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## Education Bureau

Territory-wide Syster A Asessment 2022
Secondary Mathematics
QUESTION BOOKLET

## INSTRUCTIONS

1. There are 47 questions in this paper.
2. Time allowed is 65 minutes.
3. Answer ALL questions in the separate ANSWER BOOKLET.
4. The use of HKEAA approved calculators is permitted.
5. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
6. Rough work should be done on the rough work sheet provided.
7. The diagrams in this paper are not necessarily drawn to scale.

## FORMULAS FOR REFERENCE

| Sector | Arc length | $=2 \pi r \times \frac{\theta}{360^{\circ}}$ |
| :---: | :---: | :---: |
|  | Area | $=\pi r^{2} \times \frac{\theta}{360^{\circ}}$ |
| Sphere | Surface area | $=4 \pi r^{2}$ |
|  | Volume | $=\frac{4}{3} \pi r^{3}$ |
| Cylinder | Curved surfa | $=2 \pi r h$ |
|  | Volume | $=\pi r^{2} h$ |
| Cone | Curved surface area $=\pi r l$ |  |
|  | Volume | $=\frac{1}{3} \pi r^{2} h$ |
| Prism | Volume | $=$ base area $\times$ height |
| Pyramid | Volume | $=\frac{1}{3} \times \text { base area } \times \text { he }$ |

SECTION A: Choose the best answer for each question. You should mark all your answers in the ANSWER BOOKLET.

1. A mathematics problem on division is $8 \div N$, where $N$ is a 2-digit number. Which of the following CAN be the result?
A. 0.01
B. 0.1
C. 1
D. 10
2. Determine whether a rate or a ratio should be used to relate the quantities in each of the following statements.
(i) Mum used 240 g white rice and 210 g brown rice to cook rice.
(ii) The selling price of 8 kg white rice is $\$ 120$.

|  | (i) | (ii) |
| :--- | :---: | :---: |
| A. | Ratio | Ratio |
| B. | Rate | Ratio |
| C. | Rate | Rate |
| D. | Ratio | Rate |

3. The number of terms of the polynomial $6 y^{7}-y^{2}-y+5$ is
A. 4.
B. 5 .
C. 6 .
D. 7 .
4. Simplify $\left(x^{4} y^{5}\right)^{3}$.
A. $3 x^{4} y^{5}$
B. $x^{7} y^{8}$
C. $x^{12} y^{15}$
D. $x^{64} y^{125}$
5. Determine whether each of the following is factorization or expansion.
(i) $\begin{array}{r}(x+1)(x+2)(x+5) \\ =x^{3}+8 x^{2}+17 x+10\end{array}$
(ii) $\begin{array}{r}x^{3}+8 x^{2}+17 x+10 \\ =(x+1)(x+2)(x+5)\end{array}$
A. (i) Factorization
(ii) Factorization
B. (i) Expansion
(ii) Expansion
C. (i) Expansion
(ii) Factorization
D. (i) Factorization
(ii) Expansion
6. The prices of a box of coloured pencils and a box of crayons are $\$ x$ and $\$ y$ respectively. 3 boxes of coloured pencils and 2 boxes of crayons cost $\$ 152$ in total. The price of a box of coloured pencils is lower than that of a box of crayons by $\$ 6$. Which of the following pairs of simultaneous equations shows the relation between $x$ and $y$ ?
A. $\left\{\begin{array}{l}3 x+2 y=152 \\ y-x=6\end{array}\right.$
B. $\left\{\begin{array}{l}3 x+2 y=152 \\ x-y=6\end{array}\right.$
C. $\left\{\begin{array}{l}2 x+3 y=152 \\ y-x=6\end{array}\right.$
D. $\left\{\begin{array}{l}2 x+3 y=152 \\ x-y=6\end{array}\right.$
7. Which of the following is an identity?
A. $\frac{5 x+7}{3}=0$
B. $\frac{10-x}{5}=2-x$
C. $(3 x+7)^{2}=9 x^{2}+49$
D. $(x-8)^{2}=(x-8)(x-8)$
8. The monthly salary of Alice is $\$ x$. The monthly salary of Fanny is 2 times that of Alice. If the total amount of their annual salary is more than $\$ 400000$, which of the following inequalities can be used to find the range of values of $x$ ?
A. $12(x+2 x) \geq 400000$
B. $12(x+2 x)>400000$
C. $12\left(x+\frac{x}{2}\right) \geq 400000$
D. $12\left(x+\frac{x}{2}\right)>400000$
9. Which of the following information shows the weight of a laptop with the most suitable unit and degree of accuracy?
A.

