Name:	Register Number:	Class:

4E 5N

BEDOK GREEN SECONDARY SCHOOL

Preliminary Examination 2020

4E 5N

MATHEMATICS

4048/01

Paper 1

28 August 2020

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register 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, glue or correction fluid.

Answer **all** questions.
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.
The total number of marks for this paper is 80.

For Examiner's Use
80

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

[Turn over

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 x is a number which has 4 significant figures.
$x = 7$ (nearest integer),
$x = 7.5$ (1 decimal place)
$x = 7.49$ (2 decimal places)

Find

(a) the least possible value of the number x,

Answer ……..…...…… [1]

(b) the greatest possible value of the number x.

Answer ……..…...…… [1]

---

2 Given that $\sin\theta = 0.875$, find the values of θ where $0° \leq \theta \leq 180°$.

Answer θ = ……..° or ……..° [2]

---

3 **(a)** $p^x = \dfrac{p^3}{p \times \sqrt{p}}$

Find the value of x.

Answer x = ……..…...…… [1]

(b) Simplify $\left(\dfrac{m}{25}\right)^{-\frac{1}{2}}$.

Answer ……..…...…… [1]

---

4 Write as a single fraction in its simplest form $\frac{3}{x-5}-\frac{2}{7x-1}$.

Answer ……..…...…… [2]

---

5 **(a)** The cube root of n is $2^6 \times 5^3$.

Find n as a product of its prime factors.

Answer n = ……..…..…...…… [1]

(b) A roll of wire A is 156 cm long.
A roll of wire B is 390 cm long.
Both rolls of wire A and B are cut into pieces of equal length.

Find the maximum possible length of each piece of wire.

Answer ……..…...……cm [1]

---

6 A two-digit number, x, where $10 \leq x \leq 99$, is written down at random.

Find the probability that the number is

(a) a multiple of 10,

Answer ……..…..…… [1]

(b) a perfect square.

Answer ……..…..…… [1]

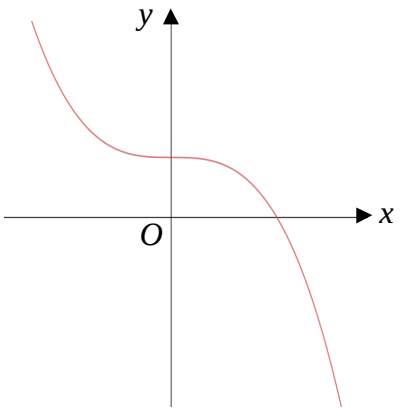
7

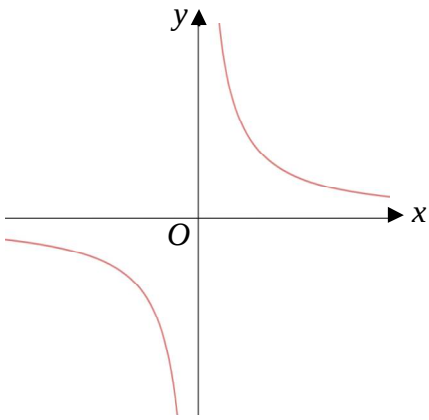
$y = x^3 + 2$	$y = x^3 - 2x^2 - x + 2$	$y = 2 - x^3$
$y = \frac{2}{x}$	$y = -\frac{2}{x}$	$y = 2^x$

Write down a possible equation for each of the given sketch graphs.

In each case, select one of the equations from the given table.

Answer





……..…..…… ……..…..……

[2]

8 y is inversely proportional to x^3.
When x has a certain value, $y = 5$.

Find the value of y when x is doubled.

Answer y = ……...…… [2]

---

9 On a particular day, the lowest temperature recorded was –5 °C.
The difference between the highest and lowest temperature recorded that day was 6 °C.

(a) Find the highest temperature on that day.

Answer ……..…...……°C [1]

(b) The lowest temperature was recorded at 0400.
The highest temperature was recorded at 1200.
The temperature is assumed to increase at a constant rate between 0400 and 1200 that day.

Find the time when the temperature was –1.5 °C.

