		Register No.	Class
Name :			

BENDEMEER SECONDARY SCHOOL
2022 PRELIMINARY EXAMINATION
SECONDARY 4 EXPRESS / 5 NORMAL (ACADEMIC)
Elementary Mathematics Paper 1
4048/01

DATE : **23 August 2022**
DURATION : **2 hours**
TOTAL : **80 marks**

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 on both sides of the paper.
You may use a 2B pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid/tape.

Answer **all** questions on the question booklet unless otherwise stated by the question.
All the diagrams in this paper are **not** drawn to scale.
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.

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 number of marks for this paper is 80.

FOR EXAMINER'S USE
80

This document consists of 19 printed pages including this cover page.

MATHEMATICAL FORMULAE

Compound Interest

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

Mensuration

$$\text{Curved surface area of cone} = \pi r l$$

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

1. The mass of tracing paper is 45 grams per square metre. What is the mass of an A4-size tracing paper in kg. Give your answer in standard from.
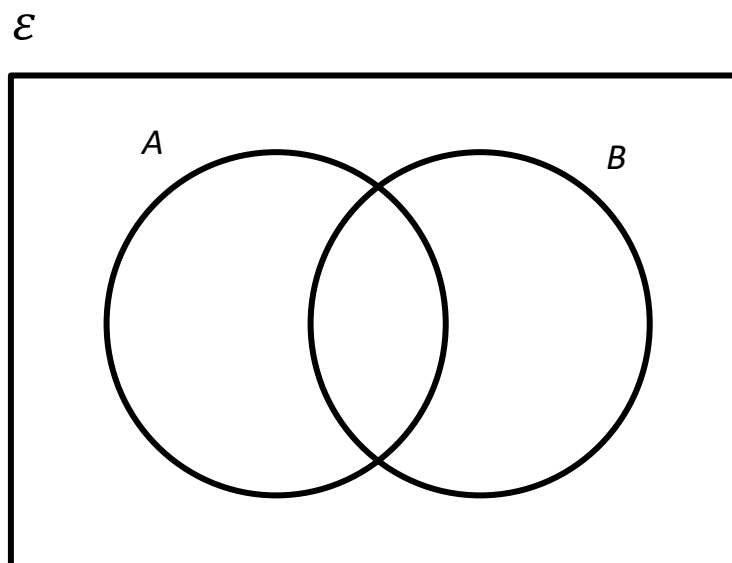[Dimension of A4-size paper is 210 mm by 297 mm]

Answer …………………… kg [3]

2. Two geometrically similar containers have volume 250 ml and 54 ml respectively.
Find the ratio of the base area of the bigger container to the base area of the smaller container.

Answer ……………….. [2]

3. **(a)** In the Venn diagram below, shade the region(s) represented by the set notation $A \cup (B' \cap A)$. [1]

(b) Given that $\varepsilon = \{x: x \text{ is an integer such that } 1 \leq x < 20 \}$,
$G = \{x: x \text{ is an odd number}\}$ and
$T = \{x: x \text{ is a square number}\}$.

List the elements of $(G \cup T)'$.

Answer (b) ……………………………..… [1]

4. A bag contains 8 white balls and 12 black balls. Two balls are drawn from the bag with replacement. Find the probability of drawing

    (a) 2 white balls,

Answer (a)……..……….. [1]

    (b) 2 balls of different colours,
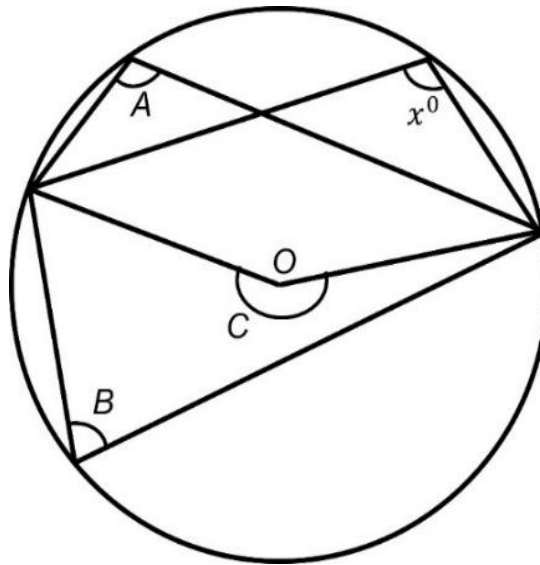
Answer (b)……..……….. [1]

    (c) at least one black ball.

