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## Education Bureau

Territory-wide System Assessment 2018

## Secondary 3 Mathematics QUESTION BOOKLET

## INSTRUCTIONS

1. There are 47 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



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) Miss Wong recorded the marks of 3A students who attempted the mathematics test yesterday.
(ii) A newspaper reported the number of people in Shatin watching the dragon boat racing on Tuen Ng Festival.
(i)
(ii)
A. To compute the exact value To compute the exact value
B. To compute the exact value To estimate
C. To estimate To compute the exact value
D.

To estimate To estimate
2. $-9.072 \times 10^{-3}=$
A. -0.009072 .
B. -0.0009072 .
C. 907.2 .
D. 9072 .
3. The price of a bottle of orange juice is $\$ x$ and the price of a bottle of milk is $\$ y$. Mary pays $\$ 500$ to buy 3 bottles of orange juice and 4 bottles of milk. What is the change?
A. $\$(500-3 x-4 y)$
B. $\$(500-3 y-4 x)$
C. $\$(3 x+4 y-500)$
D. $\$(3 y+4 x-500)$
4. Which of the following is a polynomial?
A. $4 x^{3}-5 x^{2}+\frac{6}{x}+1$
B. $4 x^{3}-5 x^{2}+6 x+1$
C. $4 x^{3}-5 x^{2}+6 \sqrt{x}+1$
D. $4 x^{3}-5 x^{2}+6 x^{-10}+1$
5.
$(-2)^{-5}=$
A. -32 .
B. 32 .
C. $-\frac{1}{32}$.
D. $\frac{1}{32}$.
6. Andy is 3 times as old as his daughter. The difference between their ages is 32 years. It is given that Andy and his daughter are $x$ years old and $y$ years old respectively. Which of the following pairs of simultaneous equations shows the relation between $x$ and $y$ ?
A. $\left\{\begin{array}{l}x=3 y \\ y-x=32\end{array}\right.$
B. $\left\{\begin{array}{l}x=3 y \\ x-y=32\end{array}\right.$
C. $\left\{\begin{array}{l}y=3 x \\ x-y=32\end{array}\right.$
D. $\left\{\begin{array}{l}y=3 x \\ y-x=32\end{array}\right.$
7. A music concert has two types of tickets costing $\$ 200$ and $\$ 120$ each. Mr Chan spends $\$ 2360$ to buy 15 tickets, in which the number for the $\$ 200$ tickets is $x$, the remaining are the $\$ 120$ tickets. Which of the following equations can be used to find the value of $x$ ?
A. $120 x+200 x=2360$
B. $200 x+120 \times 15=2360$
C. $120 x+200(15-x)=2360$
D. $200 x+120(15-x)=2360$
8. If $x>y$, which of the following inequalities is correct?
A. $\frac{x}{-7}<\frac{y}{-7}$
B. $7 x<7 y$
C. $x-7<y-7$
D. $x+7<y+7$
9. The length of a school hall is 34 m (correct to the nearest m ). Which of the following could be its actual length?
A. $\quad 33.4 \mathrm{~m}$
B. 33.5 m
C. $\quad 34.5 \mathrm{~m}$
D. $\quad 35.4 \mathrm{~m}$
10. Which of the following movie information shows the duration of a movie with the most suitable unit and degree of accuracy?
A.

| Now Showing Movie |
| :---: |
| Movie: Assessment Genius |
| Duration: 6496 seconds |

B.

| Now Showing Movie |
| :---: |
| Movie: Assessment Genius |
| Duration: 6495.63 seconds |

C.

| Now Showing Movie |
| :---: |
| Movie: Assessment Genius |
| Duration: 108 minutes |

D.

| Now Showing Movie |
| :---: |
| Movie: Assessment Genius |
| Duration: 108.26 minutes |

11. In the figure, Cone $A$ and Cone $B$ are similar solids. Their heights are 12 cm and 4 cm respectively. The total surface area of Cone $A$ is $108 \pi \mathrm{~cm}^{2}$. Find the total surface area of Cone $B$.


Cone $A$


Cone $B$
A. $36 \pi \mathrm{~cm}^{2}$
B. $18 \pi \mathrm{~cm}^{2}$
C. $12 \pi \mathrm{~cm}^{2}$
D. $4 \pi \mathrm{~cm}^{2}$
12. Which of the following represents the angle marked in the figure?
A. $\triangle R P Q$
B. $R P Q$
C. $\angle R P Q$
D. $P$

13.


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

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

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

B.

C.

D.

15. The figure shows a cube $P Q R S T U V W . F$ is the mid-point of $S R$. Which of the following is an axis of rotational symmetry of the cube?
A. $S V$
B. $R V$
C. $F U$
D. $P U$

16. In the figure, $\boldsymbol{T}(2,3)$ is rotated about the origin $O$ through $180^{\circ}$ in a clockwise direction to $T^{\prime}$. Find the coordinates of $T^{\prime}$.
A. $(-3,-2)$
B. $(-2,3)$
C. $(2,-3)$
D. $(-2,-3)$

17. $A(11,13)$ and $B(8,4)$ are two points in the rectangular coordinate plane. The coordinates of the mid-point of $A B=$
A. $(11+8,13+4)$.
B. $\left(\frac{11+8}{2}, \frac{13+4}{2}\right)$.
C. $(11-8,13-4)$.
D. $\left(\frac{11-8}{2}, \frac{13-4}{2}\right)$.
18. It is given that the slope of a straight line $\ell$ is 5 . Which of the following straight lines is parallel to $\ell$ ?

| Line | $L_{1}$ | $L_{2}$ | $L_{3}$ | $L_{4}$ |
| :---: | :---: | :---: | :---: | :---: |
| Slope | -5 | $\frac{-1}{5}$ | $\frac{1}{5}$ | 5 |

A. $L_{1}$
B. $L_{2}$
C. $L_{3}$
D. $L_{4}$
19. The frequency polygon below shows the heights (cm) of 20 volleyball team members:

Heights of 20 volleyball team members


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

Heights of 20 volleyball team members

C.

