9	M	E	4	(	Q	)

Education Bureau

Territory-wide System Assessment 2019

Secondary 3 Mathematics

QUESTION BOOKLET

INSTRUCTIONS

1. There are 47 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	=	πrl
	Volume	=	$\frac{1}{3}\pi r^2 h$
Prism	Volume	=	base area × height
Pyramid	Volume	=	$\frac{1}{3}$ × base area × 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) A hospital recorded the number of new cases of lung cancer diagnosed last year.

   (ii) The Department of Health announced the total number of daily cigarette smokers in Hong Kong last 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

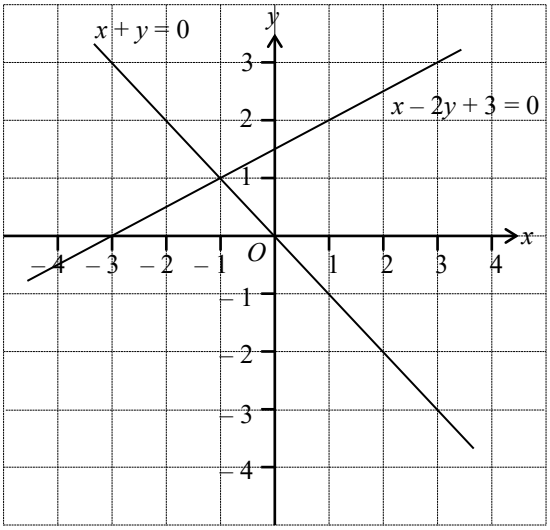
2. A bag contains x \$2 coins and y \$5 coins. The total amount of the coins is more than \$300. Which of the following inequalities represents the relationship between x and y?

   A. $2x + 5y < 300$
   B. $2x + 5y \leq 300$
   C. $2x + 5y > 300$
   D. $2x + 5y \geq 300$

3. Which of the following is an equation with the root 9?

   A. $9 + x = 0$
   B. $x - 9 = 0$
   C. $9x + 1 = 0$
   D. $9x - 1 = 0$

4.



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

According to the given graphs, solve the simultaneous equations $\begin{cases} x + y = 0 \\ x - 2y + 3 = 0 \end{cases}$ graphically.

A. (0, 0)

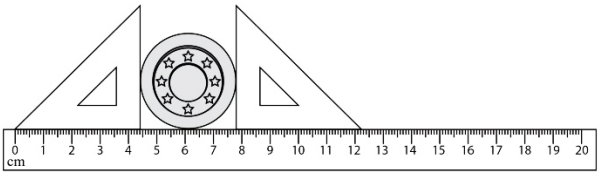
B. (–1, 1)

C. (1, –1)

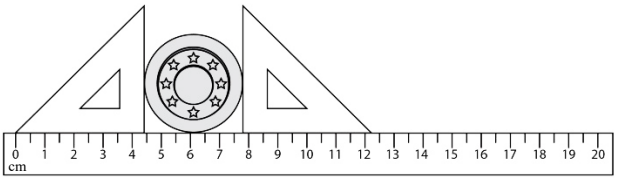
D. (–3, 0)

5. Jenny measures the diameter of a button. Which of the following rulers can give a more accurate measurement?

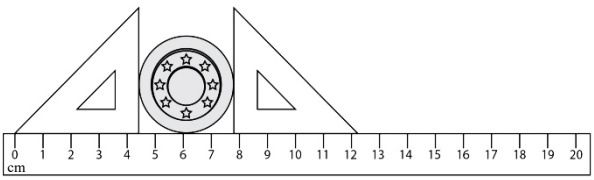
A.



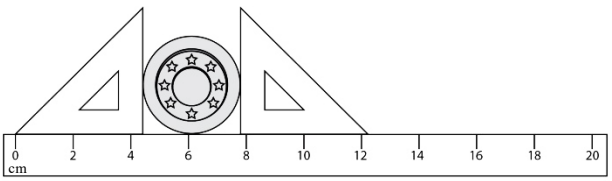
B.



C.



D.



6. Find the degree of the polynomial $6y^7 + y^2 - y + 5$.

A. 7

B. 6

C. 5

D. 4

7. $2^{-3} =$

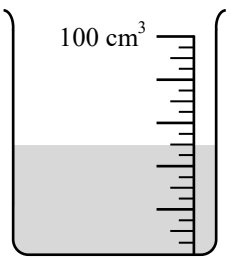
A. $\frac{1}{6}$.