Answer (c)……..……….. [1]

5. A bag of sweets is shared among a group of children. If each child gets 7 sweets, there will be 3 sweets left. If each child gets 8 sweets, there is a shortage of 4 sweets.
How many sweets are in the bag and how many children are there in the group?

Answer …………… sweets ; …..……….. children [3]

6. In the diagram below, O is the centre of the circle.

Stating the properties of circles, write down the values of angles A, B and C in terms of x.

Answer $\angle A$ = ………… ^{0}

Property: ……………………………………………..………………………………….…… [1]

Answer $\angle B$ = ………… ^{0}

Property: ……………………………………………..………………………………….…… [1]

Answer $\angle C$ = ………… ^{0}

Property: ……………………………………………..………………………………….…… [1]

7. A firm is offering a 10-year investment plan.
For the first seven years, investors are offered a simple interst of 2.5% per annum of their principal amount.
At the end of the seventh year, the total amount is invested for 3 years at 1.8% per annum, compounded half-yearly.
If an investor invested $200 000, how much would he receive at the end of 10 years?
Give your answer to the nearest dollar.

Answer $……….……….. [3]

8. Solve $125 \times \sqrt{5} = 5^{2n}$

Answer n = …………. [3]

9. R is inversely proportional to the cube of p. When the value of p is halved, the value of R changes by the factor, u. Find u.

Answer u = ……………….. [3]

10. Given $\begin{pmatrix} 3 & x & 4 \\ -1 & -5 & 0 \end{pmatrix} \begin{pmatrix} y & 2 \\ -2 & 0 \\ 0 & 6 \end{pmatrix} = \begin{pmatrix} 14 & 30 \\ -7 & -2 \end{pmatrix}$, find the value of x and y.

Answer x = ……… , *y* = …..…… [3]

11. Solve the inequality $\dfrac{3-7x}{2} \leq \dfrac{4x+5}{3}$ and hence write down the smallest rational number that satisfies the inequality.

Answer …………………..……….. [3]

Smallest rational number = ..…………… [1]

12. Factorise each of the following completely.

(**a**) $3kh - h - 3k^2 + k$

Answer (a) …………..……………….. [2]

