9	M	E	2	(	Q	)

Education Bureau

Territory-wide System Assessment 2024

Secondary 3 Mathematics

QUESTION BOOKLET

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.

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

1. $4^5 =$

A. $4 \times 4 \times 4 \times 4 \times 4$.

B. $5 \times 5 \times 5 \times 5$.

C. $4 + 5$.

D. $4 + 4 + 4 + 4 + 4$.

2. Which of the following is an irrational number?

A. 0.33

B. $0.\dot{1}$

C. $\frac{5}{11}$

D. $\sqrt{8}$

3. A restaurant bought 6 000 eggs last month and 4 800 eggs this month. Find the percentage decrease in the number of eggs bought by the restaurant this month.

A. 80%

B. 25%

C. 20%

D. 12%

4. Matthew got 80 marks in a mathematics test. He got 4 marks less than Lily. Find the ratio of Matthew's mark to Lily's mark in the test.

A. $19 : 20$

B. $20 : 19$

C. $21 : 20$

D. $20 : 21$

5. Mr Chan has x boxes of batteries. There are 50 batteries in each box. He used up 2 boxes and divided the rest of the batteries into 60 packs for selling. How many batteries are in each pack?

A. $\frac{50(x-2)}{60}$ batteries

B. $\frac{50x-2}{60}$ batteries

C. $\frac{x-2}{60}$ batteries

D. $\frac{x-50\times 2}{60}$ batteries

6. Which of the following points lies on the straight line $y = 6 - 2x$?

A. $(-6, 6)$

B. $(-1, 4)$

C. $(1, -4)$

D. $(6, -6)$

7. If $a > 1$, which of the following **MUST** be correct ?

A. $a^4 \times a^{-3} = a^{-12}$

B. $\frac{a^{-15}}{a^{-3}} = a^5$

C. $a^8 \div a^2 = a^6$

D. $(a^3)^2 = a^5$

8. Arrange the terms of the polynomial $1 + x^2 - x$ in ascending order of powers of x . Which of the following is correct ?

A. $1 - x + x^2$

B. $-x + 1 + x^2$

C. $x^2 + 1 - x$

D. $x^2 - x + 1$

9. Which of the following is an identity ?

A. $(2x-3)(2x-3)=(2x-3)^2$

B. $(2x-3)(2x-3)=(2x)^2-3^2$

C. $(2x-3)-(2x+3)=0$

D. $2(x-3)=2x-3$

10. If $x \geq y$, which of the following inequalities **MUST** be correct ?

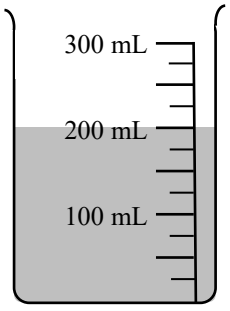
A. $\frac{x}{5} \leq \frac{y}{5}$

B. $x+5 \leq y+5$

C. $-5x \leq -5y$

D. $x-5 \leq y-5$

11. Garfield uses a beaker to measure the volume of a can of drink and the result is 200 mL. Find the percentage error of the measured value.



A. 4.17%

B. 6.25%

C. 12.5%

D. 66.7%

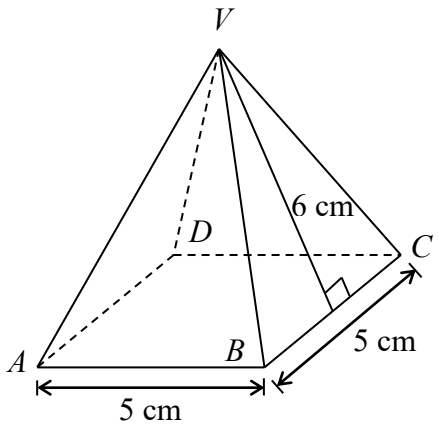
12. In the figure, $VABCD$ is a solid right pyramid. The base $ABCD$ is a square of side 5 cm. The height of $\triangle VBC$ is 6 cm. Find the total surface area of the pyramid.

