

9	M	E	1	(Q)
----------	----------	----------	----------	----------	----------	----------

Education Bureau
Territory-wide System Assessment 2020
Secondary 3 Mathematics
QUESTION BOOKLET

Gainful Use of TSA 2020 Materials

INSTRUCTIONS

1. There are 69 questions in this paper.
2. Estimated time for completion is 75 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 rough work sheet.
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. Below shows a multiplication with a decimal by a decimal. Each square represents a digit.
 Which of the following **CANNOT** be the product?

$$\begin{array}{r} \square.5 \\ \times \square.\square \\ \hline \end{array}$$

- A. 4
 B. 4.35
 C. 4.365
 D. 4.8
2. Determine whether a rate or a ratio should be used to relate the quantities in each of the following statements.
- (i) In a basketball league, the number of wins and the number of losses of a basketball team for the whole year were 45 times and 37 times respectively.
- (ii) An athlete completed 114 sit-ups in 3 minutes.

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

3. $-x^2 - x^2 =$

- A. 0.
- B. $2x^2$.
- C. $-2x^2$.
- D. $-2x^4$.

4. $(-3)^2 =$

- A. -6.
- B. 6.
- C. -9.
- D. 9.

5. Determine whether each of the following is factorization or expansion.

(i)	$x^3 - 5x^2 - 8x + 12$ $= (x + 2)(x - 1)(x - 6)$	(ii)	$(x + 2)(x - 1)(x - 6)$ $= x^3 - 5x^2 - 8x + 12$
-----	---	------	---

- A. (i) Expansion (ii) Factorization
- B. (i) Expansion (ii) Expansion
- C. (i) Factorization (ii) Factorization
- D. (i) Factorization (ii) Expansion

6. A music concert has two types of tickets including adult ticket and student ticket. The price of an adult ticket is 4 times that of a student ticket. The price of 3 adult tickets is \$360 higher than that of 7 student tickets. It is given that the prices of an adult ticket and a student ticket are \$ x and \$ y respectively. Which of the following pairs of simultaneous equations shows the relation between x and y ?

A.
$$\begin{cases} x = 4y \\ 3x - 7y = 360 \end{cases}$$

B.
$$\begin{cases} x = 4y \\ 7y - 3x = 360 \end{cases}$$

C.
$$\begin{cases} y = 4x \\ 3x - 7y = 360 \end{cases}$$

D.
$$\begin{cases} y = 4x \\ 3y - 7x = 360 \end{cases}$$

7. Which of the following is an identity?

A.
$$\frac{2x-7}{2} = x-7$$

B.
$$(x+7)^2 = x^2 + 49$$

C.
$$-(x+7) = 0$$

D.
$$-(x+7) = -x-7$$

8. There were 25 multiple choice questions in an examination. 3 marks were awarded for each correct answer and 2 marks were deducted for each wrong answer. Kelvin attempted all questions and x of his answers were correct. If he got at least 55 marks, which of the following inequalities can be used to find the range of values of x ?

A.
$$3x - 2(25 - x) > 55$$

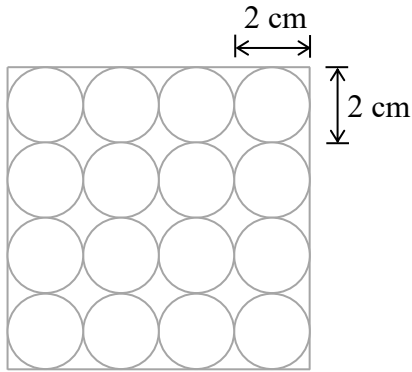
B.
$$3x - 2(25 - x) \geq 55$$

C.
$$3x + 2(25 - x) > 55$$

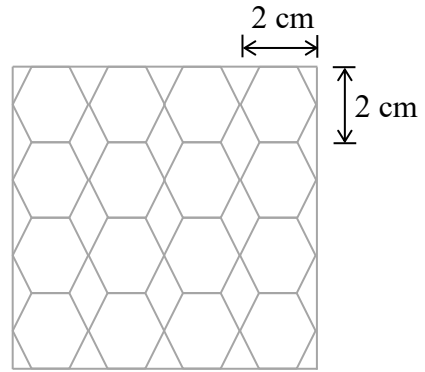
D.
$$3(25 - x) - 2x \geq 55$$

9. James measures the area of a butterfly specimen  . Which of the following graph papers can give a more accurate measurement?

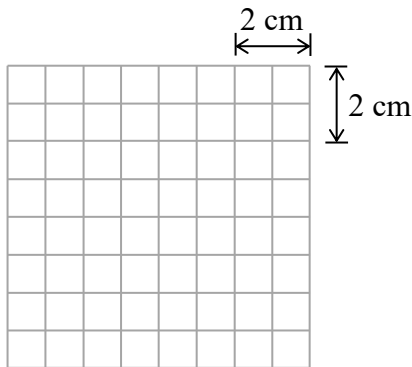
A.



