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Education Bureau
Territory-wide System Assessment 2015
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. There are two kinds of coins, \$2 and \$10, in a box. The total value of the coins is \$64. Which of the following numbers **CANNOT** be the total number of coins in the box?
 - A. 50
 - B. 28
 - C. 16
 - D. 12

2. The thickness of a piece of paper is 0.000 95 cm. Use scientific notation to represent this number.
 - A. 9.5×10^{-3} cm
 - B. 9.5×10^{-4} cm
 - C. 0.95×10^{-3} cm
 - D. 0.95×10^{-4} cm

3. Which of the following is correct?
 - A. $\sqrt{55} > 10$
 - B. $\sqrt{44} > 8$
 - C. $\sqrt{33} > 6$
 - D. $\sqrt{22} > 4$

4. There are 3 cones in each box of ice-cream cones. Henry buys x boxes and eats 2 cones. How many cones remain?
 - A. $3(x - 2)$ cones
 - B. $3(x + 2)$ cones
 - C. $(3x - 2)$ cones
 - D. $(3x + 2)$ cones

5. Which of the following polynomials has unlike terms?

- A. $5a + 5a$
- B. $9a^2 + 9a$
- C. $7a^2 - 3a^2$
- D. $2ab - 4ab$

6. Mary solved the equation $\frac{5x}{4} - 20 = \frac{x}{4} + 4$ as follows:

1 st line	$5x - 20 = x + 4$
2 nd line	$5x - x = 20 + 4$
3 rd line	$4x = 24$
4 th line	$x = \frac{24}{4}$
5 th line	$x = 6$

Determine on which line Mary first made a mistake.

- A. 1st line
- B. 2nd line
- C. 3rd line
- D. 4th line

7. Which of the following points lie on the straight line $x + 3 = 0$?

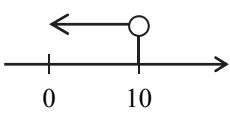
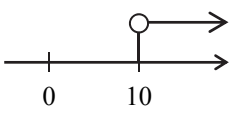
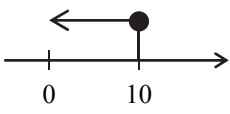
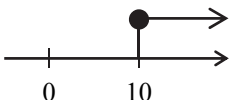
$P(3, 6), Q(-3, 0), R(0, 3), S(-3, 6)$

- A. P and R
- B. P and S
- C. Q and R
- D. Q and S

8. If $x < y$, which of the following inequalities is correct?

- A. $-2x > -2y$
- B. $2x > 2y$
- C. $2x > x + y$
- D. $x + y > 2y$

9. Which of the following diagrams represents $x \leq 10$?

- A. 
- B. 
- C. 
- D. 

10. Danny buys a bag of rice in a supermarket. Which of the following labels shows the net weight of the bag of rice with the most suitable unit and degree of accuracy?

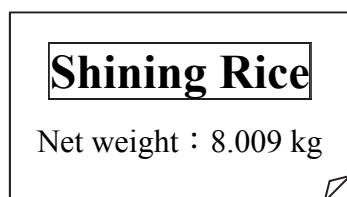
A.



B.



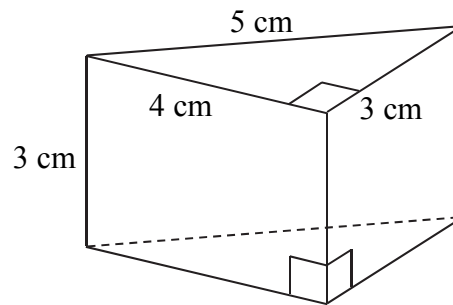
C.



D.

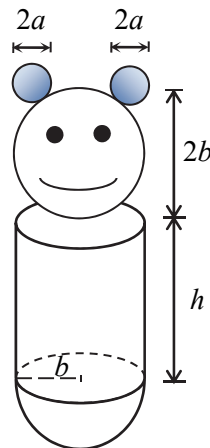


11. The figure shows a solid triangular prism. Its base is a right-angled triangle. Find the total surface area of the prism.



