## $\mathbf{9} \mathbf{M E} \mathbf{3}$ ( $\mathbf{Q}$ )

## Education Bureau

Territory-wide System Assessment 2012 Secondary 3
Mathematics

## QUESTION BOOKLET

## INSTRUCTIONS

1. There are 51 questions in this paper.
2. The 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 | $=\frac{1}{3} \times \text { base area } \times \text { height }$ |

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

1. In the following situations, are the values mentioned exact or estimated?
(i) There are 265 seats in a cinema.
(ii) The worldwide box office gross of a film is 500000000 US Dollars.

|  | (i) | (ii) |
| :--- | :---: | :---: |
| A. | Exact value | Exact value |
| B. | Exact value | Estimated value |
| C. | Estimated value | Exact value |
| D. | Estimated value | Estimated value |

2. The diameter of the Earth is about 13000000 m . Use scientific notation to represent this number.
A. $1.3 \times 10^{6} \mathrm{~m}$
B. $13 \times 10^{6} \mathrm{~m}$
C. $1.3 \times 10^{7} \mathrm{~m}$
D. $13 \times 10^{7} \mathrm{~m}$
3. Which of the following is INCORRECT?
A. $11<\sqrt{130}$
B. $12<\sqrt{150}$
C. $13<\sqrt{170}$
D. $14<\sqrt{190}$
4. $(-x)(-x)=$
A. $-2 x$.
B. $2 x$.
C. $-x^{2}$.
D. $x^{2}$.
5. Simplify $(4 a-2 a b)-(2 a b+3 a)$.
A. $7 a-4 a b$
B. $a-4 a b$
C. $7 a$
D. $a$
6. Which of the following is a polynomial?
A. $\frac{x^{2}}{y}+1$
B. $2^{x}+y+1$
C. $x^{2}+\sqrt{y}+1$
D. $x^{2}+y+1$
7. $a^{3} \cdot b^{3}=$
A. $a b^{9}$.
B. $a b^{6}$.
C. $(a b)^{6}$.
D. $(a b)^{3}$.
8. Which of the following may represent the graph of the equation $x+2 y+2=0$ ?
A.

B.

C.

D.

9. There were 40 multiple choice questions in a mathematics test. 2 marks were awarded for each correct answer and 1 mark was deducted for each wrong answer. Vivian answered all questions which included $x$ correct answers and $y$ wrong answers. Finally she got 68 marks. Which of the following pairs of simultaneous equations shows the relations between $x$ and $y$ ?
A. $\left\{\begin{array}{l}x=40+y \\ 2 x+y=68\end{array}\right.$
B. $\left\{\begin{array}{l}x+y=40 \\ 2 x+y=68\end{array}\right.$
C. $\left\{\begin{array}{l}x+y=40 \\ 2 x-y=68\end{array}\right.$
D. $\left\{\begin{array}{l}x=40+y \\ 2 x-y=68\end{array}\right.$
10. Albert was the champion in the 100 m final of a running race. Which of the following use the most suitable unit and degree of accuracy to record the time taken by him to complete the race?
A.

B.

C.

| $\underline{100 \mathrm{~m} \text { final }}$ |
| :--- |
| Champion : Albert Lee (3A) |
| Time $\quad: 12.68 \mathrm{~s}$ |

D.

11.


The solid in the figure is formed by a pyramid and a cuboid. The base of the pyramid is a square of side $b$. The length of slant edge is $a$ and the height of cuboid is $c$. Which of the following could be expressed by $b(\sqrt{3} a+b+4 c)$ ?
A. Volume of the solid
B. Total surface area of the solid
C. Total sum of lengths of the solid
D. Height of the solid
12. Which of the following 3-D figures can be made by the given net?

A.

B.

C.

D.

13. Figure $P$ is changed to Figure $Q$ after a single transformation.


The transformation is
A. rotation.
B. enlargement.
C. translation.
D. reflection.
14.


Will the size and shape of the above figure be changed after reflection?

|  | Size | Shape |
| :--- | :---: | :---: |
| A. | unchanged | unchanged |
| B. | unchanged | changed |
| C. | changed | unchanged |
| D. | changed | changed |

15. In which of the following figures, are $x$ and $y$ adjacent angles?
A.

B.

C.

D.

16. Which of the following nets CANNOT be folded into a cube?

A.

B.

C.

D.