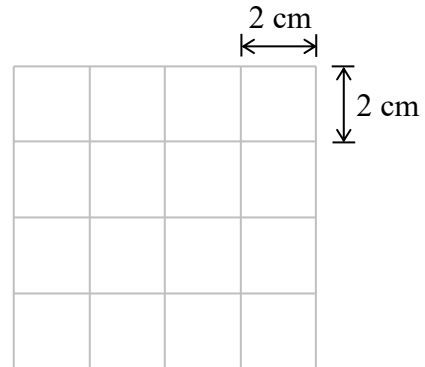
B.



C.

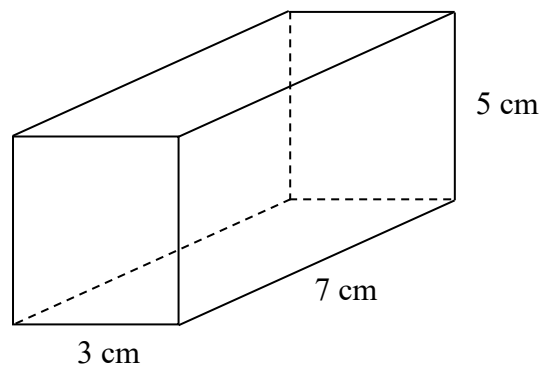


D.



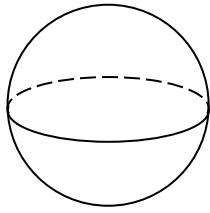
10. The figure shows a solid cuboid. Its length, width and height are 7 cm , 3 cm and 5 cm respectively. Find the total surface area of the cuboid.

- A. 60 cm^2
- B. 71 cm^2
- C. 105 cm^2
- D. 142 cm^2

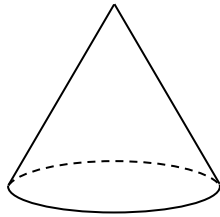


11. Which of the following figures can represent a regular polyhedron?

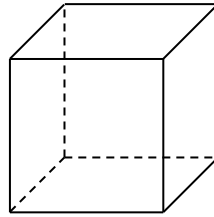
A.



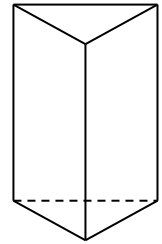
B.



C.



D.



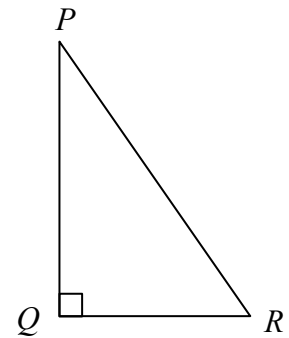
12. Which of the following represents a line segment in the figure?

A. P

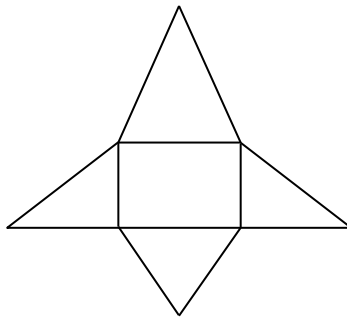
B. PQ

C. $\angle PQR$

D. $\triangle PQR$

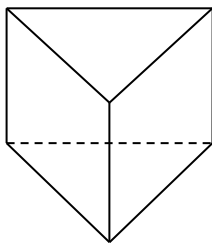


13.

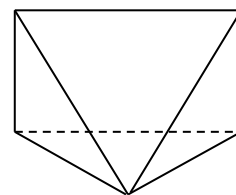


Which of the following 3-D figures can be made by the net above?

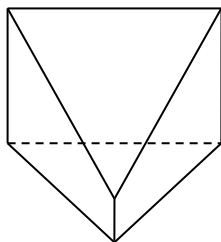
A.



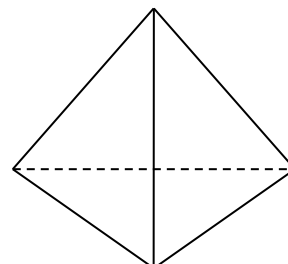
B.



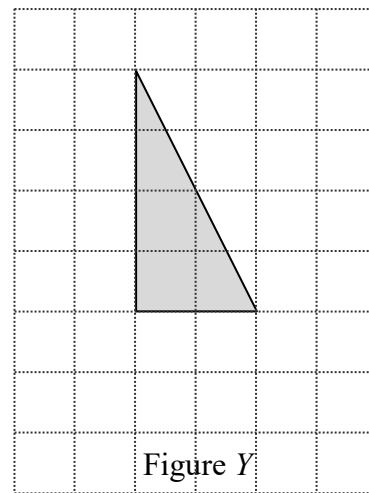
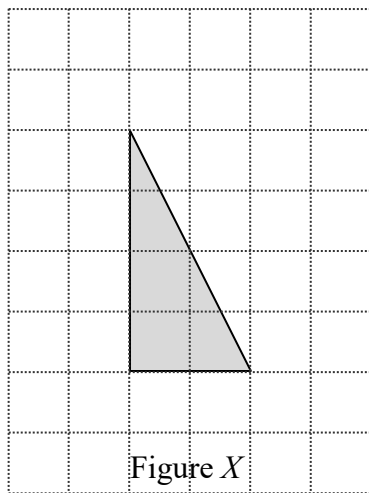
C.



D.

