9	M	E	2	(	Q	)

Education Bureau

Territory-wide System Assessment 2011

Secondary 3

Mathematics

QUESTION BOOKLET

INSTRUCTIONS

1. There are 52 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. Calculate $3-3(-2)$.

A. 9
B. 2
C. -2
D. 0

2. Round off 1.093 93 to 3 decimal places.

A. 1.09
B. 1.093
C. 1.093 9
D. 1.094

3. Which of the following is correct?

A. $\sqrt{121} < 11 < \sqrt{123}$
B. $\sqrt{142} < 12 < \sqrt{144}$
C. $\sqrt{168} < 13 < \sqrt{170}$
D. $\sqrt{193} < 14 < \sqrt{195}$

4. Which of the following objects is the fastest?

A. Object A: the speed is 18 m/s
B. Object B: the speed is 700 m/min
C. Object C: the speed is 8 000 m/h
D. Object D: the speed is 50 km/h

5. Which of the following is a polynomial?

A. $3x^2$

B. $3^x - 5x + 2$

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

D. $\frac{2}{x} + 7$

6. Simplify $5m^3 - 2m^3$.

A. $3m$

B. $3m^3$

C. 3

D. $\frac{5}{2}$

7. The sum of 3 consecutive even numbers is 420. If the smallest of them is x, which of the following equations can be used to find the value of x?

A. $x + 2x + 4x = 420$

B. $2x + 4x + 6x = 420$

C. $x + (x + 1) + (x + 2) = 420$

D. $x + (x + 2) + (x + 4) = 420$

8. Which of the following points lies on the straight line $x + 2y = 0$?

A. $(-200\ ,\ -100)$

B. $(-100\ ,\ 200)$

C. $(-200\ ,\ 100)$

D. $(100\ ,\ -200)$

9. If $x \leq y$, which of the following inequalities **MUST** be correct?

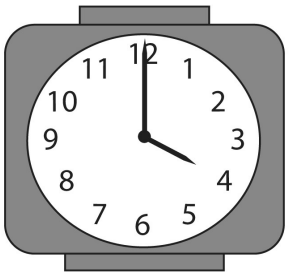
A. $2x \geq 2y$

B. $\frac{x}{-2} \geq \frac{y}{-2}$

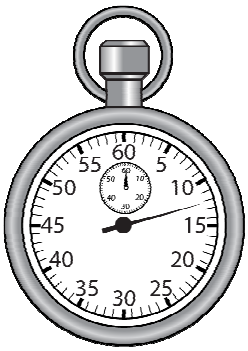
C. $x-2 \geq y-2$

D. $-x-2 \leq -y-2$

10.



Clock



Stopwatch

The figure shows a clock and a stopwatch with different graduations. Vivian wants to measure the time it takes to type a Chinese character. Of the following methods, which one is the best?

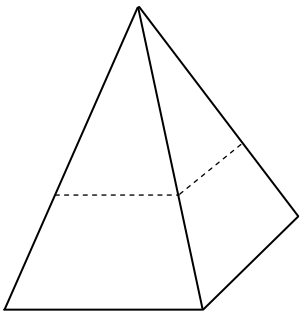
A. Vivian types one Chinese character and measures the time using the clock.

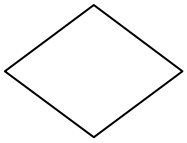
B. Vivian types one Chinese character and measures the time using the stopwatch.

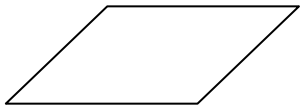
C. Vivian types 200 Chinese characters, measures the time using the clock, and then divides the time taken by 200.

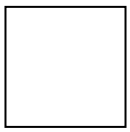
D. Vivian types 200 Chinese characters, measures the time using the stopwatch, and then divides the time taken by 200.

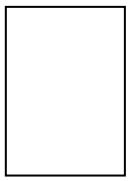
11. The figure shows a right pyramid with square base.
Ronald sketches its cross-section parallel to the base.
Which of the following sketches is the plane diagram of the cross-section?



A. 

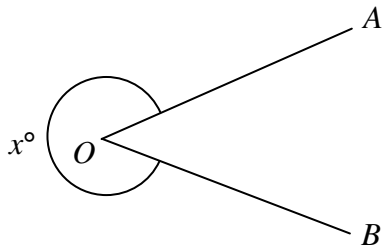
B. 

C. 

D. 

12. In the figure, AO and BO are straight lines. $x°$ is

A. a straight angle.
B. a reflex angle.
C. an acute angle.
D. an obtuse angle.



13. Figure X is changed to Figure Y after a single transformation.

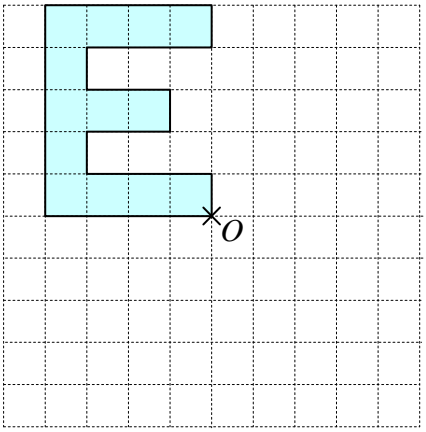
Figure X

Figure Y

The transformation is

A. rotation.
B. reflection.
C. enlargement.
D. translation.

14.

