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Education Bureau
Territory-wide System Assessment 2013
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	$= 2\pi rh$
	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. Calculate $-6 + 3(-2)$.

- A. -12
- B. -5
- C. 0
- D. 6

2. $8.35 \times 10^7 =$

- A. 8 350 000.
- B. 83 500 000.
- C. 835 000 000.
- D. 8 350 000 000.

3. Determine whether a rate or a ratio should be used to relate the two underlined quantities in each of the following statements.

- (i) Betty exchanges HKD 1 167 for USD 150 in a bank.
- (ii) The length and the width of a bank note are 149 mm and 74 mm respectively.

	(i)	(ii)
A.	Rate	Rate
B.	Rate	Ratio
C.	Ratio	Rate
D.	Ratio	Ratio

4. Which of the following is a polynomial?

A. $2^x + 3x + 1$

B. $\frac{1}{x^2} + 3x + 1$

C. $x^2 + 3x + 1$

D. $x^2 + 3\sqrt{x} + 1$

5. $(-2x^4)(5x^3) =$

A. $-10x^{12}$.

B. $-10x^7$.

C. $10x^{12}$.

D. $10x^7$.

6. Simplify $\frac{x^6}{x^{-2}}$.

A. $\frac{1}{x^4}$

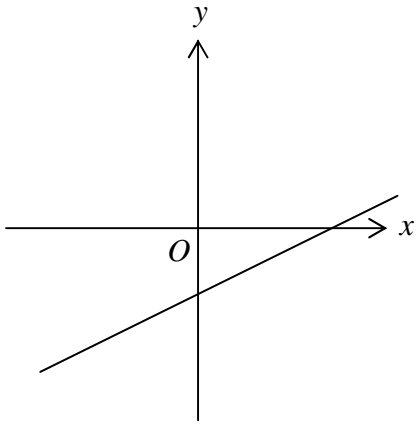
B. x^{-3}

C. x^4

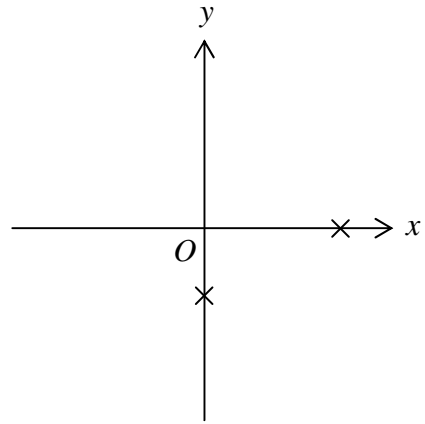
D. x^8

7. Which of the following may represent the graph of the equation $x - 2y - 4 = 0$?

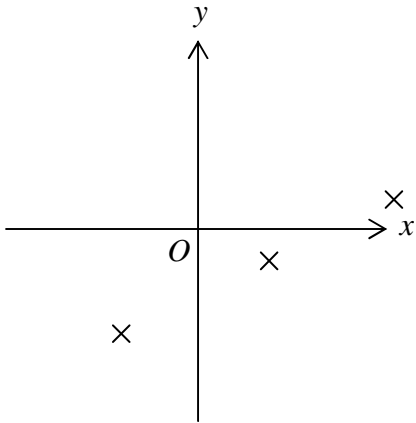
A.



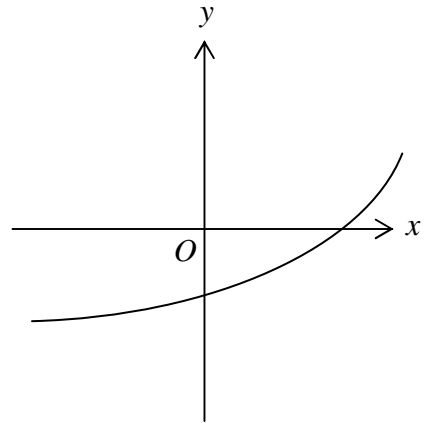
B.



C.