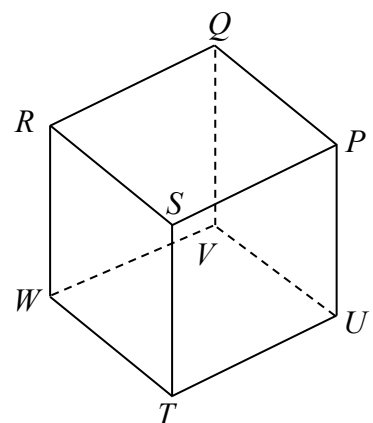


14. Figure X is changed to Figure Y after a single transformation. What is the corresponding transformation?

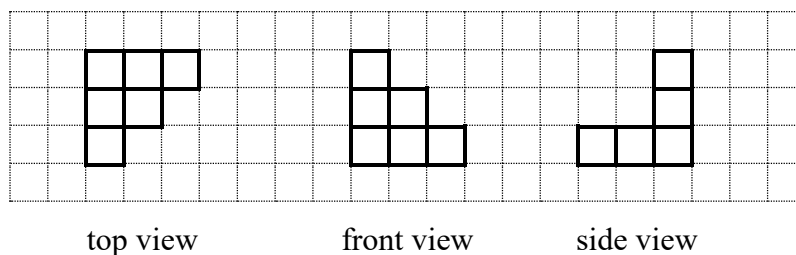


- A. Translation
 B. Rotation
 C. Reflection
 D. Enlargement
15. The figure shows a cube $PQRSTUWV$. Which of the following is an axis of rotational symmetry of the cube?

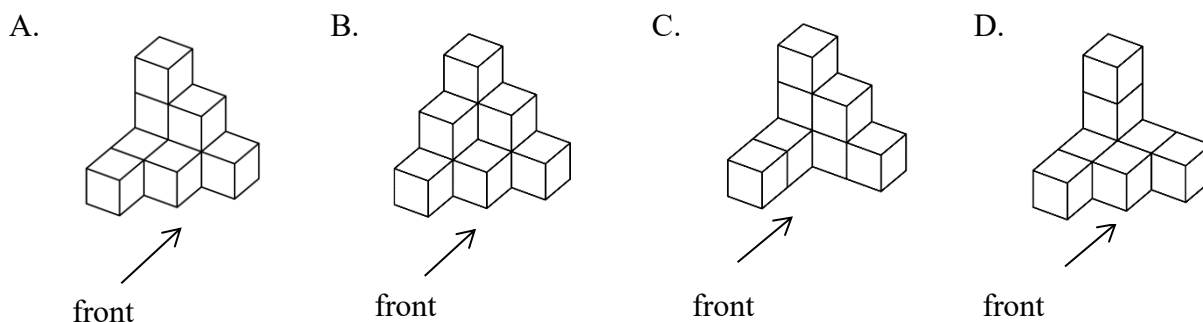
- A. RU
 B. ST
 C. SP
 D. WU



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



Which of the following could be the solid?

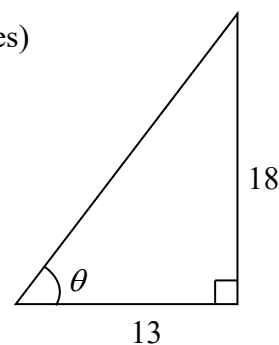


17. $P(4, 2)$ and $Q(-5, -6)$ are two points on a straight line L in the rectangular coordinate plane. Find the slope of L .

- A. 4
- B. $\frac{1}{4}$
- C. $\frac{8}{9}$
- D. $\frac{9}{8}$

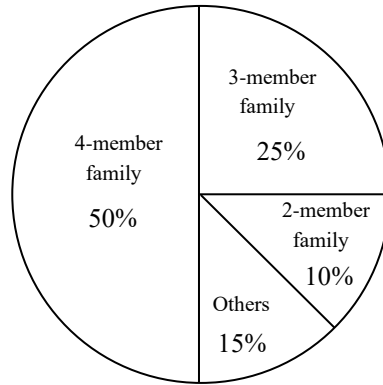
18. Referring to the figure, find θ . (Correct to 3 significant figures)

- A. 54.2°
- B. 46.2°
- C. 43.8°
- D. 35.8°



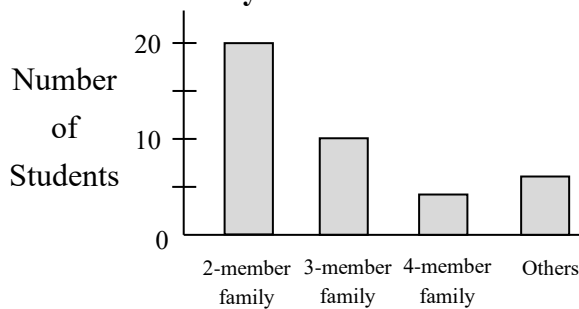
19. There are 40 students in class 3B. The pie chart below shows the survey result on the number of family members of 3B students.