A. 50 cm^2

B. 60 cm^2

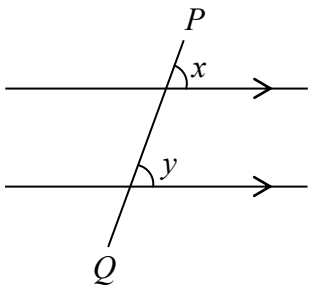
C. 85 cm^2

D. 145 cm^2

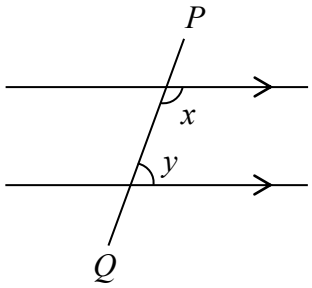


13. In each of the following figures, PQ is a straight line. Which figure shows that x and y are a pair of interior angles on the same side?

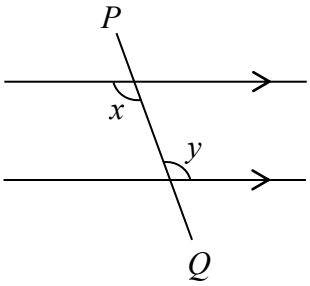
A.



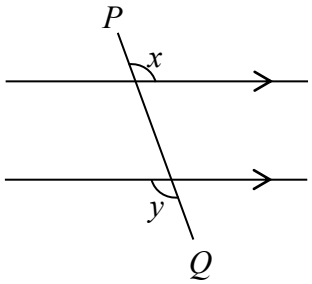
B.



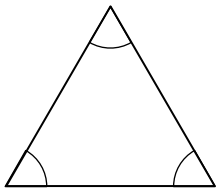
C.

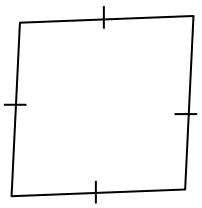


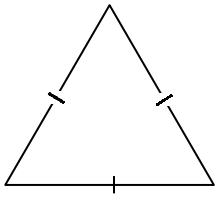
D.

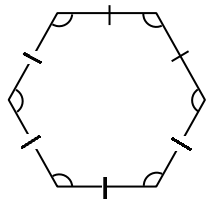


14. Which of the following **MAY NOT** be a regular polygon?

A. 

B. 

C. 

D. 

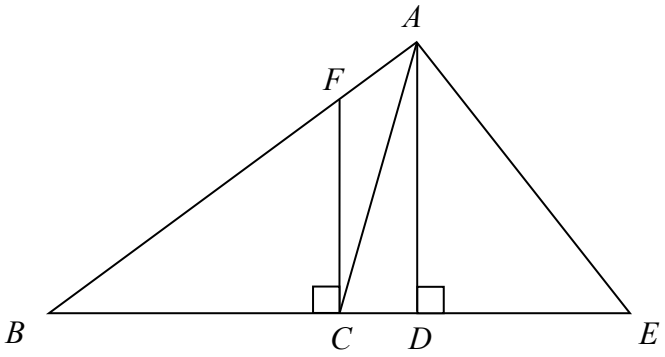
15. In $\triangle ABE$, AFB and $BCDE$ are straight lines. It is given that $BC = CE$, $FC \perp BE$ and $AD \perp BE$. Which of the following is a perpendicular bisector of $\triangle ABE$?

A. AD

B. AC

C. FC

D. BC



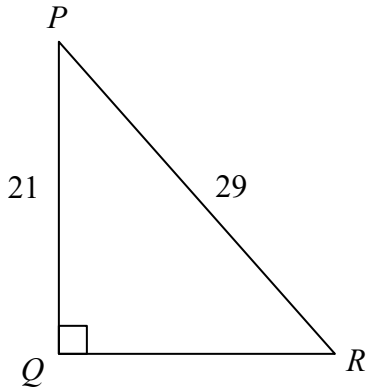
16. In the figure, $\triangle PQR$ is a right-angled triangle. If $PQ = 21$ and $PR = 29$, find QR.