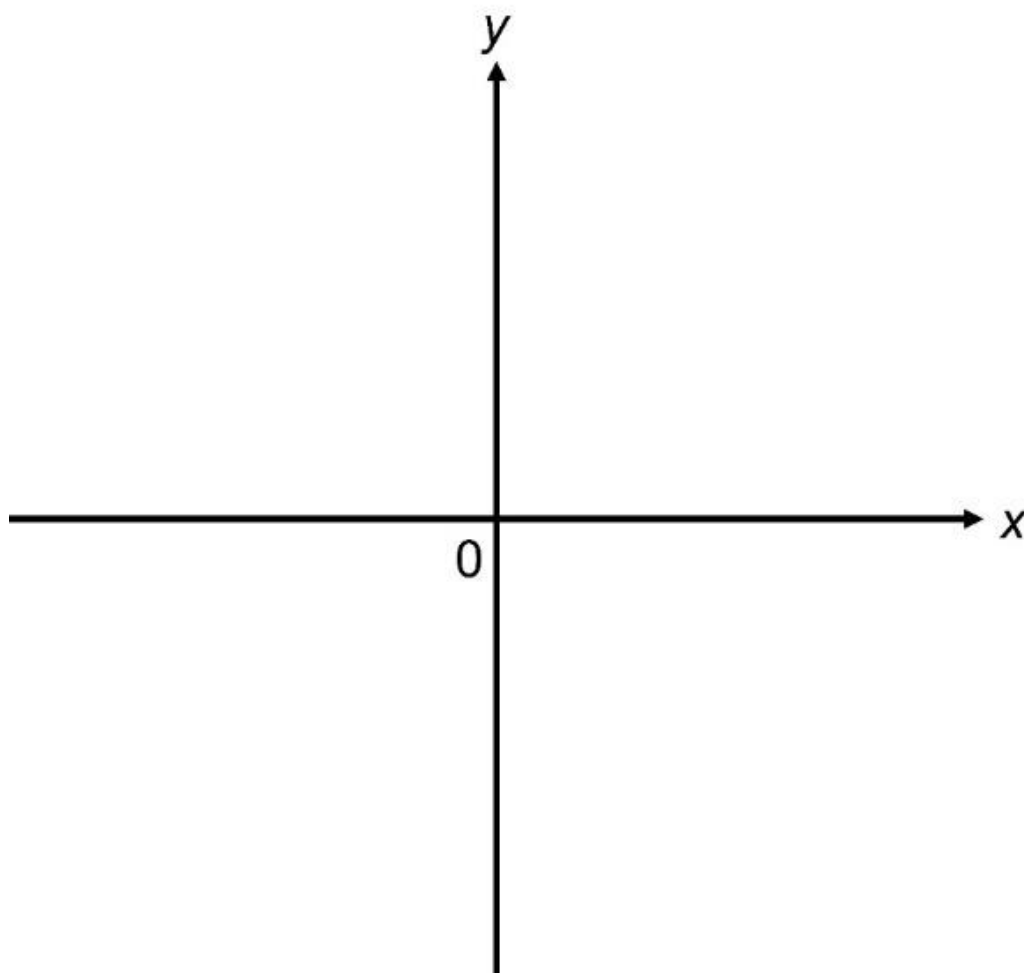(**b**) $288x^3 - 8x$

Answer (b) …………..……………….. [2]

13. Solve $\dfrac{1}{x+1} - \dfrac{2x-1}{2} = \dfrac{3}{2}$.

Answer x = ……………..……….. [4]

14. Sketch the graph of $y = (4 - x)(2 + x)$.
State clearly the horizontal and vertical intercepts, and coordinates of the turning point. [3]

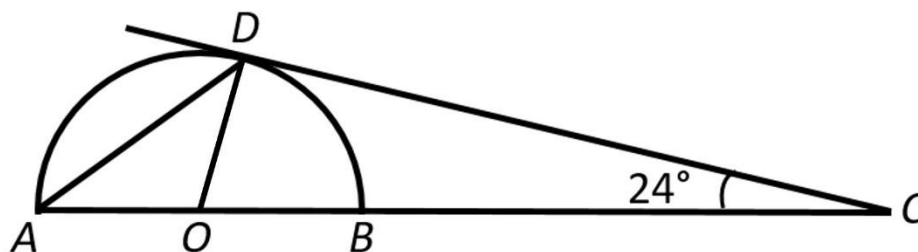Write down the equation of the tangent to the curve where gradient is zero.

Answer Equation of tangent …………………… [1]

15. (a) Construct a quadrilateral such that $AB = AD = 10$ cm, $BC = 5$ cm, $\angle DAB = 50^0$ and $\angle ABC = 110^0$. Measure DC.

Answer (a) DC = ……………. cm [2]

(b) Construct the perpendicular bisector of AD. [1]

(c) Construct the angle bisector of $\angle DAB$. [1]

(d) Hence, shade the region that is nearer to A than to D, and nearer to AD than to AB. [1]

16. The diagram shows a semicircle with centre, O. DC is the tangent to the semicircle at D and OD is the radius. $BC = 16$ m.
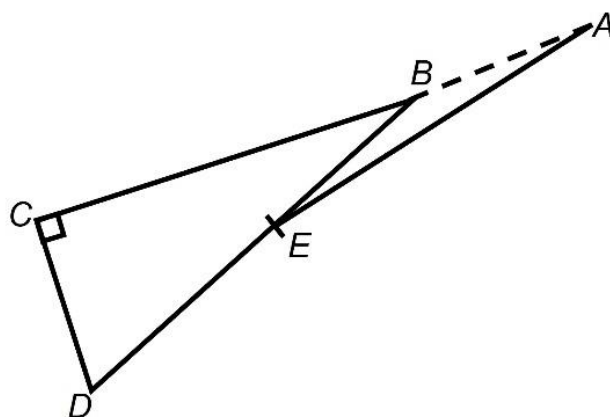

(a) Find $\angle DAB$.

Answer (a) $\angle DAB$ = ………………. ^{0} [2]

(b) Find the radius of the semicircle.

