Calculator Model :

Class Full Name Indox Numbor

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END OF YEAR EXAMINATION 2022 No. 100 SECONDARY Ibelieve, therefore I am							
MATHEMATICS Paper 2							
Secondary 3 Normal Academic 10 October 20222 hoursCandidates answer on the Question Paper							
READ THESE INSTRUCTIONS FIRST Write your class, index number and name on all the work you hand in. Write in dark blue or black pen							
You may use an HB pencil for any diagrams or graphs. Do not use staples, paper clips, glue or correction fluid.							
The number of marks is given in brackets [] at the end of each question or part question. If working is needed for any question, it must be shown with the answer. Omission of essential working will result in loss of marks. The total number of marks for this paper is 70 .							
The use of an approved scientific calculator is expected, where appropriate, If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place. For π , use either your calculator value or 3.142.							
DO NOT OPEN THIS PAPER UNTIL YOU ARE TOLD TO DO SO							
For Examiner's Us							
Setter: Mdm Joyce Toh							

This document consists of $\underline{19}$ printed pages including this cover page.

Mathematical Formulae

Compound Interest

Total amount =
$$P\left(1 + \frac{r}{100}\right)^n$$

Mensuration

Curved Surface area of a cone = πrl

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

Volume of a cone
$$=$$
 $\frac{1}{3}\pi r^2 h$
Volume of a sphere $=$ $\frac{4}{3}\pi r^3$
Area of triangle $ABC = \frac{1}{2}ab\sin c$

Arc length = $r\theta$, where θ is in radians

Sector area =
$$\frac{1}{2}r^2\theta$$
, where θ is in radians

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
$$a^{2} = b^{2} + c^{2} - 2bc \cos A$$

Statistics

Mean =
$$\frac{\Sigma f x}{\Sigma f}$$

Standard deviation = $\sqrt{\frac{\Sigma f x^2}{\Sigma f} - \left(\frac{\Sigma f x}{\Sigma f}\right)^2}$

Answer all the questions.

1(a) A passenger aircraft has 280 seats. In a particular flight, 226 seats are occupied.Calculate the percentage of empty seats in the aircraft for that flight.

(b) The cost of a seat in 2010 is \$988. Calculate the cost of a seat in 2009 if the cost in 2010 was an increase of 20.5% on the price in 2009.

- 2 Scientists estimated that an ant can consume an average of 0.024 kg of food per day. An ant colony has 2.5 million of ants.
- (a) Write 2.5 million in standard form.

(b) Estimate the total amount of food consumed in a day by the colony of ants. Leave your answer in standard form.

Answer kg [2]

(c) Assuming that the rate of consumption of food is constant throughout a day, calculate the time taken, in seconds, for the entire ant colony to consume 12 kg of food.

Answer sec [2]

3(a) Expand and simplify (3x + 5y)(2x - 3y).

(b) Write $\frac{x}{4} - \frac{2x+5}{3}$ as a fraction in its simplest form.

(c) Make *p* the subject of the formula $m = \frac{7p+r}{5}$.

4 The line passes through the points (1, 2) and (7, -2).



(a) Find the equation of the line.

(b) The line cuts the x-axis at point A. Find the coordinates of A.

Answer A = (...., ..., ...) [1]

(c) Find the equation of a line parallel to the *x*-axis and passes through the point (7, -2).

5 It is given that *n* is a positive integer.

p is found by adding 7 to 3 times of *n*.

q is found by subtracting 1 from n and multiplying the result by 2.

The result of multiplying p to q is 170.

(a) Show that $3n^2 + 4n - 92 = 0$. Answer

[2]

(b) Solve $3n^2 + 4n - 92 = 0$. Give both answers correct to 2 decimal places.

Answer n = or n = [2]

(c) Hence, find value of p.

Answer $p = \dots$ [1]

6 The coordinates of point P are (3, 4) and point Q are (12, -5).



(a) Find the equation of line *OP*.

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Answer [1]

(b) OPRQ is a parallelogram. Find the coordinates of point *R*.

Answer (.....) [1]

(c) Find the perimeter of the triangle *OPQ*.

Answer units [3]

- 7 The number of oatmeal, chocolate chip and almond cookies in a bag is in the ratio of 4: 3: 1.
- (a) Express the number of oatmeal cookies as a percentage of the total cookies in the bag.

(b) If there are 18 more chocolate cookies than almond cookies, find the total number of cookies in the bag.

Answer cookies [2]

(c) If 6 oatmeal cookies are removed from the bag, find the new ratio of oatmeal cookies : chocolate chip cookies : almond cookies.

8 **FRESH** washing powder is sold in two sizes, medium and large.



Which of the two sizes gives a better value? Show all your working clearly.

9 In the diagram, *PQR* and *RST* are straight lines. PQ = 2 cm, QR = 6 cm and PT and QS are parallel to each other.



(a) Name the triangle that is similar to triangle *QRS*.

(b) Find the value of $\frac{QS}{PT}$.

(c) Given that SR is 4 cm, find ST.

- 10 1000 tickets to a performance were sold on a particular day to *x* number of adult and *y* number of children.
- (a) Form an expression in terms of *x* and *y*.

(b) Each adult ticket cost \$8.50 and each child ticket cost \$4.50.
A total of \$7300 was collected on that particular day.
Form another equation and hence solve the simultaneous equations algebraically.

Answer	<i>x</i> =	
	y = [[3]

11 In the diagram, PQR is a straight line, $\angle SPQ = 90^{\circ}$. PQ = 5 cm and SQ = QR = 8 cm.



(a) Write $\cos \angle SQP$ as a fraction.

(b) Find $\cos \angle SQR$.

(c) Find $\angle SRQ$.

12 The variables x and y are connected by the equation $y = 4x + \frac{20}{x} - 25$.

Some corresponding values of *x* and *y* are given in the following table.

x	1	2	3	4	5	6	7	8
у	-1	h	-6.3	-4	-1	2.3	5.9	9.5

(a) Find the value of *h*.

(b) Draw the graph of
$$y = 4x + \frac{20}{x} - 25$$
 for $1 \le x \le 8$ in the given grid on page 15. [3]

(c) Using your graph, find the minimum value of *y*.

Answer $y = \dots$ [1]

(d) Using your graph, find the solutions for the equation $4x + \frac{20}{x} - 25 = -5$.

Answer $x = \dots$ [1]

(e) By drawing a tangent, find the gradient of the curve at x = 2.5.



- 13 A ladder is leaning against a vertical wall. It makes an inclined angle of 50° with the horizontal ground. The upper end of the ladder reaches a vertical height of 2.5 m.
 - (a) Find the length of the ladder.



Answer m [2]

(b) A ceiling light is placed near the ladder.
The ladder makes an inclined angle of 85° with the light bulb of the ceiling light.



Find the horizontal distance d of the light bulb from the upper end of the ladder.

(c) The ladder slides down a distance. Given the horizontal distance from the base of the ladder to the wall is 3 m, find the inclined angle x° that the ladder makes with the horizontal ground.



Answer° [2]

14(a) *P*, *Q*, *R* and *S* are four points.

PQ = 550 cm, PS = 800 cm and RS = 400 cm. Angle $QPR = 85^{\circ}$ and angle $QSR = 38^{\circ}$.



(i) Find the length QS.

(ii) Find the area of quadrilateral *PQRS*.

(b) Show that angle $FGH = 90^{\circ}$ in the triangle below. Show all your calculations and reasons clearly.



End of Paper