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ANDERSON SECONDARY SCHOOL
Preliminary Examination 2020
Secondary Four Express & Five Normal

CANDIDATE NAME:

CLASS: / INDEX NUMBER:

MATHEMATICS 4048/01

Paper 1

29 July 2020

2 hours

0800-1000h

Candidates answer on the Question Paper
Additional Materials: Nil

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use paper clips, highlighters, glue or correction fluid/tape.

Answer **all** the questions.
If working is needed for any question it must be **neatly and clearly** shown in the space below the question.
Omission of essential working will result in loss of marks.
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, unless the question requires the answer in terms of π.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 80.

Setter : Mr Mohd Alfin H R

Mathematical Formulae

Compound Interest

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

Mensuration

Curved surface area of a cone = $\pi r l$

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 = $\frac{\Sigma fx}{\Sigma f}$

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

1 The number of spectators who attended a football match was 40 000 when rounded off to 1 significant figure. State the smallest and largest possible turnout for the match.

Answer smallest = …….

largest = …….. [2]

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2 **(a)** Factorise $x^2 + 9y^2 - 6xy - 1$ completely.

Answer ……. [2]

(b) Express $\frac{2}{3(x-4)^2} + \frac{1}{4-x}$ as a single fraction.

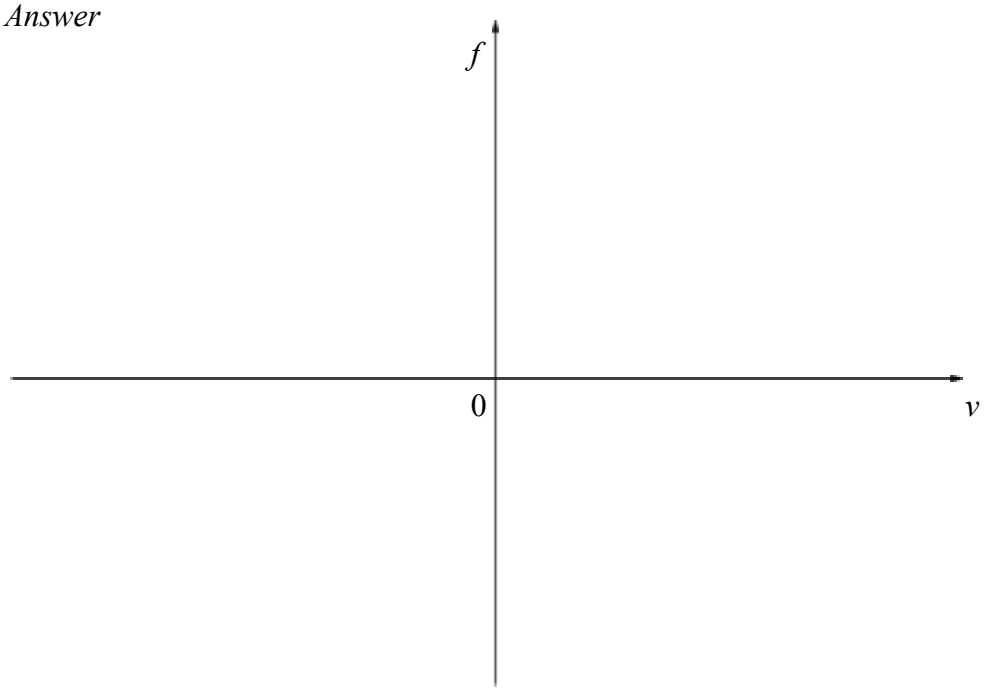
Answer ……. [2]

3 **(a)** Given that v is inversely proportional to t^3 and $v = 20$ for a particular value of t, find the new value of v when this value of t is doubled.

Answer …….. [3]

(b) Given that f is directly proportional to v^2, sketch a graph of f against v in the axes drawn below.

Answer



[1]

4 The total area of a town is 36 km^2. It is represented by a total area of 4 cm^2 on a map.

(a) Express the scale of the map in the form 1: *r*.