Survey result on the number of family members of 3B students



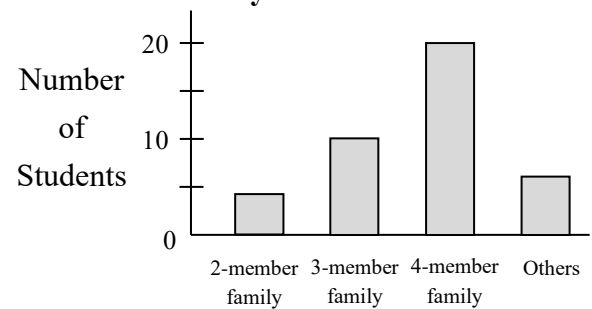
If the same set of data are presented by a bar chart, which of the following diagrams could be obtained?

A. Survey result on the number of family members of 3B students



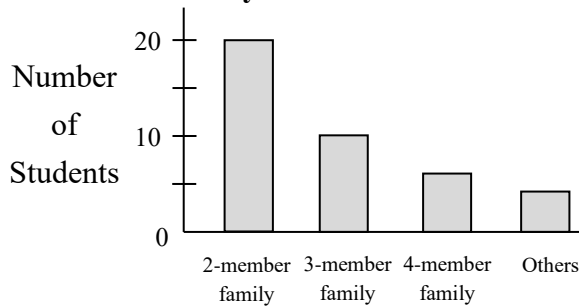
Family Size

B. Survey result on the number of family members of 3B students



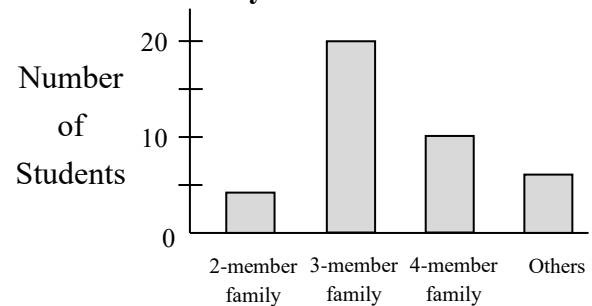
Family Size

C. Survey result on the number of family members of 3B students



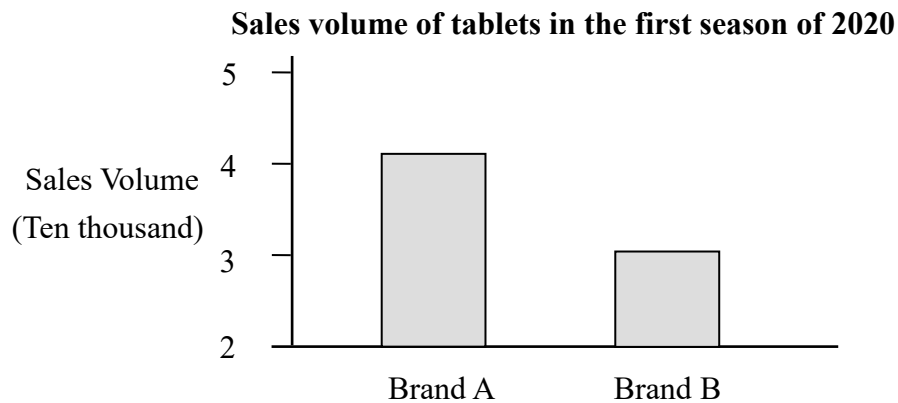
Family Size

D. Survey result on the number of family members of 3B students



Family Size

20. The diagram below shows the sales volume of two brands of tablets in the first season of 2020.



Based on the diagram above, Mr Lee believes that the sales volume of brand A are 2 times that of brand B in the first season of 2020.

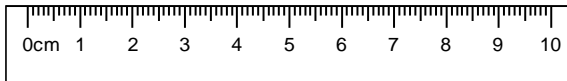
Which of the following statements is the best reason that Mr Lee is **misled** by the above diagrams?

- A. The prices of the two brands of tablets are not shown.
 - B. There is no comparison of the sales volume of other brands of tablets.
 - C. The sales place of the tablets is not shown.
 - D. The scale of the vertical axis in the diagram does not start from 0.
21. The number of positive integers less than $\sqrt{170}$ is
- A. 12.
 - B. 13.
 - C. 14.
 - D. 15.
22. Joanne has x \$3 stamps and y \$5 stamps. Her total amount of stamps is not less than \$130. Which of the following inequalities represents the relationship between x and y ?
- A. $3x + 5y > 130$
 - B. $3x + 5y \geq 130$
 - C. $3x + 5y < 130$
 - D. $3x + 5y \leq 130$

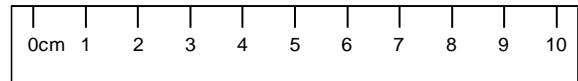
23. Which of the following statements is correct?

- A. The root of $x + 4 = 0$ is $\frac{1}{4}$.
- B. The root of $x + 5 = 0$ is $-\frac{1}{5}$.
- C. The root of $x + 6 = 0$ is 6.
- D. The root of $x + 7 = 0$ is -7 .

24.



Ruler *A*

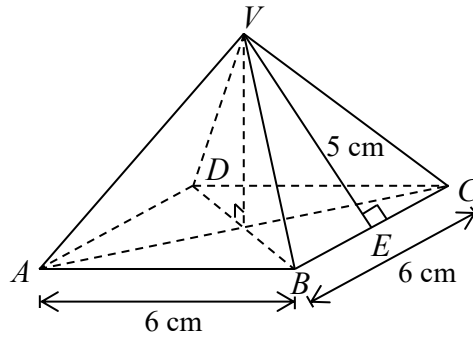


Ruler *B*

The above figure shows Ruler *A* and Ruler *B* with different graduations. Jack wants to find the thickness of a CD. Which of the following methods is **the best**?