B. $\frac{1}{8}$.

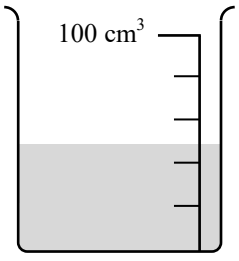
C. -6.

D. -8.

8.



Container *A*



Container *B*

The above figure shows Container A and Container B with different graduations. There is some water in each container. Mary wants to find the volume of a marble. Which of the following methods is the best?

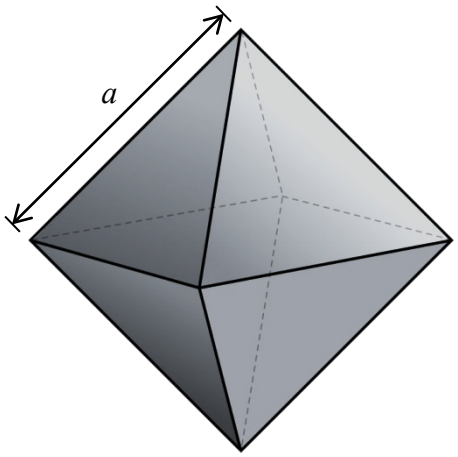
A. Mary puts a marble in Container A and measures the volume increased.

B. Mary puts a marble in Container B and measures the volume increased.

C. Mary puts 20 marbles in Container A, measures the volume increased, and then divides the volume by 20.

D. Mary puts 20 marbles in Container B, measures the volume increased, and then divides the volume by 20.

9.



The solid in the figure is an octahedron. Each of its side length is a. By considering the **dimensions**, determine which of the following could express the volume of the above figure.

A. $\frac{\sqrt{2}a^3}{3}$

B. $2\sqrt{3}a^2$

C. $\frac{a\sqrt{10a^2+7a}}{2}$

D. $\frac{\sqrt{2}a}{2}$

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

(i)	$(2x+1)(x+2)(x-3)$ $= 2x^3 - x^2 - 13x - 6$
(ii)	$2x^3 - x^2 - 13x - 6$ $= (2x+1)(x+2)(x-3)$

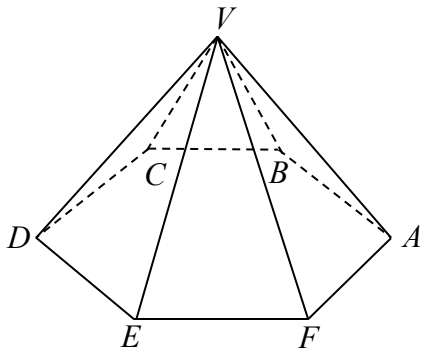
A. (i) Expansion (ii) Factorization

B. (i) Expansion (ii) Expansion

C. (i) Factorization (ii) Factorization

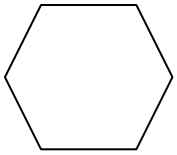
D. (i) Factorization (ii) Expansion

11. A right pyramid is placed horizontally as shown. Its base $ABCDEF$ is a regular hexagon. Max sketches a cross-section which is perpendicular to the base and passing through vertex V.

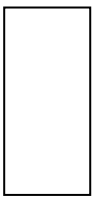


Which of the following could express the plane diagram of the cross-section?

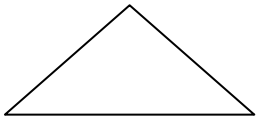
A.



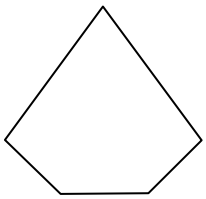
B.



C.



D.



12. Mrs Lee spends less than \$100 to buy 5 towels and 3 toothbrushes. It is given that the price of a towel is 2 times that of a toothbrush and the price of a toothbrush is \$$x$, which of the following inequalities can be used to find the range of values of x?

