Exam Strategies

A. Exam Format

Paper 1 (Conventional questions)
Duration: 2 hours; Percentage: 60%

Section	Marks	Number of questions	Other details
A(1)	33	8 – 10	Compulsory short elementary questions from the foundation part of the syllabus.
A(2)	33	4 – 5	Compulsory harder questions from the foundation part of the syllabus.
B	33	3 out of 4	Structural questions from the whole syllabus.

Paper 2 (Multiple-choice questions with 4 options)
Duration: 1 hour 30 minutes; Percentage: 40%

Section	Number of questions	Other details
A	36	Questions from the foundation part of the syllabus.
B	18	Questions from the whole syllabus.

B. More about the Exam

In paper 1, questions in section A(1) are easy and simple. They are usually of junior form standard and most candidates can handle this part. For section A(2), each question is usually divided into several parts which are inter-related. Candidates are required to make use of the results in the former parts of a question to finish the latter parts. For section B, questions are harder and each question may require knowledge in more than one topics.

In paper 2, questions in section A are easier than those in section B.

C. Marking Scheme

Marks will be awarded in the following conditions:

"A" marks: Awarded for the accuracy of the answer. However, if the correct answer is deduced from previous erroneous answers or from an incorrect method, no marks will be given.
"M" marks: Awarded for correct methods being used, no matter the answer is correct or not.
Other marks: Awarded for correctly completing a proof or arriving at an answer given in a question.

F. Distribution of Exam Questions in Paper I & II

1. Paper I

Topics \ Years	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Percentages	10a	7	17a	10b	8, 14b	6b	5	3	6, 16a(i), (ii)	6
Estimation, Rates, Ratios, and Variations	/	12	6	8	13a	11a	10a	10a	5, 10a	15
Polynomials and Formulas	1	5,9	2, 15b	1, 6	2, 6	4	1, 3	2, 6	1, 3, 10b	3, 10a
Indices, Surds and Logarithms	2, 3, 10b	4	1	2	1	1	4	1	2, 16b	1
Functions and Graphs	13	/	7	/	13c	/	/	4	/	/
Equations	8	/	15b	10a	13b, 16a	/	6	7	/	10b, 15b(iv)
Inequalities and Linear Programming	4	18	3, 17b(ii)	5, 15	4, 15a, 15b(i)	17, 17b	2, 10b	10b	4	2
Trigonometry	6, 12a(i)	3, 17	4, 9a, 18	4, 17	9, 16b 17a(ii)	3, 14	9, 14, 15a(ii)	5, 17	14	17
Sequences	15	13	17b(i)	14	12a, 12b(ii)	13b, 13c	7, 15b(ii)	15	7, 16a(iii)	/
Mensuration	5c, 7a, 12a(ii) 12b(i), (ii), (iii)	1, 16a	9b, 13	3, 18a, 18b(i), (ii)	3, 9, 12b(i), 16a	2, 6a, 11b, 13a, 15a(i), 15b	13, 15(a)(i)	9, 12b(ii)	9, 12, 13c	4, 13a
Deductive Geometry		2, 6, 14	14	13	11	10	8, 15a(iii), 15b(i)	12a, 12b(i)	8, 17a(ii)	5, 13b
Circles	9, 16a	6, 14	5, 16a, 16b(iii)	7, 16a, 16b(i)	5, 17b	9, 16a	17a	16a, 16b, 16c(i)	17a(i), 17b(ii)	16a
Coordinate Geometry	16b	8, 15	10, 16b(i), (ii)	9, 16b(ii)	7, 17a(i)	8, 16b, 17a	12, 17b	13, 14a, 14c, 16c(ii)	13a, 13b, 17b(i)	7, 12, 16b
Probability	14	11	12	12	15b(ii)	12c	16	8	11, 15c	8b, 14b
Statistics	11	10	8, 11	11	10	5, 12a, 12b	11	11	15a, 15b	8a, 9, 14a

Page total

3. Figure 2 shows a square dartboard which is formed by three squares of sides 5 cm, 10 cm and 15 cm. When a person throws a dart, he should pay \$1 first. He can get \$10 and \$1 as rewards if the dart hits the regions I and II respectively. There will be no reward if the dart hits region III.
Suppose a dart is thrown and hits the board, find the expected value that the person can get.
(3 marks)

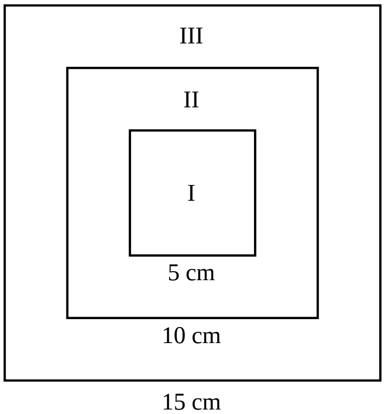

Figure 2

4. Figure 3 shows a piece of paper.

(a) Suggest a strategy to estimate the thickness of this paper.

