## $\mathbf{9} \mathbf{M E} \mathbf{4}$ ( $\mathbf{Q}$ )

## 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. Round off 3.09726 to 3 significant figures.
A. 3.1
B. $\quad 3.10$
C. 3.09
D. 3.097
2. $2.03 \times 10^{-5}=$
A. 0.000203 .
B. 0.0000203 .
C. 0.00000203 .
D. 0.000000203 .
3. Determine whether a rate or a ratio should be used to relate the quantities in each of the following statements.
(i) The length and the height of a train are 100 m and 3 m respectively.
(ii) A train takes 3 hours to travel 600 km .

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

4. The saving of Alan is $\$ A$. Betty's saving is twice Alan's saving. After Betty spent $\$ 1000$, how much did she have?
A. $\$(2 A-1000)$
B. $\$(2 A+1000)$
C. $\$\left(\frac{A}{2}-1000\right)$
D. $\$\left(\frac{A}{2}+1000\right)$
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. $\left(4 y^{6}\right)\left(-3 y^{2}\right)=$
A. $y^{8}$.
B. $y^{12}$.
C. $-12 y^{8}$.
D. $-12 y^{12}$.
7. Which of the following is an equation with the root 12 ?
A. $\frac{x}{6}+4=\frac{x}{2}+2$
B. $\frac{x}{4}+3=\frac{x}{3}+3$
C. $\frac{x}{3}+2=\frac{x}{4}+4$
D. $\frac{x}{2}+1=\frac{x}{6}+5$
8. Which of the following is an identity?
A. $2 x-9=(x-3)^{2}$
B. $2 x-9=9-2 x$
C. $2 x-9=(x-3)+(x-6)$
D. $2 x-9=2(x-9)$
9. The sum of the weight of Anthony and Kitty is less than 120 kg . The weight of Anthony is twice that of Kitty. The weight of Kitty is $x \mathrm{~kg}$. Which of the following inequalities can be used to find the range of the values of $x$ ?
A. $2 x+x<120$
B. $2 x+x>120$
C. $x+\frac{x}{2}<120$
D. $x+\frac{x}{2}>120$
10. Benny wants to measure the length of a metal rod. Among the following methods, which one can give a more accurate reading of the length?
A.

B.

C.

D.

11. In the figure, $A F B$ is a straight line. Which of the following is an acute angle?
A. $\angle A F B$
B. $\angle B F C$
C. $\angle C F D$
D. $\angle D F E$

12. Figure $X$ is changed to Figure $Y$ after a single transformation.


The transformation is
A. rotation.
B. reflection.
C. enlargement.
D. translation.
13.


Find the image of the above figure after rotating about $O$ through $90^{\circ}$ in anticlockwise direction.
A.

B.

C.

D.

14. Which of the following figures shows two similar triangles?
A.

B.

C.


D.

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

B.

C.

D.

16. In the figure, $A E B$ and $C F D$ are straight lines,
$\angle B E F=40^{\circ}, \angle C E F=65^{\circ}$ and $\angle E C F=75^{\circ}$.
Prove that $A B / / C D$.

Which of the following proofs is INCORRECT?

A. $\angle B E C=65^{\circ}+40^{\circ}$

$$
=105^{\circ}
$$

$$
\angle B E C+\angle E C F
$$

$$
=105^{\circ}+75^{\circ}
$$

$$
=180^{\circ}
$$

$$
\therefore A B / / C D \quad \text { (int. } \angle \mathrm{s} \text { supp.) }
$$

C. $\angle A E C=75^{\circ}$ (alt. $\left.\angle \mathrm{s}, A B / / C D\right)$ $\angle A E C=\angle E C F$
$\therefore A B / / C D \quad$ (alt. $\angle \mathrm{s}$ equal)
B. $\angle D F E=65^{\circ}+75^{\circ} \quad($ ext. $\angle$ of $\triangle)$

$$
=140^{\circ}
$$

$$
\angle D F E+\angle B E F
$$

$$
=140^{\circ}+40^{\circ}
$$

$$
=180^{\circ}
$$

$$
\therefore A B / / C D
$$

(int. $\angle \mathrm{s}$ supp.)
D. $\angle C F E+65^{\circ}+75^{\circ}=180^{\circ}(\angle$ sum of $\triangle)$
$\angle C F E=40^{\circ}$
$\angle C F E=\angle B E F$
$\therefore A B / / C D \quad$ (alt. $\angle \mathrm{s}$ equal)
17. In the figure, $\boldsymbol{F}(5,1)$ is rotated about the origin $O$ through $180^{\circ}$ to $\boldsymbol{F}^{\prime}$. The coordinates of $\boldsymbol{F}^{\prime}$ are
A. $(5,-1)$.
B. $(-5,1)$.
C. $(-5,-1)$.
D. $(-1,-5)$.

18. The following cumulative frequency curve shows the weight of 80 students in Secondary 1 .


Students who weigh 70 kg or above are required to join the Physical Fitness Training Program. How many students should join the program?
A. 4 students
B. 9 students
C. 66 students
D. 76 students
19. In the figure, $L_{1}$ and $L_{2}$ are two straight lines which are perpendicular to each other. The slope of $L_{1}$ is -3 . Find the slope of $L_{2}$.
A. 3
B. $\frac{1}{3}$
C. $-\frac{1}{3}$
D. -3

20. A company uses the diagram below to show the sales volume of brand T television in 2010 and 2011.


Based on the diagram above, Steven concludes that the sales volume of brand T television in 2011 is twice the sales volume in 2010.

