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## Education Bureau

Territory-wide System Assessment 2015

## Secondary 3 Mathematics QUESTION BOOKLET

## INSTRUCTIONS

1. There are 50 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 surface area $=2 \pi r h$ |  |
|  | 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 | $=\frac{1}{3} \times \text { base area } \times \mathrm{h}$ |

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) Total population of the World.
(ii) The number of textbooks bought by John in the new academic year.
(i) (ii)
A. To compute the exact value To compute the exact value
B. To compute the exact value To estimate
C. To estimate
D.

To estimate To compute the exact value To estimate
2. The thickness of a piece of paper is 0.00095 cm . Use scientific notation to represent this number.
A. $\quad 9.5 \times 10^{-3} \mathrm{~cm}$
B. $\quad 9.5 \times 10^{-4} \mathrm{~cm}$
C. $0.95 \times 10^{-3} \mathrm{~cm}$
D. $0.95 \times 10^{-4} \mathrm{~cm}$
3. $(-3 y)(-3 y)=$
A. $2(-3 y)$.
B. $-3 y^{2}$.
C. $-3^{2} y^{2}$.
D. $(-3 y)^{2}$.
4. Which of the following is a polynomial?
A. $2 x^{2}+3 \sqrt{x}$
B. $\frac{x^{2}}{2}+3 x$
C. $2^{x}+3 x$
D. $2 x^{2}+\frac{1}{3 x}$
5. $(-3)^{-3}=$
A. 27.
B. -27 .
C. $\frac{1}{27}$.
D. $-\frac{1}{27}$.
6. Which of the following statements is correct?
A. The root of $3 x-1=-2$ is -1 .
B. The root of $5 x-2=-8$ is -2 .
C. The root of $7 x+3=-18$ is -3 .
D. The root of $9 x+4=-40$ is -4 .
7. The price of a packet of potato chips is 3 times that of a can of soft drink. Tony spends $\$ 138$ to buy 5 packets of potato chips and 8 cans of soft drinks. The prices of a packet of potato chips and a can of soft drink are $\$ x$ and $\$ y$ respectively. Which of the following pairs of simultaneous equations shows the relation between $x$ and $y$ ?
A. $\left\{\begin{array}{l}y=3 x \\ 8 x+5 y=138\end{array}\right.$
B. $\left\{\begin{array}{l}y=3 x \\ 5 x+8 y=138\end{array}\right.$
C. $\left\{\begin{array}{l}x=3 y \\ 8 x+5 y=138\end{array}\right.$
D. $\left\{\begin{array}{l}x=3 y \\ 5 x+8 y=138\end{array}\right.$
8.


The above figure shows the graphs of $10 x+8 y-11=0$ and $8 x-5 y-2=0$.
Solve the simultaneous equations $\left\{\begin{array}{l}10 x+8 y-11=0 \\ 8 x-5 y-2=0\end{array}\right.$ graphically.
A. The exact solution of the simultaneous equations is $(1,1)$.
B. The exact solution of the simultaneous equations is $(0.5,0.5)$.
C. The approximate solution of the simultaneous equations is $(0.5,0.5)$.
D. There are no solutions.
9.


The above figure shows Container $A$ and Container $B$ with different graduations. There is some water in each container. Shirley wants to find the volume of a five-dollar coin.
Which of the following methods is the best?
A. Shirley puts 10 five-dollar coins in Container $A$, measures the volume increased, and then divides the volume by 10 .
B. Shirley puts 10 five-dollar coins in Container $B$, measures the volume increased, and then divides the volume by 10 .
C. Shirley puts a five-dollar coin in Container $A$ and measures the volume increased.
D. Shirley puts a five-dollar coin in Container $B$ and measures the volume increased.
10. In the figure, the radius of the circle is 13 cm . Find its area.
A. $13 \pi \mathrm{~cm}^{2}$
B. $26 \pi \mathrm{~cm}^{2}$
C. $169 \pi \mathrm{~cm}^{2}$
D. $676 \pi \mathrm{~cm}^{2}$

