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**Education Bureau**  
**Territory-wide System Assessment 2021**  
**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.

## 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	$= 2\pi rh$
	Volume	$= \pi r^2 h$
Cone	Curved surface area	$= \pi rl$
	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. Determine whether to estimate or to compute the exact value in each of the following situations.
- (i) The astronomy club of a school recorded the rainfall amounts in the New Territories in May this year.
  - (ii) Hong Kong Observatory recorded the number of red rainstorm signals issued in May this year.

	(i)	(ii)
A.	To estimate	To compute the exact value
B.	To estimate	To estimate
C.	To compute the exact value	To compute the exact value
D.	To compute the exact value	To estimate

2.  $5.71 \times 10^{-4} =$

- A.  $-0.000\ 571.$
- B.  $0.000\ 571.$
- C.  $-57\ 100.$
- D.  $57\ 100.$

3. A supermarket distributed  $x$  stamps last week and  $y$  stamps this week. **At least** 50 more stamps were distributed this week than last week. Which of the following inequalities represents the relationship between  $x$  and  $y$ ?

- A.  $y - x \geq 50$
- B.  $y - x > 50$
- C.  $y - x \leq 50$
- D.  $y - x < 50$

4. Which of the following polynomials is in ascending powers of  $y$  ?

A.  $5y + 4 + 3y^2$

B.  $3y^2 + 5y + 4$

C.  $4 + 5y + 3y^2$

D.  $3y^2 + 4 + 5y$

5. Last week, the total price of 8 cups of ice-cream was  $\$x$ . If the price of each cup of ice-cream is increased by  $\$4$  this week, then the total price of 7 cups of ice-cream is  $\$x$ . Which of the following equations can be used to find the value of  $x$  ?

A.  $\frac{x}{8} + 4 = \frac{x}{7}$

B.  $\frac{x}{8} - 4 = \frac{x}{7}$

C.  $\frac{x+4}{8} = \frac{x}{7}$

D.  $\frac{x-4}{8} = \frac{x}{7}$

6. Which of the following points lies on the straight line  $x - 2y - 3 = 0$  ?

A.  $(5, 1)$

B.  $(1, 5)$

C.  $(12, 2)$

D.  $(-5, -1)$

7. Wincy buys 5 mice and 4 sets of headphones for \$1 860. The price of a set of headphones is higher than that of a mouse by \$60. It is given that the prices of a mouse and a set of headphones are \$ $x$  and \$ $y$  respectively. Which of the following pairs of simultaneous equations shows the relation between  $x$  and  $y$ ?

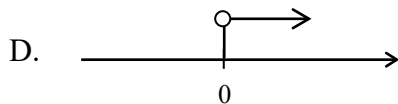
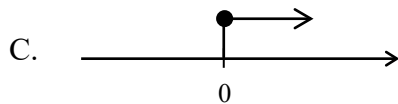
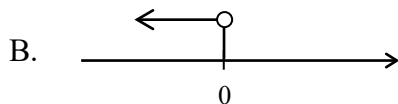
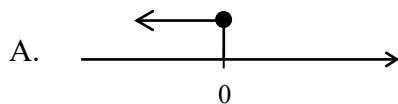
A. 
$$\begin{cases} 4x + 5y = 1860 \\ x - y = 60 \end{cases}$$

B. 
$$\begin{cases} 4x + 5y = 1860 \\ y - x = 60 \end{cases}$$

C. 
$$\begin{cases} 5x + 4y = 1860 \\ x - y = 60 \end{cases}$$

D. 
$$\begin{cases} 5x + 4y = 1860 \\ y - x = 60 \end{cases}$$

8. Which of the following diagrams represents  $x \geq 0$ ?

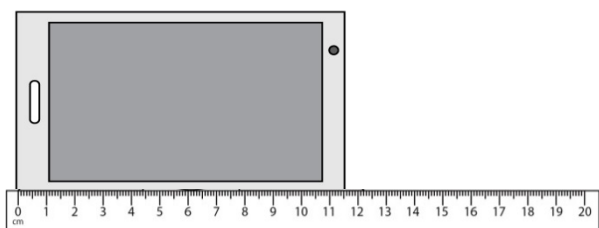


9. The width of a computer monitor is 55 cm (correct to the nearest cm). Which of the following could be its actual width?