- A. 18 cm^2
 B. 27 cm^2
 C. 42 cm^2
 D. 48 cm^2

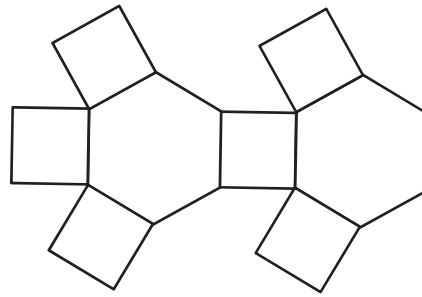
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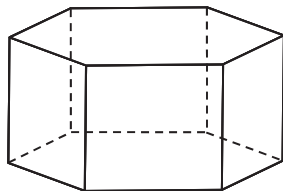
In the figure, the roly-poly toy can be divided into a head and a body. The head is formed by 3 spheres. The diameters of the spheres are $2a$, $2a$ and $2b$ respectively. The body is formed by a cylinder and a hemisphere. The base radius and the height of the cylinder are b and h respectively. The radius of the hemisphere is also b . By considering the **dimensions**, determine which of the following could express the total surface area of the roly-poly toy.

- A. $\frac{\pi}{3}(8a^3 + 6b^3 + 3b^2h)$
 B. $8\pi a^2 + \pi b(7b + 2h)$
 C. $4\pi a + 5\pi b + 2h$
 D. $2a + 3b + h$

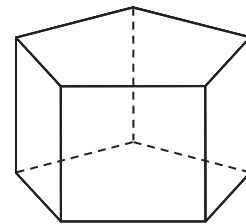
13. Which of the following 3-D figures can be made by the net on the right?



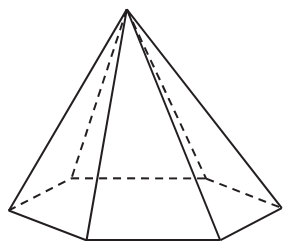
A.



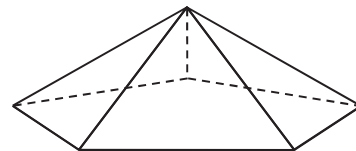
B.



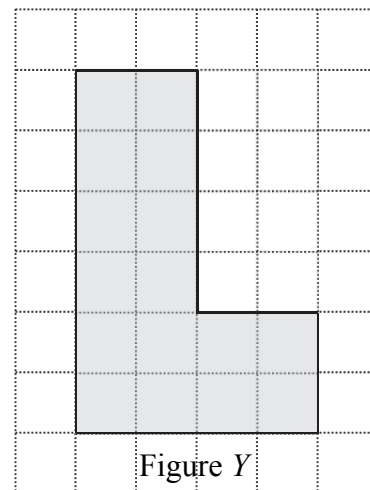
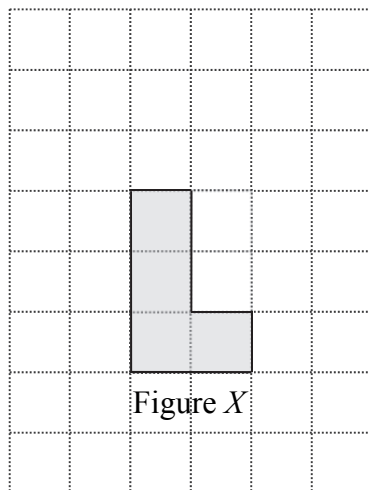
C.



D.



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



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

15.