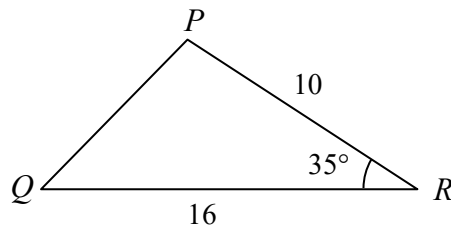
- A. Jack uses Ruler *A* to measure the thickness of a CD.
- B. Jack uses Ruler *A* to measure the thickness of a pile of 50 CDs and then divides the thickness by 50.
- C. Jack uses Ruler *B* to measure the thickness of a CD.
- D. Jack uses Ruler *B* to measure the thickness of a pile of 50 CDs and then divides the thickness by 50.

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



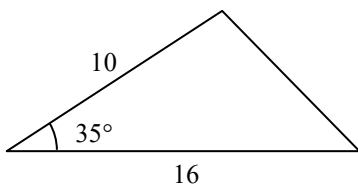
- A. 180 cm^2
 B. 96 cm^2
 C. 60 cm^2
 D. 48 cm^2

26.

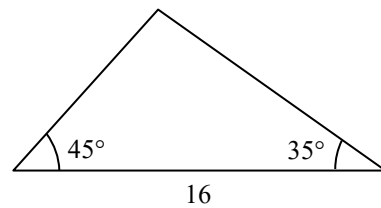


Which of the following triangles is congruent to the $\triangle PQR$ as shown in the above figure?

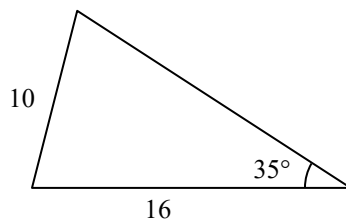
A.



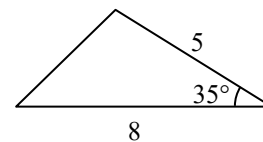
B.



C.

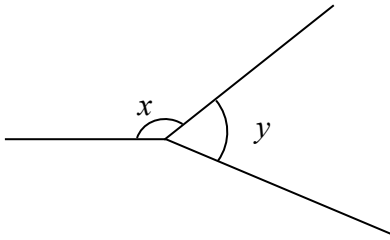


D.

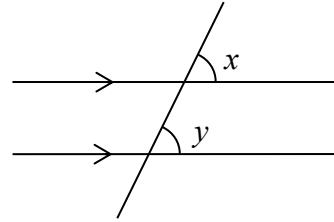


27. In each of the following figures, which figure shows that x and y are adjacent angles?

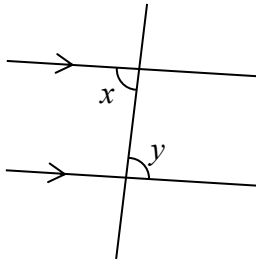
A.



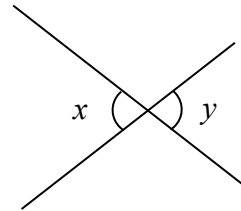
B.



C.



D.



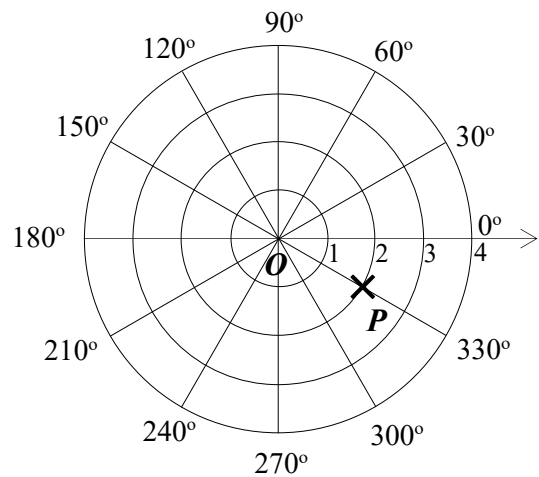
28. In the figure, the polar coordinates of point P are

A. $(2, -330^\circ)$.

B. $(-330^\circ, 2)$.

C. $(2, 330^\circ)$.

D. $(330^\circ, 2)$.



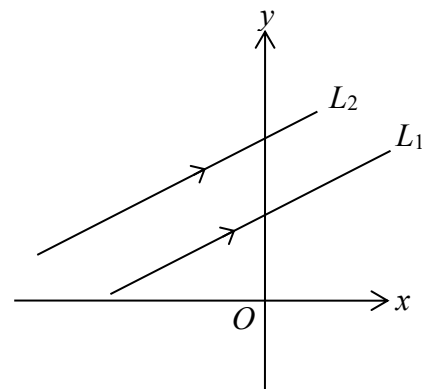
29. In the figure, the slope of line L_1 is $\frac{1}{3}$. Line L_2 is parallel to L_1 . Find the slope of L_2 .

A. $\frac{1}{3}$

B. $-\frac{1}{3}$

C. 3

D. -3



30. The following table shows the average relative humidity recorded by Hong Kong Observatory in the past 5 hours in Tsuen Wan.