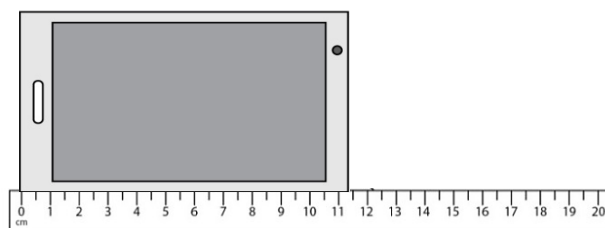
- A. 54.4 cm
- B. 54.6 cm
- C. 55.5 cm
- D. 55.6 cm

10. Chris measures the length of a smartphone. Which of the following rulers can give a more accurate measurement?

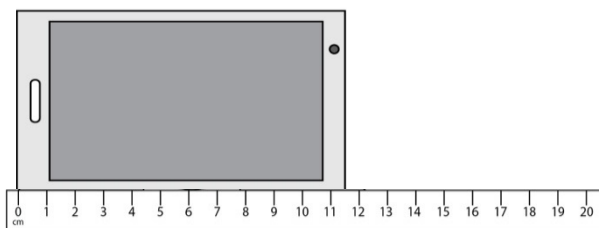
A.



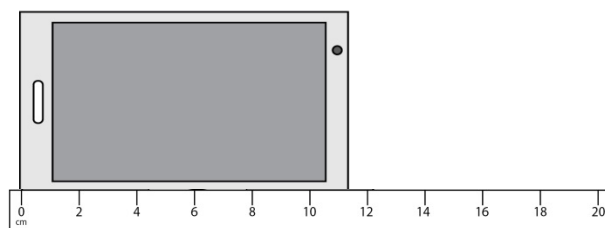
B.



C.

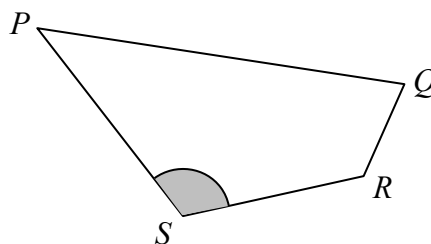


D.



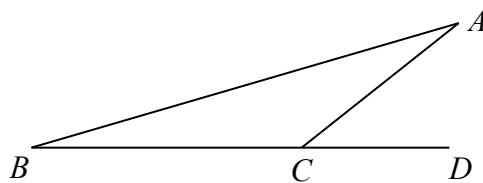
11. Which of the following represents the marked angle in the figure?

- A.  $S$
- B.  $PS$
- C.  $\angle PSR$
- D.  $RSP$

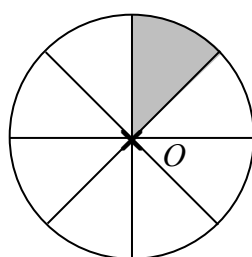


12. In the figure,  $BCD$  is a straight line. Which of the following is a straight angle?

- A.  $\angle ACB$
- B.  $\angle BCD$
- C.  $\angle CBA$
- D.  $\angle DCA$

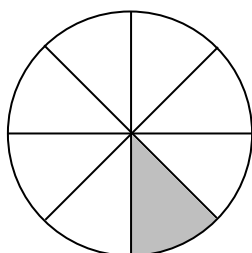


13.

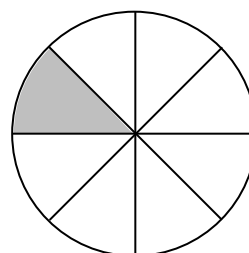


Find the image of the above figure after rotating about  $O$  through  $90^\circ$  in a clockwise direction.