11. The ratio of the volumes of two similar cones is $1: 27$. Which of the following is the ratio of their corresponding heights?
A. $1: 3$
B. $1^{2}: 3^{2}$
C. $1^{3}: 3^{3}$
D. $1^{3}: 27^{3}$
12. Which of the following represents a point shown in the figure?
A. $P$
B. $P Q$
C. $\angle Q P S$
D. PQRS

13. Which of the following 3-D figures can be made by the net on the right?

A.

B.

C.

D.

14.


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

B.

C.

D.

15.


Which of the following triangles is congruent to the $\triangle D E F$ as shown in the above figure?
A.

B.

C.

D.

16. Which of the following nets can be folded into a cube?

A.

B.

C.

D.

17. In the figure, $\boldsymbol{G}(5,-3)$ is rotated about the origin $O$ through $180^{\circ}$ to $\boldsymbol{G}^{\prime}$. The coordinates of $\boldsymbol{G}^{\prime}$ are
A. $(-5,-3)$.
B. $(-5,3)$.
C. $(-3,5)$.
D. $(3,-5)$.

18. $A(10,100)$ and $B(12,120)$ are two points in a rectangular coordinate plane. The mid-point of $A B$ is
A. $(1,10)$.
B. $(2,20)$.
C. $(11,110)$.
D. $(22,220)$.
19. The cumulative frequency polygon below shows the results of the 50 m freestyle event of 14 boys in a swimming gala.

## Results of the 50 m freestyle event of

 14 boys in a swimming gala

Which of the following histograms can be used to construct the above diagram?
A.

Results of the 50 m freestyle event of 14 boys in a swimming gala

C.

Results of the 50 m freestyle event of 14 boys in a swimming gala

B.

Results of the 50 m freestyle event of 14 boys in a swimming gala

D.

## Results of the 50 m freestyle event of 14 boys in a swimming gala


20. Mr. Lee owns 5 shops. The monthly rents (\$) of the shops are as follows: $25000, \quad 22000, \quad 6000, \quad 21000, \quad 25000$

Mr. Lee says, 'The arithmetic mean of the rents is $\$ 19800$, therefore the rents of more than half of the shops are under \$20000.'

Which of the following best explains why Mr. Lee's statement is misleading?
A. The data values are not arranged in order.
B. The mode is not equal to the arithmetic mean.
C. Mr. Lee does not get the correct arithmetic mean.
D. Mr. Lee applies the concept of median to the arithmetic mean.

## SECTION B: Write ALL the answers in the ANSWER BOOKLET.

 Working need not be shown.21. (a) Calculate $-(-3)(-5)$.
(b) Calculate $-3-(-5)$.
22. Stephen has 40 balls, which are in red, yellow or green. The numbers of red balls and yellow balls are 10 and 13 respectively.
Find number of red balls : number of yellow balls : number of green balls.
23. Find the values of $x$ and $y$ in the following arithmetic sequence.

$$
-35,-20,-5, x, y, \ldots
$$

24. Simplify $\left(5 x^{2}+3 x\right)-\left(7 x^{2}-6 x\right)$.
25. Expand $(x+1)(3 x-1)$.
26. Factorize $k x+x+k y+y$.
27. Draw the graph of the equation $x+y-2=0$ on the rectangular coordinate plane given in the ANSWER BOOKLET. The range of $x$ must include the values from -2 to 2 .
28. Expand $(2-x)^{2}$.
29. Consider the formula $\frac{x}{2}+\frac{y}{3}+\frac{z}{4}=7$. If $x=4$ and $y=9$, find the value of $z$.
30. Make $P$ the subject of the formula $N=1+\frac{P}{4}$.
31. Solve the inequality $2 x+1>-7$.
32. The figure shows the diagram of a cuboid:


Referring to the sketching shown above, add solid line(s) and dotted line(s) in the figure provided in the ANSWER BOOKLET so as to form a diagram of a triangular prism.
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 isosceles triangle. $A B=A C, \angle A B C=2 x$ and $\angle B A C=4 x$. Find $x$.