(b) A ruler as shown in the figure is used to measure the length of this paper. Find the percentage error of this measurement.
(4 marks)

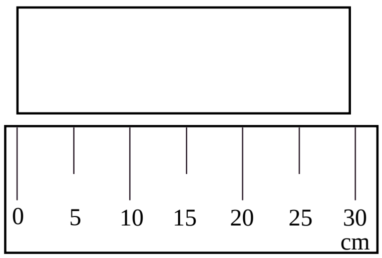

Figure 3

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15. Peggy wants to borrow a loan from a bank at an interest rate of 12%, compounded monthly to buy 100 000 shares of a new stock where the price of the stock is $4 per share. The interest is calculated at the end of each month after the loan is taken and a monthly instalment of $\$x$ is immediately repaid to the bank until the loan is fully repaid, where $x < 400\ 000$. The last instalment can be less than $\$x$.

(a) (i) Complete the following table, express the answers in terms of x if necessary.

Number of instalment	Loan interest	Outstanding balance
1		

Table 3

(ii) Show that if Peggy has not yet fully repaid the loan after the nth instalment, then she still owes the bank $\$\{400\ 000(1.01)^n - 100x[(1.01)^n - 1]\}$.

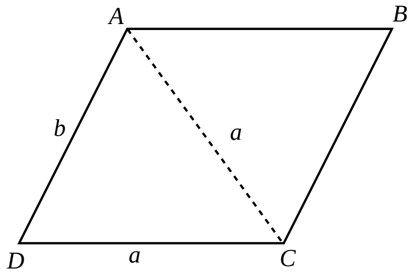
(5 marks)

(b) If Peggy wants to repay the loan by 120 equal instalments, what is the amount of each monthly instalment? (Give the answer correct to the nearest integer.)

(3 marks)

(c) If Peggy doesn't want to repay more than $6000 a month, what is the shortest period for her to fully repay the loan? (3 marks)

21. In the figure, $AC = DC = a$ and $AD = b$. Express the area of parallelogram $ABCD$ in terms of a and b.



A. $\frac{a}{2}\sqrt{a^2 - 4b^2}$

B. $\frac{a}{2}\sqrt{a^2 + 4b^2}$

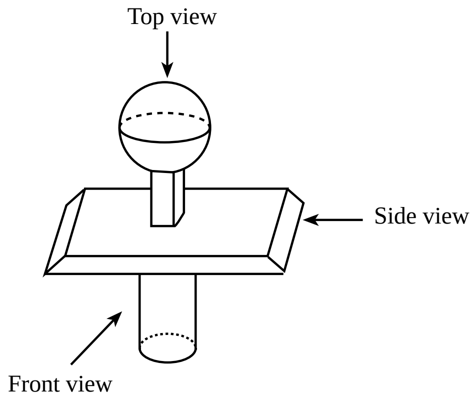
C. $\frac{b}{2}\sqrt{4a^2 - b^2}$

D. $\frac{b}{2}\sqrt{4a^2 + b^2}$

22. Find the number(s) of axis of symmetry and order(s) of rotational symmetry of a parallelogram.

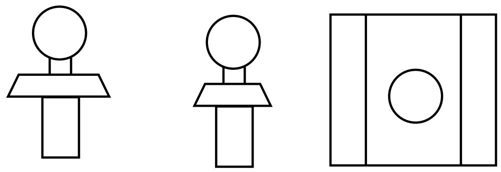
	Number of axis of symmetry	Order of rotational symmetry
A.	0	2
B.	0	4
C.	1	2
D.	2	2

23. Which of the following is the front view, side view and top view of the given figure.

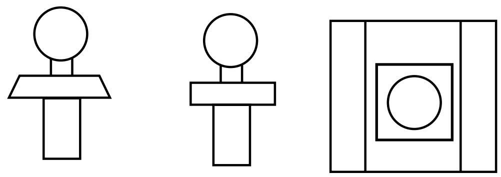


Front view Side view Top view

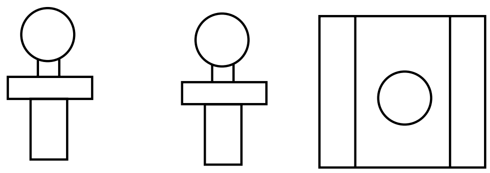
A.