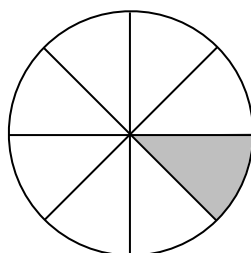
A.



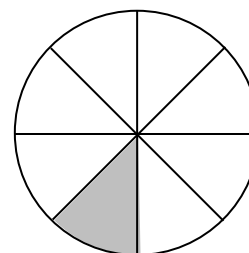
B.



C.

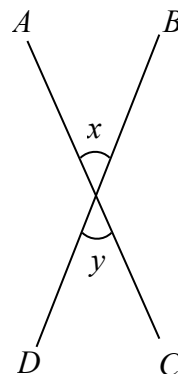


D.



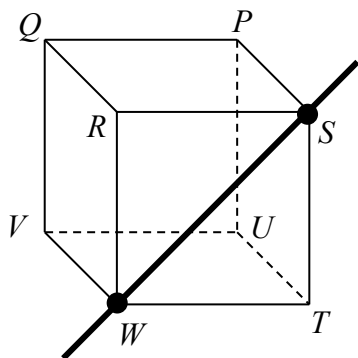
14. In the figure,  $AC$  and  $BD$  are straight lines.  $x$  and  $y$  are

- A. alternate angles.
- B. adjacent angles.
- C. corresponding angles.
- D. vertically opposite angles.

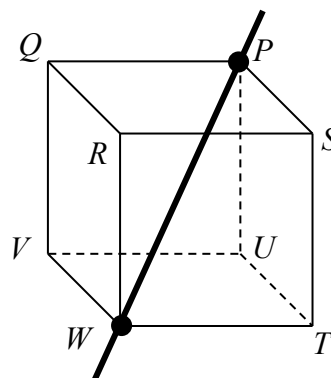


15. In the following figures, which thick line is an axis of rotational symmetry of cube  $PQRSTUVW$ ?

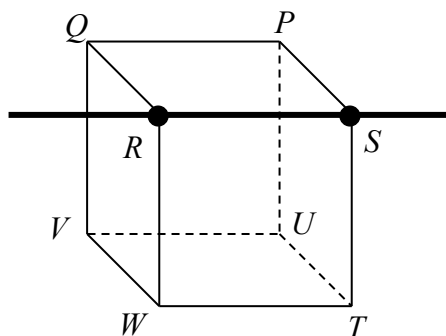
A.



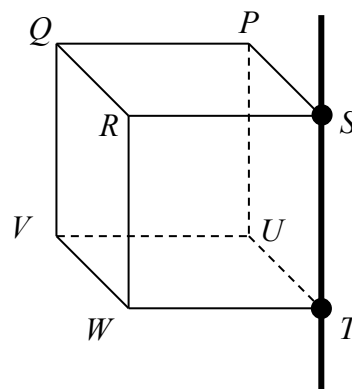
B.



C.



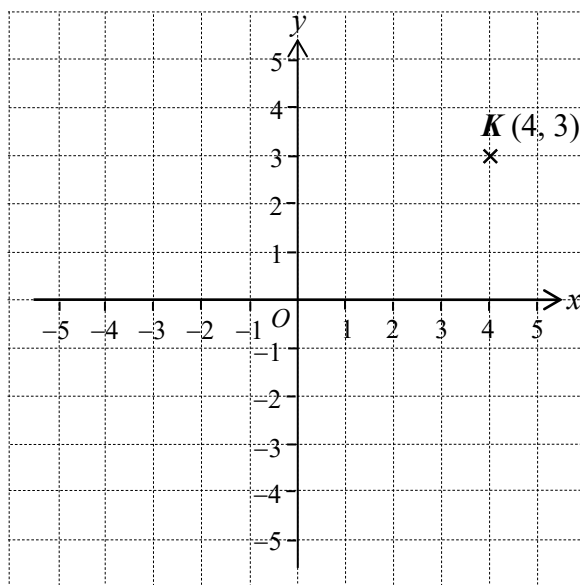
D.