Answer ……..…...…… [2]

---

10 Solve the simultaneous equations

$3x - 4y = -16$,

$5x + 6y = 5$.

Answer x = ……

y = …… [3]

---

11 **(a)** Solve the inequalities $-8 \leq 7 - 3x < 10$.

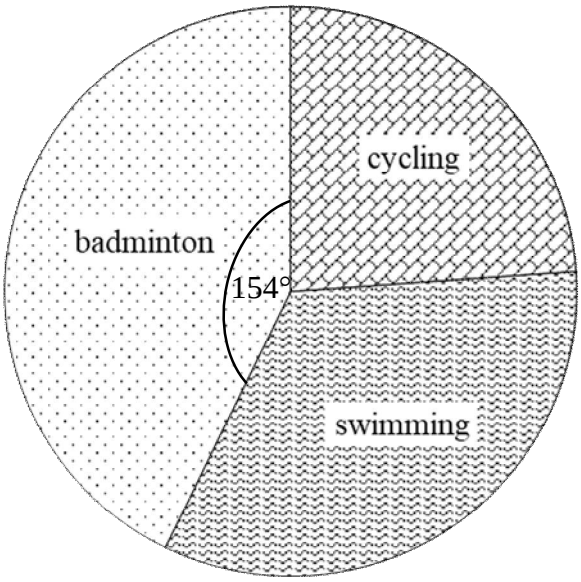
Answer …… [2]

(b) Write down the smallest integer which satisfy $-8 \leq 7 - 3x < 10$.

Answer …… [1]

---

12 The pie chart represents the amount of time that Alicia spent on cycling, swimming and playing badminton in a particular week.



The total amount of time that she spent on the three sports that week was 15 hours. The angle representing the amount of time that she spent on playing badminton was 154°.

(a) That week, Alicia spent 5 hours swimming.

Calculate the angle of the sector representing the amount of time spent on swimming.

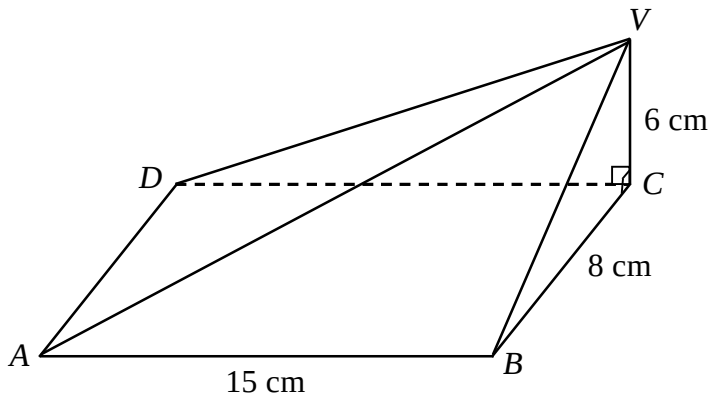
Answer ……..…...……° [1]

(b) On each of the seven days that week, Alicia spent the same amount of time playing badminton.

Calculate the amount of time, in minutes, she spent on playing badminton each day.

Answer ……..…...……min [2]

13



VABCD is a rectangular pyramid with vertex *V* directly above *C* of the base *ABCD*.
AB = 15 cm, *BC* = 8 cm and *VC* = 6 cm.

Find

(a) the volume of the pyramid,

Answer ……..…..…...……cm^3 [1]

(b) the length of *AC*,

Answer ……..…..…...……cm [1]

(c) angle *VAC*.

Answer ……..…..…...……° [1]

14 Use the factorisation method to solve the equation $(3x - 1)(x + 1) = 4$.

Answer x = …….. or …….. [3]