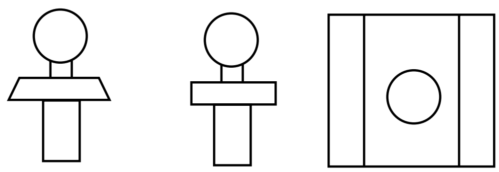
B.



C.



D.



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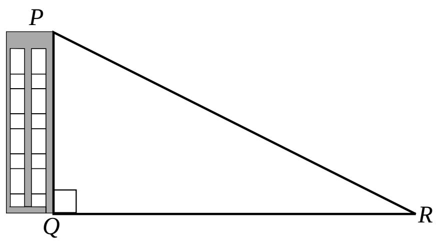
29. In the figure, PQ is a building. If $PQ : QR = 1 : 5$, what is the angle of depression of R from P?



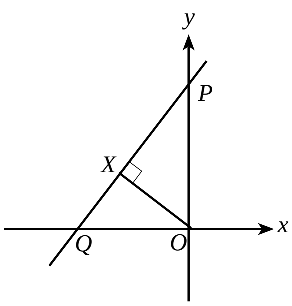
A. 11.3°

B. 11.5°

C. 78.5°

D. 78.7°

30. In the figure, X is a point on PQ. $OX = 4.8$, $OQ = 6$ and $OX \perp PQ$. Find the equation of PQ.



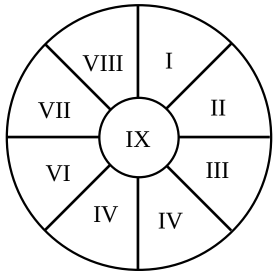
A. $4x - 3y - 24 = 0$

B. $4x - 3y + 24 = 0$

C. $4x + 3y - 24 = 0$

D. $4x + 3y + 24 = 0$

31. The figure shows a dartboard that formed by two concentric circles. The radii of the larger circle and the smaller circle are 8 cm and 4 cm respectively. The area of region I to region VIII are the same. If a dart is thrown and hits the dartboard, find the probability that it hits region VI.



A. $\frac{1}{32}$

B. $\frac{3}{32}$

C. $\frac{1}{4}$

D. $\frac{3}{4}$

32. Peter pays \$10 to play the following game once, find his expected return.

A. –\$3.875

B. –\$3.125

C. \$3.125

D. \$10

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7. $y = \dfrac{x-1}{x+1}$

$y(x+1) = x - 1$ 1A

$xy + y = x - 1$

$y + 1 = x - xy$ 1A

$y + 1 = x(1-y)$ 1A

$x = \underline{\underline{\dfrac{y+1}{1-y}}}$ 1A

(4)

8. (a) Coordinates of D

$= \left(\dfrac{0+4}{2}, \dfrac{2+4}{2}\right)$

$= \underline{\underline{(2,\ 3)}}$ 1A

(b) **Thinking Process**

Since C is a point on the x-axis, its y-coordinate must be 0. Set up an equation by using the fact that AB is perpendicular to CD.

Slope of AB

$= \dfrac{4-2}{4-0}$

$= \dfrac{1}{2}$

Let $(x, 0)$ be the coordinates of C.

Slope of CD

$= \dfrac{0-3}{x-2}$

$= \dfrac{-3}{x-2}$ 1M

$\because\ AB \perp CD$

$\therefore\ \left(\dfrac{1}{2}\right)\left(\dfrac{-3}{x-2}\right) = -1$ 1M

$-3 = -2(x-2)$

$-3 = -2x + 4$

$2x = 7$

$x = \dfrac{7}{2}$

$\therefore$ Coordinates of C are $\left(\dfrac{7}{2},\ 0\right)$. 1A

(4)

Reminder

Since $AB \perp CD$, the product of their slopes is -1.

