## $\mathbf{9}$ ME $\mathbf{3}$ ( $\mathbf{Q}$ )



## 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 surfac | $=2 \pi r h$ |
|  | 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 | $=\frac{1}{3} \times \text { base area } \times \mathrm{he}$ |

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

1. Determine whether to estimate or to compute the exact value in each of the following situations.
(i) The astronomy club of a school recorded the rainfall amounts in the New Territories in May this year.
(ii) Hong Kong Observatory recorded the number of red rainstorm signals issued in May this year.
(i)
(ii)
A. To estimate

To compute the exact value
B. To estimate

To estimate
C. To compute the exact value To compute the exact value
D. To compute the exact value To estimate
2. The number of positive integers less than $\sqrt{73}$ is
A. 6 .
B. 7 .
C. 8 .
D. 9 .
3. Determine whether a rate or a ratio should be used to relate the quantities in each of the following statements.
(i) 3 identical microwave ovens worth $\$ 2460$ in total.
(ii) The prices of a fan and a rice cooker are $\$ 480$ and $\$ 640$ respectively.

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

4. $a \times a+b \times b=$
A. $2 a+2 b$.
B. $2 a b$.
C. $(a+b)^{2}$.
D. $a^{2}+b^{2}$.
5. Last week, the total price of 8 cups of ice-cream was $\$ x$. If the price of each cup of ice-cream is increased by $\$ 4$ this week, then the total price of 7 cups of ice-cream is $\$ x$. Which of the following equations can be used to find the value of $x$ ?
A. $\frac{x}{8}+4=\frac{x}{7}$
B. $\frac{x}{8}-4=\frac{x}{7}$
C. $\frac{x+4}{8}=\frac{x}{7}$
D. $\frac{x-4}{8}=\frac{x}{7}$
6. Which of the following may represent the graph of the equation $x+5 y+5=0$ ?
A.

B.

C.

D.

7. 



The above figure shows the graphs of $3 x-2 y+18=0$ and $3 x-y+12=0$.
According to the given graphs, solve the simultaneous equations $\left\{\begin{array}{l}3 x-2 y+18=0 \\ 3 x-y+12=0\end{array}\right.$ graphically.
A. $(6,-2)$
B. $(0,9)$
C. $(-2,6)$
D. $(-4,0)$
8. If $x<y$, which of the following inequalities is correct?
A. $6 x>6 y$
B. $-6 x>-6 y$
C. $\frac{x}{6}>\frac{y}{6}$
D. $x-6>y-6$
9. The width of a computer monitor is 55 cm (correct to the nearest cm ). Which of the following could be its actual width?
A. $\quad 54.4 \mathrm{~cm}$
B. 54.6 cm
C. $\quad 55.5 \mathrm{~cm}$
D. 55.6 cm
10.


The solid in the figure is a regular tetrahedron. Each of its side length is $a$.
By considering the dimensions, which of the following could be expressed by $\sqrt{3} a^{2}$ ?
A. Total sum of the lengths of the solid
B. Height of the solid
C. Total surface area of the solid
D. Volume of the solid
11. In the figure, $B C D$ is a straight line. Which of the following is a straight angle?
A. $\angle A C B$
B. $\angle B C D$
C. $\angle C B A$

D. $\angle D C A$
12.


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

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

13. In the figure, $A C$ and $B D$ are straight lines. $x$ and $y$ are
A. alternate angles.
B. adjacent angles.
C. corresponding angles.
D. vertically opposite angles.

14. The figure shows a cube $P Q R S T U V W$. Which of the following is a plane of reflectional symmetry of the cube?

A. $Q R S P$
B. $Q R W V$
C. PSWV
D. PSTU
15. 



Which of the following nets can be folded into the regular tetrahedron above?
A.

B.

C.

D.

16. In the figure, $B Q C$ and $A P R B$ are straight lines. In $\triangle A B C, A R=R B=21 \mathrm{~cm} . Q R \perp A B$ and $C P \perp A B$. Which of the following is an altitude of $\triangle A B C$ ?
A. $C P$
B. $C R$
C. $Q R$
D. $A C$

17. $A(7,4)$ and $B(1,0)$ are two points in the rectangular coordinate plane. The coordinates of the mid-point of $A B$ are
A. $(6,4)$.
B. $(8,4)$.
C. $(3,2)$.
D. $(4,2)$.

18. Find the value of $\tan \theta$ in the figure.
A. $\frac{28}{45}$
B. $\frac{28}{53}$
C. $\frac{45}{28}$

D. $\frac{45}{53}$
19. A university is doing a survey on the online learning of Hong Kong secondary school students. Which of the following is the most suitable method to collect data?
A. Obtain the number of student online accounts from a publisher.
B. Conduct a survey of all secondary school students in Hong Kong using questionnaires.
C. Study the relevant reports from regions other than Hong Kong.
D. Search for the sales figures of tablets in the last year.
20. The cumulative frequency polygon below shows the donations of 140 Secondary 3 students in a charitable event.

Donations of Secondary 3 students in a charitable event


If the amount donated by a student is $\$ 40$ or above, the student can get a certificate. How many Secondary 3 students can get the certificate?
A. 20 students
B. 50 students
C. 60 students
D. 80 students

SECTION B: Write ALL the answers in the ANSWER BOOKLET. Working need not be shown.
21. A tuckshop used directed numbers to represent its monthly profit and loss.