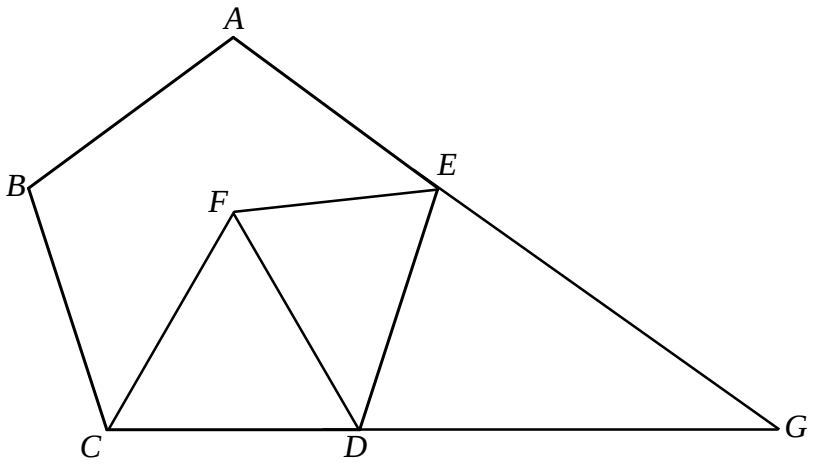
---

15 The price of an apartment at the end of 2010 was 7% higher than that at the end of 2009. The price of the same apartment at the end of 2011 was 5% higher than that at the end of 2010.

Calculate the price of the apartment at the end of 2011 as a percentage of the price at the end of 2009.

Answer ……..…...……% [3]

16



ABCDE is a regular pentagon.
Triangle *CDF* is an equilateral triangle.
AEG and *CDG* are straight lines.

Find

(a) angle *EDG*,

Answer ……° [1]

(b) angle *DGE*,

Answer ……° [1]

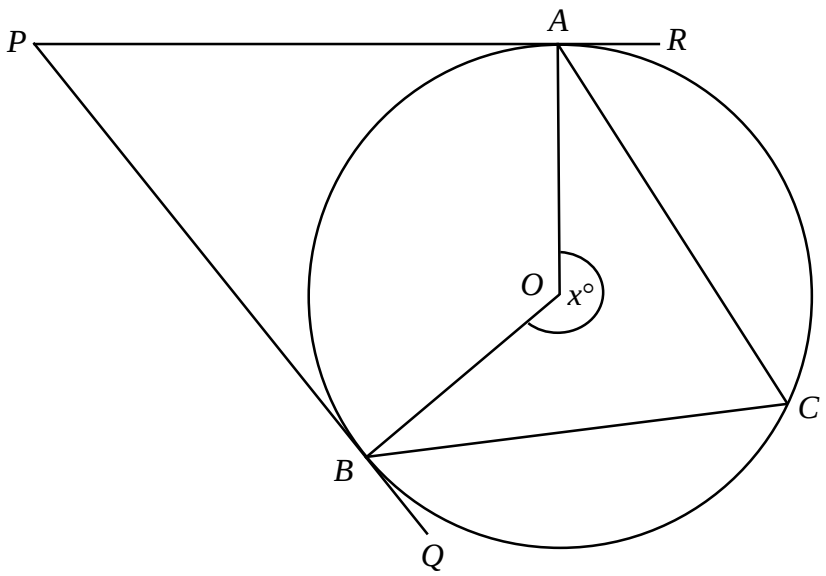
(c) angle *BCF*,

Answer ……° [1]

(d) angle *DFE*.

Answer ……° [1]

17



A, *B* and *C* are points on a circle with centre *O*.
PAR and *PBQ* are tangents to the circle at *A* and *B* respectively.
Reflex angle *AOB* = *x*°.

(a) Find, in terms of *x*, giving reasons for each answer,

(i) angle *ACB*,

Answer ……..…...……° [2]

(ii) angle *APB*.

Answer ……..…...……° [1]

(b) Given that the size of angle *ACB* is 1.5 times the size of angle *APB*, find the value of *x*.

Answer x = ……..…...……. [1]

18 A survey was carried out to find out the amount of time that each student spent on social media each day. The results are shown in the table.

Number of hours	1	2	3	4	5
Number of students	1	x	6	11	4

(a) Joe said, "The mode is 4 hours if x has a value equal to or bigger than 0 and less than 11."

State whether you agree with Joe. Explain your answer.

_____

_____

_____

_____ [1]

(b) Adeline said, "If the median is 3 hours, the largest possible value of x is 20."

State whether you agree with Adeline. Explain your answer.