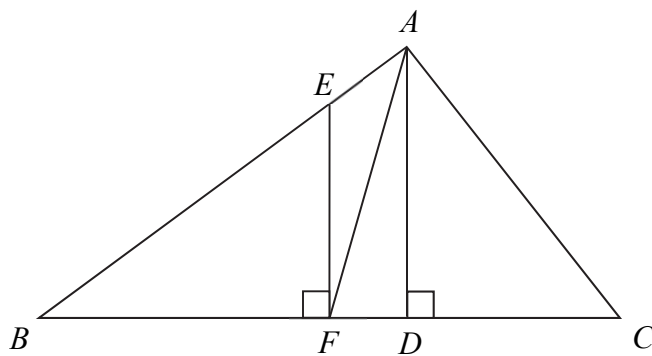


Will the size and shape of the above figure be changed after reflection?

	Size	Shape
A.	changed	unchanged
B.	unchanged	changed
C.	unchanged	unchanged
D.	changed	changed

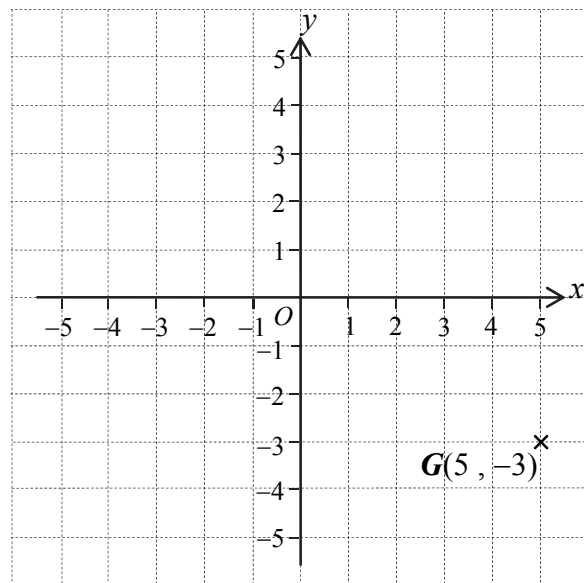
16. In $\triangle ABC$, $BF = FC$, $EF \perp BC$ and $AD \perp BC$. Which of the following is a perpendicular bisector of $\triangle ABC$?

- A. AF
- B. AD
- C. EF
- D. FC



17. In the figure, $G(5, -3)$ is rotated about the origin O through 180° to G' . The coordinates of G' are

- A. $(-5, -3)$.
- B. $(-5, 3)$.
- C. $(-3, 5)$.
- D. $(3, -5)$.



18. It is given that the slope of a straight line ℓ is $-\frac{4}{7}$. Which of the following straight lines is parallel to ℓ ?

Straight line	L_1	L_2	L_3	L_4
Slope	$\frac{4}{7}$	$-\frac{4}{7}$	$\frac{7}{4}$	$-\frac{7}{4}$

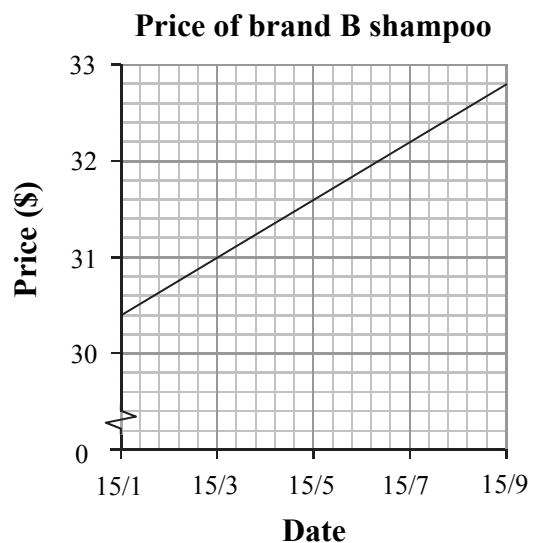
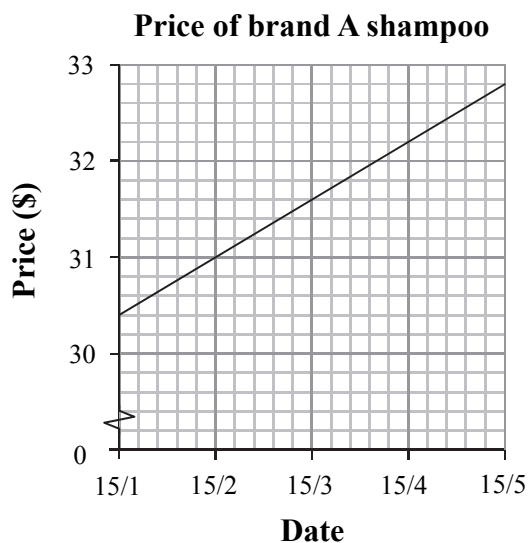
- A. L_4
- B. L_3
- C. L_2
- D. L_1

