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Education Bureau
Territory-wide System Assessment 2016
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.

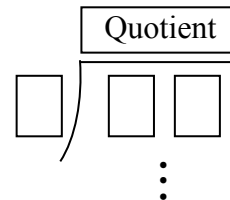
FORMULAS FOR REFERENCE

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	$= \text{base area} \times \text{height}$
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. Which of the following numbers **CANNOT** be the quotient when a two-digit number is divided by a one-digit number?

- A. 9
- B. 10
- C. 20
- D. 100



2. Round off 1.04095 to 3 significant figures.

- A. 1.04
- B. 1.041
- C. 1.0410
- D. 1.04000

3. The smallest integer greater than $\sqrt{123}$ is

- A. 10.
- B. 11.
- C. 12.
- D. 13.

4. Which of the following is a polynomial?

A. $\frac{1}{2x^2} + 5$

B. $2x^2 + 5$

C. $2^x + 5$

D. $2\sqrt{x} + 5$

5. Simplify $\frac{(x^2)^6}{x^4}$.

A. x^2

B. x^3

C. x^4

D. x^8

6. Which of the following is an equation with the root 50?

A. $x - 100 = 0$

B. $x + 100 = 0$

C. $x - 50 = 0$

D. $x + 50 = 0$

7. The heights of Johnny and Carmen are x cm and y cm respectively. The height of Johnny is 2 times the height of Carmen. The sum of their heights is 252 cm. Which of the following pairs of simultaneous equations shows the relation between x and y ?

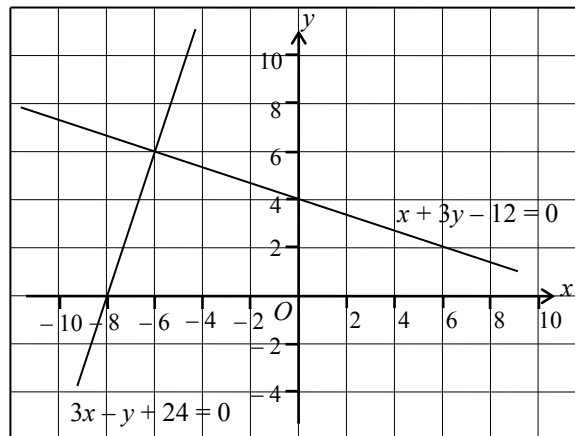
A.
$$\begin{cases} y = 2x \\ x + y = 252 \end{cases}$$

B.
$$\begin{cases} y = 2x \\ y + 2x = 252 \end{cases}$$

C.
$$\begin{cases} x = 2y \\ x + y = 252 \end{cases}$$

D.
$$\begin{cases} x = 2y \\ x + 2y = 252 \end{cases}$$

8.



The above figure shows the graphs of $x + 3y - 12 = 0$ and $3x - y + 24 = 0$.

Solve the simultaneous equations
$$\begin{cases} x + 3y - 12 = 0 \\ 3x - y + 24 = 0 \end{cases}$$
 graphically.

- A. $(-6, 6)$
 B. $(6, -6)$
 C. $(-8, 0)$
 D. $(0, 4)$

9. Helen is x years old now. William's age is 3 times Helen's age. After 4 years, William's age is greater than 50. Which of the following inequalities can be used to find the range of values of x ?

A. $3x - 4 > 50$

B. $3x + 4 > 50$

C. $\frac{x}{3} - 4 > 50$

D. $\frac{x}{3} + 4 > 50$

10. Which of the following uses the most suitable unit and degree of accuracy to express the time required of a student going from home to school?

A. 1 hour

B. 1.123 hours

C. 0.05 day

D. 0.046 8 day

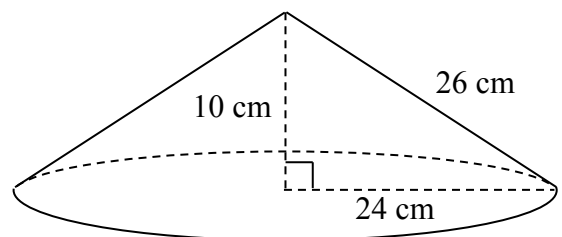
11. The figure shows a right circular cone. The height, base radius and slant height are 10 cm, 24 cm and 26 cm respectively. Find the volume of the cone. Express the answer in terms of π .