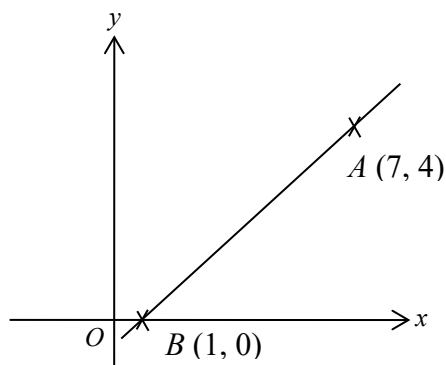
16. In the figure,  $K(4, 3)$  is rotated about the origin  $O$  through  $180^\circ$  to  $K'$ . Find the coordinates of  $K'$ .

- A.  $(-4, 3)$
- B.  $(3, -4)$
- C.  $(-4, -3)$
- D.  $(-3, -4)$



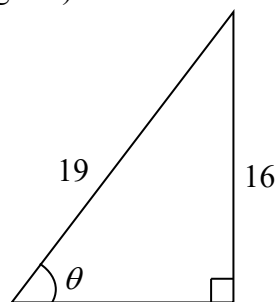
17.  $A(7, 4)$  and  $B(1, 0)$  are two points in the rectangular coordinate plane. The coordinates of the mid-point of  $AB$  are

- A.  $(6, 4)$ .
- B.  $(8, 4)$ .
- C.  $(3, 2)$ .
- D.  $(4, 2)$ .

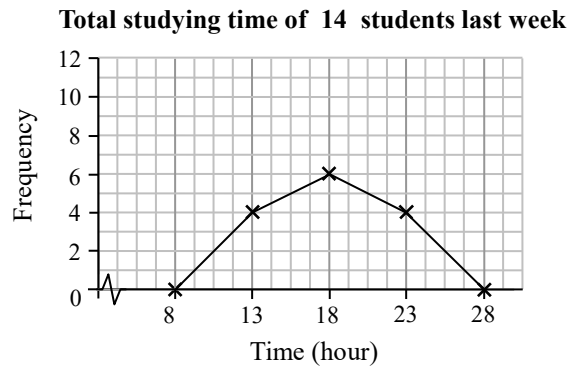


18. Referring to the figure, find  $\theta$ . (Correct to 3 significant figures)

- A.  $32.6^\circ$
- B.  $40.1^\circ$
- C.  $49.9^\circ$
- D.  $57.4^\circ$

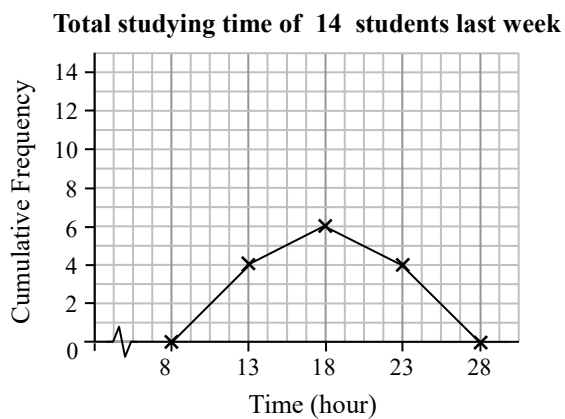


19. The frequency polygon below shows the total studying time of 14 students last week.

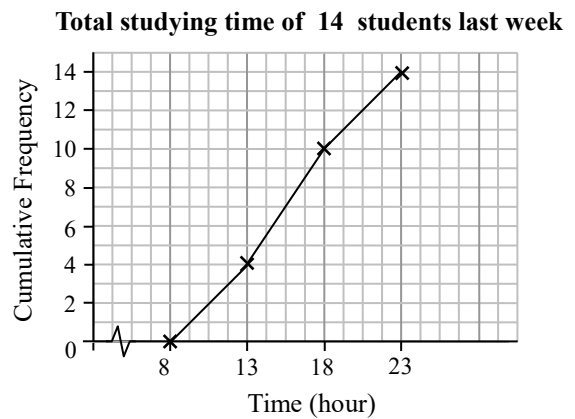


If the same set of data are presented by a cumulative frequency polygon, which of the following diagrams could be obtained?