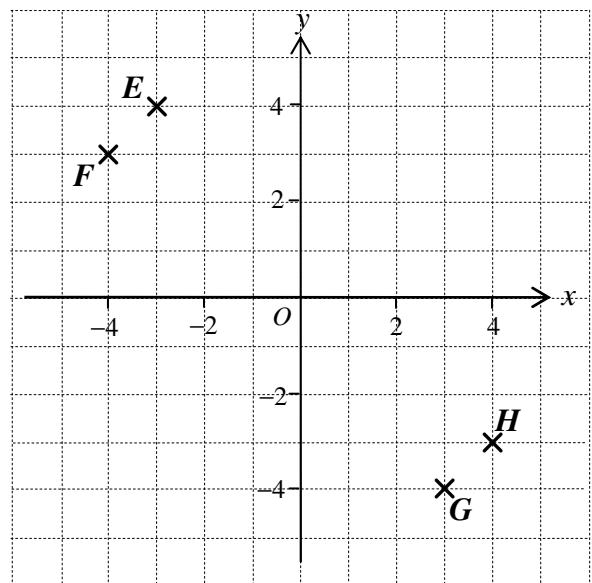


D.

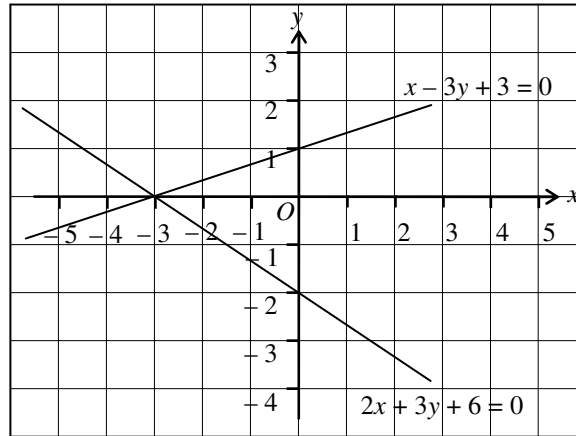


8. In the figure, which point can be represented by $(-3, 4)$?

- A. *E*
- B. *F*
- C. *G*
- D. *H*



9.



The above figure shows the graphs of $2x + 3y + 6 = 0$ and $x - 3y + 3 = 0$.

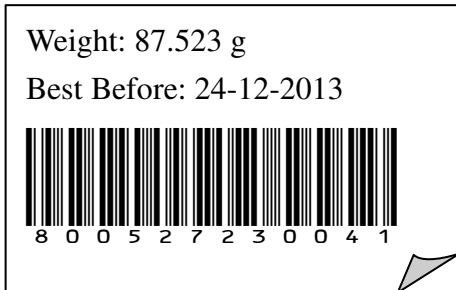
Solve the simultaneous equations $\begin{cases} 2x + 3y + 6 = 0 \\ x - 3y + 3 = 0 \end{cases}$ graphically.

- A. $(0, 1)$
 - B. $(0, -2)$
 - C. $(-3, 0)$
 - D. $(0, -3)$
10. If $x \leq y$, which of the following inequalities **MUST** be correct?
- A. $-5x \geq -5y$
 - B. $\frac{x}{5} \geq \frac{y}{5}$
 - C. $5 + y \leq 5 + x$
 - D. $y - 5 \leq x - 5$
11. The width of a wardrobe is 120 cm (correct to the nearest cm). Which of the following is the possible range of the actual width of the wardrobe?

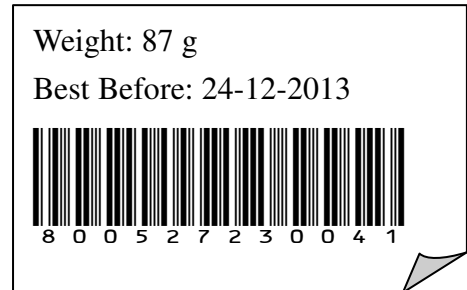
	<u>Lower limit</u>	<u>Upper limit</u>
A.	115 cm	125 cm
B.	119 cm	121 cm
C.	119.45 cm	120.55 cm
D.	119.5 cm	120.5 cm

12. Edison buys a pack of sweets in a supermarket. Which of the following labels shows the weight of the pack of sweets with the most suitable unit and degree of accuracy?

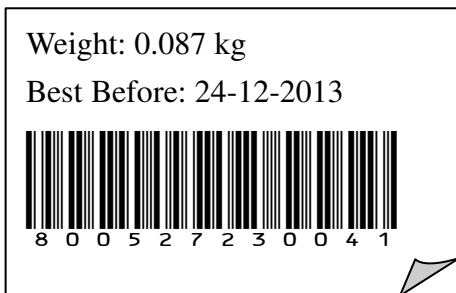
A.