A. $624\pi \text{ cm}^3$

B. $1200\pi \text{ cm}^3$

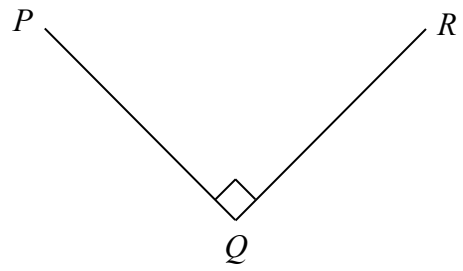
C. $1920\pi \text{ cm}^3$

D. $5760\pi \text{ cm}^3$

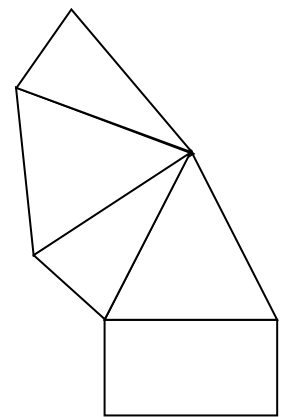


12. Which of the following represents a line segment shown in the figure?

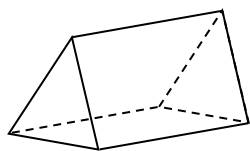
- A. P
- B. PQ
- C. PQR
- D. $\angle PQR$



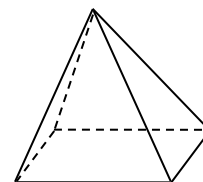
13. Which of the following 3-D figures can be made by the net on the right?



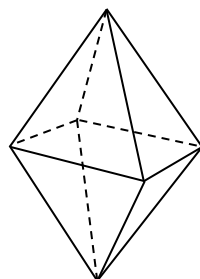
A.



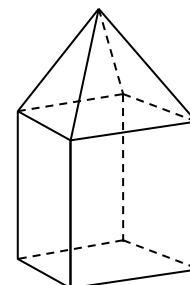
B.



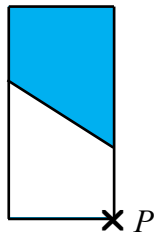
C.



D.

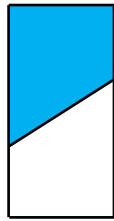


14.



Find the image of the above figure after rotating about P through 270° in a clockwise direction.

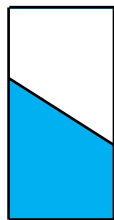
A.



B.



C.

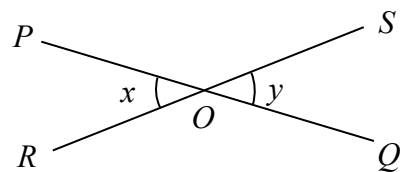


D.

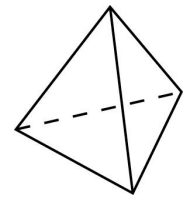


15. In the figure, POQ and ROS are straight lines. x and y are

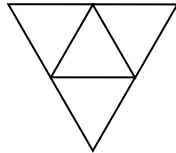
- A. vertically opposite angles.
- B. angles at a point.
- C. corresponding angles.
- D. exterior angles.



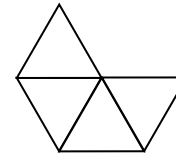
16. Which of the following nets **CANNOT** be folded into a regular tetrahedron?



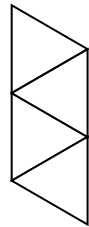
A.



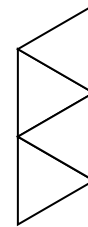
B.



C.

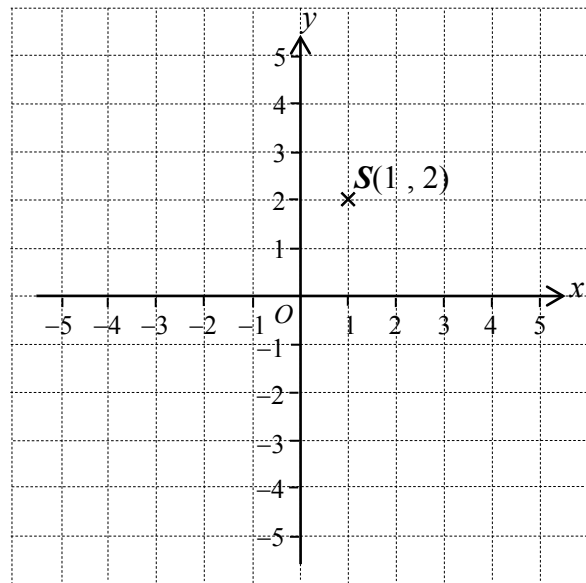


D.



17. In the figure, $S(1, 2)$ is rotated about the origin O through 90° in an anticlockwise direction to S' . The coordinates of S' are

- A. $(2, -1)$.
- B. $(-1, -2)$.
- C. $(1, -2)$.
- D. $(-2, 1)$.