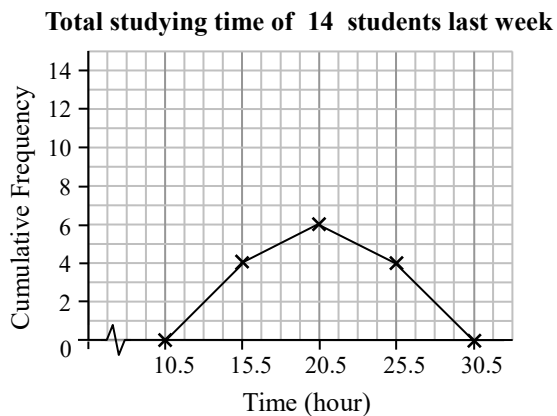
A.



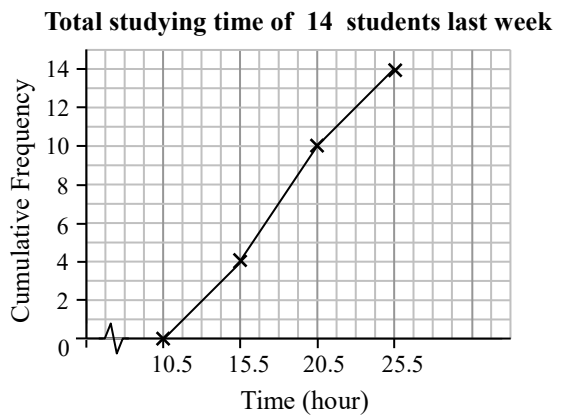
B.



C.



D.



20. A university is doing a survey on the online learning of Hong Kong secondary school students. Which of the following is the most suitable method to collect data?
- A. Obtain the number of student online accounts from a publisher.
  - B. Conduct a survey of all secondary school students in Hong Kong using questionnaires.
  - C. Study the relevant reports from regions other than Hong Kong.
  - D. Search for the sales figures of tablets in the last year.

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

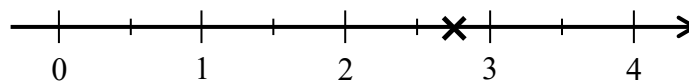
21. A tuckshop used directed numbers to represent its monthly profit and loss.  
For example,  
–2 000 dollars represents that the loss of the tuckshop was 2 000 dollars.

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

- (i) The profit of the tuckshop in May was 5 500 dollars.
- (ii) The loss of the tuckshop in June was 3 200 dollars.

22. Use the symbol ‘ $\times$ ’ to mark the number  $\sqrt{3}$  on the number line given in the **ANSWER BOOKLET**.

Example:  $\sqrt{3} + 1$  is marked on the number line below.



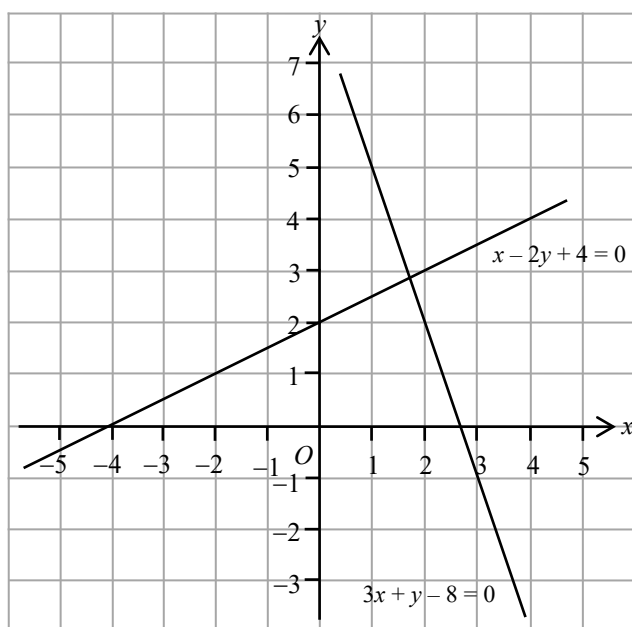
23. There are 132 students ordering lunch set  $A$  in a secondary school today. The number of students ordering lunch set  $B$  is greater than that of lunch set  $A$  by 12. Find the ratio of the number of students ordering lunch set  $A$  to that of lunch set  $B$ .
24. The  $n^{\text{th}}$  term of a sequence is  $2n(n + 1)$ . Find the value of the  $6^{\text{th}}$  term of the sequence.