A. $5x + 3(2x) \leq 100$

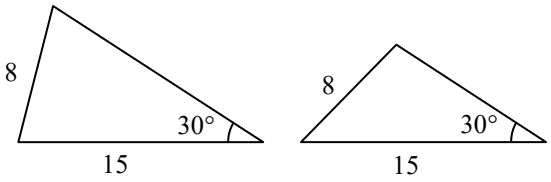
B. $5x + 3(2x) < 100$

C. $5(2x) + 3x \leq 100$

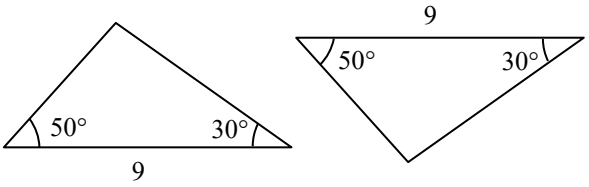
D. $5(2x) + 3x < 100$

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

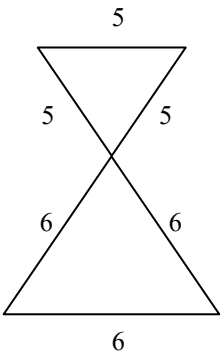
A.



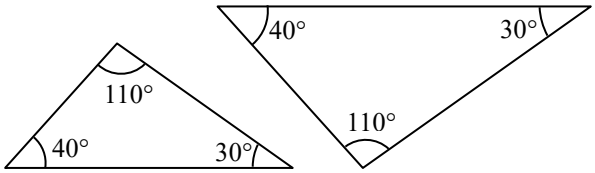
B.



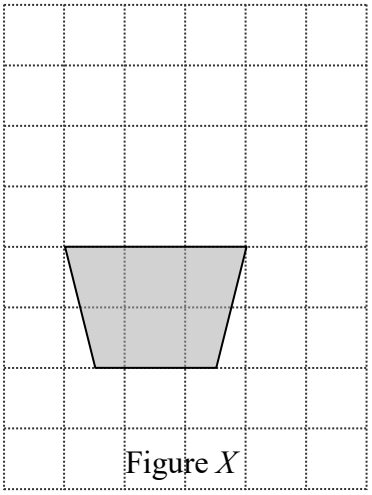
C.

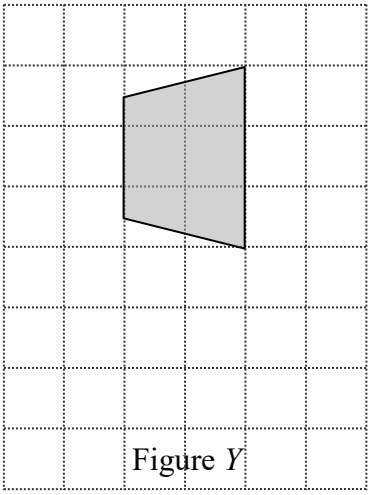


D.



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





A. Enlargement

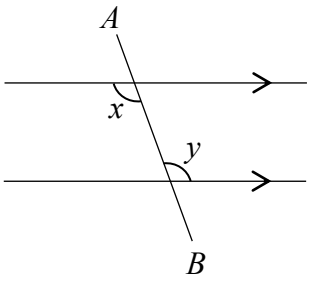
B. Translation

C. Reflection

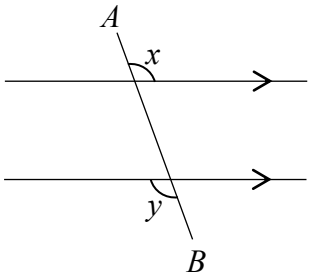
D. Rotation

15. In each of the following figures, AB is a straight line. Which figure shows that x and y are a pair of corresponding angles?

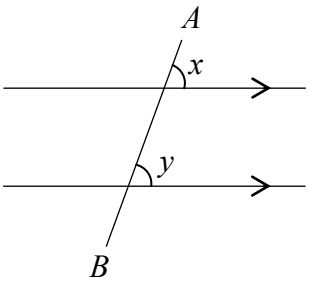
A.



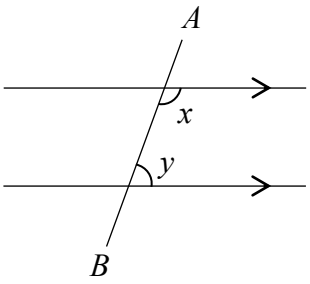
B.



C.



D.