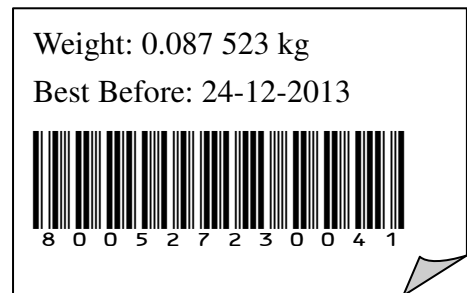
B.



C.



D.



13. Figure *P* is changed to Figure *Q* after a single transformation. What is the corresponding transformation?

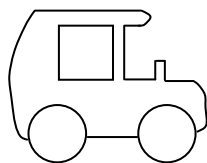


Figure *P*

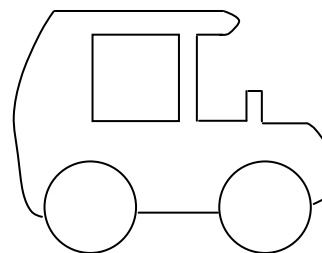
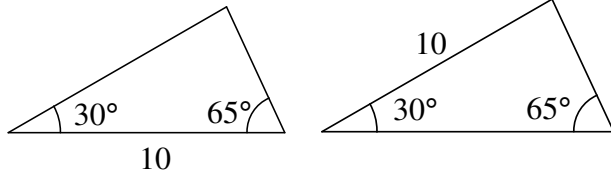


Figure *Q*

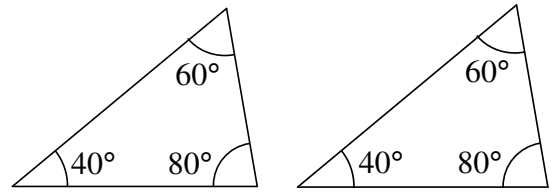
- A. Enlargement
- B. Rotation
- C. Translation
- D. Reflection

14. Which of the following pairs of triangles **MUST** be congruent?

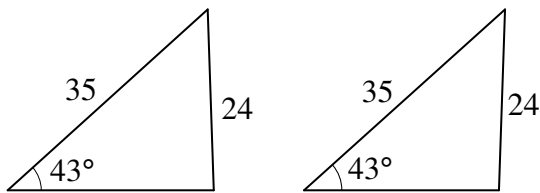
A.



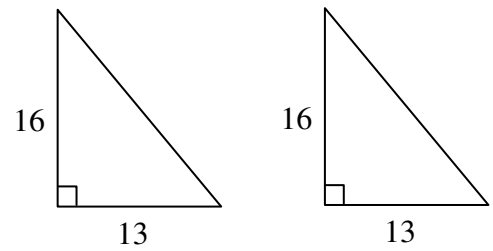
B.



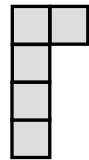
C.



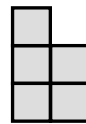
D.



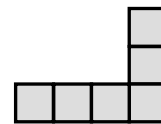
15. The figures below show the 2-D representations of a solid from various views.



top view



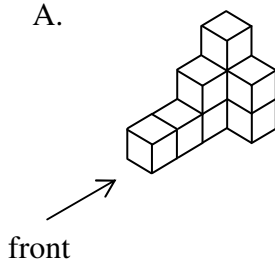
front view



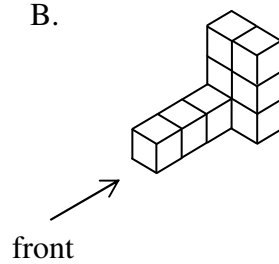
side view

Which of the following could be the solid?

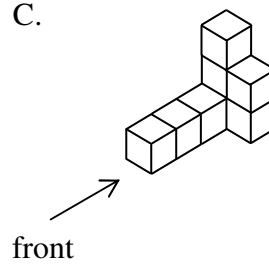
A.



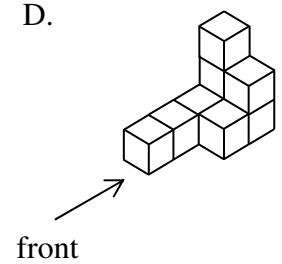
B.