19. The following table shows the ways of going to school by 200 students.

Ways	Percentage of the whole
By bus	37%
By MTR	41%
By Minibus	12%
Others	10%

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

- A. Pie chart
 - B. Stem-and-leaf diagram
 - C. Scatter diagram
 - D. Cumulative frequency polygon
20. The diagrams below show the prices of two different brands of shampoos in 2014.



Based on the diagrams above, Johnson believes that the prices of the two brands of shampoos are increasing at the same rate.

Which of the following statements is the best reason that Johnson is misled by the above diagrams?

- A. The number of customers buying brand A shampoo and that of brand B shampoo are not shown.
- B. The scales of the 2 horizontal axes are not the same.
- C. The scales of the 2 vertical axes are not the same.
- D. There is no comparison of the prices of other brands of shampoos.

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

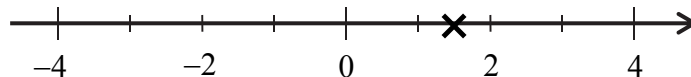
21. +5 persons represents 5 persons boarding a train, while –5 persons represents 5 persons leaving a train.

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

- (i) On Platform No.1, there are 68 persons boarding a train.
(ii) On Platform No.2, there are 95 persons leaving a train.

22. Use the symbol ‘×’ to mark the number $-\frac{7}{2}$ on the number line given in the **ANSWER BOOKLET**.

Example: $\frac{3}{2}$ is marked on the number line below.



23. Let S be the sum of the first n positive integers $1, 2, 3, \dots, n$. S can be calculated by the following formula:

$$S = \frac{n(n+1)}{2}$$

If $n = 60$, find the value of S .

24. Figure 1 to Figure 4 consist of 1, 4, 9 and 16 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)

25. Expand $-a^2(3-a^2)$.

26. Factorize $kx + x + ky + y$.

27. Factorize $x^2 + 5x - 6$.

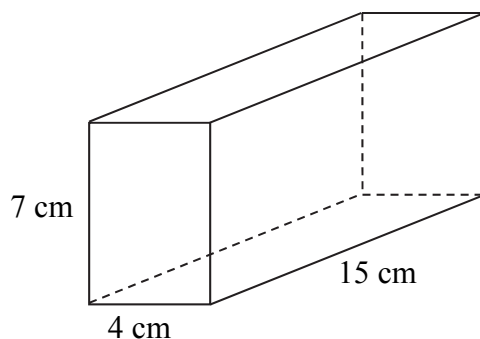
28. Solve $2(3x - 4) + 5(2 - x) = 9$.

