Class Index No

Name: _____

OUTRAM SECONDARY SCHOOL PRELIMINARY EXAMINATION 2022

Subject	:	**Mathematics**
Level (Stream)	:	**Secondary Four Express & Five Normal Academic**
Paper	:	**1 (4048)**
Date	:	**29 August 2022**
Duration	:	**2 hours**
Marks	:	**80**

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number 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, highlighters, glue or correction fluid.

Answer **all** questions on the Question Paper.
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 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.

The number of marks is given in brackets [ ] at the end of each question or part question.

80

This document consists of **21** printed pages, including this cover page.

Setter: **MR AJMAL KHAN**

Mathematical Formulae

Compound interest

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

Mensuration

$$\text{Curved surface area of a cone} = \pi rl$$

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

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

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

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

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

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

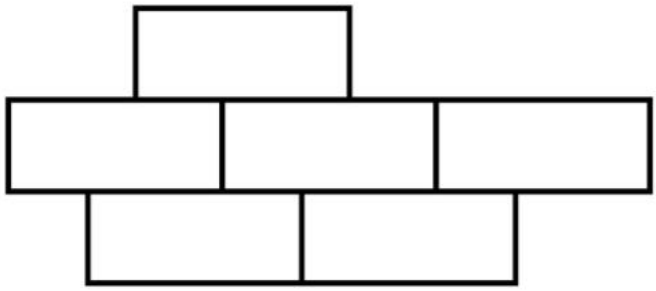
Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

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

Answer **all** the questions.

1



The shape above is formed by stacking 6 congruent rectangular boxes.
Each rectangle box has a length of 20cm and breadth of 10cm. Find the perimeter of the shape.

Answer: ……cm [2]

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2 **(a)** 4 boys take 12 hours to completely paint 3 rooms.
How long would it take 12 boys to completely paint 3 rooms?

Answer: ……hours [1]

(b) A girl takes 8 hours to paint 1 room.
How long would it take for a boy and a girl to paint completely 1 room together?

Answer: ……hours [2]

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3 **(a)** Javed sold a watch for $900. He made a profit of 80% of the cost price. Calculate the cost price.

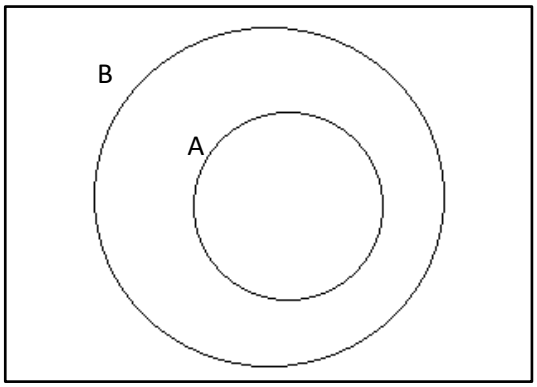
Answer …….[2]

(b) Ching Boi borrowed a sum of money from XYZ Bank, which charges 2.75% per annum, compounded quarterly. At the end of the first year, he needs to pay an interest charge of $78.50. Find the original sum of money Ching Boi borrowed, giving your answer correct to the nearest cent.

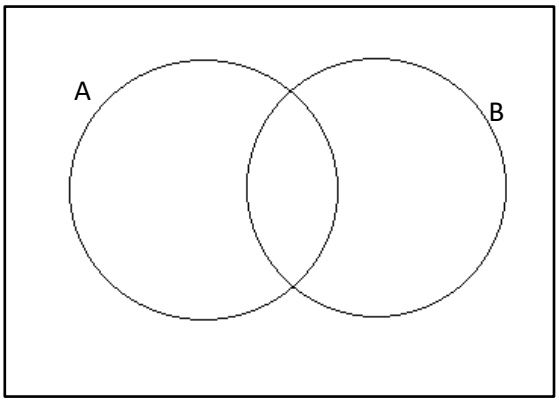
Answer …….[2]

4 **(a)** Shade the region representing [2]

(i) $A \cup B'$,



(ii) $(A' \cup B)'$.