A. $\sqrt{29^2 - 21^2}$

B. $\sqrt{29^2 + 21^2}$

C. $29^2 - 21^2$

D. $29^2 + 21^2$



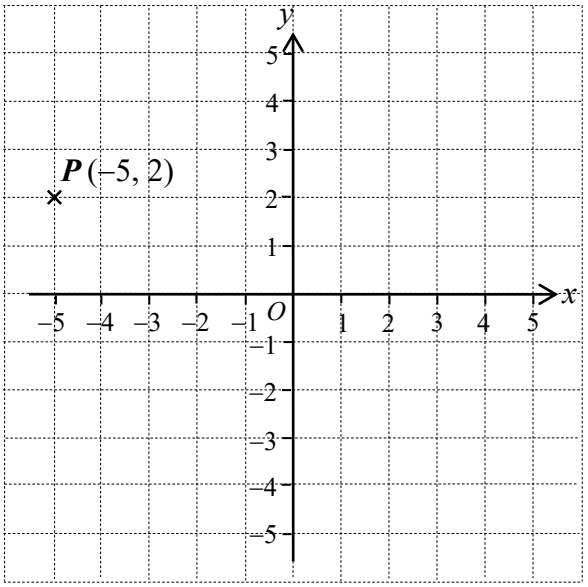
17. In the figure, $\boldsymbol{P}(-5, 2)$ is rotated about the origin O through $90°$ in an anticlockwise direction to $\boldsymbol{P'}$. Find the coordinates of $\boldsymbol{P'}$.

A. $(-5, -2)$

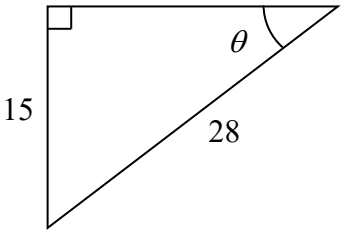
B. $(5, -2)$

C. $(2, 5)$

D. $(-2, -5)$

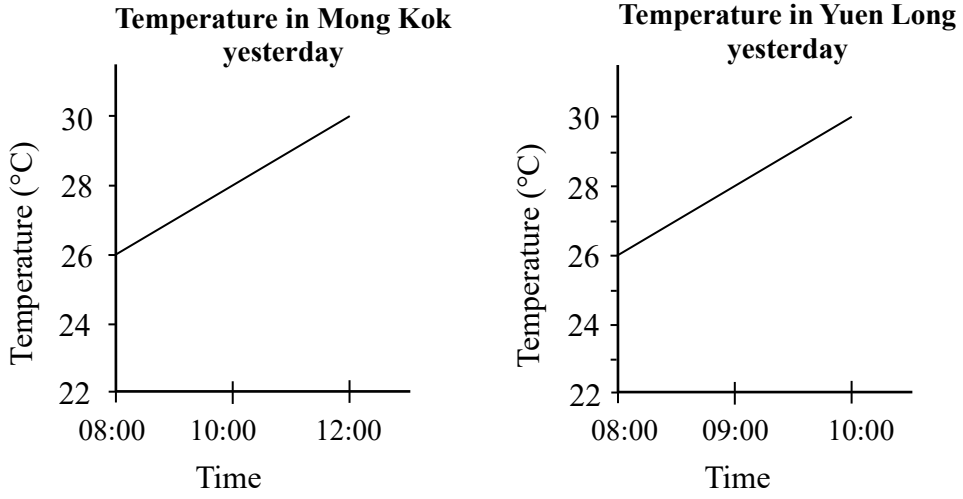


18. Referring to the figure, find θ. Give the answer correct to 3 significant figures.



A. 28.2°
B. 32.4°
C. 57.6°
D. 61.8°

19. The charts below show the temperatures in Mong Kok and Yuen Long yesterday. Hence, Sam claims that the temperatures raised at the same rate in Mong Kok and Yuen Long yesterday.



Which of the following statements is the best reason that Sam is **misled** by the above charts?

A. There is no comparison with the temperatures of other regions.
B. The scales of the horizontal axis in the two charts are not the same.
C. The scales of the vertical axis in the two charts are not the same.
D. The scales of the vertical axis in the two charts do not start from 0.

20. The following table shows the personal vaccination history and the corresponding frequency of people who reserved a booking at a vaccination clinic yesterday.

Vaccination history	Never vaccinated	Received 1 dose to 3 doses of vaccine	Received more than 3 doses of vaccine
Frequency	1	497	2

According to the table above, find the relative frequency of the people who received 1 dose or more of vaccine.

A. $\frac{1}{500}$

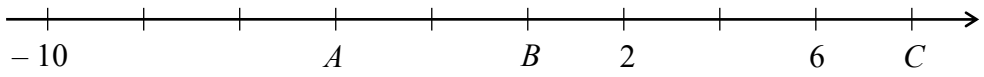
B. $\frac{2}{500}$

C. $\frac{497}{500}$

D. $\frac{499}{500}$

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

21. Write down the numbers represented by A, B and C shown on the number line below.



22. Round off $0.051\,54$ to 2 decimal places.

23. In each of the following situations, determine whether the relationship between x and y is direct proportion or inverse proportion.