25. Find the coefficient of  $y^6$  in the polynomial  $3y^6 - 4y^5$ .

26. Expand  $(2x - 1)(x - 1)$ .

27. Factorize  $x^2 + 8x + 16$ .

28.



The above figure shows the graphs of  $3x + y - 8 = 0$  and  $x - 2y + 4 = 0$ .

According to the given graphs,  $(2, 3)$  is the \* exact solution / approximate solution

of the simultaneous equations  $\begin{cases} 3x + y - 8 = 0 \\ x - 2y + 4 = 0 \end{cases}$ .

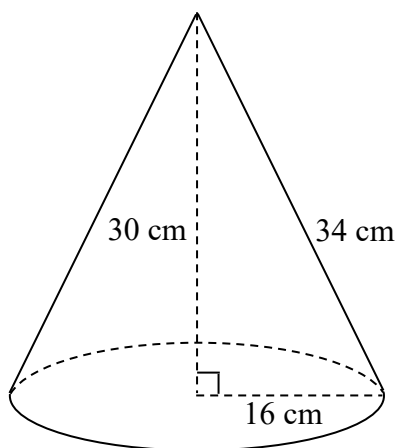
(\*Circle the correct answer in the **ANSWER BOOKLET**)

29. Consider the formula  $D = b^2 - 4ac$ . If  $a = 3$ ,  $b = 2$  and  $c = -1$ , find the value of  $D$ .

30. In the **ANSWER BOOKLET**, fill in the box with  $>$  or  $<$  to express the relation between the numbers.

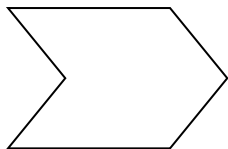
$$-\frac{1}{4} \quad \boxed{\phantom{00}} \quad -0.3$$

31. The figure shows a right circular cone. Its base radius, height and slant height are 16 cm, 30 cm and 34 cm respectively. Find the volume of the cone. Express the answer in terms of  $\pi$ .

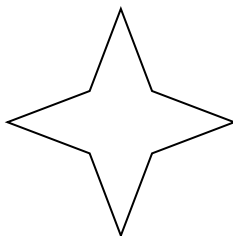


32. Which of the following polygons is convex?

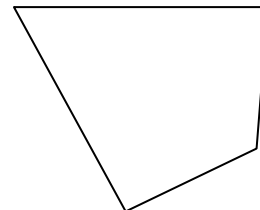
P.



Q.

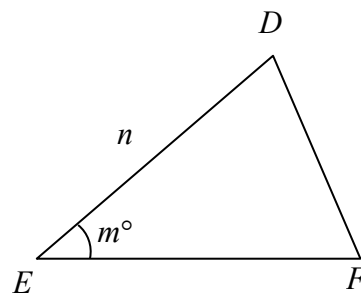
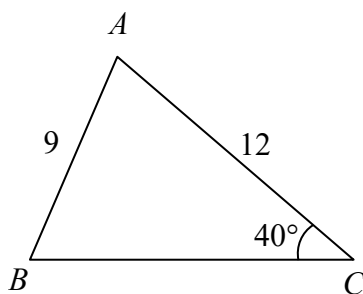


R.