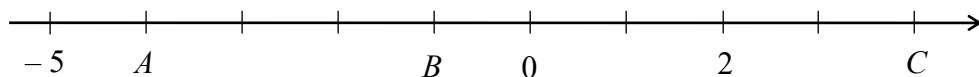
Time	6:00 a.m.	7:00 a.m.	8:00 a.m.	9:00 a.m.	10:00 a.m.
Average relative humidity (%)	65	60	63	58	55

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

- A. Stem-and-leaf diagram
- B. Pie chart
- C. Scatter diagram
- D. Broken line graph

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

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



32. The Caspian Sea is the largest lake in the world. Its area is about $371\,000\text{ km}^2$. Use scientific notation to represent this area.
33. In an old book collection event, the ratio of the number of popular science books collected to the number of fiction books collected is $14 : 9$. If there are 56 popular science books, how many fiction books are there?

34. A scientific formula is given as follows:

$$E = \frac{p^2}{2m}$$

If $p = 30$ and $E = 50$, find the value of m .

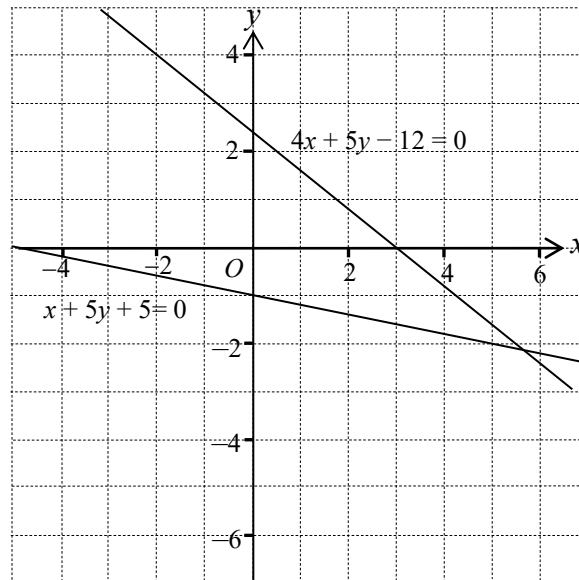
35. The n^{th} term of a sequence is $\frac{1}{4n}$. Find the value of the 5^{th} term of the sequence.

36. Simplify $5x + 3y - 4x - 6y$.

37. Factorize $y^2 - 9$.

38. Solve the equation $4(x+1) = -12$.

39.



The above figure shows the graphs of $4x + 5y - 12 = 0$ and $x + 5y + 5 = 0$.

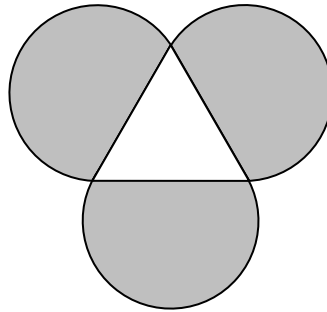
According to the given graphs, $(6, -2)$ is the * exact solution / approximate solution

of the simultaneous equations $\begin{cases} 4x + 5y - 12 = 0 \\ x + 5y + 5 = 0 \end{cases}$.

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

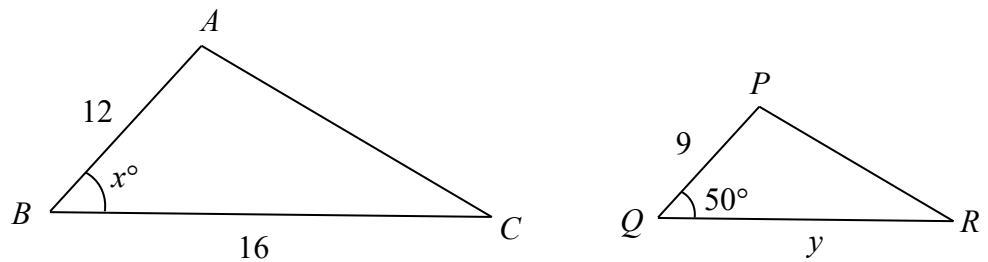
40. Solve the inequality $3x + 6 > 0$.

41. The figure below has rotational symmetry. Find its order of rotational symmetry.

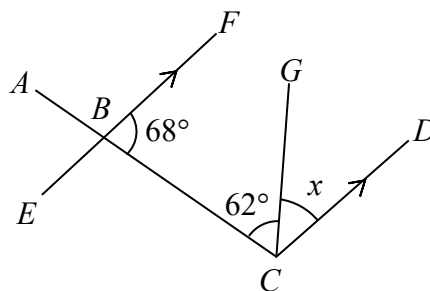


42. In the figure, $\triangle ABC \sim \triangle PQR$. Find

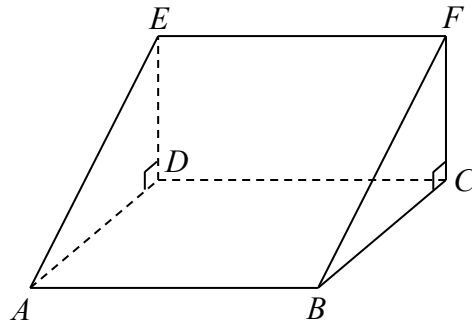
- (a) the value of x ,
- (b) the value of y .