(i) A bottle of soft drink is divided into x cups equally. Each cup has y mL.

(ii) A ticket for a theme park is sold at $\$200$. Wilson pays $\$y$ to buy x tickets.

24. Solve the equation $x = \dfrac{21-5x}{2}$.

25. Find the value of $(-10)^{-2}$.

26. The diameter of the pollen of a plant is about $0.000\,04$ m. Use scientific notation to represent the diameter.

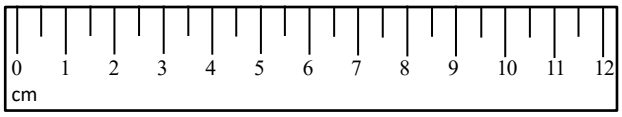
27. Simplify $(5x - 4y) + (8y - 2x)$.

28. Factorise $4x - 8x^2$.

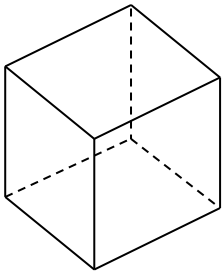
29. Expand $(6x + 1)(6x - 1)$.

30. Simplify $\left(\frac{5y}{2x}\right)\left(\frac{5x}{2y}\right)$.

31. Wilson uses the ruler shown in the figure to measure the length of a ticket and the result is 8.5 cm (correct to the nearest 0.5 cm). Find the maximum absolute error of the measurement.

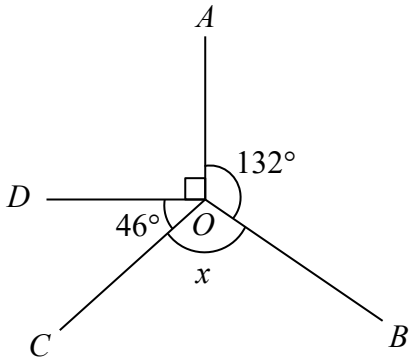


32. The figure shows the diagram of a cube:



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 **right pyramid with quadrilateral base**.

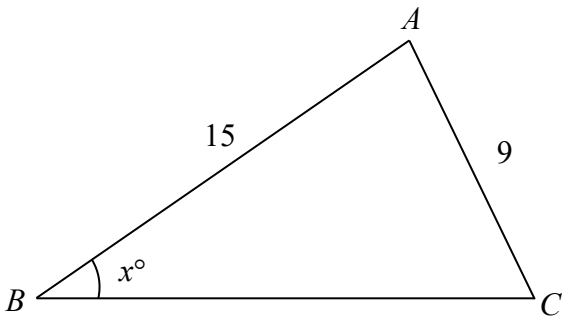
33. In the figure, $\angle AOD$ is a right angle. It is given that $\angle AOB = 132°$ and $\angle DOC = 46°$. Find x.

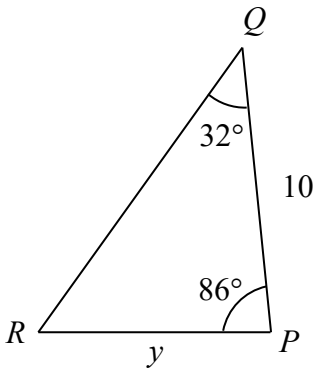


34. In the figure, $\triangle ABC \sim \triangle PQR$. Find

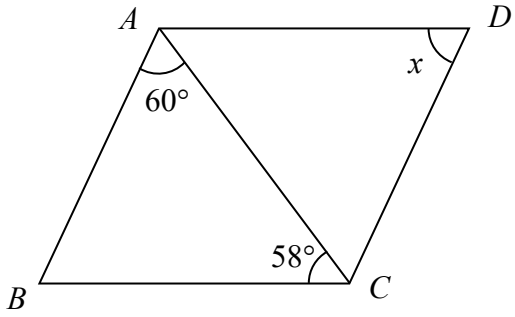
(a) the value of x,

(b) the value of y.