17. In the figure, which point can be represented by $(0,-3)$ ?
A. $\boldsymbol{P}$
B. $\boldsymbol{Q}$
C. $\boldsymbol{R}$
D. $S$

18. $A(4,7)$ and $B(6,-3)$ are two points in a rectangular coordinate plane. The mid-point of $A B$ is
A. $(10,4)$.
B. $(5,2)$.
C. $(1,-5)$.
D. $(-1,5)$.
19. Refer to the figure, find the compass bearing of $Y$ from $X$.
A. $\mathrm{N} 35^{\circ} \mathrm{E}$
B. $\quad \mathrm{N} 55^{\circ} \mathrm{E}$
C. $\quad \mathrm{S} 35^{\circ} \mathrm{W}$
D. $555^{\circ} \mathrm{W}$

20. The diagram below shows the time spent (in hours) by 15 students on computer last week:

Time spent by 15 students
on computer last week


Which of the following stem-and-leaf diagrams can be used to construct the above diagram?
A.

Time spent by 15 students on computer last week

| Stem (10 hours) | Leaf (1 hour) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 2 | 5 | 8 |  |  |
| 2 | 1 | 5 |  |  |  |  |
| 3 | 2 | 4 | 5 | 5 | 5 |  |
| 4 | 3 | 3 | 8 |  |  |  |
|  |  |  |  |  |  |  |

C.

Time spent by 15 students on computer last week

| Stem (10 hours) | Leaf (1 hour) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 |  |  |
| 2 | 2 |  |  |  |  |
| 3 | 2 | 3 | 4 | 5 | 6 |
| 4 | 2 | 3 |  |  |  |

B.

Time spent by 15 students on computer last week

| Stem (10 hours) | Leaf (1 hour) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2 | 2 | 2 | 5 | 8 |  |  |
| 3 | 1 | 5 |  |  |  |  |
| 4 | 2 | 4 | 5 | 5 | 5 | 7 |
| 5 | 3 | 3 | 8 |  |  |  |

D.

## Time spent by 15 students on computer last week

| Stem (10 hours) | Leaf (1 hour) |  |  |  |  |
| ---: | :---: | :---: | :---: | :---: | :---: |
| 2 | 2 | 3 | 4 |  |  |
| 3 | 2 |  |  |  |  |
| 4 | 2 | 3 | 4 | 5 | 6 |
| 5 | 2 | 3 |  |  |  |

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. Use the symbol ' $x$ ' to mark the number $\frac{8}{3}$ on the number line given in the ANSWER

## BOOKLET.

Example: $\frac{3}{4}$ is marked on the number line below.

23. Calvin and Tim are 15 and 21 years old respectively. Find the ratio of their ages after 3 years.
24. Stanley makes paper planes at a rate of 4 planes/hour. How long does it take him to make 12 paper planes?
25. Find the value of $x$ in the following Fibonacci sequence.

$$
1,1,2,3,5,8,13,21,34, x, \ldots
$$

26. Write down the variable of the polynomial $7 x^{6}-x^{2}+5 x+8$.
27. Expand $(x+2)(2 x+3)$.
28. Factorize $x^{2}-25$.
29. Solve $\frac{y}{2}-\frac{y}{3}=4$.
30. Simplify $\frac{3 y}{x}+\frac{y}{3 x}$.
31. Solve the inequality $-x+3<5$.
32. The radius of a circle is 7 cm . Find its circumference. Express the answer in terms of $\pi$.
33. Use the given letters to name the parallelogram on the right.

34. The figure shows the diagram of a semi-sphere.


Referring to the sketching shown above, use solid lines and dotted lines to draw a diagram of a cylinder in the space provided in the ANSWER BOOKLET.
35.


In the figure, $\triangle A B C \sim \triangle L M N$. Find
(a) the value of $x$,
(b) the value of $y$.
36. In the figure, $A B C$ and $E F G$ are straight lines and parallel to each other, $\angle C B D=62^{\circ}$ and $\angle D F G=36^{\circ}$. Find the value of $x$.

37. In the figure, $\triangle A B C$ is an equilateral triangle, $B A D$ is a straight line and $\angle A C D=22^{\circ}$. Find the value of $x$.

38. In the figure, $A B C D$ is a trapezium where $A D / / B C$. Find the value of $x$.

39. Find the polar coordinates of point $\boldsymbol{C}$ in the figure.

40. The 2011 Population Census was conducted by the Census and Statistics Department. The procedure for conducting the census included the following four stages:
(1) Using suitable graphs to represent data.
(2) Analyzing graphs and data to make reports.
(3) Giving questionnaires to all households and collecting their information.
(4) Organizing the data collected from the questionnaires.