_____

_____

_____

_____ [1]

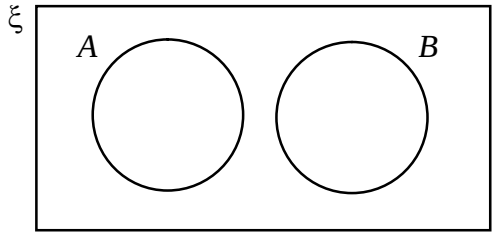
(c) The mean number of hours each student spent on social media is 3.3.

Find the value of x.

Answer x = …… [2]

19 **(a)** $\xi = \{a, b, c, d, e, f\}$
$A = \{b, d\}$ and $f \notin B$

The Venn diagram represents ξ, A and B.



(i) Find $A \cap B$.

Answer $A \cap B$ =…..…...…… [1]

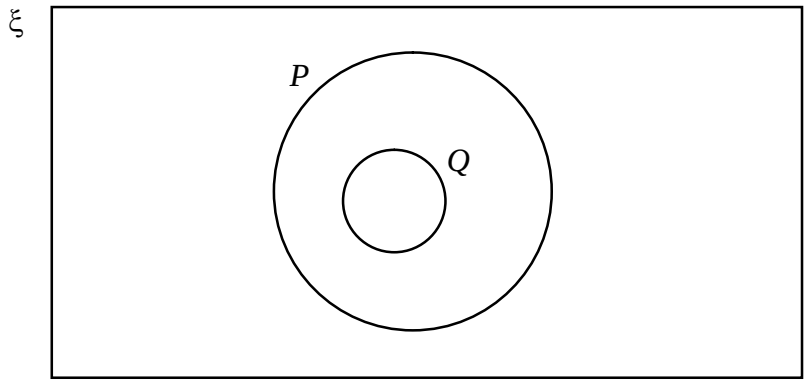
(ii) List all the proper subsets of A.

Answer ……..……....…… [1]

(iii) B contains the largest possible number of elements, list the elements in B.

Answer ……..……..…...…… [1]

(b) On the Venn diagram, shade the region which represents $P' \cup Q$. [1]



20 Factorise completely

(a) $m^2 - 2m + 1 - n^2$,

Answer ……..…...…… [2]

(b) $3ax + bx - 6ay - 2by$.

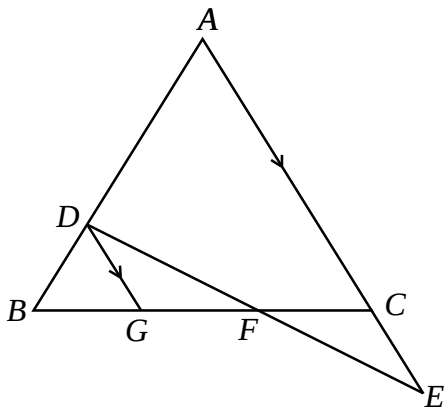
Answer ……..…...…… [2]

21 Mrs Huang bought some chicken floss buns and hotdog buns for an outing.
The ratio of the number of chicken floss buns to the number of hotdog buns bought was 11 : 7.
At the end of the outing, the number of each type of buns left was 4.
The ratio of the number of chicken floss buns to the number of hotdog buns consumed was 8 : 5.

Calculate the total number of buns that Mrs Huang bought.

Answer ……..…...…… [4]

22 The diagram shows an isosceles triangle ABC with $AB = AC$.
Points G and E lie on BC and AC produced such that $DG = CE$.
The lines DE and BC intersect at point F. DG is parallel to AE.



(a) Prove that triangle DGF is congruent to triangle ECF.

_____

_____

_____

_____

_____

_____

_____ [2]

(b) Show that $BD = CE$.

_____

_____

_____

_____

_____

_____

_____ [2]

23 Aldrick and Bryan are two salespersons for a fitness programme.
The new subscriptions that they obtained in May and June for packages *F*, *G* and *H* are shown in the table.