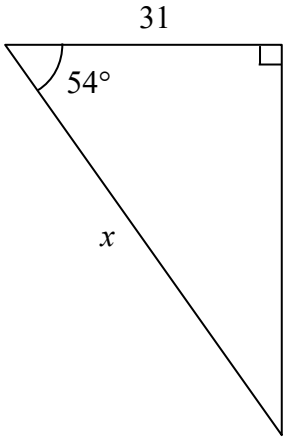




35. In the figure, $ABCD$ is a parallelogram. It is given that AC is the diagonal, $\angle BCA = 58°$ and $\angle BAC = 60°$. Find x.



36. Find the value of x in the figure. Give the answer correct to 3 significant figures.

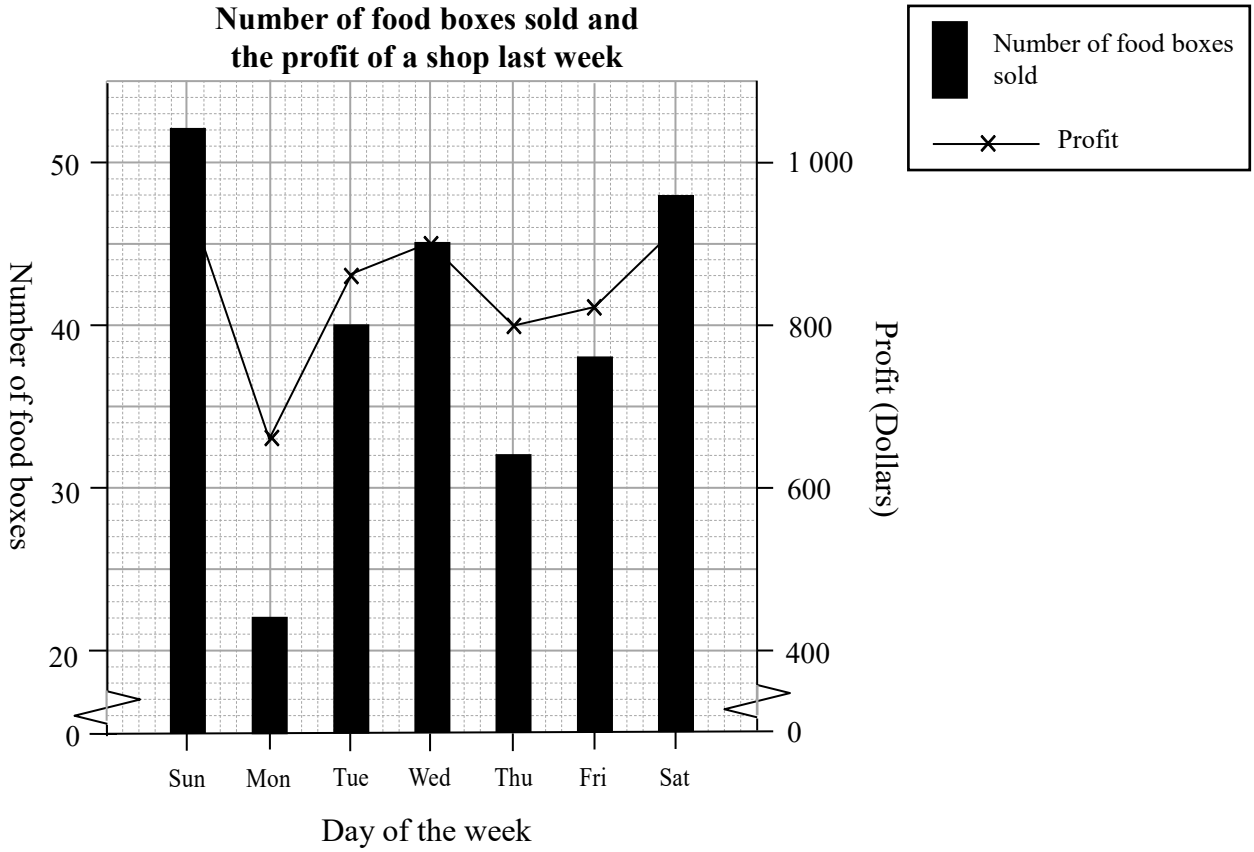


37. The following data shows the number of push-ups done by 20 students in one minute.

45	34	35	41	33
27	43	48	49	41
51	24	57	18	10
37	44	47	20	58

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

38. The diagram below shows the number of food boxes sold and the profit of a shop last week.

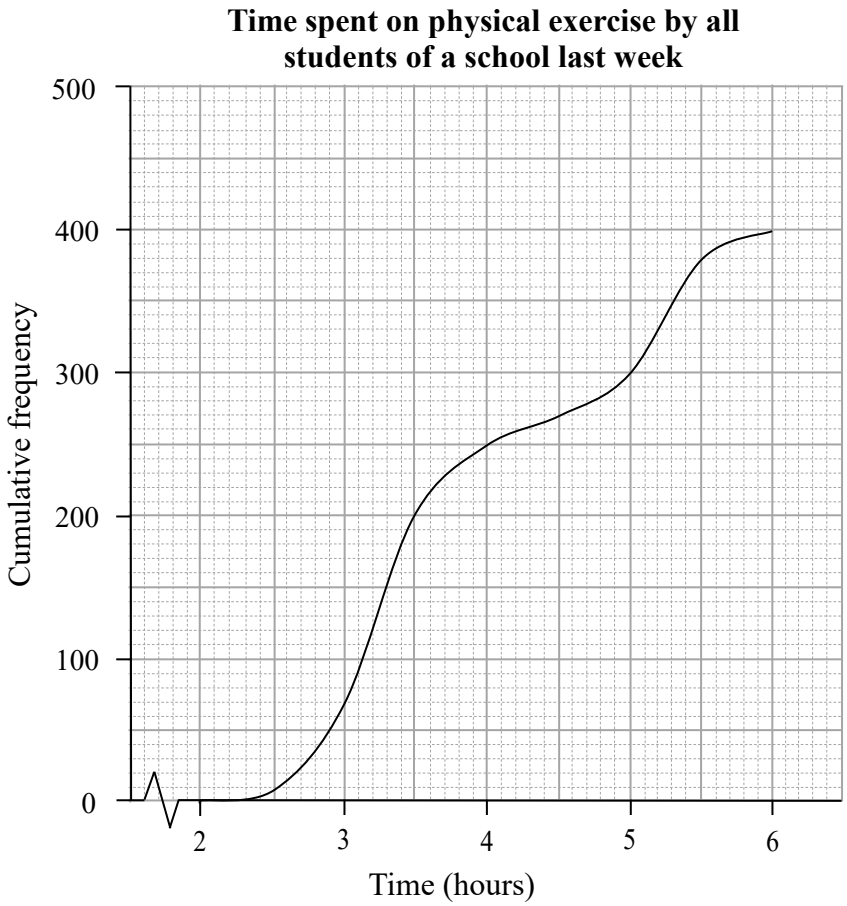


According to the above diagram, answer the following questions.

(a) What was the total profit from the food boxes sold last week?

(b) What was the mean profit of each food box sold last Thursday?