Answer 1: …… [2]

(b) Find the area of the town on a second map with scale is 1 : 60 000. Leave your answer in cm^2.

Answer ……cm^2 [2]

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5 **(a)** Solve the inequality $9-5x<2-\frac{x}{4}\leq\frac{x}{3}-\frac{4x}{7}$.

Answer …… [3]

(b) Solve the equation $\frac{3}{(2x-1)^2}=\frac{1}{3}$.

Answer x =…….. or …….. [2]

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6 **(a)** Simplify $\left(\frac{x^6}{25y^4}\right)^{-\frac{1}{2}}$, giving your answer in positive indices.

Answer ……. [2]

(b) Solve the equation $9\sqrt[3]{3^{3x}} = \frac{1}{3^{3(2-x)}}$.

Answer x = …… [3]

(c) Given that $a > 0$ and n is an even number, deduce the number of solutions for the equation $ax^n - x = 0$. Explain your answer clearly.

Answer ……

……

……

…… [3]

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7 **(a)** Express $x^2 - 2x + 3$ in the form $(x - a)^2 + b$.

Answer …… [2]

(b) Hence state the minimum value of $x^2 - 2x + 3$.

Answer …… [1]

(c) State the equation of the line of symmetry of the graph of $y = x^2 - 2x + 3$.

Answer …… [1]

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8 **(a)** Express 13 824 as a product of its prime factors.

Answer 13 824 = …….. [1]

(b) Using your answer to part **(a)**, explain why 13 824 is a perfect cube.

Answer……

……

…… [1]

(c) Given that a and b are both prime numbers and $\frac{a}{b}<1$, find the values of a and b such that $\frac{a}{b}\times 13\ 824$ is a perfect square.

Answer a = …….

b = …….. [2]

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9 Solve the following simultaneous equations.

$$4x-y=-4$$
$$\frac{1}{3}y+x=\frac{5}{2}$$

Answer $x =$ ……..…..

$y =$ …… [3]

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10 A is the point $(-4, 2)$ and B is the point $(3, 0)$.

(a) Find the equation of the line AB.

Answer …… [3]

(b) Find the length AB.

Answer ……units [2]

(c) State the number of points of intersection between the line AB and the line $y = \frac{1}{2}x + 1$. Explain your answer.

Answer……

……

…… [2]

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11 Consider the sequence

$$1^2 - 5, \quad 2^2 - 7, \quad 3^2 - 9, \quad 4^2 - 11, \ ...$$

(a) Find an expression, in terms of n, for the nth term, T_n, of this sequence.

Answer $T_n =$…… [1]

(b) Evaluate T_8.

Answer $T_8 =$……
[1]

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12 A and B are two geometrically similar objects such that

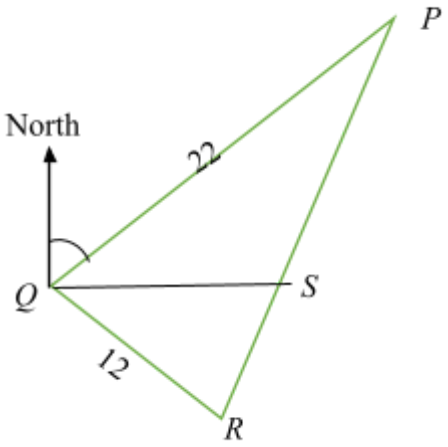
$\frac{\text{surface area of } A}{\text{surface area of } B} = \frac{y}{y+7}$ and $\frac{\text{volume of } A}{\text{volume of } B} = \frac{1}{8}$.

Find the value of y.