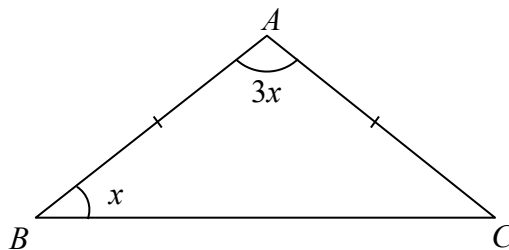


33. In the figure,  $\triangle ABC \cong \triangle DFE$ . Find

- (a) the value of  $m$ ,  
(b) the value of  $n$ .

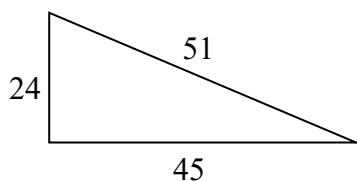


34. In the figure,  $\triangle ABC$  is an isosceles triangle. It is given that  $AB = AC$ ,  $\angle ABC = x$  and  $\angle BAC = 3x$ . Find  $x$ .

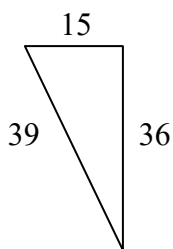


35. Which of the following must be right-angled triangle(s)? (May be more than one answer)

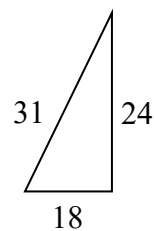
Triangle  $X$



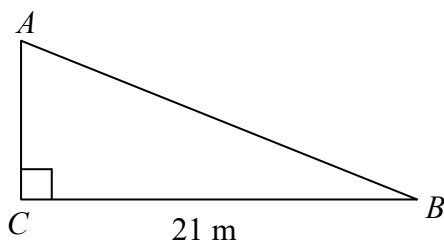
Triangle  $Y$



Triangle  $Z$



36. In the figure, the gradient of the path  $AB$  is  $\frac{2}{5}$ . If the horizontal distance  $BC$  is 21 m, find the vertical distance  $AC$ .



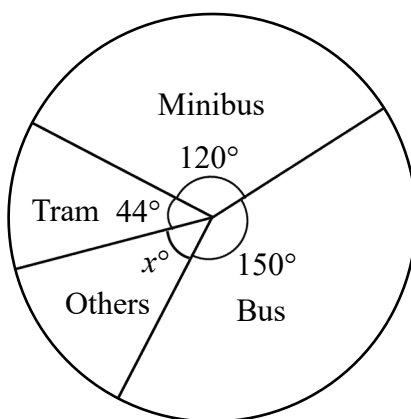
37. The following data show the number of late arrivals in each class of a secondary school last month.

2	10	11	0	5	9
6	15	6	25	0	22
18	13	17	12	4	7

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

38. The following pie chart shows the vehicles used by Secondary 3 students to go to school.

**Vehicles used by Secondary 3 students to go to school**



According to the above chart, answer the following questions.

- Find the value of  $x$ .
- If there are 22 Secondary 3 students going to school by tram, find the total number of students of that level.
- What percentage of Secondary 3 students are going to school by bus or minibus?

39. The table below shows the number of stamps obtained in 'Food Treasure Scheme' by 50 students.

Number of stamps	0 – 9	10 – 19	20 – 29	30 – 39
Number of Students	29	11	7	3

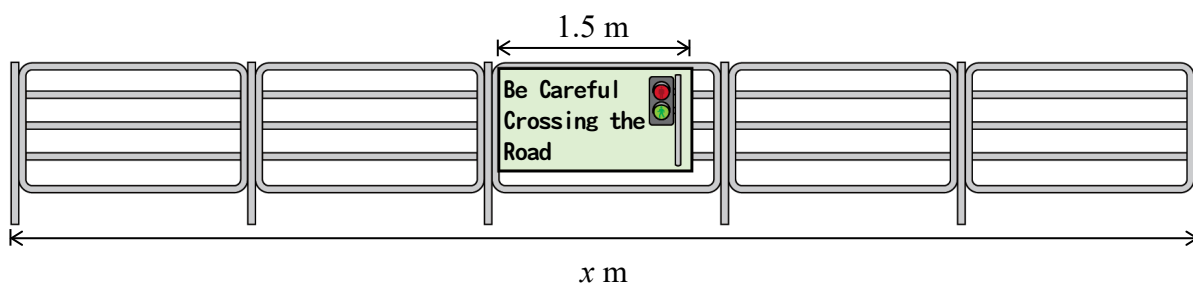
Find the modal class of the number of stamps obtained by the 50 students.