39. The cumulative frequency curve below shows the distribution of time spent on physical exercise by all students of a school last week.



According to the above diagram, answer the following questions.

(a) How many students does the school have?

(b) What was the number of students who spent less than 3 hours on physical exercise last week?

Go on to the next page

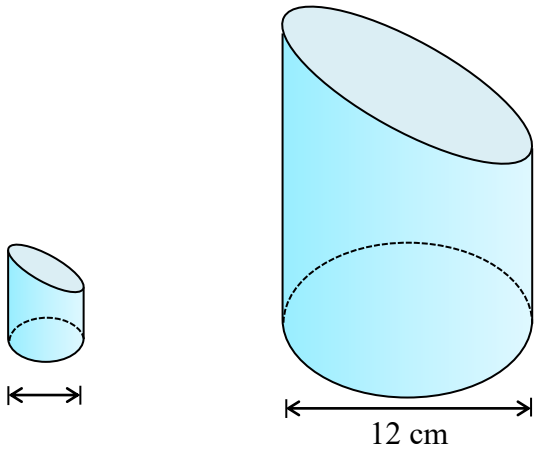
SECTION C: All working must be clearly shown.
Write the mathematical expressions, answers and statements/conclusions in the spaces provided in the ANSWER BOOKLET.

40. The birth rate of a city increases by 2% annually. If the newborn population of the city was $25\,000$ in 2021, find the newborn population of the city in 2023.

41. Jason has a part-time job at a fast food shop. He is paid on an hourly basis. If he works for 4 hours, he will earn $\$240$. If he worked for 18 hours in the shop this week, find his wage for this week.