9. (a) $2\pi(5)\left(\dfrac{\angle AOB}{360°}\right) = \dfrac{25}{6}\pi$ 1A

$10\pi\left(\dfrac{\angle AOB}{360°}\right) = \dfrac{25}{6}\pi$

$\dfrac{\angle AOB}{360°} = \dfrac{5}{12}$

$\angle AOB = \underline{\underline{150°}}$ 1A

(b) **Thinking Process**

Use the fact that the perimeter of the sector is the same as the circumference of the circle.

Circumference

$= \dfrac{25}{6}\pi + 2 \times 5$

$= \left(\dfrac{25}{6}\pi + 10\right)$ cm 1A

Radius of the circle

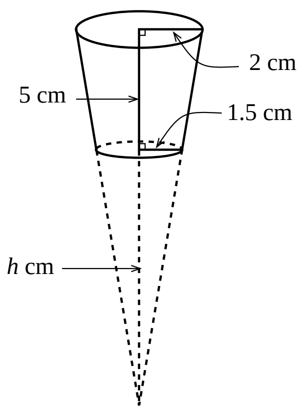
$= \dfrac{\dfrac{25}{6}\pi + 10}{2\pi}$ 1M

$= \underline{\underline{3.67 \text{ cm}}}$ (*correct to 3 significant figures*) 1A

(5)

10. (a) **Thinking Process**

Find the height of the smaller cone by applying the properties of similar triangles.



As shown in the figure, let h cm be the height of the smaller cone.

$\frac{h}{1.5} = \frac{h+5}{2}$ 1M

$2h = 1.5(h+5)$

$2h = 1.5h + 7.5$

$0.5h = 7.5$

$h = 15$ 1A

Volume of the smaller cone

$= \frac{1}{3}\pi(1.5)^2(15)$

$= 11.25\pi \text{ cm}^3$ 1A

Volume of the larger cone

$= \frac{1}{3}\pi(2)^2(15+5)$

$= 26\frac{2}{3}\pi \text{ cm}^3$ 1A

$\therefore$ Volume of the frustum

$= 26\frac{2}{3}\pi - 11.25\pi$ 1M

$= \underline{\underline{15\frac{5}{12}\pi \text{ cm}^3}}$ 1A

(6)

(b) Volume of the cube

$= 6^3$

$= 216 \text{ cm}^3$ 1A

Volume of the stand

$= \underline{\underline{\left(216 - 15\frac{5}{12}\pi\right) \text{cm}^3}}$ 1A

(2)

11\. (a) Let $I = k_1 + k_2T^2$, where $k_1, k_2 \neq 0$. 1M

When $T = 1000$, $I = 150\ 000\ 000$.

$150\ 000\ 000 = k_1 + k_2(1000)^2$

$150\ 000\ 000 = k_1 + 1\ 000\ 000k_2 \quad \ldots\ldots (1)$

When $T = 2000$, $I = 450\ 000\ 000$.

$450\ 000\ 000 = k_1 + k_2(2000)^2$

$450\ 000\ 000 = k_1 + 4\ 000\ 000k_2 \quad \ldots\ldots (2)$

1A

(2) – (1):

$300\ 000\ 000 = 3\ 000\ 000k_2$

$k_2 = 100$ 1A

Substituting $k_2 = 100$ into (1),

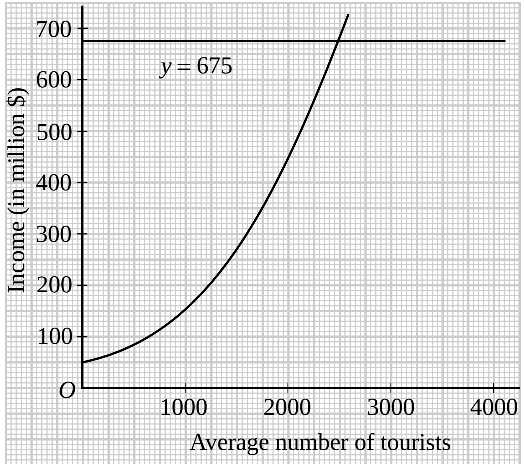
$150\ 000\ 000 = k_1 + 1\ 000\ 000 \times 100$

$k_1 = 50\ 000\ 000$ 1A

$\therefore \quad I = 50\ 000\ 000 + 100T^2$ 1A

(5)

(b) Draw a straight line $y = 675$ on the graph.



From the graph, $T \geq 2500 \quad \ldots\ldots (3)$ 1A

$\because$ The park can at most accommodate 4000 tourists.