Answer $y =$ ..... [3]

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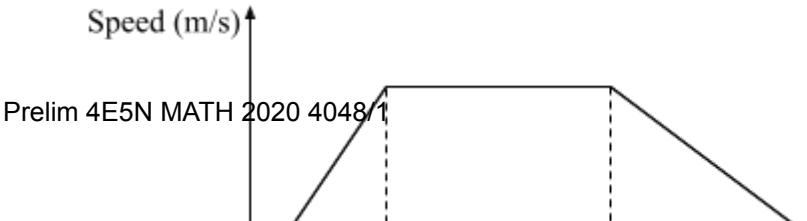
13 In the diagram below, $PQ = 22$ km, $QR = 12$ km, the bearing of P from Q is 048° and angle PQR is acute. S is due east of Q. The area of triangle PQR is thrice the area of triangle SQR. Find angle SQR.



Answer angle $SQR =$.....° [3]

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14 The diagram shows the speed-time graph of a racing car driving along a road.
The total distance travelled is 720 m.



(a) Calculate the maximum speed of the racing car.

Answer …… m/s [2]

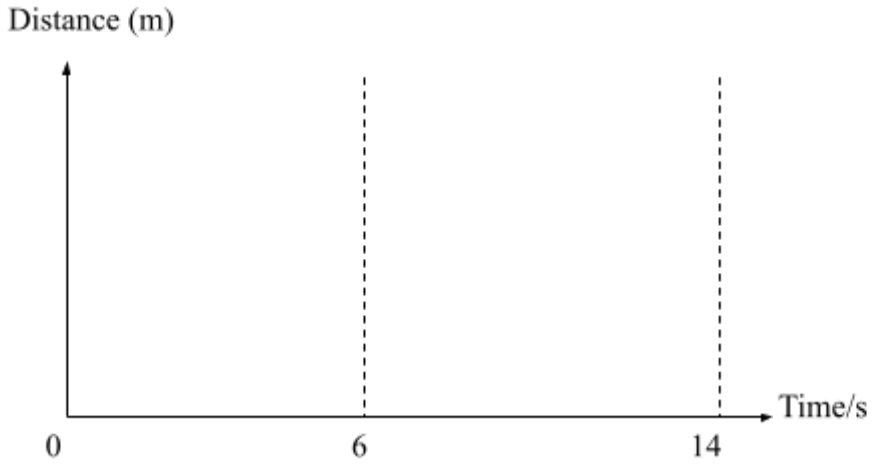
(b) Find the deceleration in the last 8 seconds of the journey.

Answer …… m/s^2 [1]

(c) Find the speed of the racing car at time $t = 16$ s.

Answer …… m/s [2]

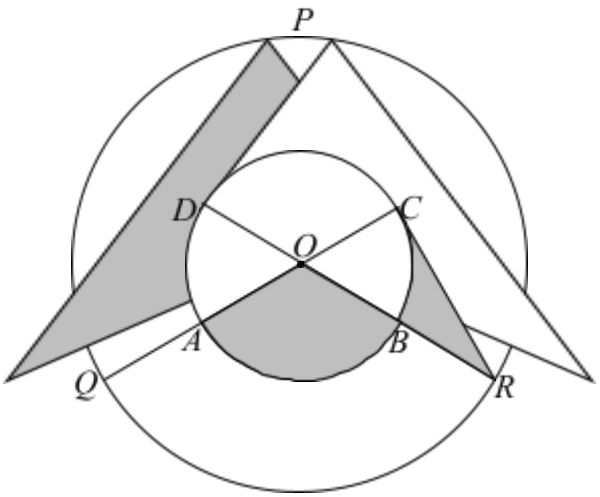
(d) Sketch the distance-time graph for the first 14 seconds of the racing car's journey, in the axes provided below. [2]



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15 In the diagram below, O is the centre of both circle $ABCD$ and circle PQR.

PQ and PR are tangents to the smaller circle at points D and C respectively.



(a) Show that triangle PQC is congruent to triangle PRD.

Answer……

……

……

…… [3]

(b) Show that triangle *OCR* is similar to triangle *PDR*.

