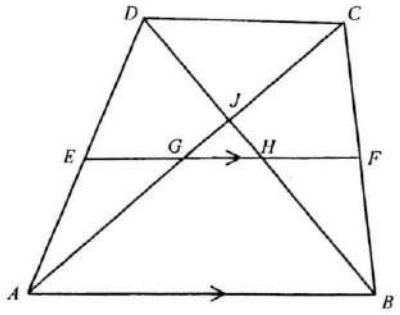
Mr Chan's total annual income is \$$P$ and his sum of all allowances is \$168 000. It is known that Mr Chan has to pay salaries tax at the standard rate.

(i) Express his salaries tax in terms of P.

(ii) Find the least value of P. (4 marks)

(c) Mr Lee's allowance for the current year is also \$168 000. His monthly salary was \$120 000 three years ago. His monthly salary increased at a rate of r % per year, where r is a positive integer. Mr Lee does not need to pay salaries tax at standard rate this year. Find the possible values of r. (3 marks)

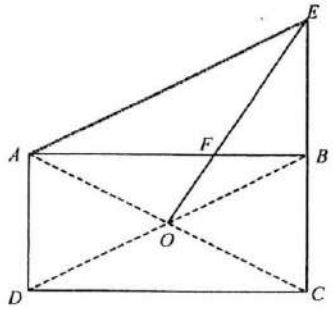
3. In the figure, E and F are the mid-points of AD and BC respectively. Given that $EF // AB$, and the diagonals BD and AC meet at J. BD and AC cut EF at H and G respectively.



(a) Prove that $DC // AB$. (3 marks)

(b) Given that $AJ = 10$cm, $JC = HB$ and $DJ - JH = 3$ cm. Find the length of BH. (7 marks)

4. (a) $ABCD$ is a rectangle where $AD = (8 - 2x)$ cm and $AB = 8x$ cm. The diagonals of the rectangle intersect at O. Given that $OA = (5x - 1)$ cm.
Find the possible value(s) of x. (3 marks)



(b) The line CB is produced to E such that $BE = CB$.

(ii) Find the length of FB. (4 marks)

(iii) A student claims that CF bisects $\angle ACE$, do you agree with him? Explain your answer. (2 marks)

End of Paper I

Paper II

1. $a^2 + a(a + a) =$

A. $3a^2$. B. $3a^3$. C. a^4. D. a^5.

2. How many significant figures does 0.0140 have?

A. 2 B. 3 C. 4 D. 5

3. $\dfrac{5^{3n}}{25^{n-1}} =$

A. 5^{n-1}. B. 5^{n+1}. C. 5^{n+2}. D. 5^{5n-2}.

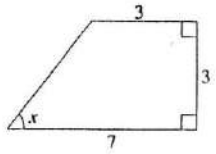
4. Amy sold a vase to Brian at a profit of 15%. Later, Brian sold the vase to Carmen for \$6400 and gained \$420. What was the cost price of the vase for Amy?

A. \$ 5200 B. \$ 5970 C. \$ 6877 D. \$ 7780

5. If the point $A(-3, 4)$ is rotated anti-clockwise about the origin through 180° to the point B, then the coordinates of B are

A. $(3, -4)$. B. $(-4, 3)$. C. $(-3, -4)$. D. $(4, 3)$.

6. In the figure, $\cos x =$



A. $\dfrac{3}{7}$. B. $\dfrac{5}{7}$.

C. $\dfrac{3}{5}$. D. $\dfrac{4}{5}$.

7. The frequency distribution table below shows the time (in hours) spent by a group of teenagers in using computers in a week. If $\frac{2}{9}$ of them spent 20 h – 24 h in using computers in a week, find the value of n.

Time (h)	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34
Frequency	2	3	5	10	n	$n-3$

A. 14 B. 15 C. 16 D. 17

8. If $(5x + P)^2 = 25x^2 - 30x + Q$, then $Q =$

A. 3. B. 9. C. 12. D. 36.

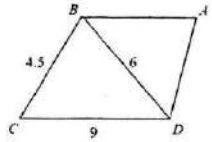
9. If $2x - 3y = x + 3 = 3x - y$, then $x =$

A. 8. B. $\dfrac{24}{5}$. C. $\dfrac{6}{5}$. D. -2.

10. The ratio of the base radii of the two cylinders of equal height is 1 : 2. What is the ratio of the curved surface areas of the two cylinders?

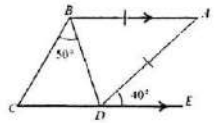
A. 1 : 1 B. 1 : 2 C. 1 : 4 D. 1 : 8

11. In the figure, $\Delta BAD \sim \Delta DBC$, $BC = 4.5$, $BD = 6$ and $CD = 9$. Find AB.



A. 3 B. 4 C. 5 D. 6

12. In the figure, CDE is a straight line, $AB = AD$, $AB // CE$, $\angle ADE = 40°$ and $\angle CBD = 50°$. Find $\angle BCD$.