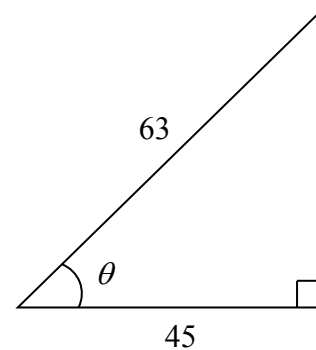


18. $A(2, 8)$ and $B(5, 12)$ are two points on a straight line L in a rectangular coordinate plane. Find the slope of L .

- A. $\frac{7}{20}$
- B. $\frac{20}{7}$
- C. $\frac{3}{4}$
- D. $\frac{4}{3}$

19. Referring to the figure, find θ . (Correct to the nearest degree)

- A. 54°
- B. 46°
- C. 44°
- D. 36°



20. The following table shows the unemployment rate of a country from 2008 to 2014.

Year	2008	2009	2010	2011	2012	2013	2014
Unemployment rate (%)	3.5	5.3	4.3	3.4	3.3	3.4	2.9

Which of the following is the most suitable for presenting the data above?

- A. Broken line graph
- B. Stem-and-leaf diagram
- C. Scatter diagram
- D. Cumulative frequency curve

SECTION B: Write ALL the answers in the ANSWER BOOKLET.
Working need not be shown.

21. Danny uses directed numbers to represent the time differences between Hong Kong and other cities. For example, the local time in City A is 10 hours behind the local time in Hong Kong, the time difference is represented by -10 hours.

Use a directed number to represent each of the following situations:

- (i) The local time in Paris is 7 hours behind the local time in Hong Kong.
- (ii) The local time in Tokyo is 1 hour ahead of the local time in Hong Kong.

22. Round off 8.9904 to 3 decimal places.

23. The walking speed of Amy is 4.5 km/h. Find the number of hours she takes to walk 18 km.

24. Consider the sequence of square numbers:

$$1, 4, 9, 16, x, y, \dots$$

Find the values of x and y .

25. The n^{th} term of a sequence is $\frac{1}{2n+1}$. Find the value of the 12th term of the sequence.

26. Factorize $x^2 + 5x$.

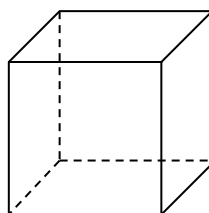
27. Solve $3(x - 2) = 2x$.

28. Expand $(a + 10)(a - 10)$.

29. Consider the formula $K = \frac{2a^2}{b}$. If $a = 3$ and $b = -2$, find the value of K .

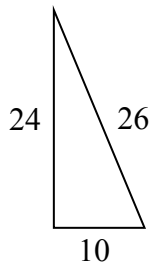
30. Solve the inequality $x - 10 \leq 20$.