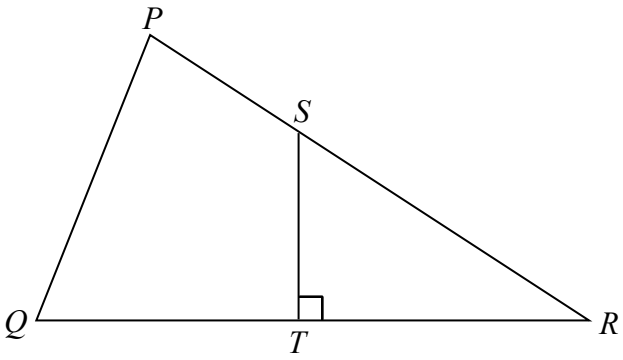
16. In $\triangle PQR$, $QT = TR$ and $ST \perp QR$. ST **MUST** be

A. a perpendicular bisector of $\triangle PQR$.

B. an angle bisector of $\triangle PQR$.

C. a median of $\triangle PQR$.

D. an altitude of $\triangle PQR$.



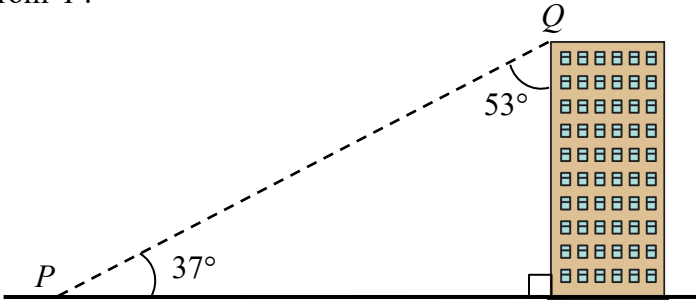
17. In the figure, a building is standing vertically on the horizontal ground. Find the angle of elevation of the top of the building Q from P.

A. 143°

B. 127°

C. 53°

D. 37°



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18. It is given that the slope of a straight line ℓ is $\frac{5}{9}$. Which of the following straight lines is perpendicular to ℓ?

Line	L_1	L_2	L_3	L_4
Slope	$-\frac{5}{9}$	$\frac{5}{9}$	$-\frac{9}{5}$	$\frac{9}{5}$

A. L_1

B. L_2

C. L_3

D. L_4

19. The table below shows the sales figures of 6 types of furniture for a furniture shop last month.

Types of furniture	A	B	C	D	E	F
Number of item sold	21	7	12	3	14	5

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

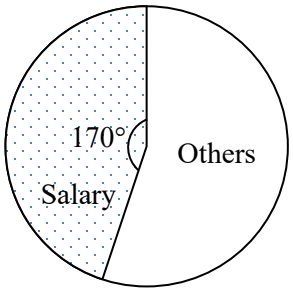
A. Stem-and-leaf diagram

B. Bar chart

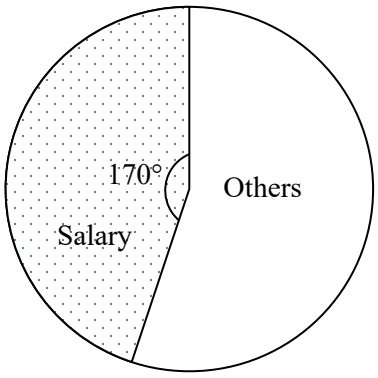
C. Scatter diagram

D. Cumulative frequency polygon

20. The total expenditures of company *A* and company *B* are the same. The pie charts below show the expenditure distribution of company *A* and company *B*.



Expenditure of company *A*



Expenditure of company *B*

Based on the diagrams above, Mr Chan believes that the expenditure on salary of company *B* is more than that of company *A*.

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

A. The business nature of these two companies is not shown.

B. The number of staff of these two companies is not shown.

C. The total income of these two companies is not shown.

D. The size of the charts is not the same.

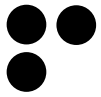
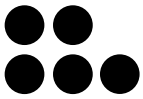
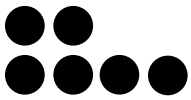
SECTION B: Write ALL the answers in the ANSWER BOOKLET. Working need not be shown.

21. Calculate $-3 + 4\,(-1)$.

22. Write down the constant of the polynomial $5y^2 + 4y + 7$.

23. How many positive integers are less than $\sqrt{142}$?

24. Figure 1 to Figure 4 consist of 3, 4, 5 and 6 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 $x(x - 4y + 3)$.

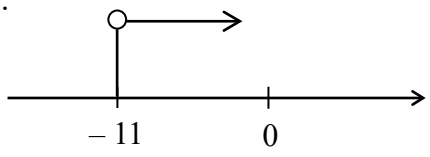
26. Solve the equation $\frac{2x-3}{7}=1$.