	May		June	
	Aldrick	Bryan	Aldrick	Bryan
Package *F*	18	15	20	21
Package *G*	32	37	30	34
Package *H*	11	14	16	15

The information is represented by the matrices **A** and **B**.

$$\mathbf{A} = \begin{pmatrix} 18 & 15 \\ 32 & 37 \\ 11 & 14 \end{pmatrix} \text{ and } \mathbf{B} = \begin{pmatrix} 20 & 21 \\ 30 & 34 \\ 16 & 15 \end{pmatrix}$$

(a) **(i)** Find **B** – **A**.

Answer ……..…...…… [1]

(ii) Describe what the elements in **B** – **A** represent.

_____

_____

_____ [1]

(b) The sales commissions for packages *F*, *G* and *H* are \$30, \$45 and \$60 respectively.

(i) Represent the information in a 1×3 matrix **C**.

Answer ……..…...…… [1]

(ii) Find **CA**.

Answer ……..…...…… [1]

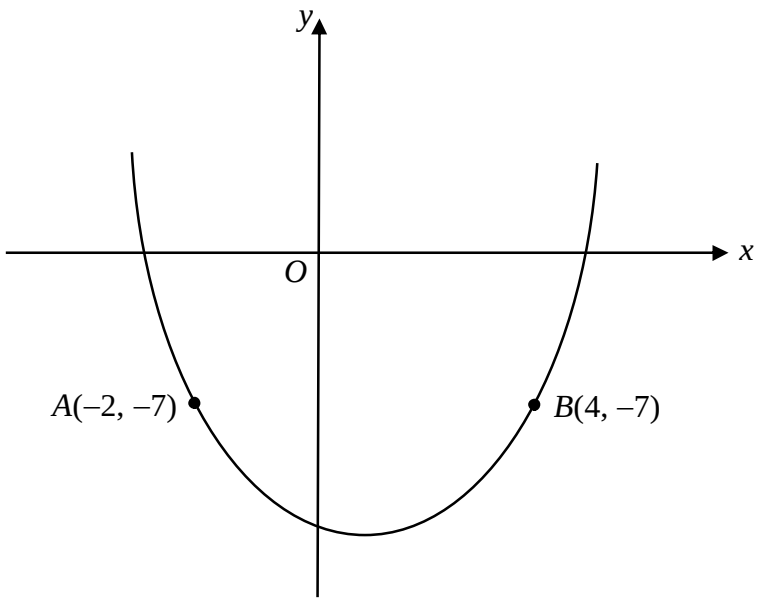
23 **(iii)** Describe what the elements in **CA** represent.

_____

_____

_____ [1]

24



The figure shows the graph of $y = (x - p)^2 + q$.
Points A (–2, –7) and B (4, –7) lie on the curve.

(a) Find the values of p and q.

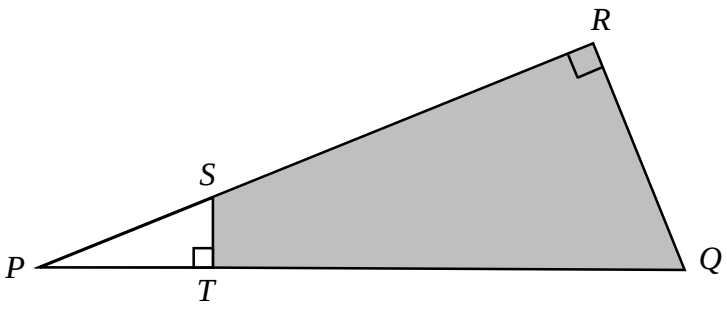
Answer p = ……..……

q = ……..……..…… [3]

(b) **Hence** find the coordinates of the x-intercepts of the curve.

Answer (……, ……) or (……, ……) [2]

25



PQR is a right-angled triangle.
ST is perpendicular to *PQ*.
PR = 12 cm, *QR* = 5 cm, *PT* = 3 cm and angle *PRQ* = 90°.

(a) Show that triangle *PQR* is similar to triangle *PST*.

_____

_____

_____

_____

_____ [2]

(b) The area of triangle *PST* is 1.875 cm^2.

Find the area of quadrilateral *SRQT*.

Answer ……..…...……cm^2 [3]

End of Paper