31. The figure shows a solid cube. Its total surface area is 294 cm^2 . Find the side length of the cube.

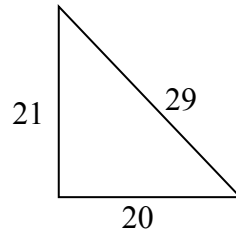


32. Which of the following must be right-angled triangles? (More than one answer)

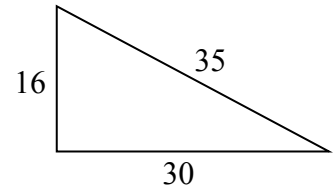
Triangle *A*



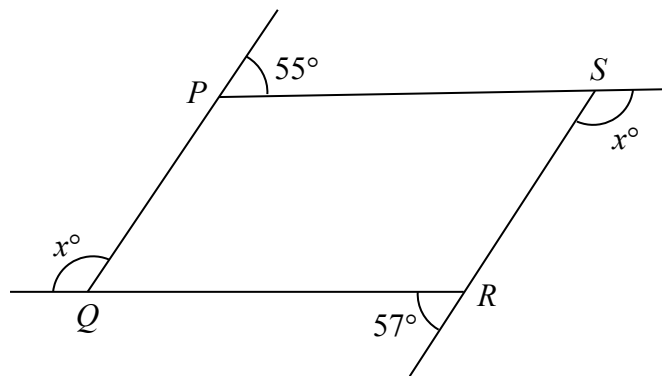
Triangle *B*



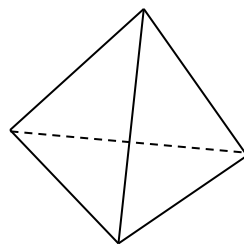
Triangle *C*



33. The figure shows the exterior angles of a quadrilateral *PQRS*. Find the value of *x*.

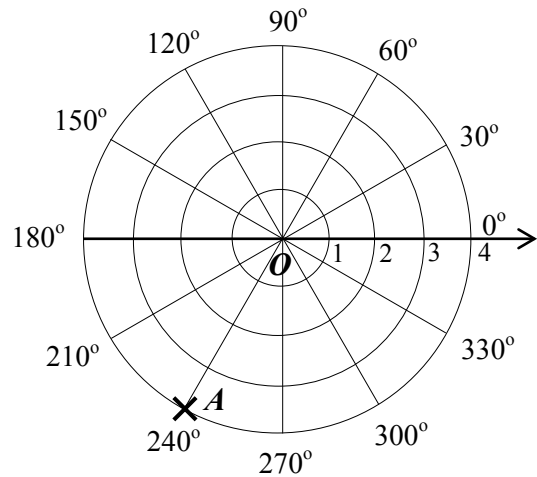


34. The figure shows the diagram of a pyramid with triangular base:

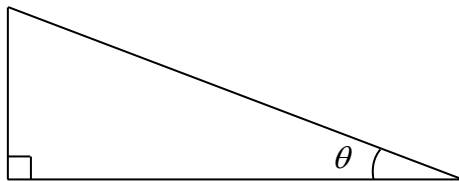


Referring to the sketching shown above, add 2 solid lines and 2 dotted lines in the figure provided in the **ANSWER BOOKLET** so as to form a diagram of a **cube**.

35. Find the polar coordinates of point A in the figure.



36. In the figure, $\tan \theta = 0.38$. Find θ . (Correct to the nearest 0.1°)



37. A shopping mall manager is doing a survey on the number of people entering and leaving the mall. The survey is conducted in the following four stages.

- (1) Organise the record of the number of people entering and leaving the mall at different time intervals into a table.
- (2) Analyse the charts and draw conclusions.
- (3) Record the number of people entering and leaving the mall at different time intervals.
- (4) According to the table, present the data by using suitable charts.

Arrange these stages in correct order. For example: (1) \rightarrow (2) \rightarrow (3) \rightarrow (4)

38. The following stem-and-leaf diagram shows the heights (correct to the nearest cm) of the sunflowers in a garden.

Heights of sunflowers

Stem (10 cm)	Leaf (1 cm)
2	3 6 8
3	4 5 5 9
4	1 3 3 5 5 5 7
5	3 4 4 6
6	0 2

According to the above stem-and-leaf diagram, answer the following questions.

- (a) How many sunflowers are there in the garden?
- (b) Find the mode of the heights of the sunflowers.
- (c) How many sunflowers in the garden are over 40 cm in height?

39. A dice is thrown 100 times and the outcomes are recorded as follows:

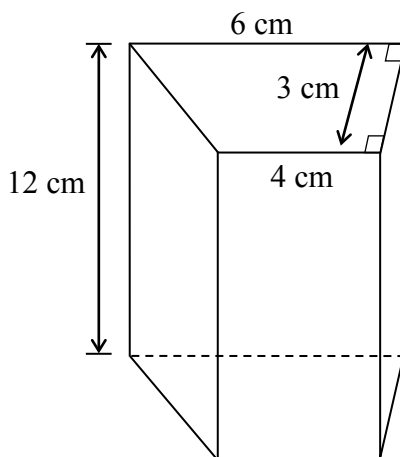
Outcome	1	2	3	4	5	6
Frequency	13	16	22	11	18	20

Find the empirical probability of getting the outcome '1'.

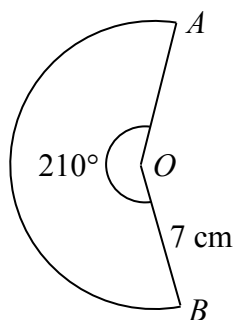
SECTION C: All working must be clearly shown.
 Write the mathematical expressions, answers and statements/conclusions
 in the spaces provided in the ANSWER BOOKLET.

40. Janet deposits \$6 800 in a bank at a simple interest rate of 2% p.a. Find the interest she will receive after 3 years.

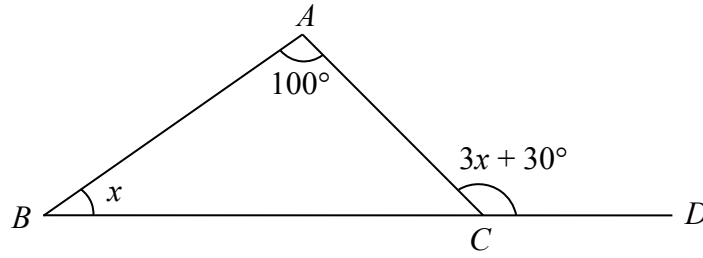
41. In the figure, the base of the prism is a trapezium. The upper base, lower base and height of the trapezium are 4 cm, 6 cm and 3 cm respectively. The height of the prism is 12 cm. Find the volume of the prism.