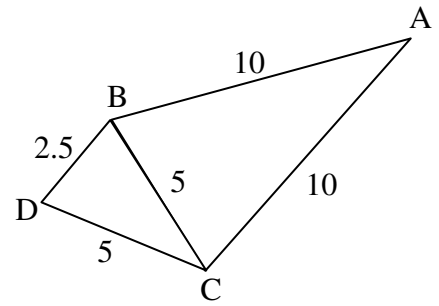
C.



D.



16. In the figure, $AB = AC = 10$, $BC = DC = 5$ and $BD = 2.5$.
Prove that $\triangle ABC$ and $\triangle CBD$ are similar.



Which of the following proofs is correct?

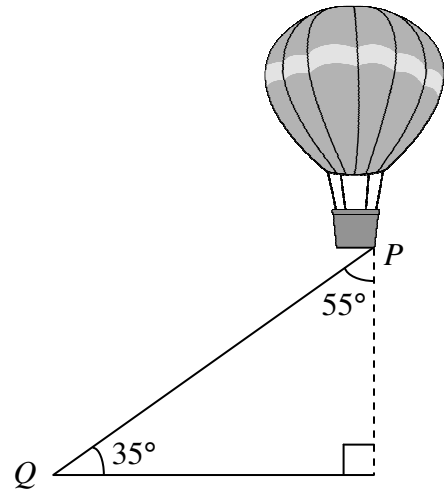
- A. $\frac{AB}{CB} = \frac{10}{5} = 2$
 $\frac{AC}{CD} = \frac{10}{5} = 2$
 $\angle ACB = \angle BCD$ (corr. \angle s, $\cong \triangle$ s)
 $\therefore \triangle ABC \cong \triangle CBD$ (SAS)
- B. $\frac{AB}{CB} = \frac{10}{5} = 2$
 $\frac{AC}{CD} = \frac{10}{5} = 2$
 $\angle ACB = \angle BCD$ (corr. \angle s, $\sim \triangle$ s)
 $\therefore \triangle ABC \sim \triangle CBD$ (ratio of 2 sides, inc. \angle)
- C. $\frac{AB}{CB} = \frac{10}{5} = 2$
 $\frac{AC}{CD} = \frac{10}{5} = 2$
 $\frac{BC}{BD} = \frac{5}{2.5} = 2$
 $\therefore \frac{AB}{CB} = \frac{AC}{CD} = \frac{BC}{BD} = 2$
 $\therefore \triangle ABC \cong \triangle CBD$ (SSS)
- D. $\frac{AB}{CB} = \frac{10}{5} = 2$
 $\frac{AC}{CD} = \frac{10}{5} = 2$
 $\frac{BC}{BD} = \frac{5}{2.5} = 2$
 $\therefore \frac{AB}{CB} = \frac{AC}{CD} = \frac{BC}{BD} = 2$
 $\therefore \triangle ABC \sim \triangle CBD$ (3 sides proportional)

17. If $A(8, 5)$ and $B(-3, -4)$ are two points in a rectangular coordinate plane, the distance between A and B is

- A. $\sqrt{[8 - (-3)] + [5 - (-4)]}$ units.
- B. $\sqrt{(8 - 3) + (5 - 4)}$ units.
- C. $\sqrt{[8 - (-3)]^2 + [5 - (-4)]^2}$ units.
- D. $\sqrt{(8 - 3)^2 + (5 - 4)^2}$ units.

18. In the figure, the (1) of point Q on the ground from the bottom P of the hot-air balloon is (2).

- | | | |
|----|---------------------|------------|
| | <u>(1)</u> | <u>(2)</u> |
| A. | angle of elevation | 35° |
| B. | angle of elevation | 55° |
| C. | angle of depression | 35° |
| D. | angle of depression | 55° |



19. A community organisation conducted a survey and recorded the ages and average daily sleeping time of 10 people.

Interviewee	A	B	C	D	E	F	G	H	I	J
Age	40	35	50	20	30	65	55	60	25	45
Average sleeping time (h)	9	8	10	6	8	11	10	11	7	9

An officer of the organisation wants to use a statistical graph to find out whether the 2 sets of data relate to each other. Which of the following is the most suitable?