Answer (b) radius = …………… m [3]

17. (a) The diagram shows a right-angled triangle *BCD*. *A* is a point on *CB* produced such that *BA = BE = 6* cm. *CD = 5* cm and *CB = 12* cm.

Giving your answer in fraction, find the value of
(i) sin ∠*CBD*
(ii) cos ∠*ABD*

Answer (a)(i) ……………… [2]

(a)(ii) ……………… [1]

(b) Hence, find the area of Δ*BEA*.

(b) …………….… cm² [2]

18. P is the point $(7, -6)$ and $\overrightarrow{PQ} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$.
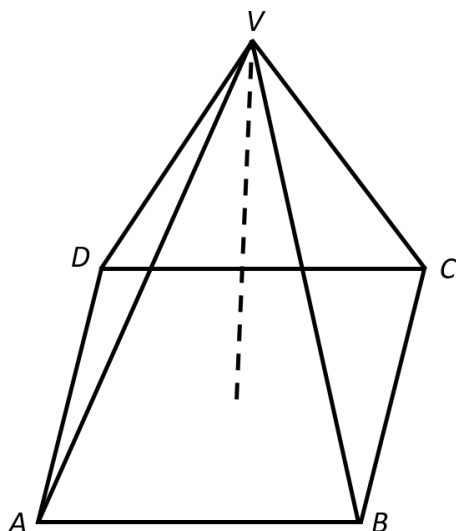
(a) Find the coordinates of point Q.

Answer (a) …………..…… [2]

(b) Find the magnitude of $\overrightarrow{PQ}$.

Answer (b) …………..…… units [1]

(c) Given that $\overrightarrow{QP} = 3\overrightarrow{PR}$, find the coordinates of point R.

Answer (c) …………..…… [3]

19. *VABCD* is a pyramid with a square base of sides 6cm. $\Delta VAB, \Delta VBC, \Delta VCD$ and ΔVDA are equilateral triangles.

(a) Show that the height of the pyramid is 4.24 cm. [2]

(b) Find the volume of the pyramid.

Answer (b)……….……… cm³ [2]

(c) Find the total surface area of the pyramid.

Answer (c)…….….……… cm^2 [3]

20. (a) The box-and-whisker plot shows the distribution of the mass of 40 students in Sec 3.
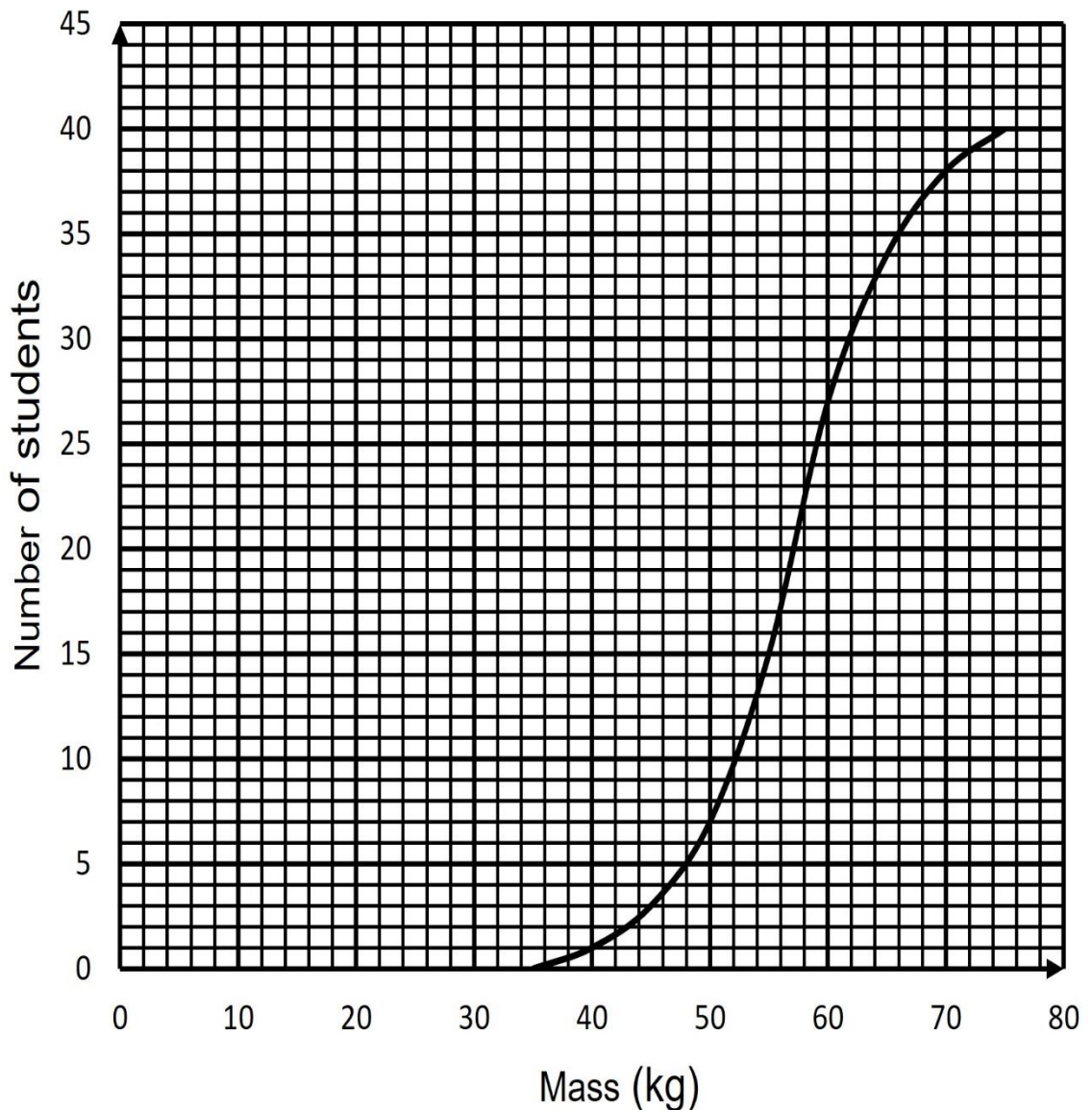