(b) $\mathcal{E}$ = {integers: $4 \leq x < 20$}

A = {factors of 30}

B = {multiples of 4}

(i) List the elements in $A \cap B$.

Answer …… [1]

(ii) Find $n(A \cup B)$.

Answer …… [1]

5 The first four terms in a sequence is given as such

$$T_1 = 3^0 + 3$$
$$T_2 = 3^1 + 5$$
$$T_3 = 3^2 + 7$$
$$T_4 = 3^3 + 9$$

(a) Find the value of T_5.

Answer …… [1]

(b) Find, an expression, in terms of *n*, for T*n*.

Answer …….. [2]

6 **(a)** Simplify $2(7x+5)-11$.

Answer ……... [1]

(b) Factorise $10a-5ab$.

Answer ……... [1]

---

7 Factorise completely $4px-3qx-20py+15qy$.

Answer ……... [2]

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8 The area of triangle *ABC* is 47.9 cm^2. *AB* = 17.5 cm and *BC* = 11.6 cm.
Find the two possible sizes of angle *ABC*.

Answer …….or……... [2]

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9 **(a)** Express 676 as a product of its prime factors.

Answer ……... [2]

(b) Given that 676n is a perfect cube, find the smallest possible integer value of n.

Answer n = ……..…… [2]

10 Two cards are drawn at random one at a time with replacement from a pack of 10 cards, numbered 1 to 10. Find the probability that the two numbers on the cards drawn are

(a) both even,

Answer …….…… [2]

(b) multiples of 2 but not multiples of 4.

Answer ……... [2]

11 The data below shows the marks scored by 10 students in a Mathematics test.

24, 28, 82, 38, 45, 46, 54, 58, 80, 64. Find the

(a) median,

Answer…… [2]

(b) interquartile range.

Answer ……. [2]

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12 In a regular polygon, the ratio interior angle: exterior angle = 5:1

Calculate the number of sides of the polygon.

Answer…….. [3]

13 **(a)** Compute A^2, A^3 and A^4 if $A = \begin{pmatrix} 1 & a \\ 0 & 1 \end{pmatrix}$.

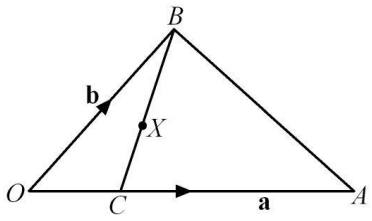
$A^2 = A \times A$, $A^3 = A \times A \times A$, $A^4 = A \times A \times A \times A$. [4]

Answer

(b) Hence, deduce A^n, where n is a positive integer.

Answer ……..... [1]

14 In the diagram, C is a point on the side OA of ΔOAB such that $3OC = OA$.
$\overrightarrow{OA}$ and $\overrightarrow{OB}$ are $\boldsymbol{a}$ and $\boldsymbol{b}$ respectively and the point X on BC is such that
$\overrightarrow{OX} = \frac{1}{5}\mathrm{a} + \frac{2}{5}\mathrm{b}$.



(a) Find, in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$,
(i) $\overrightarrow{BC}$,

Answer …….. [1]

(ii) $\overrightarrow{BX}$.

Answer …….. [1]

(b) Find the value of k if $\overrightarrow{BX} = k\overrightarrow{BC}$.

Answer …….. [2]

(c) Hence, find and simplify $\frac{\text{area of } \Delta OAX}{\text{area of } \Delta OAB}$.