Which of the following statements is the best reason that Steven is misled by the above diagram?
A. The sales volumes of other years are not shown in the diagram.
B. The sales volumes of other brands of television are not shown in the diagram.
C. The vertical scale starts from 0 .
D. The heights of the bars are not proportional to the sales volumes.

SECTION B: Write ALL the answers in the ANSWER BOOKLET. Working need not be shown.
21. Round off 0.02668 to 3 decimal places.
22. Fanny deposits $\$ 6000$ in a bank. The simple interest rate is $2.5 \%$ p.a. How long will it take Fanny to receive an amount of $\$ 6600$ ?
23. Albert and Donald divide an amount of money in the ratio $7: 3$. Albert gets $\$ 2800$. How much does Donald get?
24. The profit $(\$ P)$ of selling toy trains by a company can be calculated by the following formula:
$P=80 n-1200$, where $n$ is the number of toy trains sold.
If $P=6000$, find the value of $n$.
25. Find the value of $x$ in the following Fibonacci sequence.
$1,1,2,3,5,8,13,21,34, x, \ldots$
26. Simplify $\left(2 y^{2}+5\right)-\left(3-y^{2}\right)$.
27. When $2 x^{3}-3 x^{2}-11 x+6$ is factorized, the result is $(x+2)(2 x-1)(x-3)$. What is the result when $(x+2)(2 x-1)(x-3)$ is expanded?
28. Factorize $x^{2}-x-12$.
29.


The above figure shows the graph of $3 x+4 y+4=0$. Which of the following points lie(s) on the graph? (May be more than one answer)
$P(4,-4), \quad Q(2,-4), \quad R(-1,0), \quad S(0,-1)$
30. Consider the formula $v=u+a t$.

If $v=36, u=12$ and $a=6$, find the value of $t$.
31. According to the diagram, write down an inequality in $x$.

32. The figure shows a right circular cone with a height of 15 cm and base diameter of 12 cm . Find the volume of the cone. Express the answer in terms of $\pi$.

33. Which of the following polygons MUST be equilateral? (May be more than one answer)
P.

Q.

R.

34. A cuboid is placed horizontally as shown. Sketch the cross-section of the cuboid in the ANSWER BOOKLET if it is cut vertically along the dotted line $A B$.

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, $A B C D$ is a straight line, $\angle A B E=162^{\circ}$ and $\angle C E D=78^{\circ}$. Find the value of $x$.

37. Figure 1 shows a cube $A B C D E F G H$. In Figure $2, A D H G$ is a plane of reflectional symmetry of the cube. Apart from the plane $A D H G$, name ONE OF THE OTHER planes of reflectional symmetry containing vertex $A$


Figure 1


Figure 2
38. Which of the following must be right-angled triangle(s)? (May be more than one answer)

Triangle $F$
Triangle $G$
Triangle $H$


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

40. Find the value of $x$ in the figure. (Correct to 3 significant figures)

41. The following table shows the number of times 40 members practised in a yoga centre last month.

| Number of times | $0-4$ | $5-9$ | $10-14$ | $15-19$ | $20-24$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Number of members | 2 | 12 | 16 | 8 | 2 |

Find the mean number of times 40 members practised in the yoga centre last month.
42. 60 graduates of a secondary school entered University A, B or C last year. The following table shows the distribution of graduates in these 3 universities:

| University | A | B | C |
| :---: | :---: | :---: | :---: |
| Frequency | 21 | 30 | 9 |

One of the 60 graduates is chosen randomly. Find the empirical probability that the chosen graduate studies in University C.

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. Daniel deposits $\$ 9600$ in a bank. After half a year, he will obtain a simple interest of $\$ 144$. Find the annual interest rate.
44. The present value of a camera is $\$ 8000$. The rate of depreciation is $25 \%$ each year. Find the value of the camera after three years.
45. (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.
46. Degree Fahrenheit $\left({ }^{\circ} \mathrm{F}\right)$ and degree Celsius $\left({ }^{\circ} \mathrm{C}\right)$ are two kinds of units for measuring temperature. The relation between $F$ degree Fahrenheit and $C$ degree Celsius can be represented by the following formula:

$$
F=\frac{9 C}{5}+32
$$

(a) Make $C$ the subject of the formula.
(b) If $F=104$, find the value of $C$.
47. The figure shows a solid cylinder. Its base radius is 10 cm and its height is 16 cm . Find the curved surface area of the cylinder. Express the answer in terms of $\pi$.

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. Find the area of trapezium $A B C D$ in the rectangular coordinate plane.

50. The table below shows the number of newborn babies in Hong Kong from 2006 to 2010.

| Year | 2006 | 2007 | 2008 | 2009 | 2010 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Number of newborn babies (ten thousand) | 6.6 | 7.1 | 7.9 | 8.2 | 8.9 |

According to the above data, complete the broken line graph in the ANSWER BOOKLET.
51. The pie chart below shows favorite sports of Secondary 3 students of a school.

## Favorite sports of Secondary 3 students of a school



According to the above diagram, answer the following questions.
(a) Find the value of $x$.
(b) In Secondary 3, there are 20 students whose favorite sport is swimming. How many students are there in Secondary 3?
(c) Find the number of students whose favorite sport is football.

## END OF PAPER

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