43. In the figure, ABC and EBF are straight lines. $EF \parallel CD$, $\angle FBC = 68^\circ$ and $\angle GCB = 62^\circ$. Find x .

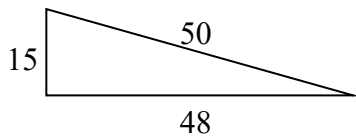


44. The figure shows a triangular prism. $ABCD$ and $CDEF$ are rectangles. $ABCD$ is a horizontal plane and $CDEF$ is a vertical plane. Name the projection of EF on the plane $ABCD$.

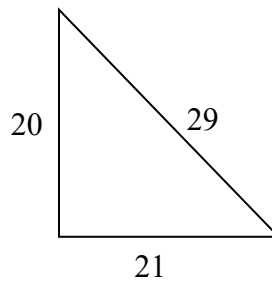


45. Which of the following must be right-angled triangle(s)? (May be more than one answer)

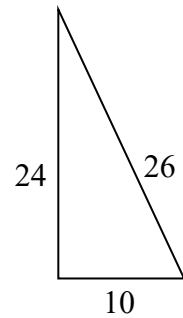
Triangle P



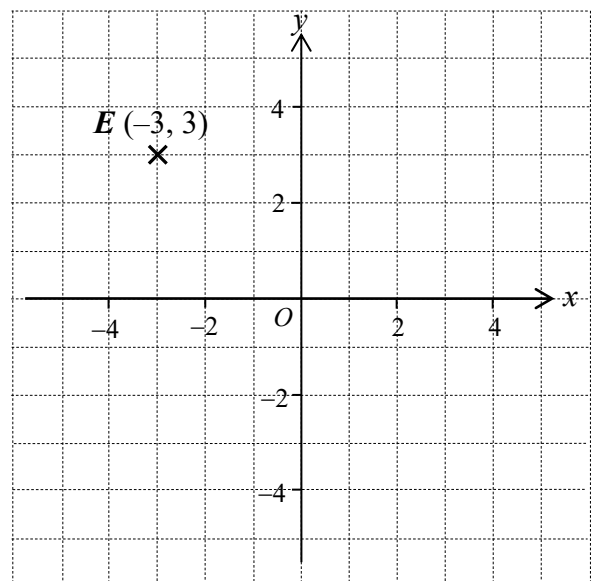
Triangle Q



Triangle R



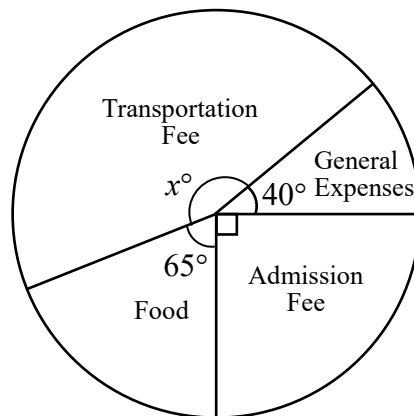
46. In the figure, $E(-3, 3)$ is translated 4 units to the right to E' . Find the coordinates of E' .



47. Determine whether each of the following data is discrete or continuous.
- The best time of each race in the Sports Day of a school
 - The number of students participating in different races in the Sports Day of a school

48. The following pie chart shows the expenditure of a 3A class activity.

Expenditure of a 3A class activity



According to the above chart, answer the following questions.


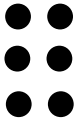
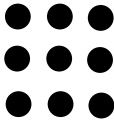
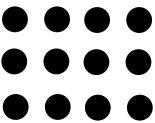
- Find the value of x .
 - If the admission fee is \$540, find the total expenditure of the activity.
 - What is the difference between the expenditure on food and the general expenses of the activity?
49. The following data show the individual scores of a basketball player in the last 7 competitions.

12, 15, 8, 18, 16, 18, 18

Find the mean and the median of the above data.

50. Calculate $\frac{-3-6}{9}$.

51. Figure 1 to Figure 4 consist of 3, 6, 9 and 12 dots respectively.

			
Figure 1	Figure 2	Figure 3	Figure 4

According to the above pattern, how many dots does Figure n consist of? (Express the answer in terms of n)

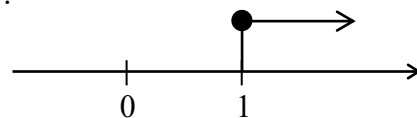
52. Write down the degree of the polynomial $6x^4 - 5x^2 + 3$.

53. Expand $x(2 - y)$.

54. Factorize $ax - bx + 3a - 3b$.

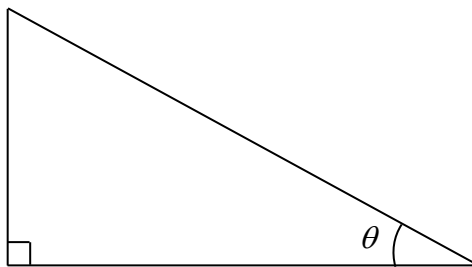
55. Make b the subject of the formula $a = \frac{4+b}{3}$.