Answer …….. [2]

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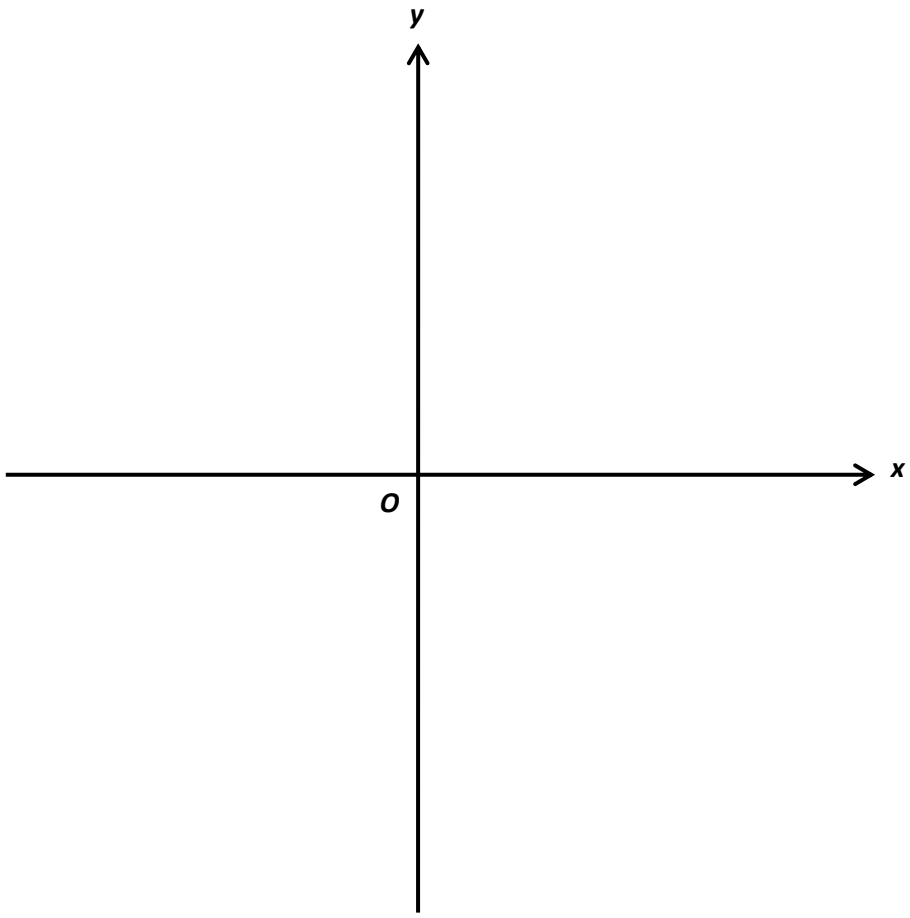
15 **(a)** Express $x^2 - 2x + 4$ in the form $(x-h)^2 + k$.

Answer …….. [2]

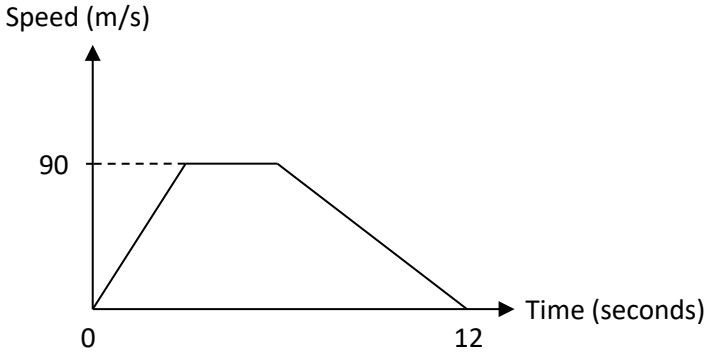
(b) Sketch the graph of $y = x^2 - 2x + 4$ on the axes given below. Indicate clearly the coordinates of the turning point and the value where the graph crosses the *y*-axis. [3]



(c) Write down the equation of the line of symmetry of the function $y = x^2 - 2x + 4$.

Answer …….. [1]

16 The diagram shows the speed-time graph of a moving particle over a period of 12 seconds. The particle accelerated, and then travelled at a constant speed of 90 m/s for 3 seconds before decelerating.