43   x   52   y   z

The range of the mass is 33 kg. 25% of the students weigh 47 kg or less and the interquartile range is 18 kg. Find the value of *x*, *y* and *z*.

Answer (a) x = ……… *, y =* …..…… *, z =* ……..… [3]

(b) The cumulative frequency curve shows the distribution of the mass of 40 students in Sec 4.

Mass of students in Sec 4

Find the

(i) median,

Answer (b)(i) …………………. kg [1]

(ii) interquartile range, and

Answer (b)(ii) …………………. kg [1]

(iii) percentage of students who are above 55 kg.

Answer (b)(ii) …………………. % [1]

(c) Make two comparisons between the mass of the students in Sec 3 and those in Sec 4.

Answer (c)

…………………………………………………………………………………..….

…………………………………………………………………………………..….

…………………………………………………………………………………..….

…………………………………………………………………………………..….

…………………………………………………………………………………..….

…………………………………………………………………………………….. [2]

End of Paper

Answers for checking:

1. 2.81×10^{-3} kg   2. $25 : 9$ 3(b)   {2, 6, 8, 10, 12, 14, 18}

4(a) $\dfrac{4}{25}$ (b) $\dfrac{12}{25}$ (c) $\dfrac{21}{25}$

5. 52 sweets, 7 children

6. $\angle A = x°$, $\angle B = 180^0 - x°$, $\angle C = 2x°$

7. \$247 979   8. $n = 1\dfrac{3}{4}$ 9. $u = 8$

10. $x = 18\dfrac{1}{2}$, $y = 17$

11. $x \geq -\dfrac{1}{29}, \dfrac{-1}{29}$

12(a) $(3k - 1)(h - k)$ (b) $8x(6x - 1)(6x + 1)$ 13. $x = 0$ or $x = -2$

14. $y = 9$

16(a) $33°$ (b)   11.0 m

17(a)(i) $\dfrac{5}{13}$ (ii) $-\dfrac{12}{13}$ (b) 6.92 cm^2

18(a)   (12 , -7)   (b)   5.10 units   (c) $\left(\dfrac{16}{3}, \dfrac{-17}{3}\right)$

19(b)   50.88 cm^3 (c)   98.4 cm^2

20(a) $x = 47, y = 65, z = 76$ (b)(i) 57 kg   (ii)   10 kg   (iii)   62.5%