A. 40° B. 50° C. 60° D. 70°

13. It is given that S_1 is the sum of the interior angles of a convex polygon and S_2 is the sum of the exterior angles. If $S_1 + S_2 = 1080°$, find the number of sides of the polygon.

A. 5 B. 6 C. 7 D. 8

14. Given that $y = \dfrac{1}{3}(x - 4)$. If $y < 2$, find the range of values of x.

A. $x < 10$ B. $x < 2$ C. $x > 2$ D. $x > 10$

15. a and b are any numbers such that $a < b$. If k is a positive integer, which of the following must be true?

I. $a + k < b + k$

II. $-ka < -kb$

III. $a^k < b^k$

A. I only B. I and II only C. I and III only D. II and III only

16. If $\frac{2x+1}{3} - \frac{3-2x}{2} > x$, then

A. $x > \frac{4}{7}$. B. $x > \frac{7}{4}$. C. $x < \frac{4}{7}$. D. $x < \frac{7}{4}$.

17. If P is less than Q by 10% and Q is greater than R by 10%, then

A. P is less than R by 10%. B. P is less than R by 1%.

C. P is greater than R by 1%. D. P is greater than R by 10%.

18. The cost of a shirt is \$30, where 40% is for raw materials and 60% is for wages. If the cost for raw materials is increased by 40% and that of wages is decreased by 40%, the percentage change of the cost of the shirt is

A. –8%. B. –5%. C. 0%. D. 5%.

19. Daniel borrowed \$10 000 from a bank and the interest was compounded half-yearly. If the interest rate is 4% p.a., find, correct to the nearest integer, the interest after 2 years.

A. \$404 B. \$816 C. \$824 D. \$1699

20. Harry owns a flat with rateable value of \$80 000 a year. The tax rate for rates is 5% per annum. If the rates for the first half of the year are exempted, what are the rates that he should pay for that year?

A. \$800 000 B. \$8 000 C. \$4 000 D. \$2 000

21. $110_{10} - 110_2 + 110_{16} =$

I. 101111000_2

II. $10111100l_2$

III. 376_{10}

IV. 178_{16}

A. I only B. I and II only C. II and III only D. I, III and IV only

22. If the sides of a triangle are 5, 9 and x, find the number of possible integral values of x.

A. 7 B. 9 C. 11 D. 13

23. A number is first decreased by k% and then increased by k%. If the final number is $\frac{5}{9}$ of the original number, find the value of k.

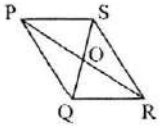
A. $\frac{4}{9}$ B. $\frac{2}{3}$ C. $33\frac{1}{3}$ D. $66\frac{2}{3}$

24. Which of the following conditions can be used to determine that $ABCD$ is a parallelogram?

A. $\angle A = \angle B$, $\angle C = \angle D$ B. $AB = AD$, $BC = CD$

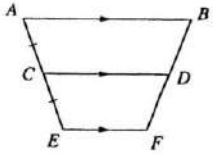
C. $AD \parallel BC$, $AD = BC$ D. $AB \parallel DC$, $\angle B = \angle C$

25. In the figure, $PQRS$ is a parallelogram. PR and SQ intersect at O. How many pairs of congruent triangles are there?



A. 2 B. 3 C. 4 D. 5

26. In the figure, $AB \parallel CD \parallel EF$ and $AC = CE$. Which of the following must be true?



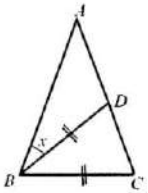
I. $\frac{BD}{DF} = 1$

II. $\frac{EF}{CD} = \frac{1}{2}$

III. $CD = \frac{AB + EF}{2}$

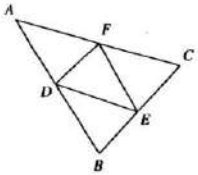
A. I and II only B. I and III only C. II and III only D. I, II and III

27. In the figure, ADC is a straight line and BD is the angle bisector of $\angle ABC$. If $AB = AC$ and $BD = BC$, then $x =$



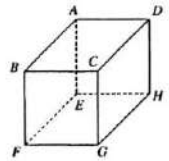
A. 28°. B. 32°. C. 36°. D. 40°.

28. In the figure, D, E and F are the mid-points of the AB, BC and CA of ΔABC respectively. If the area of ΔDEF = 10 cm^2, then the area of ΔABC is



A. 20 cm^2. B. 30 cm^2. C. 40 cm^2. D. 80 cm^2.

29. The figure shows a cube $ABCDEFGH$. Name the angle that the line AG makes with the plance $CDHG$.



A. $\angle ACG$ B. $\angle AGE$ C. $\angle DAG$ D. $\angle AGD$

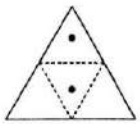
30. Solve the compound inequality $\begin{cases} 5(x-2) \le -15 \\ 2(6-x) \ge 8 \end{cases}$

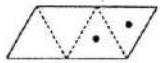
A. $x \le -1$ B. $x \le 2$ C. $2 \le x \le -1$ D. No solution

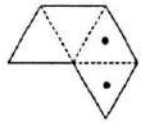
31. Solve $(x+2) = (x-3)(x+2)$.