Find

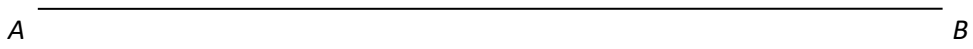
(a) the distance travelled in the 12 seconds,

Answer …….. [1]

(b) the time taken for the particle to decelerate if its deceleration is 12 m/s^2.

Answer …….. seconds [2]

17 A triangle ABC has lengths $AB = 12$ cm, $AC = 13$ cm and angle $ABC = 75°$.
The line AB is already drawn in the space below.



(a) Complete the triangle ABC above. Label point C clearly. [1]

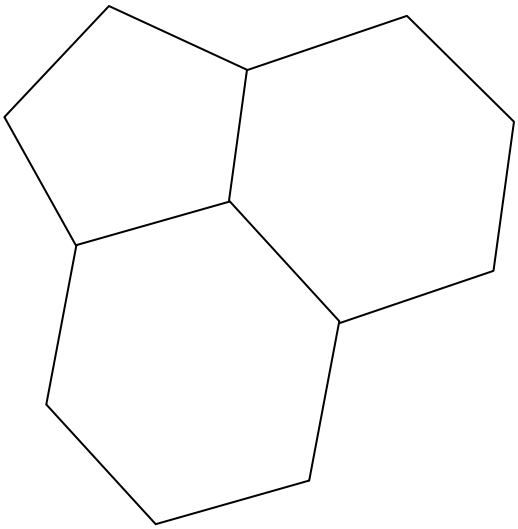
(b) Construct the perpendicular bisector of the line segment BC. [1]

(c) Construct the angle bisector of the angle BCA. [1]

(d) The point X lies equidistant from the point B and C and is also equidistant to the lines AC and BC. Measure the length of AX.

Answer AX = …… [1]

18 The diagram below shows two hexagons and one pentagon joined together.



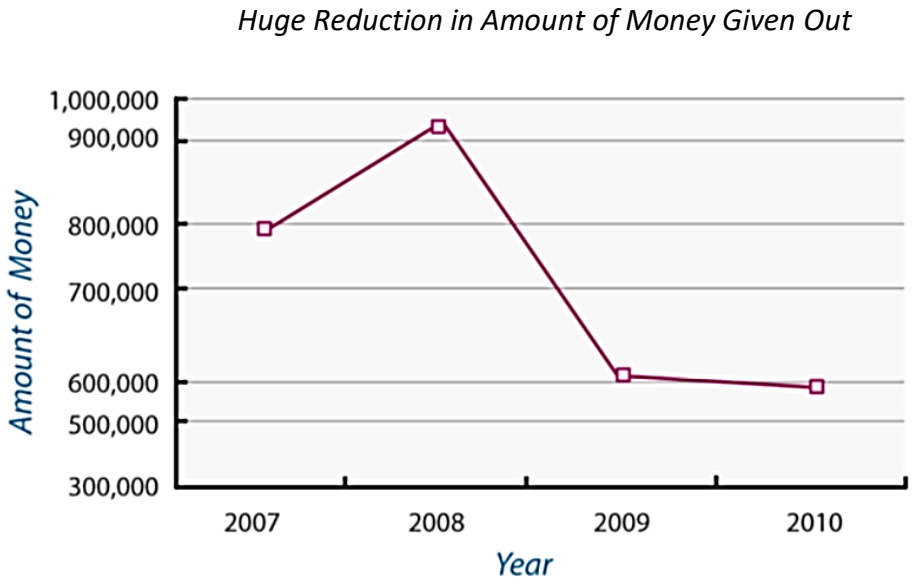
(a) Calculate the sum of the interior angles of a pentagon.

Answer …….. ° [1]

(b) If we assume the hexagon to be regular, what is the size of each of its' interior angle?