27. Make W the subject of the formula $G=\frac{W}{3}-4$.

28. Factorize $kx + ky + 3x + 3y$.

29. Consider the formula $s=\frac{t^2}{2+w}$. If $t=5$ and $w=-3$, find the value of s.

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



31. In the following figures, Figure A is formed by 9 identical squares. Figure B is formed by filling 4 parts of Figure A with the same colour as shown. Write down the number of axes of symmetry of Figure A and Figure B respectively.

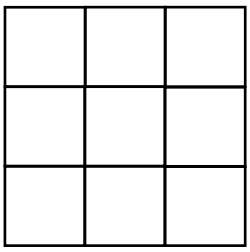


Figure A

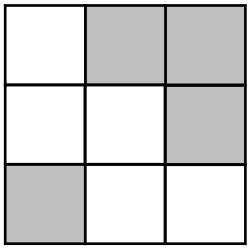
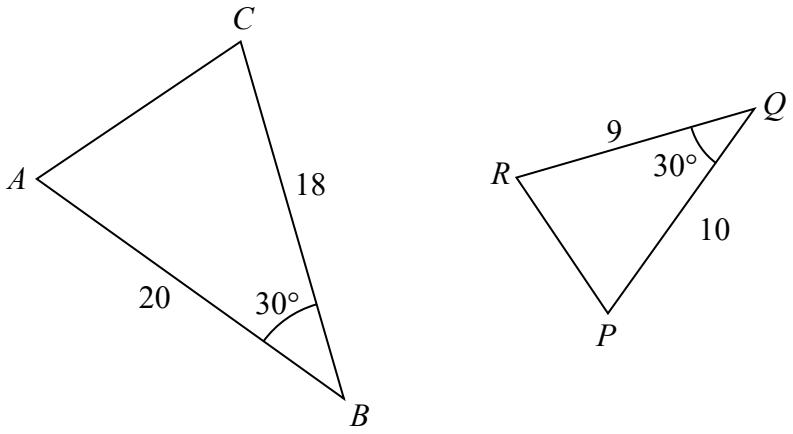


Figure B

32.

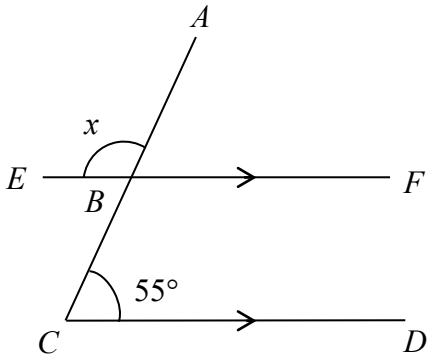


According to the given information in the above figure,

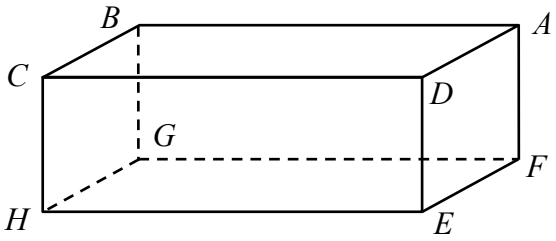
(a) identify whether $\triangle ABC$ and $\triangle PQR$ are congruent or similar triangles, and

(b) choose the correct reason.

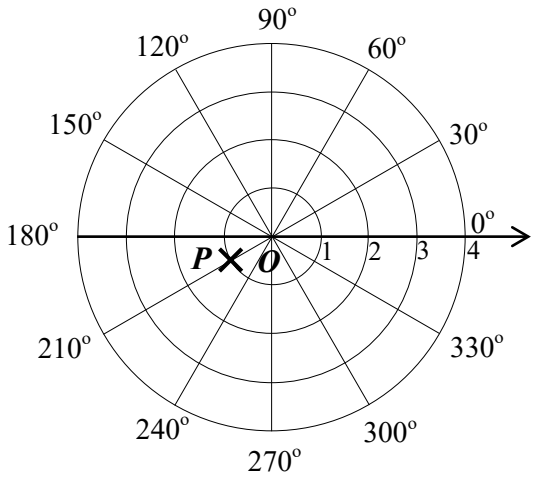
33. In the figure, ABC and EBF are straight lines. $EF \parallel CD$ and $\angle ACD = 55°$. Find x.



