9	M	E	2	(	Q	)

Education Bureau

Territory-wide System Assessment 2019

Secondary 3 Mathematics

QUESTION BOOKLET

INSTRUCTIONS

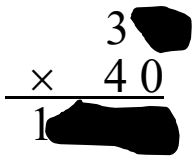
1. There are 47 questions in this paper.
2. The time allowed is 65 minutes.
3. Answer ALL questions in the separate ANSWER BOOKLET.
4. The use of HKEAA approved calculators is permitted.
5. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
6. Rough 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. Jenny multiplied a two-digit number by a two-digit number. Her work was made dirty accidentally. Which of the following **CANNOT** be the product?



A. 1 160

B. 1 240

C. 1 400

D. 1 560

2. $-8.321 \times 10^4 =$

A. $-83\,210$.

B. $-8\,321$.

C. $8\,321$.

D. $83\,210$.

3. The shopkeeper of a stationery store has x pencils. After discarding 2 broken pencils, the remaining pencils could all be put in boxes. If there are 6 pencils in each box, how many boxes of pencils are there?

A. $\left(\frac{x-2}{6}\right)$ boxes

B. $\left(\frac{x}{6}-2\right)$ boxes

C. $(6x-2)$ boxes

D. $6(x-2)$ boxes

4. Which of the following is **NOT** a polynomial ?

A. $6x^3 - 5x^2 + 4x$

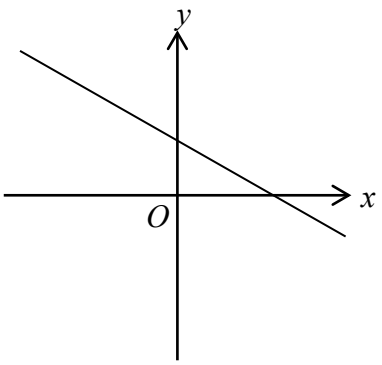
B. $6x^3 - 5x^2 + 4\sqrt{x} + 2$

C. $6x^3 - 5x^2 + 4x + 2$

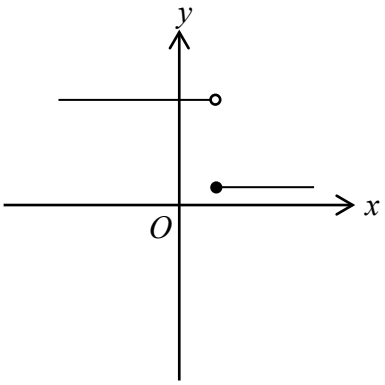
D. $6x^3 - 5x^2 + \frac{x}{4} + 2$

5. Which of the following may represent the graph of the equation $x + 2y - 8 = 0$?

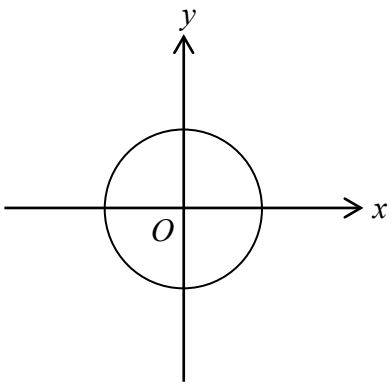
A.



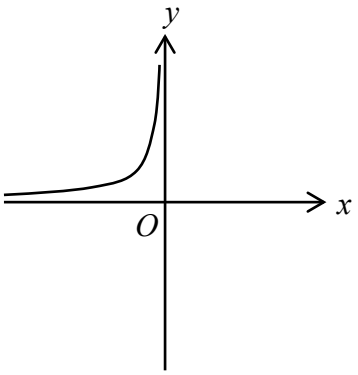
B.



C.



D.



6. David spends \$41 to buy 2 rulers and 3 pencils. Bowie spends \$92 to buy 5 rulers and 6 pencils. It is given that the prices of a ruler and a pencil are $\$x$ and $\$y$ respectively. Which of the following pairs of simultaneous equations shows the relation between x and y?