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. A cutlery set is sold at 25% off and the selling price is \$480 . Find the marked price of the cutlery set.

41. The figure shows a banner hanging on a railing beside a road. The length of the banner is 1.5 m. Estimate the length ( $x$  m) of the set of railing and explain your estimation method.



42. Complete the table for the equation  $x - 4y = 4$  in the ANSWER BOOKLET.

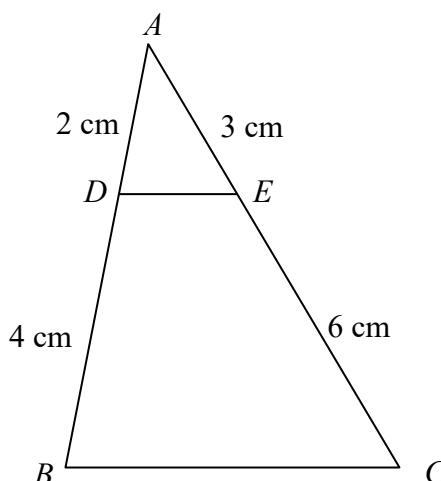
$x$	$-4$	$0$	$4$
$y$		$-1$	

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

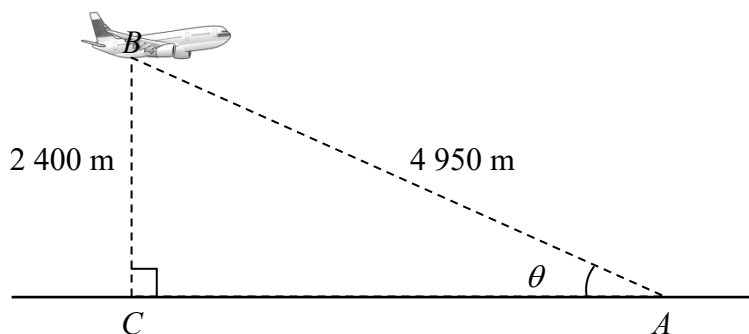


43. Solve the simultaneous equations  $\begin{cases} y = 7x + 10 \\ y = 5x + 8 \end{cases}$ .

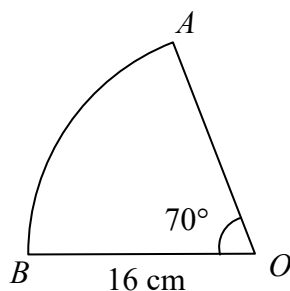
44. In the figure,  $ADB$  and  $AEC$  are straight lines.  $AD = 2$  cm,  $AE = 3$  cm,  $DB = 4$  cm and  $EC = 6$  cm. Prove that  $\triangle ABC \sim \triangle ADE$ .



45. In the figure, Joseph is standing at point  $A$  to observe an aeroplane. When the aeroplane reaches point  $B$ , its distance from Joseph  $AB$  is 4 950 m and its vertical distance from the ground  $BC$  is 2 400 m. Find the angle of elevation  $\theta$  of point  $B$  from point  $A$ . (Correct the answer to the nearest degree)



46. In the figure, the radius of sector  $OAB$  is 16 cm and  $\angle AOB = 70^\circ$ . Find the area of the sector. Give the answer correct to 3 significant figures.



47. The following data show the marks (full mark is 50) of 15 students in a Mathematics test.

12	16	22	5	19
30	31	12	26	15
43	37	26	30	48

Complete the stem-and-leaf diagram in the **ANSWER BOOKLET** to represent the above data.

END OF PAPER

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