35. The figure shows a cube $P Q R S T U V W . F$ and $G$ are the mid-points of $P U$ and $R W$ respectively. Which of the following are axes of rotational symmetry of the cube?
(MORE THAN one answer)
(I) $R U$
(II) $S T$
(III) $F G$
(IV) $F W$

36. In the figure, $V A B C D$ is a pyramid with a rectangular base. Its base $A B C D$ is a horizontal plane and its height is $V C$. Name the angle between $V B$ and the plane $A B C D$.

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

Triangle $A$


Triangle $B$


Triangle $C$


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38. $\boldsymbol{P}(-4,1)$ is translated 3 units upwards to $\boldsymbol{P}^{\prime}$. Find the coordinates of $\boldsymbol{P}^{\prime}$.

39. The following chart shows the record of relative humidity (\%) in Cheung Chau on one day.

The record of relative humidity (\%) in Cheung Chau on one day


According to the above chart, answer the following questions.
(a) At what time was the relative humidity equal to $65 \%$ ?
(b) What was the difference of the relative humidity between 19:00 and 22:00?
(c) At what time did the relative humidity increase most compared to the relative humidity of one hour before?
40. The cumulative frequency polygon below shows the body temperature of 25 students.

The body temperature of 25 students


How many students have a body temperature of $37.5^{\circ} \mathrm{C}$ or above?
41. The table below shows the marks that Cindy got in different sub-papers of a music examination and the weight of each sub-paper.

|  | Sub-paper |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Performing | Theory | Creating | Listening |
| Mark | 90 | 75 | 66 | 84 |
| Weight | $35 \%$ | $30 \%$ | $25 \%$ | $10 \%$ |

Find the weighted mean mark of Cindy.

SECTION C: All working must be clearly shown. Write the mathematical expressions, answers and statements/conclusions in the spaces provided in the ANSWER BOOKLET.
42. Peter sells a jacket at a profit of $55 \%$. If the profit is $\$ 330$, find the cost price of the jacket.
43. Michael bought a smartphone for $\$ 400$ two years ago. Its value has decreased by $35 \%$ each year. Find the present value of the smartphone.
44. (a) Simplify $\left(x^{-4}\right)^{-2}$ and express the answer with positive index.
(b) Simplify $\frac{\left(x^{-4}\right)^{-2} y^{3}}{y^{6}}$ and express the answer with positive indices.
45. In the figure, $A D=C D$ and $\angle A D B=\angle C D B$. Prove that $\triangle A B D \cong \triangle C B D$.

46. In the figure, the radius of sector $O A B$ is 6 cm and $\angle A O B=50^{\circ}$. Find the area of the sector. Correct the answer to the nearest $0.1 \mathrm{~cm}^{2}$.

47. The figure shows a cylinder. Its height is 9 cm and its base diameter is 8 cm . Find the volume of the cylinder. Express the answer in terms of $\pi$.

48. In the figure, there are 2 computer rooms and 7 classrooms along the two sides of a corridor. The length of each computer room is 12 m . Estimate the length of the corridor and explain your estimation method.

49. In the figure, 3 identical boxes of tissues are placed in a cabinet. The length of each box is 22 cm and $B C=12 \mathrm{~cm}$. Find $\theta$. (Correct to 3 significant figures)

50. The table below shows the weights of 60 suitcases.

| Weight (kg) | $16-20$ | $21-25$ | $26-30$ | $31-35$ |
| :---: | :---: | :---: | :---: | :---: |
| Frequency | 8 | 32 | 14 | 6 |

Find the mean weight of the 60 suitcases.

## END OF PAPER

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