A. $\begin{cases} 3x+2y=41 \\ 6x+5y=92 \end{cases}$

B. $\begin{cases} 2x+3y=41 \\ 5x+6y=92 \end{cases}$

C. $\begin{cases} 2x+3y=41 \\ 6x+5y=92 \end{cases}$

D. $\begin{cases} 3x+2y=41 \\ 5x+6y=92 \end{cases}$

7. The price of a pair of sports shoes is $\$y$. The price of a jacket is $\frac{1}{3}$ that of a pair of sports shoes. Ryan spends \$1 400 to buy two pairs of sports shoes and one jacket.

Which of the following equations can be used to find the value of y?

A. $y+2(3y)=1400$

B. $2y+3y=1400$

C. $y+2\left(\frac{y}{3}\right)=1400$

D. $2y+\frac{y}{3}=1400$

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

A. $x+12>y+12$

B. $x-12>y-12$

C. $12x>12y$

D. $\frac{x}{-12}>\frac{y}{-12}$

9. Mr Lam takes High Speed Rail from Hong Kong West Kowloon station to Guangzhounan station in 51 mins (correct to the nearest minute). Which of the following could be the actual time taking the rail?

A. 51.6 mins

B. 51.5 mins

C. 50.6 mins

D. 50.4 mins

10. Which of the following health records shows the weight of a three-month-old baby with the most suitable unit and degree of accuracy?

A.

Health Record
Name: Sheung Kin On
Weight: 5 000 g

B.

Health Record
Name: Sheung Kin On
Weight: 5 431 g

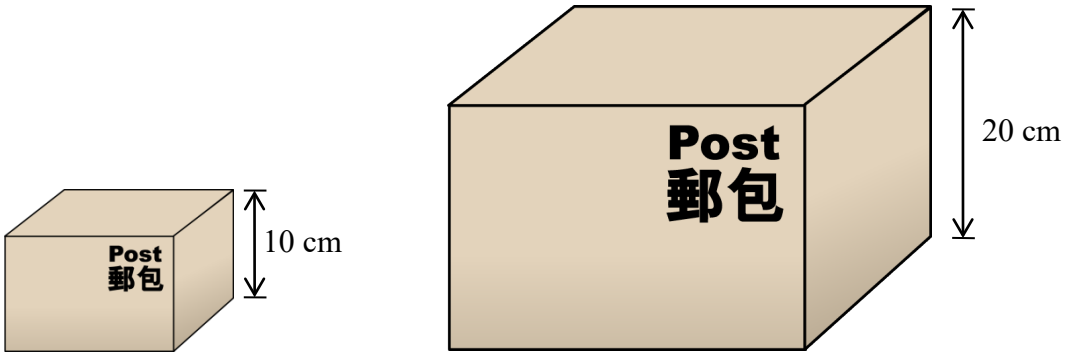
C.

Health Record
Name: Sheung Kin On
Weight: 5.43 kg

D.

Health Record
Name: Sheung Kin On
Weight: 5.431 27 kg

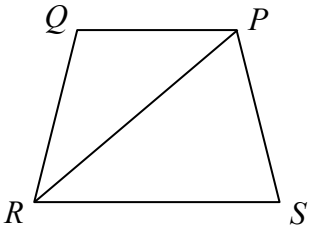
11. In the figure, Parcel A and Parcel B are similar solids. Their heights are 10 cm and 20 cm respectively. The volume of Parcel A is 1 200 cm^3. Find the volume of Parcel B.



Parcel A Parcel B

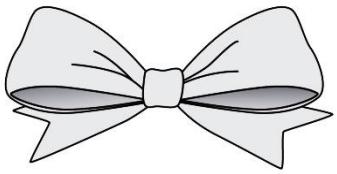
A. 2 400 cm^3
B. 4 800 cm^3
C. 7 200 cm^3
D. 9 600 cm^3

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



A. $\triangle PQR$
B. $\angle PQR$
C. PS
D. P

13.

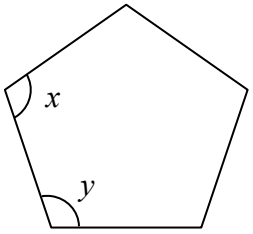


Will the size and shape of the above figure be changed after translation?