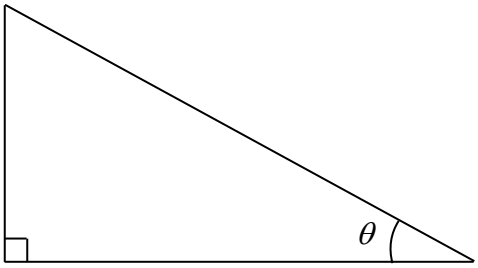
34. In the figure, $ABCDEFGH$ is a cuboid and $EFGH$ is a horizontal plane. Name the projection of CD on the plane $EFGH$.



35. Find the polar coordinates of point $\boldsymbol{P}$ in the figure.



36. In the figure, $\tan\theta = 0.97$. Find θ. (Correct to 3 significant figures)

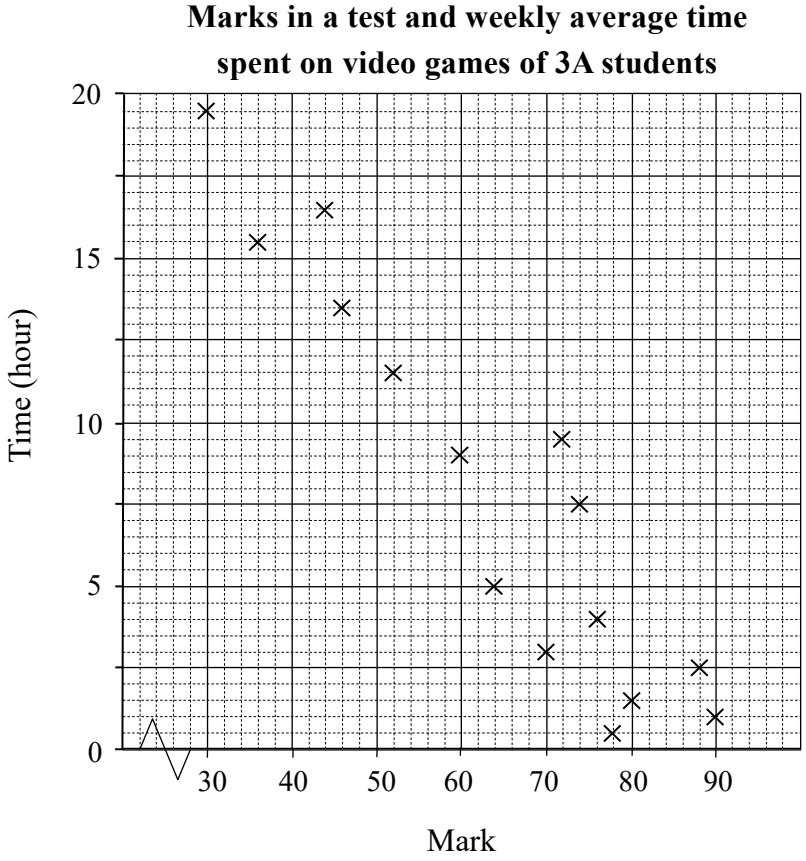


37. The following data show the number of exercise books in the school bags of 15 students.

11	8	7	12	7
4	7	6	7	10
5	10	8	9	12

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

38. The scatter diagram below shows the marks in a test and weekly average time (hour) spent on video games of 3A students. The marks of all students in the test are different.



According to the above scatter diagram, answer the following questions.

(a) How many students are there in 3A?

(b) Find the number of hours spent on video games per week on average of the student getting the highest mark in the test.

(c) How many students spend more than 10 hours on video games per week on average?

39. The following data show the number of attendance at a children's playground last week.

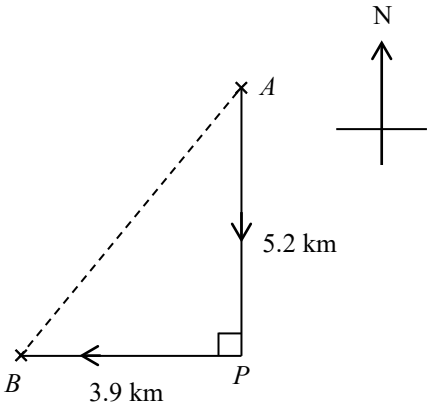
342, 579, 57, 64, 50, 72, 96

Find the mean and the median of the above data.