- A. Bar chart
- B. Scatter diagram
- C. Pie chart
- D. Frequency polygon

20. In which of the following sets of data, is the median 70 and the mode 50?

- A. 50, 50, 70, 50, 50
- B. 50, 70, 70, 70, 50
- C. 50, 90, 70, 50, 50
- D. 50, 90, 70, 80, 50

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

21. Irene uses directed numbers to represent the changes of the Hang Seng Index.
For example,
+150 points represents a rise of 150 points of the Hang Seng Index.
0 points represents no change in the Hang Seng Index.

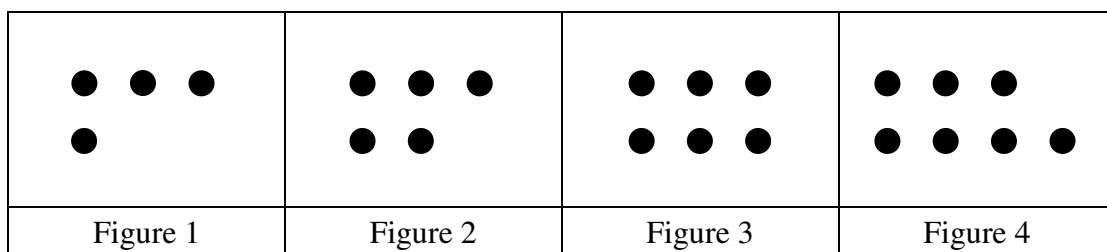
Use a directed number to represent each of the following situations:

- (i) A rise of 350 points
(ii) A drop of 300 points

22. Calculate $\frac{-4-2}{-2+4}$.

23. There are 60 students in a class. 23 of them are girls and the rest are boys. Find the ratio of the number of girls to the number of boys.

24. The following figures are formed by 4, 5, 6 and 7 dots respectively.



According to the above pattern, how many dots form Figure n (express the answer in terms of n)?

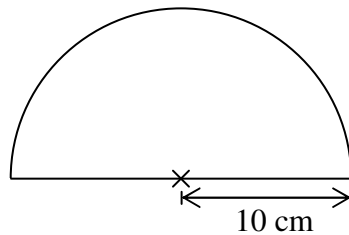
25. Arrange the terms of the polynomial $3x^2 + 5 - x^4 - 6x$ in descending powers of x .
26. Expand $(y-1)(y+2)$.
27. Factorize $9x^2 - 1$.
28. Solve $-12 + x = 8 - 3x$.

29. Expand $(x-3)^2$.

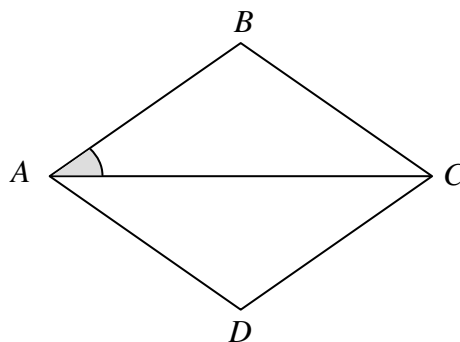
30. Make x the subject of the formula $y = \frac{x+1}{3}$.

31. Solve the inequality $2x+9 \geq 3$.

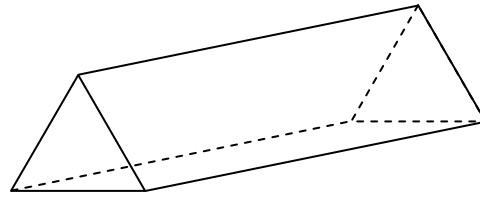
32. The following figure is a semi-circle of radius 10 cm. Find the area of the figure and express the answer in terms of π .