Heights of 20 volleyball team members

B.

Heights of 20 volleyball team members

D.

Heights of 20 volleyball team members

20. Student Union investigates the students' opinions on the food quality of the school tuck shop. Which of the following is the most suitable method to collect data?
A. Conduct a survey of all students using questionnaires.
B. Interview the school principal.
C. Search the opening hours of the tuck shop last month.
D. Observe and record the number of students buying food at the tuck shop during recess on a day.

SECTION B: Write ALL the answers in the ANSWER BOOKLET. Working need not be shown.
21. Stephen uses directed numbers to represent the rise and drop in the water level of a reservoir. For example,
+3 cm represents the water level of a reservoir has risen by 3 cm .
Use a directed number to represent each of the following situations:
(i) The water level of Pok Fu Lam Reservoir has risen by 5 cm .
(ii) The water level of Shing Mun Reservoir has dropped by 4 cm .
22. Round off 7.01856 to 3 significant figures.
23. Use the symbol " $x$ " to mark the number 1.25 on the number line given in the ANSWER BOOKLET.
Example: -0.75 is marked on the number line below.

24. A scientific formula is given as follows:

$$
s=u t+\frac{1}{2} a t^{2}
$$

If $u=-3, t=4$ and $a=10$, find the value of $s$.
25. The $n^{\text {th }}$ term of a sequence is $2 n+7$. Find the value of the $5^{\text {th }}$ term of the sequence.
26. Expand $(5 x+2)(x+1)$.
27. Factorize $x^{2}+4 x+4$.
28. Simplify $\frac{1}{2 b} \times \frac{b}{3 a}$.
29.


The above figure shows the graphs of $2 x-5 y-6=0$ and $3 x-2 y+6=0$.
According to the given graphs, $(-4,-3)$ is the $*$ exact solution $/$ approximate solution of the simultaneous equations $\left\{\begin{array}{l}2 x-5 y-6=0 \\ 3 x-2 y+6=0\end{array}\right.$.
(*Circle the correct answer in the ANSWER BOOKLET)
30. In the ANSWER BOOKLET, fill in the box with $>$ or < to express the relation between the numbers.

$$
-\frac{1}{5} \quad \square \quad-100
$$

31. The figure shows a right circular cone. The height, base radius and slant height are 35 cm , 12 cm and 37 cm respectively.
Find the volume of the cone. Express the answer in terms of $\pi$.

32. Which of the following polygons is / are convex? (May be more than one answer)
P.

Q.

R.

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

34. In the figure, $\triangle A B C$ is an equilateral triangle. $A B D$ is a straight line. Find $x$.

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

Triangle $A$


Triangle $B$


Triangle $C$

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

37. The following data show the high jump results (correct to the nearest cm ) of 15 students on Sports Day.

| 112 | 123 | 138 | 121 | 131 |
| :--- | :--- | :--- | :--- | :--- |
| 132 | 128 | 130 | 119 | 133 |
| 125 | 114 | 136 | 127 | 135 |

Use the data to complete the two frequency distribution tables in the ANSWER BOOKLET.
38. The pie chart below shows the various expenditures of Kerry's birthday party. The expenditure on decoration is $\$ 480$.

Various expenditures of Kerry's birthday party


According to the above pie chart, answer the following questions.
(a) Find the value of $x$.
(b) Find the total expenditure of the birthday party.
(c) What is the difference between the expenditures on food and drinks?
39. The table below shows the time spent using mobile phones by 80 students yesterday.

| Time (minute) | $0-29$ | $30-59$ | $60-89$ | $90-119$ |
| :---: | :---: | :---: | :---: | :---: |
| Frequency | 26 | 32 | 15 | 7 |

Find the modal class of the time spent using mobile phones by the 80 students yesterday.

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 cost of a piece of jewellery is $\$ 5000$. Kelly sells it for $\$ 6500$. Find the profit per cent.
41. (a) Simplify $\left(x^{2}\right)^{6}$ and express the answer with positive index.
(b) Simplify $\frac{\left(x^{2}\right)^{6}}{x^{-5}}$ and express the answer with positive index.
42. In $\triangle A B C, \angle B A C=105^{\circ}$. Find $x$.

43. Solve the simultaneous equations $\left\{\begin{array}{l}3 x+5 y=31 \\ 3 x-5 y=11\end{array}\right.$.
44. Complete the table for the equation $x-y-2=0$ in the ANSWER BOOKLET.

| $x$ | -2 | 2 | 4 |
| :--- | :--- | :--- | :--- |
| $y$ |  | 0 |  |

According to the table, draw the graph of this equation on the rectangular coordinate plane given in the ANSWER BOOKLET.
45. The figure shows a sphere of radius 5 cm . Find the surface area of the sphere. Give the answer correct to 3 significant figures.

46. In the figure, $A D B$ and $B E C$ are straight lines. $\angle A C B=\angle E D B$. Prove that $\triangle A B C \sim \triangle E B D$.

47. The table below shows the highest temperature (correct to the nearest ${ }^{\circ} \mathrm{C}$ ) of each month recorded from January to July in a city.

| Month | January | February | March | April | May | June | July |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Highest temperature $\left({ }^{\circ} \mathrm{C}\right)$ | 13 | 9 | 16 | 26 | 23 | 32 | 34 |

Draw a broken line graph in the ANSWER BOOKLET to represent the above data.

## Do not write on this page.

## Answers written on this page will not be marked.

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Prepared by the Hong Kong Examinations and Assessment Authority