For example,
-2000 dollars represents that the loss of the tuckshop was 2000 dollars.
Use a directed number to represent each of the following situations:
(i) The profit of the tuckshop in May was 5500 dollars.
(ii) The loss of the tuckshop in June was 3200 dollars.
22. Calvin measured and found the value of the speed of light was $299000000 \mathrm{~m} / \mathrm{s}$ in an experiment. Use scientific notation to represent this speed.
23. Use the symbol ' $x$ ' to mark the number $\sqrt{3}$ on the number line given in the ANSWER BOOKLET.
Example: $\sqrt{3}+1$ is marked on the number line below.

24. Find the values of $x$ and $y$ in the following arithmetic sequences.

$$
4, \quad 7, \quad 10, \quad 13, \quad 16, \quad x, \quad y, \ldots
$$

25. Expand $\left(4-x^{3}\right)(2 x)$.
26. Factorize $x^{2}+x-20$.
27. Expand $(5 x+1)^{2}$.
28. Consider the formula $D=b^{2}-4 a c$. If $a=3, b=2$ and $c=-1$, find the value of $D$.
29. In the ANSWER BOOKLET, fill in the box with $>$ or $<$ to express the relation between the numbers.

$$
-\frac{1}{4} \quad \square \quad-0.3
$$

30. The figure shows the diagram of a triangular prism:


Referring to the sketch shown above, add 1 solid line and 1 dotted line in the figure provided in the ANSWER BOOKLET so as to form a diagram of a pyramid with square base.
31.


According to the given information in the above figure,
(a) identify whether $\triangle A B C$ and $\triangle C D E$ are congruent or similar triangles, and
(b) choose the correct reason.
32. In the figure, $\triangle A C D$ is an equilateral triangle. It is given that $\angle B E D=100^{\circ}$, find $x$.

33. Find the coordinates of point $\boldsymbol{R}$ in the figure.

34. Find the distance between two points $J(4,22)$ and $K(12,7)$ in the rectangular coordinate plane.
35. Find the value of $x$ in the figure. (Correct to 3 significant figures)

36. The following data show the number of late arrivals in each class of a secondary school last month.

| 2 | 10 | 11 | 0 | 5 | 9 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 6 | 15 | 6 | 25 | 0 | 22 |
| 18 | 13 | 17 | 12 | 4 | 7 |

Use the data to complete the two frequency distribution tables in the ANSWER BOOKLET.
37. The broken line graph below shows the pollutant concentrations of nitrogen dioxide $\left(\mu \mathrm{g} / \mathrm{m}^{3}\right)$ recorded at Kwun Tong monitoring station last week.

## Concentrations of nitrogen dioxide recorded at Kwun Tong monitoring station last week



According to the above broken line graph, answer the following questions.
(a) How many days was the concentration of nitrogen dioxide higher than $40 \mu \mathrm{~g} / \mathrm{m}^{3}$ last week?
(b) On which two consecutive days did the concentration of nitrogen dioxide increase most last week?
(c) What was the difference between the concentration of nitrogen dioxide recorded on Friday and Saturday?
38. Class 3A participated in an interclass English Speech Competition. The following table shows the weight of each marked item and its marks in these items.

|  | Assessment Item |  |  |
| :---: | :---: | :---: | :---: |
|  | Presentation <br> Skills | Creativity | Collaboration <br> Skills |
| Mark | 72 | 96 | 84 |
| Weight | $60 \%$ | $10 \%$ | $30 \%$ |

Find the weighted mean mark of Class 3A.
39. Chris draws a character from a computer game 60 times. Below shows the frequency and the types of characters drawn.

| Type of Character | Animal | Alien | Human | Others |
| :---: | :---: | :---: | :---: | :---: |
| Frequency | 25 | 12 | 20 | 3 |

Find the empirical probability that Chris draws an alien from the game.

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. A concert hall has $\underline{31}$ aisles. Each aisle has $\underline{58}$ seats. Estimate the number of seats in this hall and judge whether it has enough seats for 1500 people.

Based on the description above, give an appropriate approximation for each of the UNDERLINED VALUES respectively. Use these 2 approximations for estimating the total number of seats in the hall. Briefly explain whether there are enough seats.
41. Catherine made a deposit into a bank. The simple interest rate is $4 \%$ p.a. She will receive $\$ 520$ interest after 2 years. Find the principal of her deposit.
42. Complete the table for the equation $x-4 y=4$ in the ANSWER BOOKLET.

| $x$ | -4 | 0 | 4 |
| :---: | :---: | :---: | :---: |
| $y$ |  | -1 |  |

According to the table, draw the graph of this equation on the rectangular coordinate plane given in the ANSWER BOOKLET.
43. (a) Simplify $(3 y)^{2}$ and express the answer with positive index.
(b) Simplify $\frac{1}{y^{5}}(3 y)^{2}$ and express the answer with positive index.
44. In the figure, $A B C$ and $F B D$ are straight lines. $\angle F B A=57^{\circ}$ and $\angle F D E=123^{\circ}$. Prove that $A C / / D E$.

45. In the figure, the base of the prism is a trapezium. The upper base, lower base and height of the trapezium are $3 \mathrm{~cm}, 6 \mathrm{~cm}$ and 8 cm respectively. The height of the prism is 10 cm . Find the volume of the prism.

46. In the figure, $B C D$ is a straight line. $\angle A C B=35^{\circ}$ and $\angle A D C=15^{\circ}$. Find $x$.

47. The table below shows the take-away waiting time (minute) of 40 customers in a restaurant.

| Time (minute) | $0-4$ | $5-9$ | $10-14$ | $15-19$ |
| :---: | :---: | :---: | :---: | :---: |
| Frequency | 5 | 16 | 13 | 6 |

(a) According to the above table, complete the frequency distribution table in the ANSWER BOOKLET.
(b) Find the mean take-away waiting time of the 40 customers.

## END OF PAPER

## Do not write on this page.

Answers written on this page will not be marked.
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