$\therefore \quad T \leq 4000 \quad \ldots\ldots (4)$ 1A

Combining (3) and (4), we have

$2500 \leq$ average number of tourists ≤ 4000 1A

(3)

Reminder

From the graph, the scale of the y-axis is in million dollars.

Thus, a line $y = 675$ is drawn to represent 675 000 000.

12\. (a) $400x^2 + 400x - 861 = 0$

$(20x - 21)(20x + 41) = 0$ 1A

$x = \underline{\underline{\frac{21}{20} \text{ or } -\frac{41}{20}}}$ 1A

(2)

(b) $2000(1 + r\%)^2 + 2000(1 + r\%) = 4305$ 1M

$400(1 + r\%)^2 + 400(1 + r\%) = 861$

$400(1 + r\%)^2 + 400(1 + r\%) - 861 = 0$

From (a), $1 + r\% = \frac{21}{20}$ or 1M

$1 + r\% = -\frac{41}{20}$ (*rejected*)

$r\% = \frac{1}{20}$

$r = \underline{\underline{5}}$ 1A

(3)

Reminder

The interest rate must be positive.

6. Geometry (I)

A Angles and Parallel Straight Lines

1. Angles at a point

$a + b + c + d + e = 360°$ (*∠s at a point*)

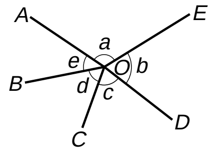


Fig. 6.1

2. Adjacent angles on a straight line

$a + b + c = 180°$ (*adj. ∠s on st. line*)

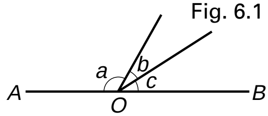


Fig. 6.2

3. Vertically opposite angles

$a = b$ (*vert. opp. ∠s*)

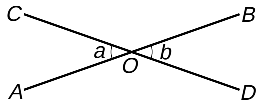


Fig. 6.3

4. Parallel lines

(a) $a = b$ (*corr. ∠s, AB // CD*)

(b) $b = c$ (*alt. ∠s, AB // CD*)

(c) $b + d = 180°$ (*int. ∠s, AB // CD*)

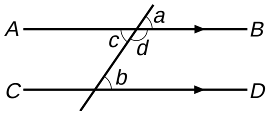


Fig. 6.4

5. Testing for parallel lines

AB // CD if either

(a) $a = b$ (*corr. ∠s equal*)

(b) $b = c$ (*alt. ∠s equal*)

(c) $b + d = 180°$ (*int. ∠s supp.*)

Example 1

In Fig. 6.5, *AB // CD*. $\angle RQP = 63°$ and $\angle TRB = 80°$. Find the values of the unknowns.

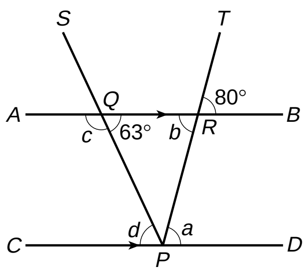


Fig. 6.5

Solution:

$a = \angle TRB$ (*corr. ∠s, AB // CD*)

$\quad = \underline{\underline{80°}}$

18. Trigonometry (II)

A Area of Triangles

1. Area Formula

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

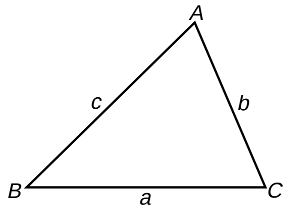


Fig. 18.1

Example 1

Find the area of the triangle.
(Give the answer correct to one decimal place.)

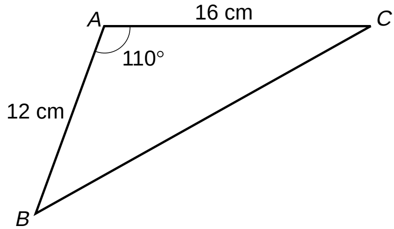


Fig. 18.2

Solution:

$$\text{Area of } \Delta ABC = \frac{1}{2}(12)(16)\sin 110^\circ$$
$$= \underline{\underline{90.2 \text{ cm}^2}} \quad (\textit{correct to 1 decimal place})$$

2. Heron's Formula

Area of $\Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$,

where $s = \frac{1}{2}(a+b+c)$

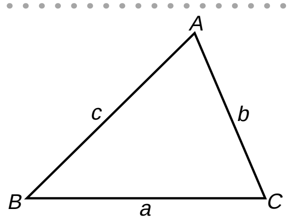


Fig. 18.3