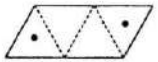
A. $x = 3$ B. $x = 4$ C. $x = -2$ or $x = 3$ D. $x = -2$ or $x = 4$

32. The figure shows a regular tetrahedron in which dots are drawn on two of its faces. Which of the following is not its possible net?

A. 

B. 

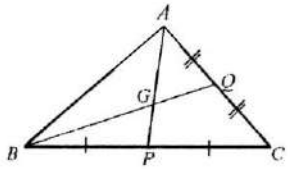
C. 

D. 

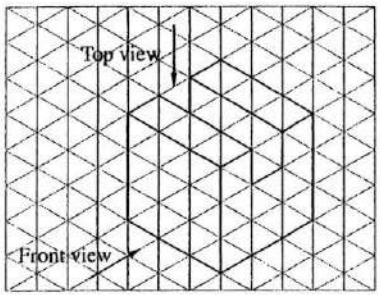
33. In the figure, if $AQ = CQ$, $BP = CP$ and $AP = 12$ cm, then $AG =$

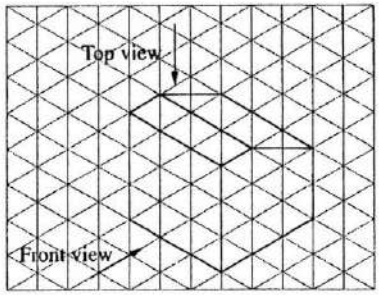
A. 4 cm. B. 6 cm.

C. 8 cm. D. 10 cm.



34.





Compare the two prisms in the above figure, which are the following is/are true?

I. They have the same front view.

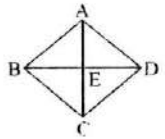
II. They have the same top view.

III. They have the same volume.

A. I only B. I and III only C. II and III only D. I, II and III

35. How many planes of reflection are there in a regular o

A. 5 B. 6 C. 8



36. In the figure, $ABCD$ is a rhombus. AC and BD intersect at E. If $AD = (x-2)$ cm, $AC = (2x-12)$ cm and $BD = (2x-8)$ cm, then the perimeter of rhombus $ABCD$ is

A. 30 cm. B. 32 cm. C. 36 cm. D. 40 cm.

37. If the mode of the seven numbers 8, 6, 1, 2, 6, a and b is 8, then the median of the seven numbers is

A. 3. B. 6. C. 7. D. 8.

38. Susan and Jane applied for the same post. Their scores in different categories and the weight assigned to each category are as follows:

	Education	Work experience	Typing	Speaking
Susan	82	65	53	72
Jane	85	x	76	68
Weight	4	3	2	1

If they got the same weighted mean, find the value of x.

A. 43 B. 45 C. 46 D. 47

39. The mean of a group of n numbers is m. If the numbers 2, 3 and 4 are removed from the group, the mean of the remaining $n-3$ numbers remains unchanged. Find the value of m.

A. 1 B. 2 C. 3 D. $n-3$

40. Which of the following is not true for a cube?

	Order of rotational symmetry	Corresponding number of axes of rotational symmetry
A.	2	6
B.	3	4
C.	4	3
D.	6	2

41. It is known that the mean, median and mode of 9 data are 28, 26 and 18 respectively. After deleting the datum 32, which of the following must be true?

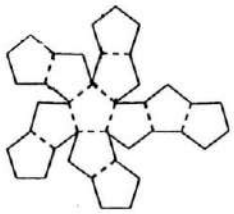
I. The mean will decrease.

II. The median will decrease.

III. The mode will decrease.

A. I only B. I and II only C. I and III only D. II and III only

42. The following figure shows the net of a polyhedron. All the faces are regular pentagons. The number of vertices of the polyhedron is



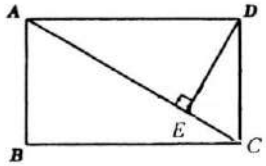
A. 12.

B. 18.

C. 20.

D. 30.

43. In the figure, AC is a diagonal of rectangle $ABCD$ and $DE \perp AC$. If $AC = 4$ cm, $DC = 2$ cm, then $DE =$



A. 1 cm.

B. $\sqrt{3}$ cm.

C. 2 cm.

D. $\sqrt{12}$ cm.

44. When every datum in a set of data is decreased by 3, which of the following will also decrease by 3?

I. Mean

II. Median

III. Mode

A. I only B. I and II only C. II and III only D. I, II and III

45. Let O be the origin. If the coordinates of the points A and B are $(-4, 4)$ and $(-8, 0)$ respectively, which of the following gives the coordinates of the circumcentre and orthocentre of ΔOAB?

	Circumcentre	Orthocentre
A.	$(-4, 0)$	$(-4, 4)$
B.	$(-4, 0)$	$(-4, 2)$
C.	$(-4, 4)$	$(-4, 2)$
D.	$(-4, 4)$	$(-4, 0)$

~ End of Paper II~