Answer …….. [2]

19 State one feature of the line graph below that may be misleading and explain why.



Answer : ……

……

……

……

……

……...[2]

20 (a) Evaluate $4+2a^0$.

Answer …….. [1]

(b) Simplify $(3h)^3 \times 2g^2h^4$.

Answer …….. [2]

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21 Solve the simultaneous equations.

$$3x+8y=11$$
$$x+4y=3$$

Answer x = ……..

y = …….[3]

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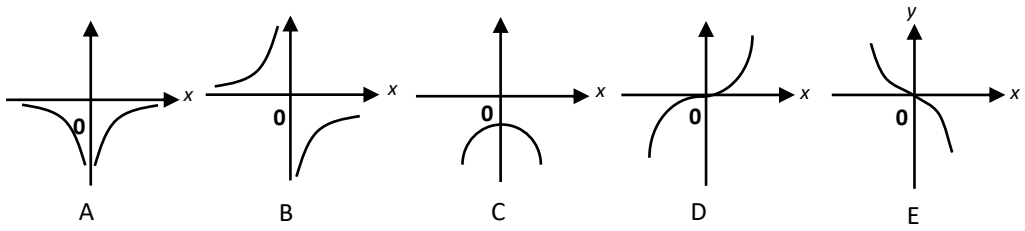
22 5 different graphs are sketched as shown.



Which of the above sketches could be the graph of the followings?

(a) $y = -\frac{7}{x^2}$,

Answer …… [1]

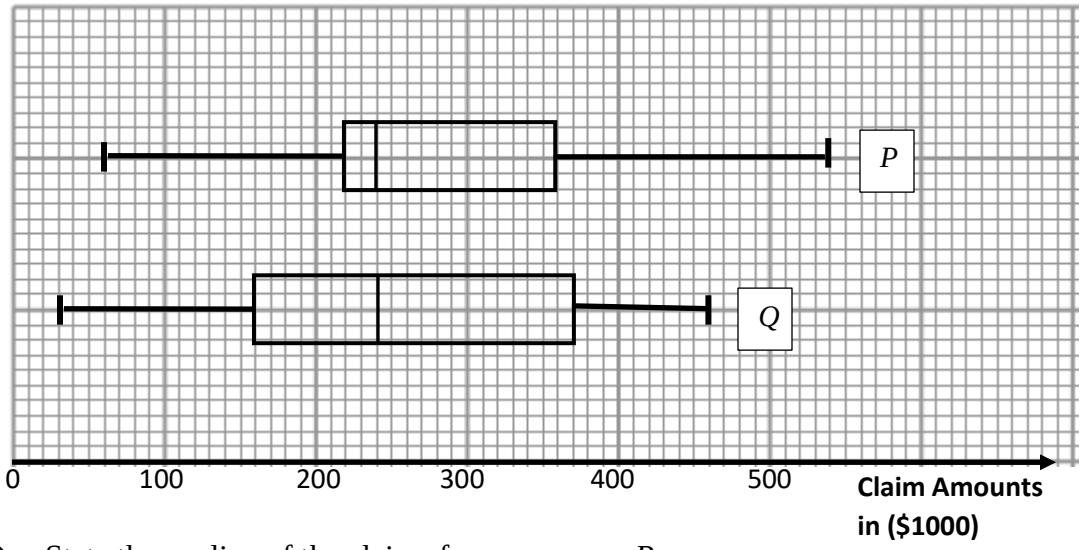
(b) $y = -4x^2 - 2$,

Answer ……[1]

(c) $y = 3x^3$.

Answer …… [1]

23 The first 300 claims for insurance companies *P* and *Q* are shown in the box and whiskers plot below.



(a) State the median of the claims from company *P*.

Answer …….. [1]

(b) Find the inter-quartile range of claims from company *Q*.

Answer …….. [2]

(c) Compare the claims of companies *P* and *Q*. Comment on the distribution of claims for both companies.

Answer _____

_____

_____ [2]

End of Paper