42. In the figure, the radius of sector OAB is 7 cm and reflex $\angle AOB = 210^\circ$. Find the area of the sector.
 Give the answer correct to the nearest 0.1 cm^2 .



43. In the figure, BCD is a straight line. $\angle ABC = x$, $\angle CAB = 100^\circ$ and $\angle ACD = 3x + 30^\circ$. Find x .

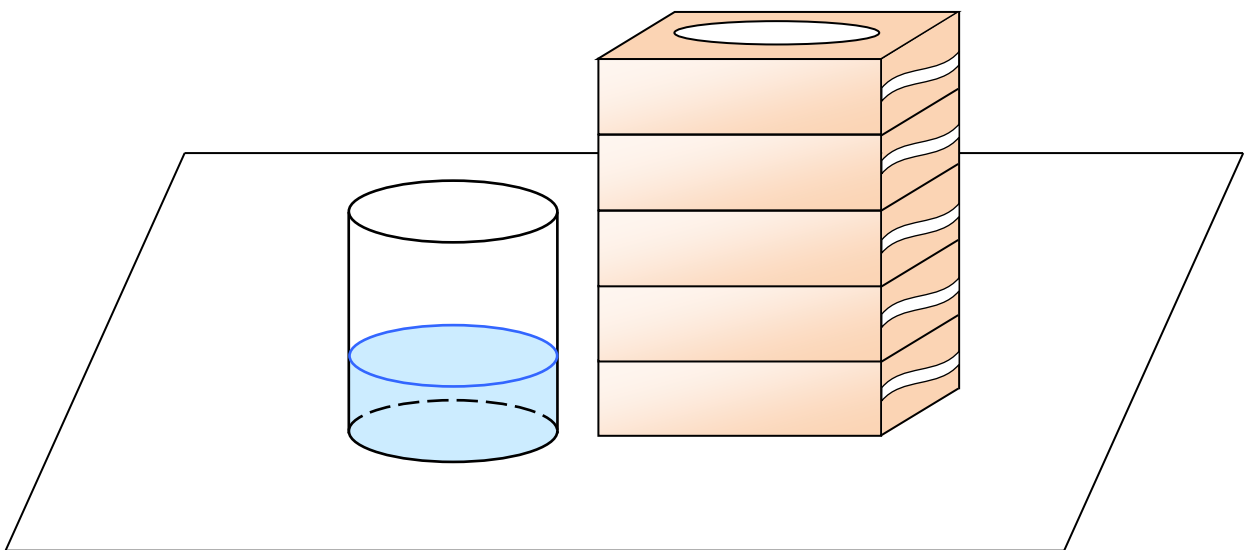


44. Complete the table for the equation $x + 3y - 3 = 0$ in the **ANSWER BOOKLET**.

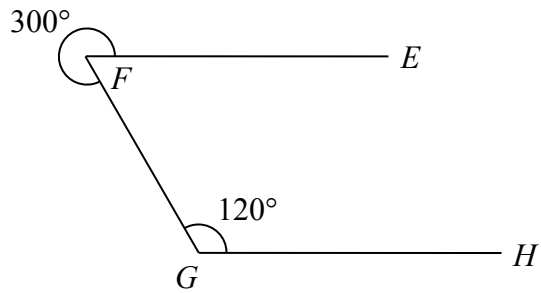
x	-3	0	3
y	2		

According to the table, draw the graph of this equation on the rectangular coordinate plane given in the **ANSWER BOOKLET**.

45. In the figure, a cylindrical glass filled with some water and a few boxes of tissue paper are placed on a table. The capacity of the glass is 525 mL. Estimate the volume of water in the glass and explain your estimation method.



46. In the figure, reflex $\angle EFG = 300^\circ$, $\angle FGH = 120^\circ$. Prove that $FE \parallel GH$.



47. The following data show the time taken by 20 athletes to finish a 400 m running race (correct to the nearest s).

69	54	71	57	67
57	59	64	66	59
79	75	61	68	55
61	58	52	62	63

Use the data to complete the two frequency distribution tables in the **ANSWER BOOKLET**.

END OF PAPER

Do not write on this page.

Answers written on this page will not be marked.