Answer……

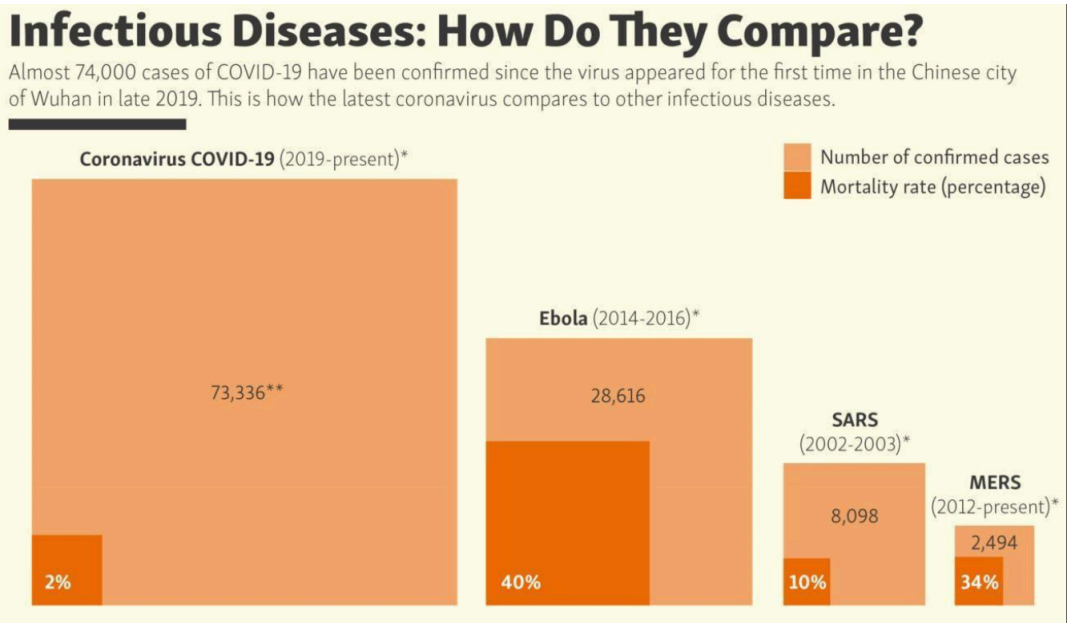
……

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…… [2]

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16 The infographic shown below provides a statistical comparison of the latest coronavirus to other infectious diseases which are similar in nature.



Explain why this infographic could be misleading in nature.

Answer……

……

……

…… [2]

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17 **(a)** The radius of planet A and B is approximately 6.95×10^5 km and 6×10^6 m. Find the difference in the diameter, in kilometres, of both the planets. Give your answer in standard form.

Answer…… km [2]

(b) **(i)** Factorise completely $(y-2)^3-4y+8$.

Answer ..... [2]

(ii) Hence, find the minimum value of $(y-2)^3-4y+8$ when $y \geq 4$. .

Answer ..... [1]

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18 The test score of Class 4A consisting of 25 students is given in the stem-and-leaf diagram below.

Stem	Leaf						
4	0	2					
5	1	3	3				
6	3	4	8	8	8	9	
7	0	1	2	5	6	7	8
8	2	4	7	7	8		
9	3	5					

Legend: $4 \mid 0$ represents 40.

(a) Find the median score.

Answer ..... [1]

(b) Find the interquartile range.

Answer ..... [2]

(c) Find the modal score.