29. Simplify $\frac{x}{y} - \frac{x}{3y}$.

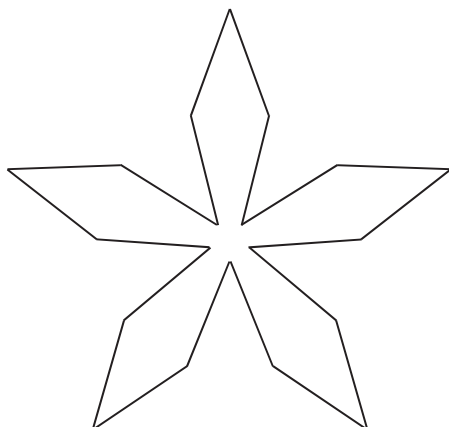
30. In the **ANSWER BOOKLET**, fill in the box with $>$ or $<$ to express the relation between the numbers.

$$-\frac{5}{3} \quad \boxed{} \quad -\frac{5}{4}$$

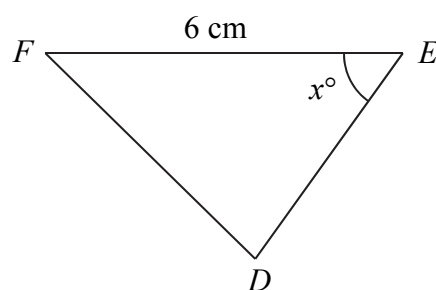
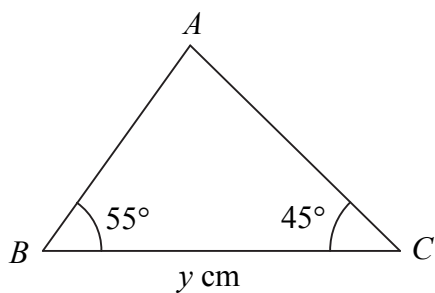
31. The length, width and height of a solid cuboid are 15 cm, 4 cm and 7 cm respectively. Find the total surface area of the cuboid.



32. Draw **ALL** axes of symmetry of the following figure in the **ANSWER BOOKLET**.



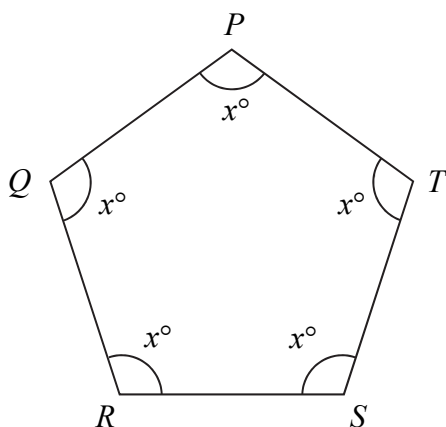
33.



In the figure, $\triangle ABC \cong \triangle DEF$. Find

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

34. The figure shows a pentagon $PQRST$. Find the value of x .



35. Figure 1 shows a rhombus $ABCD$. AC and BD are diagonals and intersect at E . Rhombus $ABCD$ is folded along AC as shown in Figure 2. Find the angle between the plane ACD and the plane ABC .

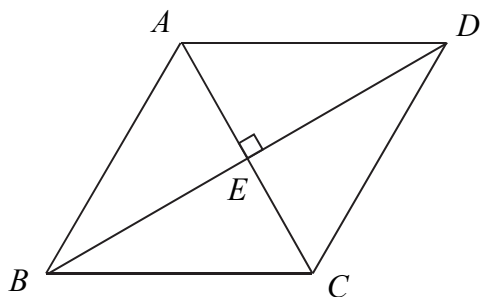


Figure 1

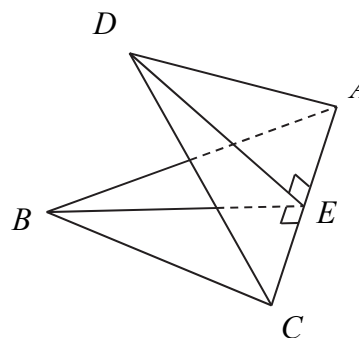
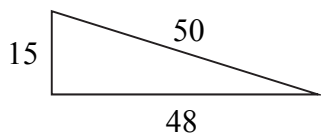