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

Go on to the next page

14. In the figure, x and y are



A. exterior angles of the pentagon.

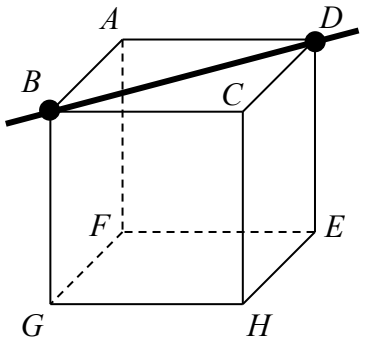
B. interior angles of the pentagon.

C. corresponding angles.

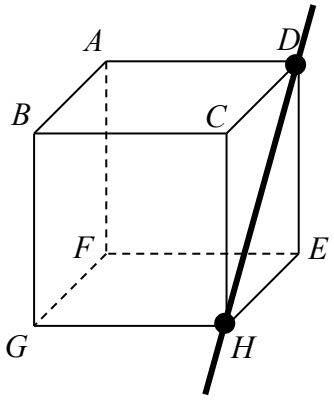
D. adjacent angles.

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

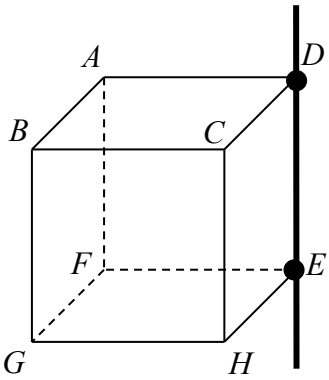
A.



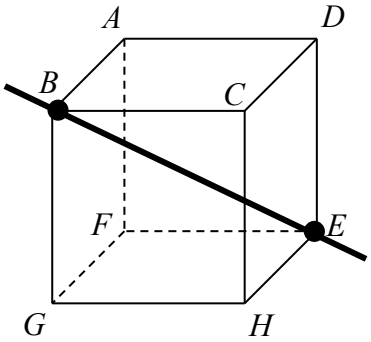
B.



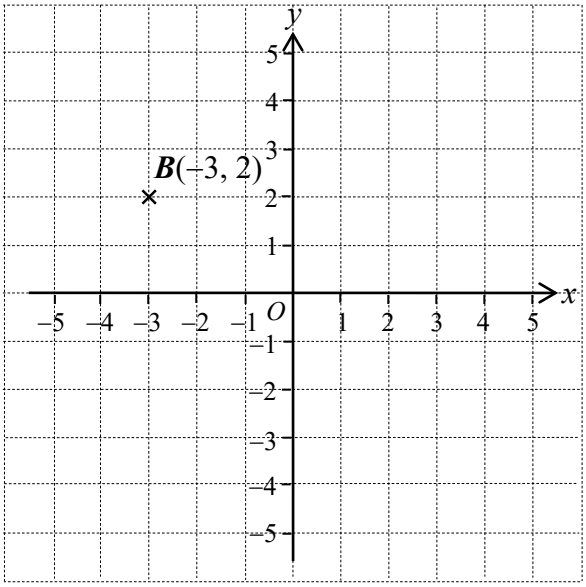
C.



D.



16. In the figure, $\boldsymbol{B}\ (-3, 2)$ is reflected about the y-axis to $\boldsymbol{B'}$. Find the coordinates of $\boldsymbol{B'}$.



A. (2, 3)

B. (3, –2)

C. (3, 2)

D. (–3, –2)

17. $A\ (-2, 5)$ and $B\ (4, -17)$ are two points in the rectangular coordinate plane. The coordinates of the mid-point of AB are

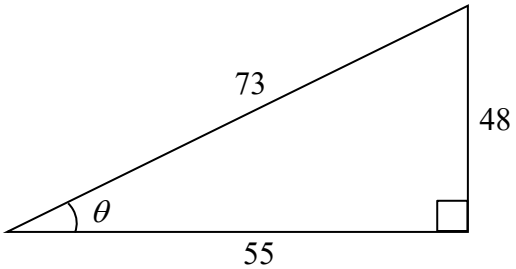
A. $(-2-4,\ 5-(-17))$.

