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TUTGATHER PRACTICE PAPER

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2027

Candidate Number

MATHEMATICS Compulsory Part
PAPER 1

Question-Answer Book

TUTGATHER
PRACTICE PAPER · NOT AN OFFICIAL HKEAA PAPER

1 hour 5 minutes

This paper must be answered in English

Topic practice: Variations

INSTRUCTIONS

(1) This paper consists of THREE sections, A(1), A(2) and B.

(2) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins.

(3) Unless otherwise specified, all working must be clearly shown.

(4) Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

(5) The diagrams in this paper are not necessarily drawn to scale.

(6) Calculators and mathematical drawing instruments may be used.

(7) The marks for each question are shown in brackets.

(8) No extra time will be given after the 'Time is up' announcement.

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SECTION A(1) (16 marks)

1. It is given that y varies directly (正變) as x^2 . When $x = 4$, $y = 48$. Find the value of x when $y = 243$, given that $x > 0$. **(3 marks)**

2. It is given that y varies inversely (反變) as the square root of x. When $x = 9$, $y = 20$.

(a) Find y when $x = 16$. **(2 marks)**

(b) Find x when $y = 10$. **(1 mark)**

3. It is given that z varies jointly (聯變) as x^2 and y. When $x = 2$ and $y = 3$, $z = 36$.

(a) Express z in terms of x and y. **(2 marks)**

(b) Find z when $x = 3$ and $y = 5$. **(2 marks)**

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4. The time T minutes needed to fill a swimming pool varies inversely as the number n of identical pumps used. When 3 pumps are used, the pool is filled in 80 minutes.

(a) Express T in terms of n. **(2 marks)**

(b) Find the time needed to fill the pool when 5 pumps are used. **(2 marks)**

(c) The pool must be filled within 45 minutes. Find the least number of pumps required. **(2 marks)**

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SECTION A(2) (24 marks)

5. The cost C dollars of making a gold pendant varies directly as the cube of its width w cm. When the width is 2 cm, the cost is 4800 dollars.

(a) Find the cost of making a pendant of width 2.5 cm. **(2 marks)**

(b) If the width of a pendant is increased by 20%, find the percentage increase in its cost. **(3 marks)**

(c) A pendant costs 16 200 dollars. Find its width. **(2 marks)**

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6. The illuminance E lux on a surface varies inversely as the square of its distance d metres from a lamp. When the surface is 2 m from the lamp, the illuminance is 300 lux.

(a) Find the illuminance when the surface is 5 m from the lamp. **(2 marks)**

(b) Find the distance when the illuminance is 192 lux. **(2 marks)**

(c) If the distance is increased by 25%, find the percentage decrease in the illuminance. **(2 marks)**

(d) A student claims that moving the surface from 4 m to 2 m doubles the illuminance. Is the claim correct? Explain your answer. **(2 marks)**

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7. The stopping distance d metres of a car is the sum of a reaction distance and a braking distance. The reaction distance is constant, while the braking distance varies directly as the square of the speed v km/h. When $v = 40$, $d = 22$; when $v = 60$, $d = 42$.

(a) Express d in terms of v. **(3 marks)**

(b) Find the stopping distance when the speed is 80 km/h. **(2 marks)**

(c) Find the speed, correct to 3 significant figures, when the stopping distance is 100 m. **(2 marks)**

(d) On a wet road the braking distance is 1.5 times its value on a dry road, while the reaction distance is unchanged. Find the stopping distance of the car travelling at 100 km/h on a wet road. **(2 marks)**

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SECTION B (10 marks)

8. The power output P watts of a small wind turbine varies jointly as the square of its blade radius r metres and the cube of the wind speed v m/s. When $r = 2$ and $v = 5$, the power output is 1000 W.

(a) Find the power output when $r = 2.5$ and $v = 4$. **(2 marks)**

(b) The wind speed increases by 20% while the blade radius remains unchanged. Find the percentage increase in the power output. **(2 marks)**

(c) The turbine starts generating electricity when the wind speed reaches 3 m/s. Find its power output at this speed when $r = 2$. **(2 marks)**

(d) The blade radius is reduced by 10%. Find the percentage increase in wind speed required to keep the power output unchanged. Give your answer correct to 3 significant figures. **(4 marks)**

END OF PAPER

Answers written in the margins will not be marked.
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