C.

B.

D.

10. 



The figure shows a solid right triangular prism. Its base is a right-angled triangle. Find the total surface area of the prism.
A. $800 \mathrm{~cm}^{2}$
B. $860 \mathrm{~cm}^{2}$
C. $920 \mathrm{~cm}^{2}$
D. $1200 \mathrm{~cm}^{2}$
11. The figure shows a right circular cone. Its base radius, height and slant height are $5 \mathrm{~cm}, 12 \mathrm{~cm}$ and 13 cm respectively. Find the volume of the cone. Express the answer in terms of $\pi$.

A. $65 \pi \mathrm{~cm}^{3}$
B. $90 \pi \mathrm{~cm}^{3}$
C. $100 \pi \mathrm{~cm}^{3}$
D. $300 \pi \mathrm{~cm}^{3}$
12. Which of the following represents a quadrilateral in the figure?
A. $P Q R S$
B. $P Q S R$
C. $\triangle P Q S$
D. $Q S$

13.


Which of the following 3-D figures can be made by the net above?
A.

B.

C.

D.

14.


Find the image of the above figure after rotating about $O$ through $180^{\circ}$ in an anticlockwise direction.
A.

B.

D.
C.


15. Which of the following figures shows that $a$ and $b$ are angles at a point?
A.

B.

C.

D.

16. The figures below show the 2-D representations of a solid from various views.


Which of the following could be the solid?
A.


front
B.

front

C.

front
D.

front
17. $\quad P(7,6)$ and $Q(5,-4)$ are two points on a straight line $L$ in the rectangular coordinate plane. The slope of $L=$
A. $\frac{7-5}{6-(-4)}$.
B. $\frac{6-(-4)}{7-5}$.
C. $\frac{7-5}{6-4}$.
D. $\frac{6-4}{7-5}$.
18. Referring to the figure, find $\theta$. (Correct to 3 significant figures)
A. $37.7^{\circ}$
B. $38.4^{\circ}$
C. $51.6^{\circ}$
D. $52.3^{\circ}$


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19. The stem-and-leaf diagram below shows the number of push-ups done by 20 students in one minute.

Number of push-ups done by 20 students in one minute

| Stem (10) | Leaf (1) |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | 16 |  |  |  |  |  |  |  |  |  |
| 1 | 0 | 1 | 1 | 2 | 2 | 3 | 5 |  |  |  |
| 2 | 3 | 4 | 6 | 8 |  |  |  |  |  |  |
| 3 | 2 | 5 |  |  |  |  |  |  |  |  |
| 4 | 0 | 0 |  |  |  |  |  |  |  |  |

If the same set of data are presented by a pie chart, which of the following diagrams could be obtained?
A.

Number of push-ups done by
20 students in one minute


Number of push-ups done by
20 students in one minute

C.

Number of push-ups done by
20 students in one minute


## Number of push-ups done by

20 students in one minute

20. The diagram below shows the queuing times of customers at Great Hotpot Restaurant and Nice Hotpot Restaurant yesterday.


Based on the diagram above, Mr Chan believes that the average queuing times at the two hotpot restaurants yesterday are the same.
Which of the following statements is the best reason that Mr Chan is misled by the above diagrams?
A. The total numbers of customers at the two hotpot restaurants are not shown.
B. The numbers of seats at the two hotpot restaurants are not shown.
C. The scales of the two vertical axes are not the same.
D. The scales of the two horizontal axes are not the same.

SECTION B: Write ALL the answers in the ANSWER BOOKLET. Working need not be shown.
21. Write down the numbers represented by $A, B$ and $C$ on the number line below.

22. Round off 8927 to 1 significant figure.
23. Use the symbol ' $x$ ' to mark the number $\frac{3}{8}$ on the number line given in the ANSWER BOOKLET.
Example: $\frac{11}{8}$ is marked on the number line below.