B. $(-2+4,\ 5+(-17))$.

C. $\left(\dfrac{-2-4}{2},\ \dfrac{5-(-17)}{2}\right)$.

D. $\left(\dfrac{-2+4}{2},\ \dfrac{5+(-17)}{2}\right)$.

18. Find the value of $\cos\theta$ in the figure.



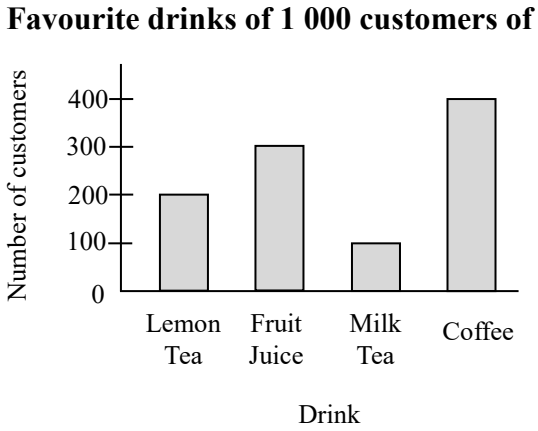
A. $\dfrac{48}{55}$

B. $\dfrac{48}{73}$

C. $\dfrac{55}{73}$

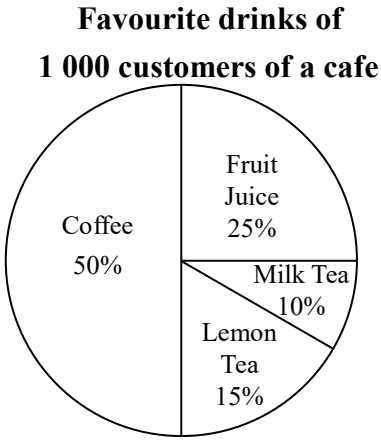
D. $\dfrac{73}{55}$

19. The bar chart below shows the favourite drinks of 1 000 customers of a cafe:

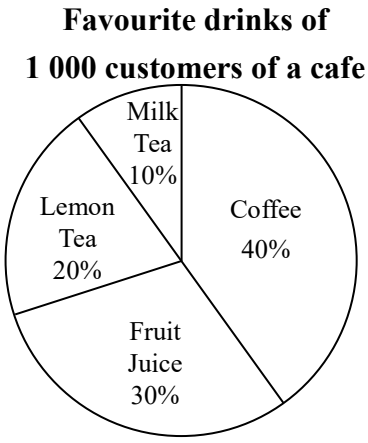


If the same set of data is presented by a pie chart, which of the following diagrams could be obtained?

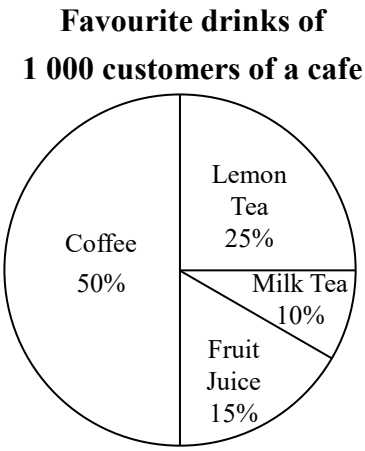
A.



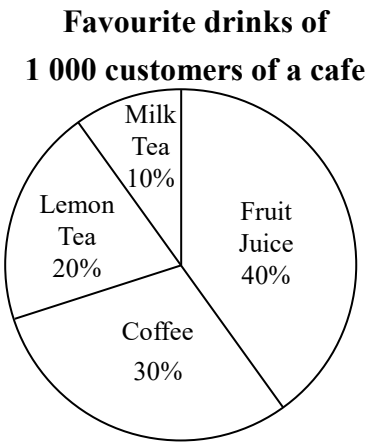
B.



C.



D.



20. A library officer wants to know which type of books has been borrowed most frequently. Which of the following is the most suitable method to collect data?

A. Study the past records of books being borrowed.

B. Record the number of people borrowing books in one day.

C. Hold an election for "My favorite book" .

D. Conduct a survey using questionnaires on the number of visits in the district of the library.

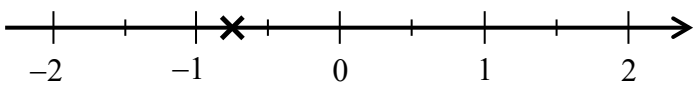
SECTION B: Write ALL the answers in the ANSWER BOOKLET.
Working need not be shown.