33. Use suitable notation and given letters to represent the angle marked in the figure.

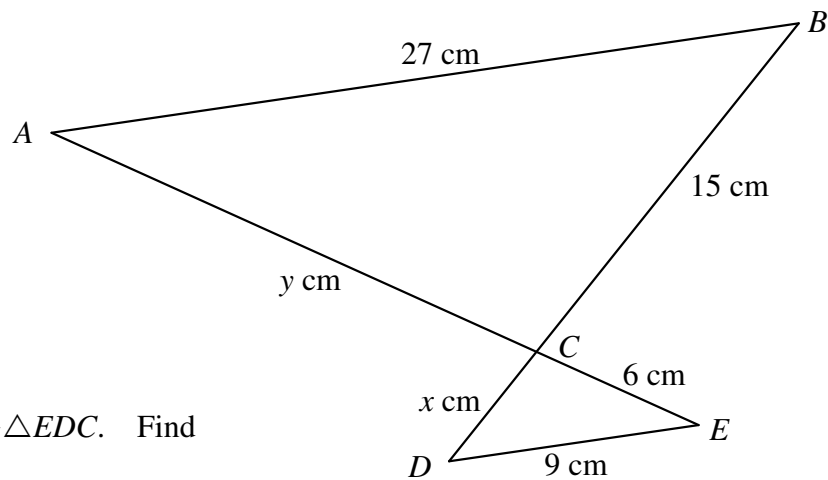


34. The figure shows the diagram of a triangular prism:



Referring to the sketching shown above, draw a diagram of a **pyramid with rectangular base** in the space provided in the **ANSWER BOOKLET**. (Use solid lines and dotted lines to show all edges)

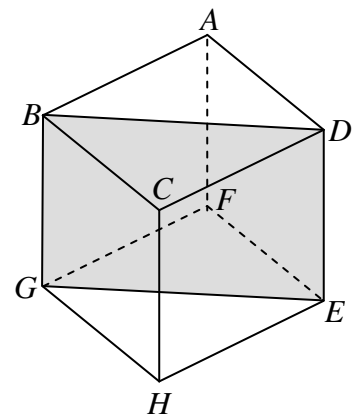
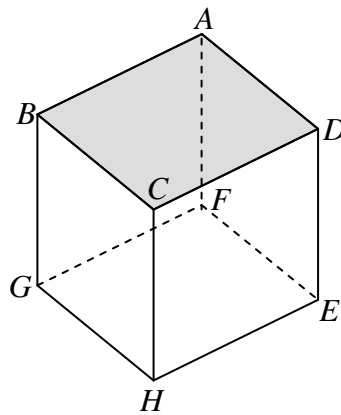
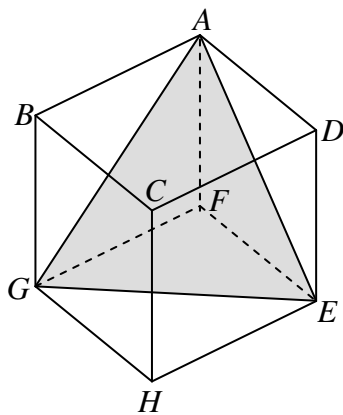
35.



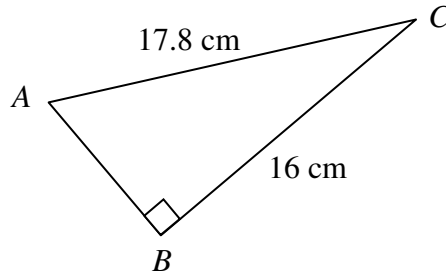
In the figure, $\triangle ABC \sim \triangle EDC$. Find

- (a) the value of x ,
- (b) the value of y .

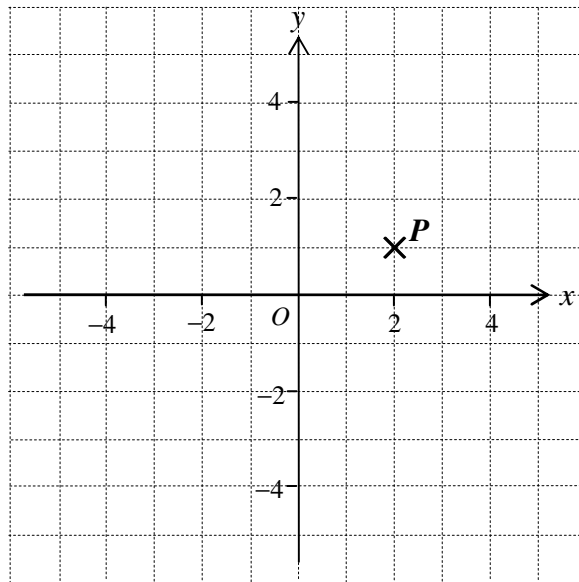
36. The following shaded regions are three planes of the cube $ABCDEFGH$, namely, AEG , $ADCB$ and $BDEG$. **ONE** of them is a plane of reflectional symmetry of the cube. Name this plane of reflectional symmetry.