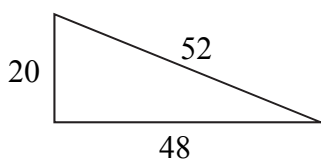
Figure 2

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

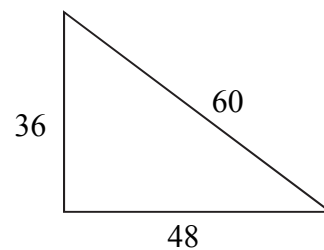
Triangle A



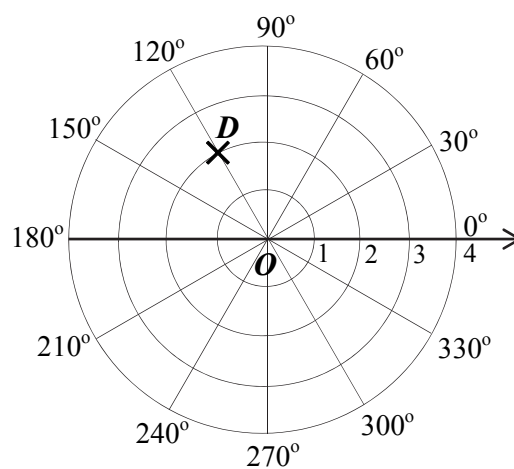
Triangle B



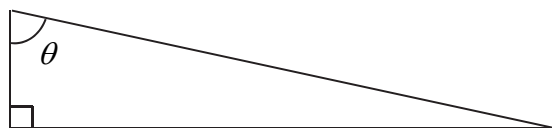
Triangle C



37. Find the polar coordinates of point D in the figure.

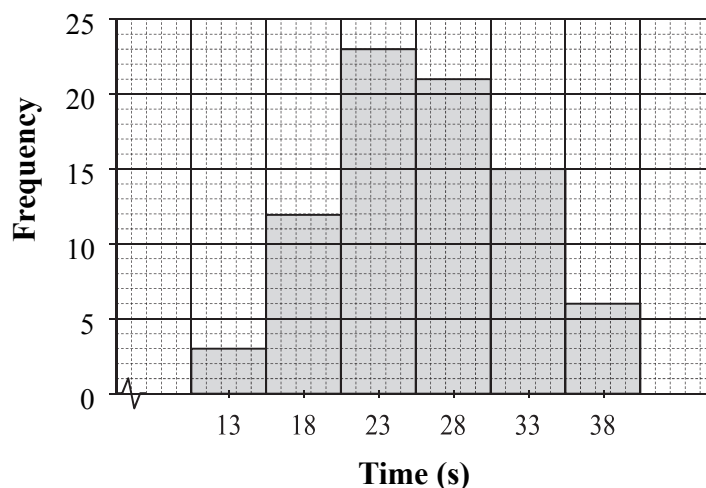


38. Refer to the figure, $\cos \theta = \frac{1}{5}$. Find θ . (Correct to the nearest 0.1°)



39. Determine whether each of the following data is discrete or continuous.
- The number of MTR stations
 - The length of the platform of Wong Tai Sin station
40. The histogram below shows the time taken (s) by 80 students to solve an online problem.

Time taken by 80 students to solve an online problem



According to the above histogram, answer the following questions.

- Complete the frequency distribution table in the **ANSWER BOOKLET**.
 - How many students took less than 20.5 s to solve the online problem?
 - If only 4 students spent less time than Jacky on solving the online problem, which group should the time taken by Jacky belong to?
41. Two dice are thrown 100 times. The sum of the two numbers obtained in each throw is recorded in the following table:

Sum of the two numbers	2	3	4	5	6	7	8	9	10	11	12
Frequency	3	5	8	11	14	19	15	12	7	4	2

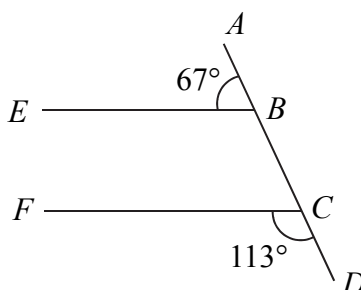
Find the empirical probability that the sum of the two numbers is less than 7.