24. Figure 1 to Figure 4 consist of $4,8,12$ and 16 dots respectively.


According to the above pattern, how many dots does Figure $n$ consist of ? (Express the answer in terms of $n$ )
25. Find the constant term of the polynomial $2 y^{6}-3 y^{5}+4$.
26. Factorize $x^{2}+8 x+15$.
27. Solve the equation $3=\frac{x-12}{x}$.
28. Simplify $\frac{1}{2 y}+\frac{1}{7 y}$.
29. Solve the inequality $5 x \leq x+24$.
30. The figure shows a sphere of radius 7 cm . Find the surface area of the sphere. Express the answer in terms of $\pi$.

31. The figure below has rotational symmetry. Find its order of rotational symmetry.

32. In the figure, $\triangle A D B \cong \triangle C D B$. Find
(a) the value of $x$,
(b) the value of $y$.

33. The figure shows the interior angles of a pentagon $A B C D E$. Find $k$.

34. The figure shows a cube $A B C D E F G H . E F G H$ is a horizontal plane. Name the projection of $A B$ on the plane $E F G H$.

35. Which of the following must be right-angled triangle(s)? (May be more than one answer)

Triangle $P$


Triangle $Q$


Triangle $R$

36. Find the polar coordinates of point $\boldsymbol{P}$ in the figure.

37. A secondary school is doing a survey to analyse students' use of online social platforms. The survey is conducted in the following four stages.
(1) Analyse the data and the statistical charts to draw conclusions.
(2) Collect the questionnaires and organise the data obtained.
(3) Give questionnaires about the use of online social platforms to all students at the school.
(4) According to the organised data, construct suitable statistical charts.

Arrange these stages in correct order. For example: (1) $\rightarrow(2) \rightarrow(3) \rightarrow(4)$
38. The following data show the scores of 7 athletes in a gymnastics competition.

$$
7.6, \quad 6.8, \quad 6.9, \quad 7.5, \quad 7.3, \quad 7.3, \quad 6.3
$$

Find the mean and the median of the above data.
39. The scatter diagram below shows the heights $(\mathrm{cm})$ and the weights $(\mathrm{kg})$ of 3 A students. There are no students of the same height and weight in the class.


According to the above scatter diagram, answer the following questions.
(a) Jack is the tallest student in class 3A. Find his weight.
(b) How many students of height over 170 cm are there in the class?
(c) How many students are there in class 3A?

SECTION C: All working must be clearly shown.
Write the mathematical expressions, answers and statements/conclusions in the spaces provided in the ANSWER BOOKLET.
40. The maximum load of a goods lift is 2400 kg . Mr Chan wants to transport 3 machines at the same time in the lift. The weights of the machines are $727 \mathrm{~kg}, 683 \mathrm{~kg}$ and 898 kg respectively.

Based on the description above, give an appropriate approximation for the weight of each machine. Hence, estimate the total weight of the machines. Briefly explain whether Mr Chan can transport all machines at the same time in the lift.
41. Candy deposits $\$ 40000$ in a bank. The interest rate is $5 \%$ p.a. compounded yearly. Find the amount she will receive after 2 years.
42. Complete the table for the equation $y=-x+1$ in the ANSWER BOOKLET.

| $x$ | -3 | 0 | 3 |
| :--- | :--- | :--- | :--- |
| $y$ |  | 1 |  |

According to the table, draw the graph of this equation on the rectangular coordinate plane given in the ANSWER BOOKLET.
43. Solve the simultaneous equations $\left\{\begin{array}{l}x-2 y=-5 \\ x+2 y=11\end{array}\right.$.
44. The figure shows a solid right prism. The base area of the prism is $25 \mathrm{~cm}^{2}$. It is given that the volume of the prism is $275 \mathrm{~cm}^{3}$. Find the height of the prism.

45. In the figure, the radius of sector $O A B$ is 25 cm and $\angle A O B=75^{\circ}$. Let $x$ be the arc length of the sector, find $x$. Give the answer correct to 3 significant figures.

46. In the figure, $A C=D B$ and $\angle A C B=\angle D B C$. Prove that $\triangle A B C \cong \triangle D C B$.

47. In the game "Rock - Paper - Scissor", there are three gestures which are Paper (P), Scissor (S) and Rock (R). Rules of the game: Paper beats Rock, Rock beats Scissor, Scissor beats Paper and the same gesture is a tie. Betty and Peggy are playing the game. They show one of the gestures randomly.
(a) Some of the possible outcomes are given in the table provided in the ANSWER BOOKLET. Fill the remaining ones in the blanks.
(b) Find the probability that the next round is a tie.

## END OF PAPER

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