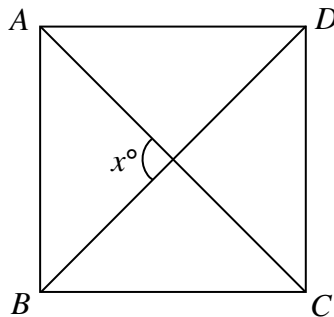
37. In the figure, $\angle ABC = 90^\circ$, $AC = 17.8$ cm and $BC = 16$ cm. Find the length of AB .



38. Find the coordinates of point P in the figure.



39. In the figure, $ABCD$ is a square. Find the value of x .



40. Patrick is doing a survey to analyse online shopping modes of local university students. The survey is conducted in the following four stages.

- (1) Organise the data of various online shopping modes collected from the questionnaires.
- (2) Give questionnaires about online shopping modes to local university students.
- (3) Analyse graphs and data to draw conclusions.
- (4) Use suitable graphs to represent the data of various online shopping modes.

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

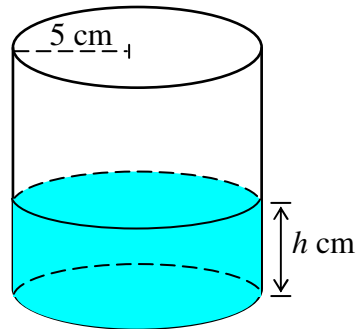
41. Alan tossed two fair coins at the same time. He carried out the experiment 100 times and recorded the results as follows:

Result	No heads	1 head only	2 heads
Number of occurrence	24	59	17

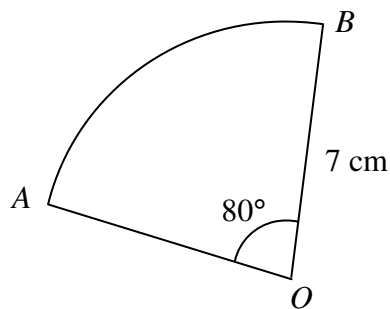
Find the empirical probability of getting 2 heads.

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. The base radius of a cylindrical vessel is 5 cm. It contains $175\pi \text{ cm}^3$ of water to a depth of h cm. Find the value of h .



43. Terry bought a tablet computer for \$5 600. He then sold it for \$7 280. Find the profit per cent.
44. In the 76 games played by the Excellent football team last year, the ratio of the number of games won, lost and drawn was 11 : 5 : 3. Find the number of games drawn.
45. In the figure, the radius of sector OAB is 7 cm and $\angle AOB = 80^\circ$. Find the area of the sector. Correct the answer to 3 significant figures.



46. Complete the table for the equation $y = 2x - 1$ in the **ANSWER BOOKLET**.

x	-2	0	2
y			3

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

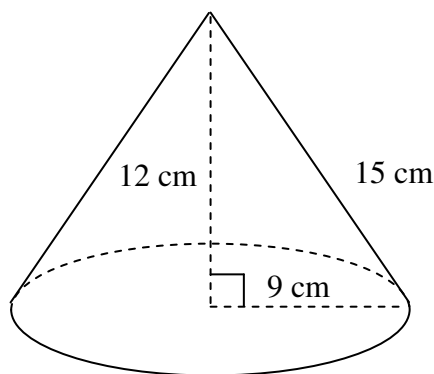
47. The following frequency distribution table shows the waiting time of 35 patients in an Accident & Emergency Department.

Waiting time (min)	21 – 40	41 – 60	61 – 80	81 – 100	101 – 120	121 – 140
Frequency	4	2	10	3	15	1

(a) According to the above table, complete the cumulative frequency table in the **ANSWER BOOKLET**.

(b) According to the result of (a), draw the corresponding cumulative frequency polygon.

48. The figure shows a solid right circular cone of height 12 cm and base radius 9 cm. Its slant height is 15 cm. Find the total surface area of the cone in terms of π .



49. Solve the simultaneous equations $\begin{cases} 3x - y = 20 \\ 2x + y = 15 \end{cases}$.

50. Jacky went to a supermarket to buy 2 cans of baked beans with tomato sauce, 1 can of luncheon meat and 3 cans of corn soup. The prices of the items are listed below:

Items	Baked beans with tomato sauce	Luncheon meat	Corn soup
Unit price	\$19.8	\$14.7	\$9.6

Jacky found that he had \$100 only.

Based on the description above, give **an approximation for the unit price of each item** respectively. Use these 3 approximations to estimate the total amount required. Briefly explain whether Jacky had enough money to pay for the items.

END OF PAPER