21. Directed numbers are used to represent the remaining stored value and the overdraft on an Octopus card.
For example,
– 20 dollars represents that the overdraft is 20 dollars.
Use a directed number to represent each of the following situations:

(i) The remaining stored value on Mary's Octopus card is 70 dollars.
(ii) The overdraft on John's Octopus card is 3 dollars.

22. Round off 0.018 71 to 3 significant figures.

23. Use the symbol '×' to mark the number $-\frac{7}{4}$ on the number line given in the **ANSWER BOOKLET**.
Example: $-\frac{3}{4}$ is marked on the number line below.



24. A scientific formula is given as follows:

$$E = \frac{mv^2}{2}$$

If $E = 10$ and $v = 2$, find the value of m.

Go on to the next page

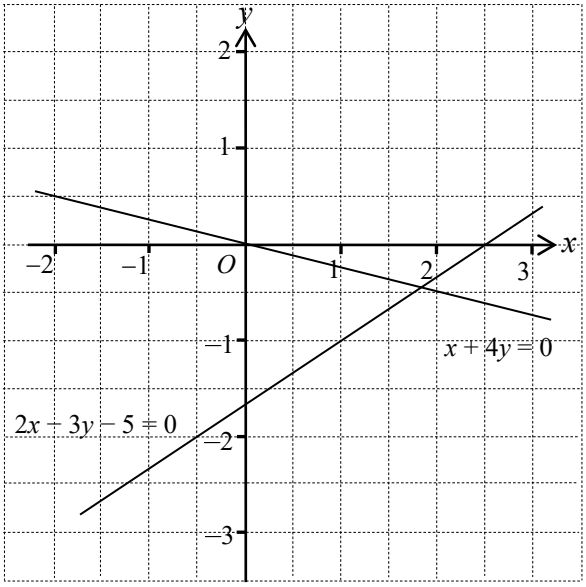
25. The n^{th} term of a sequence is $n^2 - 1$. Find the value of the 4^{th} term of the sequence.

26. Expand $(3x + 4)(x - 2)$.

27. Factorize $x^2 - 10x + 25$.

28. Simplify $\frac{1}{4f} - \frac{1}{6f}$.

29.



The above figure shows the graphs of $2x - 3y - 5 = 0$ and $x + 4y = 0$.

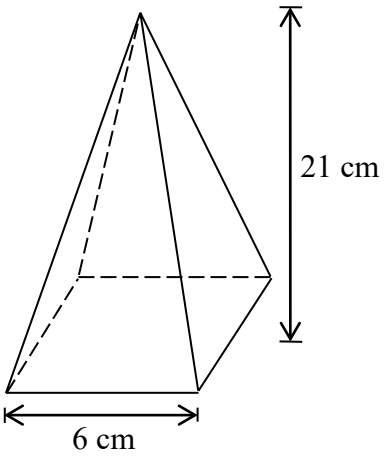
According to the given graphs, $(2.0, -0.5)$ is the * exact solution / approximate solution of the simultaneous equations $\begin{cases} 2x - 3y - 5 = 0 \\ x + 4y = 0 \end{cases}$.

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

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

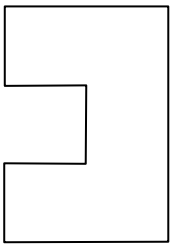
$\frac{4}{21}$ ☐ $\frac{5}{19}$

31. The height of the pyramid in the figure is 21 cm . Its base is a square of side 6 cm . Find the volume of the pyramid.

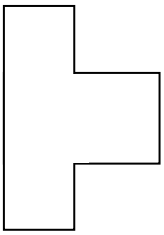


32. Which of the following polygons is / are concave? (May be more than one answer)

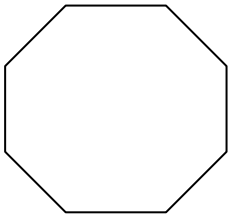
P.



Q.