56. According to the diagram, write down an inequality in x .

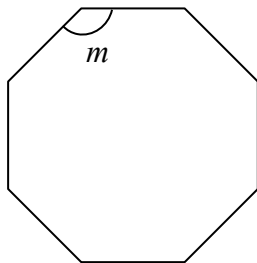


57. The radius of a circle is 7 cm. Find its area. (Express the answer in terms of π)

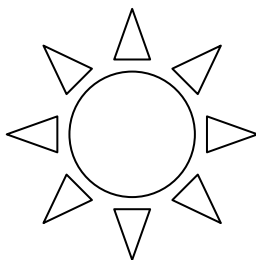
58. In the figure, $\cos \theta = 0.76$. Find θ . (Correct to 3 significant figures)



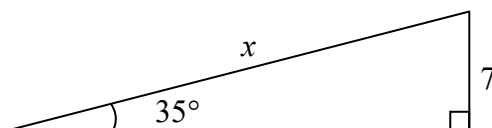
59. The figure shows a regular octagon. Find m .



60. The figure below has reflectional symmetry. Find the number of axes of symmetry.

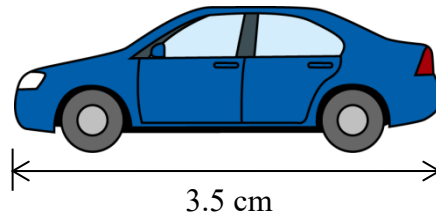


61. Find the value of x in the figure. (Correct to 3 significant figures)

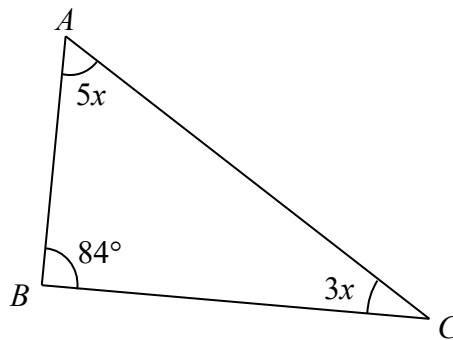


62. Mary deposits \$60 000 in a bank. The interest rate is 4% p.a. **compounded** yearly. Find the interest she will receive after 2 years.

63. The figure shows a scale drawing of a model car with a scale of 1 : 24. The length of the model car in the figure is 3.5 cm. Find the actual length of the model car. (Give the answer in cm)

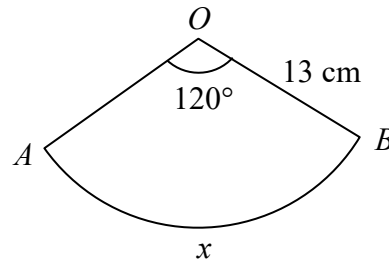


64. In $\triangle ABC$, $\angle ABC = 84^\circ$. Find x .

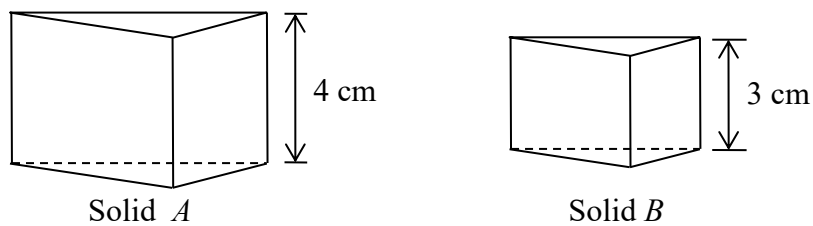


65. Solve the simultaneous equations $\begin{cases} 4x + 7y = 25 \\ 4x + 5y = 19 \end{cases}$.

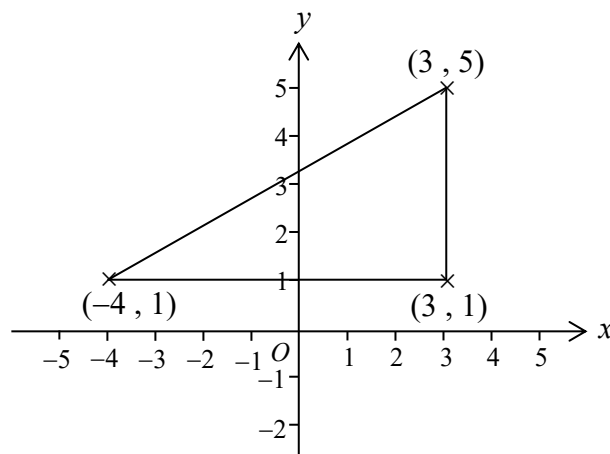
66. In the figure, the radius of sector OAB is 13 cm and $\angle AOB = 120^\circ$. Let x be the arc length of the sector, find x . Give the answer correct to 3 significant figures.



67. In the figure, Solid A and Solid B are similar solids. Their heights are 4 cm and 3 cm respectively. The volume of Solid A is 128 cm^3 . Find the volume of Solid B .



68. Find the area of the triangle in the figure.



69. A two-digit number is formed by the digits 2, 7, 8 at random. The digits can be repeated.

For example: 28, 77

- (a) Some of the possible outcomes are given in the table provided in the **ANSWER BOOKLET**. Fill the remaining ones in the blanks.
- (b) Find the probability that the two-digit number is an even number.

END OF PAPER