Arrange these stages in the correct order. For example: (1) $\rightarrow(2) \rightarrow(3) \rightarrow(4)$
41. Jackson participated in a gymnastics competition of a university. The following table shows the weight of each marking item and the marks that he got in these items.

|  | Marking item |  |  |
| :---: | :---: | :---: | :---: |
|  | Skill | Artistry | Difficulty |
| Weight | 2 | 1 | 1 |
| Mark | 7 | 4 | 3 |

Find the weighted mean mark of Jackson.
42. A minibus company operates 4 routes in a district. Due to an increase in cost, the company has adjusted the fares of the routes as follows:

| Route | $P$ | $Q$ | $R$ | $S$ |
| :---: | :---: | :---: | :---: | :---: |
| Original fare (\$) | 3.6 | 5 | 6.4 | 9 |
| Adjusted fare (\$) | 4.5 | 5.7 | 7.8 | Operation stopped |

It is given that the mean of the original fares of the routes $P, Q, R$ and $S$ is $\$ 6$ and the mean of the adjusted fares of the routes $P, Q$ and $R$ is also $\$ 6$.
After adjustment, the minibus company claims that the average fare of the routes REMAINS
UNCHANGED. Do you think the claim is reasonable? Circle the correct answer in the ANSWER BOOKLET.
(a) The claim is reasonable / not reasonable.
(b) Reason (choose one of the following):
(i) It is because the mean of the original fares and the mean of the adjusted fares are comparable and equal.
(ii) It is because the mean of the original fares include 4 routes, while the mean of the adjusted fares include 3 routes, so they are not comparable.

SECTION C: All working must be clearly shown.
Write the mathematical expressions, answers and statements/conclusions in the spaces provided in the ANSWER BOOKLET.
43. The marked price of a table is $\$ 2450$. It is now sold at a discount of $20 \%$. Find the selling price of the table.
44. (a) Simplify $\left(x^{3}\right)^{2}$ and express the answer with positive index.
(b) Simplify $\frac{\left(x^{3}\right)^{2}}{x^{-5}}$ and express the answer with positive index.
45. Complete the table for the equation $2 x+y-1=0$ in the ANSWER BOOKLET.

| $x$ | -2 |  | 2 |
| :---: | :---: | :---: | :---: |
| $y$ |  | 1 | -3 |

According to the table, draw the graph of this equation on the rectangular coordinate plane given in the ANSWER BOOKLET.
46. Solve the simultaneous equations $\left\{\begin{array}{l}x=3 y-1 \\ y=x-5\end{array}\right.$.
47. In the figure, the base of the prism is a right-angled triangle. Find the volume of the prism.

48. In the figure, the radius of sector $O A B$ is 3 cm and $\angle A O B=105^{\circ}$. Find the area of the sector. Correct the answer to 3 significant figures.

49. A ship leaves $P$ and sails 9 km due west to $A$. Then it sails due north to $B$. If $B$ is 10.2 km away from $P$, find the distance between $A$ and $B$.

50. An organization has recorded the years of service of 20 employees. The result is shown below:

| 1 | 5 | 26 | 7 | 10 |
| :---: | :---: | :---: | :---: | :---: |
| 14 | 18 | 5 | 12 | 4 |
| 11 | 9 | 10 | 12 | 17 |
| 15 | 8 | 8 | 9 | 24 |

Use the data to complete the two frequency distribution tables in the ANSWER BOOKLET.
51. The stem-and-leaf diagram below shows the time taken (correct to the nearest s) by 3 C students to swim 50 m .

Time taken by 3C students to swim 50 m

| Stem (10 s) | Leaf (1 s) |  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 2 | 8 | 8 | 9 |  |  |  |  |  |  |  |
| 0 | 3 | 0 | 2 | 5 | 7 |  |  |  |  |  |
|  | 4 | 1 | 1 | 3 | 4 | 4 | 6 | 8 | 9 | 9 |
|  | 5 | 2 | 5 | 5 | 6 | 7 | 7 | 8 |  |  |

According to the above diagram, answer the following questions.
(a) How many students are there in 3C ?
(b) Find the time taken (correct to the nearest s) by the slowest student to swim 50 m .
(c) How many students take less than 31 s to swim 50 m ?

## END OF PAPER

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