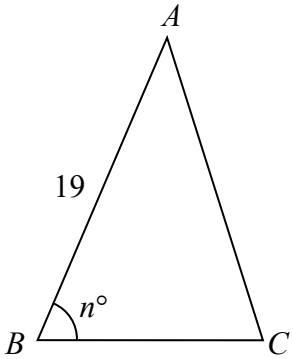


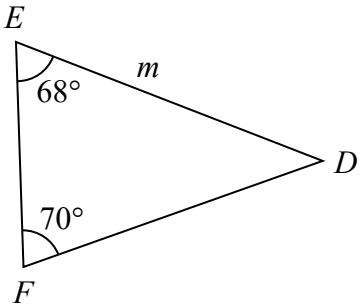
R.



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

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





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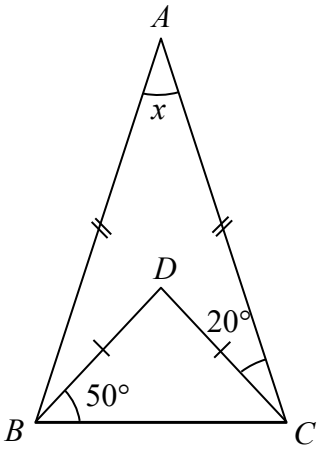
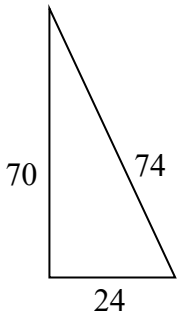
34. In the figure, $\triangle ABC$ and $\triangle DBC$ are isosceles triangles. Given that $AB = AC$, $DB = DC$, $\angle DBC = 50°$ and $\angle ACD = 20°$. Find x.