SECTION C: All working must be clearly shown.

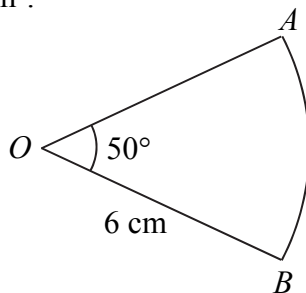
Write the mathematical expressions, answers and statements/conclusions in the spaces provided in the ANSWER BOOKLET.

42. Peter sells a jacket at a profit of 55%. If the profit is \$330, find the cost price of the jacket.
43. David deposits \$7 500 in a bank at an interest rate of 6% p.a. compounded yearly. Find the interest he will receive after 2 years.
44. Solve the simultaneous equations
$$\begin{cases} 5x + 2y = 31 \\ 3x + 2y = 25 \end{cases}$$
.

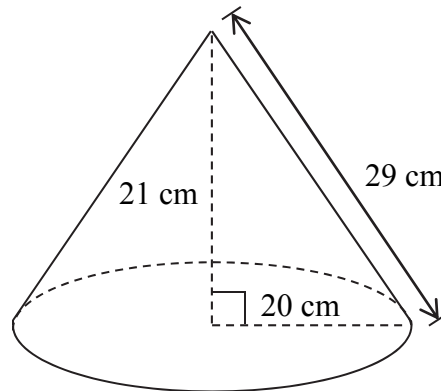
45. In the figure, $ABCD$ is a straight line. $\angle ABE = 67^\circ$ and $\angle FCD = 113^\circ$. Prove that $BE \parallel CF$.



46. In the figure, the radius of sector OAB is 6 cm and $\angle AOB = 50^\circ$. Find the area of the sector. Correct the answer to the nearest 0.1 cm^2 .

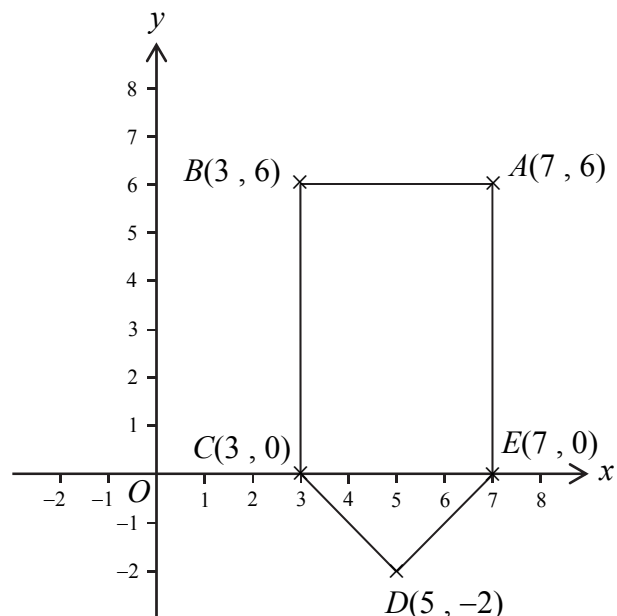


47. The figure shows a right circular cone of height 21 cm and base radius 20 cm. Its slant height is 29 cm. Find the curved surface area of the cone in terms of π .



48. Jacky wants to use a lorry to carry some machines weighing 58.8 kg each. The maximum loading of the lorry is 1800 kg. Give **an appropriate approximation** for the weight of each machine. Hence, estimate the maximum number of machines that can be carried by the lorry each time.
Remarks: Consider the weight of the machine and the maximum loading of the lorry only.

49. Find the area of the pentagon $ABCDE$ in the figure.



50. The following data show the waiting time (min) of 20 passengers at a bus stop.

5	12	25	2	21
23	3	20	21	11
16	11	13	27	26
14	19	5	11	4

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.