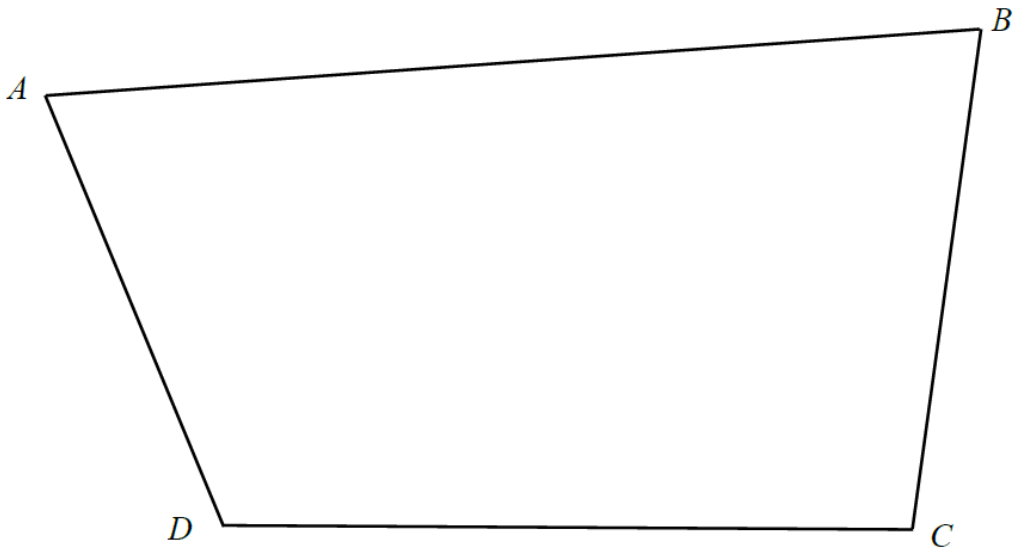
Answer ..... [1]

(d) A score of at least 76 is required for a student to obtain a distinction. Find the percentage of students in class 4A who obtained a distinction.

Answer ..... [1]

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19 The diagram below shows a plot of farming land *ABCD*.



(a) Construct the perpendicular bisector of AB. [1]

(b) Construct the bisector of angle ADC. [1]

(c) A water pump is to be installed at $ABCD$ such that it is closer to the line CD than the line AD. Shade the region representing the area where the water pump can be installed. [1]

End of Paper

Answer Key:

1. Smallest = 35 000 Largest = 44 999 **2a.** $(x-3y+1)(x-3y-1)$ **2b.** $\frac{14-3x}{3(x-4)^2}$

3a. 2.5 **3b.** Sketch **4a.** 1 : 300 000 **4b.** 100 cm^2

5a. $x \geq 168$ **5b.** $x = 2$ or $x = -1$ **6a.** $\frac{5y^2}{x^3}$ **6b.** $x = 4$ **6c.** 2 solutions

7a. $(x-1)^2 + 2$ **7b.** 2 **7c.** $x = 1$ **8a.** $13824 = 2^9 \times 3^3$

8b. Can write as cube of another no' **8c.** $a = 2, b = 3$ **9.** $x = \frac{1}{2}$ & $y = 6$

10a. $y = -\frac{2}{7}x + \frac{6}{7}$ or $7y = -2x + 6$ **10b.** 7.28 units

10c. Different gradient, one pt of intersection **11a.** $T_n = n^2 - (2n+3)$ or $T_n = n^2 - 2n - 3$

11b. 45 **12.** $y = \frac{7}{3}$ **13.** $\angle SQR = 37.8°$ **14a.** $v = 48$ **14b.** 6 m/s^2 **14c.** 36

14d. Sketch **15a.**

$\angle QPC = \angle RPD$ (common $\angle$), $\angle RDP = 90^0$ (tan $\perp$ rad)

$\angle QCP = 90^0$ (tan $\perp$ rad), $\therefore \angle RDP = \angle QCP$

$PD = PC$ (tangents from an external point)

Hence by ASA test, it is shown that ΔPQC is congruent to ΔPRD.

15b.

$\angle OCR = \angle PDR = 90°$ (tan $\perp$ rad) , $\angle ORC = \angle PRD$ (common $\angle$)

Hence, by AA test, it is shown that ΔOCR is similar to ΔPDR.

16. Area of the shaded square representing mortality rate is not in proportion to the percentage quoted or the number of confirmed cases quoted.(with specific data quoted)

17a. 1.378×10^6 km **17bi.** $y(y-2)(y-4)$ **17bii.** 0 **18a.** 71 **18b.** 19.5 **18c.** 68 **18d.** 40%

19.