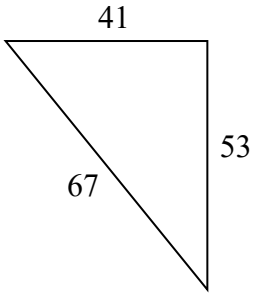


35. Which of the following must be right-angled triangle(s)? (May be more than one answer)

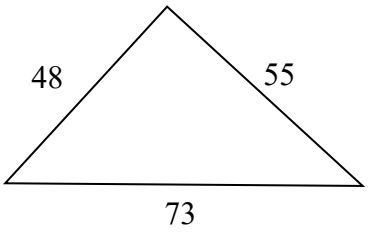
Triangle P



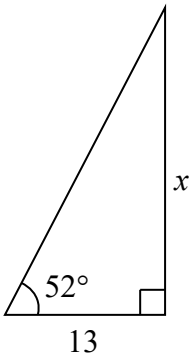
Triangle Q



Triangle R



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

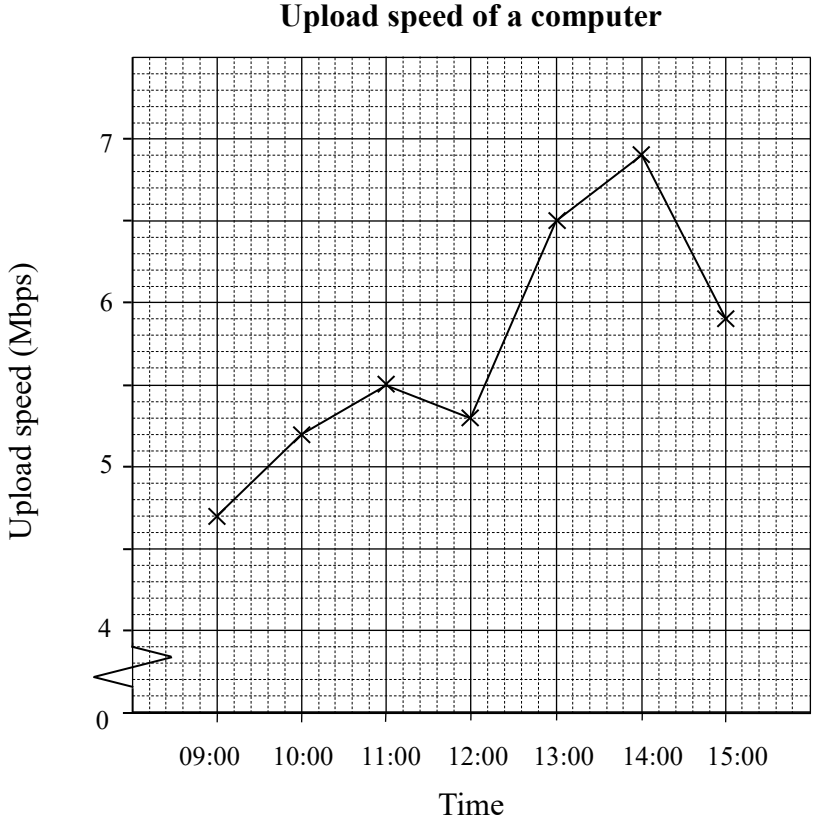


37. The following data show the number of exercise books in the school bags of 15 students.

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 following chart shows the upload speed (Mbps) of a computer.



According to the above chart, answer the following questions.

(a) At what time was the upload speed equal to 5.2 Mbps?

(b) At what time did the upload speed decrease most compared to the upload speed of one hour before?

(c) What was the difference of the upload speeds recorded at 12:00 and 13:00 ?

39. The table below shows the number of departures from Hong Kong last year of 60 interviewees in the airport.

Number of departures	0 – 4	5 – 9	10 – 14	15 – 19
Frequency	32	14	10	4

Find the modal class of the number of departures from Hong Kong last year of the 60 interviewees.

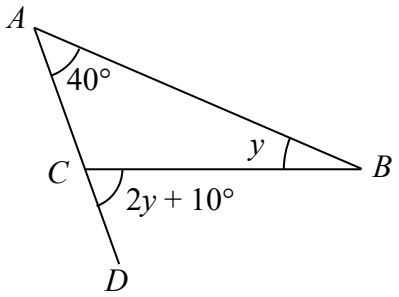
SECTION C: All working must be clearly shown.
Write the mathematical expressions, answers and statements/conclusions in the spaces provided in the ANSWER BOOKLET.

40. The cost of a smartphone is $\$6\,500$. The shop sells it at a loss of 12%. Find the selling price of the phone.

41. (a) Simplify $(a^4)^3$ and express the answer with positive index.

(b) Simplify $\dfrac{a^{-6}}{(a^4)^3}$ and express the answer with positive index.

42. In the figure, ACD is a straight line. $\angle BAC = 40°$, $\angle ABC = y$ and $\angle BCD = 2y + 10°$. Find y.



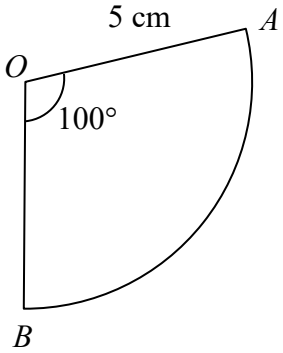
43. Solve the simultaneous equations $\begin{cases} 2x + y = 11 \\ x = 2y + 3 \end{cases}$.

44. Complete the table for the equation $x - 2y - 1 = 0$ in the **ANSWER BOOKLET**.

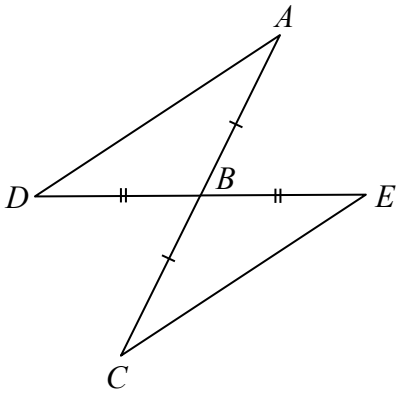
x	–3	1	3
y	–2		

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

45. In the figure, the radius of sector OAB is 5 cm and $\angle AOB = 100°$. Find the area of the sector. (Correct to 3 significant figures)



46. In the figure, ABC and DBE are straight lines. $AB = CB$ and $BD = BE$.
Prove that $\triangle ABD \cong \triangle CBE$.



47. The table below shows the number of times Secondary 3 students of a school used their Octopus cards last week.

Number of times using Octopus card	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29
Class mark	7	12	17	22	27
Frequency	10	16	24	12	8

Draw a frequency polygon in the **ANSWER BOOKLET** to represent the above data.

END OF PAPER

Do not write on this page.

Answers written on this page will not be marked.

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