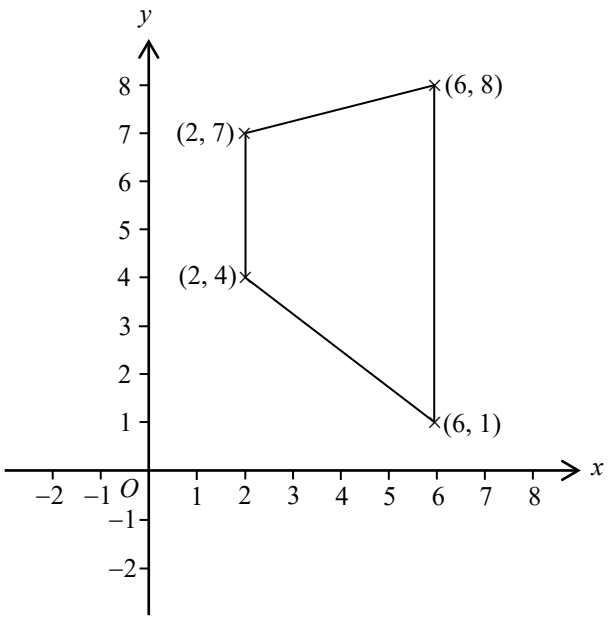
SECTION C: All working must be clearly shown.
Write the mathematical expressions, answers and statements/conclusions in the spaces provided in the ANSWER BOOKLET.

40. Carrie deposits \$50 000 in a bank. The interest rate is 2% p.a. **compounded** yearly. Find the amount she will receive after 3 years. Give the answer correct to the nearest dollar.

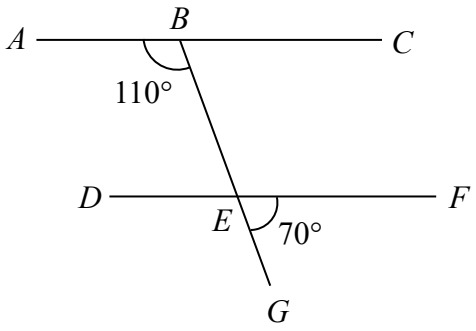
41. Tina walks due south for 5.2 km from A to P. Then, she walks due west for 3.9 km to B. Find the distance between A and B.



42. Find the area of the trapezium in the figure.



43. In the figure, ABC, DEF and BEG are straight lines. $\angle ABE = 110°$ and $\angle FEG = 70°$. Prove that $AC // DF$.



44. Complete the table for the equation $y = \frac{x-1}{2}$ in the **ANSWER BOOKLET**.

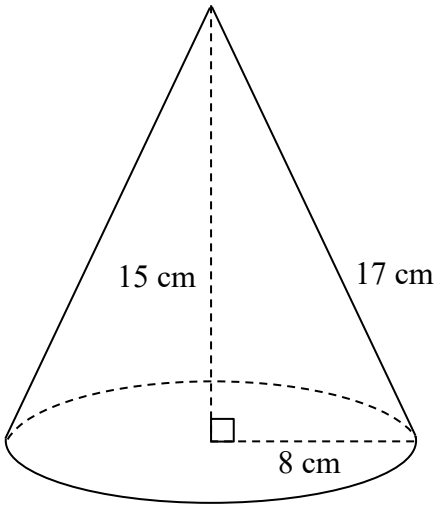
x	–3	1	3
y	–2		

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

45. In a department store, customers can get a discount for any purchase of \$500 or above. Miss Chan bought 3 items in the store. The prices of the items are \$256, \$102 and \$201 respectively.

Based on the description above, give **an appropriate approximation** for the price of each of the items. Hence, estimate the total amount that Miss Chan paid for the items. Briefly explain whether she can get the discount.

46. The figure shows a solid right circular cone of height 15 cm and base radius 8 cm. Its slant height is 17 cm. Find the curved surface area of the cone. Express the answer in terms of π.



47. A fast food shop offers 3 types of set lunch including set *A*, set *B* and set *C*. Each set lunch has a drink choosing from drink *X*, drink *Y* and drink *Z*.
    (a) Some of the possible outcomes are given in the table provided in the **ANSWER BOOKLET**. Fill the rest of possible outcomes in the blanks.
    (b) If Rosa chooses a set lunch and a drink randomly, find the probability that she chooses set *A* and drink *Y*.

END OF PAPER

Do not write on this page.

Answers written on this page will not be marked.

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