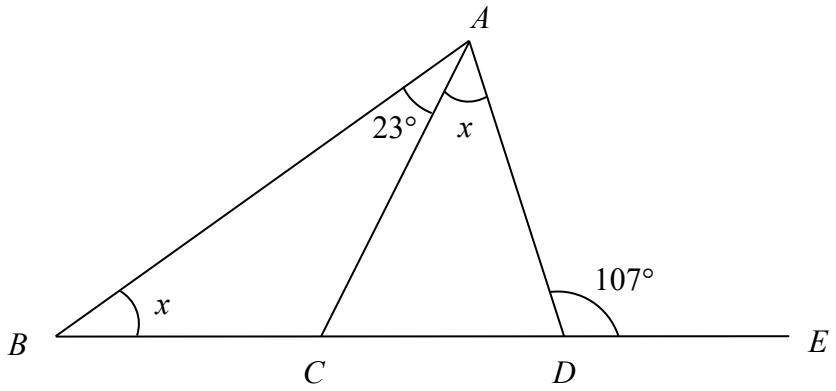
42. Solve the simultaneous equations $\begin{cases} 2x+5y=6 \\ x-5y=18 \end{cases}$.

43. In the figure, Solid A and Solid B are similar and the total surface areas are $200\ \text{cm}^2$ and $1\,800\ \text{cm}^2$ respectively. Their bases are circles. The base diameter of Solid B is 12 cm. Find the base diameter of Solid A.

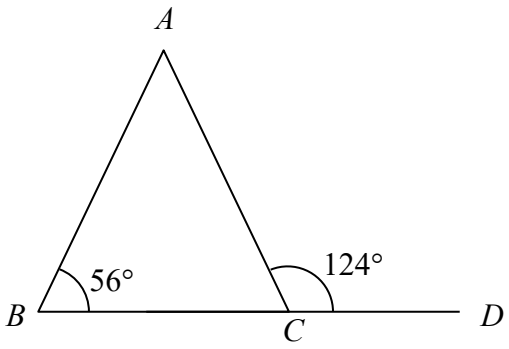


Solid A Solid B

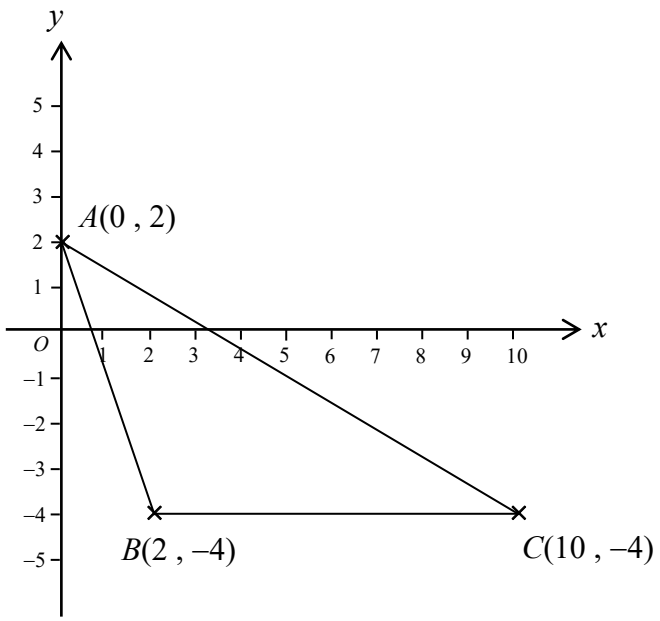
44. In the figure, $BCDE$ is a straight line. It is given that $\angle BAC = 23°$ and $\angle ADE = 107°$. Find x.



45. In the figure, BCD is a straight line. It is given that $\angle ABC = 56°$ and $\angle ACD = 124°$. Prove that $\triangle ABC$ is an isosceles triangle.



46. Find the area of $\triangle ABC$ in the figure.



47. The following data shows the training records of breath-hold duration under water by 20 members of a school swimming team.

Duration (seconds)	**Class boundaries (seconds)**	**Class mark (seconds)**	**Frequency**
40 – 44	39.5 – 44.5	42	3
45 – 49		47	2
50 – 54	49.5 – 54.5	52	
55 – 59	54.5 – 59.5	57	4
60 – 64		62	6
65 – 69	64.5 – 69.5	67	1

According to the above table, complete the frequency distribution table and the histogram in the **ANSWER BOOKLET**.

END OF PAPER

Do not write on this page.

Answers written on this page will not be marked.

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