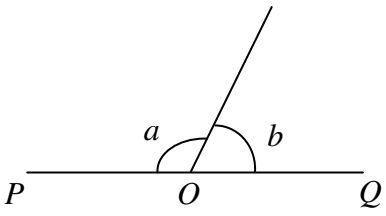


Will the size and shape of the above figure be changed when it is rotated about O through 180° in anticlockwise direction?

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

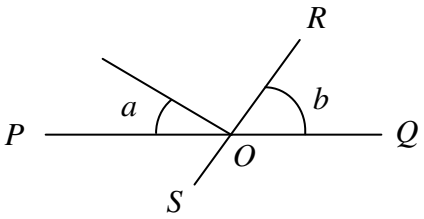
15. Which of the following figures shows that a and b are vertically opposite angles?

A.



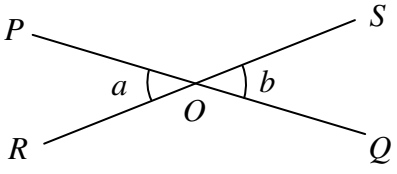
POQ is a straight line

B.



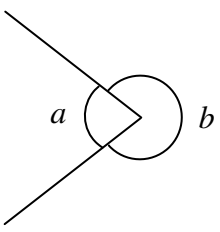
POQ and ROS are straight lines

C.



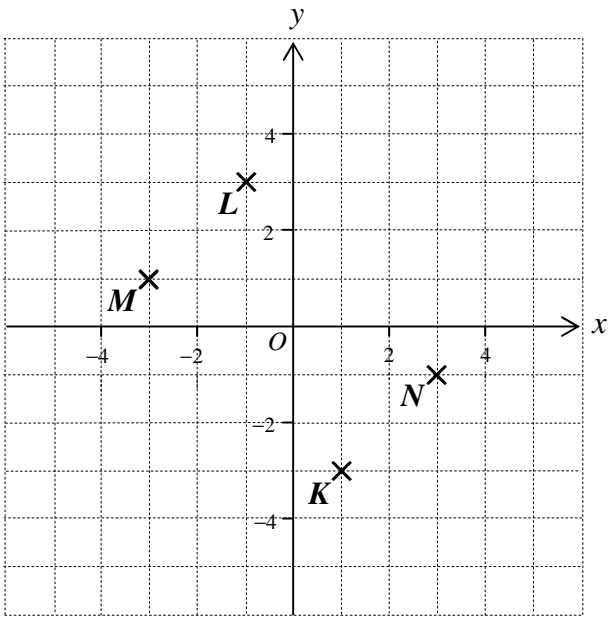
POQ and ROS are straight lines

D.



16. In the figure, which point can be represented by (3 , −1)?

A. ***K***
B. ***L***
C. ***M***
D. ***N***



17. If $A(5 , 8)$ and $B(-3 , -6)$ are two points in a rectangular coordinate plane, the distance between A and B is

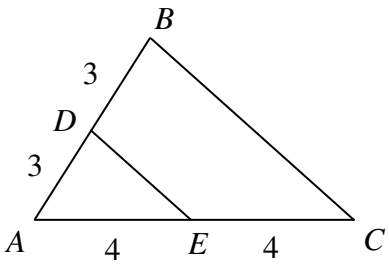
A. $\sqrt{[5-(-3)] + [8-(-6)]}$ units.

B. $\sqrt{[5+(-3)] + [8+(-6)]}$ units.

C. $\sqrt{[5-(-3)]^2 + [8-(-6)]^2}$ units.

D. $\sqrt{[5+(-3)]^2 + [8+(-6)]^2}$ units.

18. In the figure, AEC and ADB are straight lines, $AD = DB = 3$ and $AE = EC = 4$.
Prove that $\triangle ABC$ and $\triangle ADE$ are similar.



Which of the following proofs is correct?

A. $AD = DB$ (given)
$AE = EC$ (given)
$DE = BC$ (given)
$\therefore \triangle ABC \cong \triangle ADE$ (SSS)

B. $\frac{AB}{AD} = \frac{6}{3} = 2$
$\frac{AC}{AE} = \frac{8}{4} = 2$
$\therefore \frac{BC}{DE} = 2$ (corr. sides, ~△s)
$\therefore \frac{AB}{AD} = \frac{AC}{AE} = \frac{BC}{DE}$
$\therefore \triangle ABC \sim \triangle ADE$ (3 sides proportional)

C. $\angle BAC = \angle DAE$ (common angle)
$AD = DB$ (given)
$AE = EC$ (given)
$\therefore \triangle ABC \cong \triangle ADE$ (SAS)

D. $\angle BAC = \angle DAE$ (common angle)
$\frac{AB}{AD} = \frac{6}{3} = 2$
$\frac{AC}{AE} = \frac{8}{4} = 2$
$\therefore \frac{AB}{AD} = \frac{AC}{AE}$
$\therefore \triangle ABC \sim \triangle ADE$ (ratio of 2 sides, inc. $\angle$)

19. Which of the following data is continuous?

A. The number of compact discs in a drawer
B. The weight of a steak
C. The number of passengers in a bus
D. The number on a restaurant queue ticket

20. The following stem-and-leaf diagram shows the study hours of 20 students in Applied Learning Courses.

Study hours of 20 students in Applied Learning Courses

Stem (10 hours)	Leaf (1 hour)
1	2 5 9
2	0 2 2
3	0 0 0 1 1 4 9
4	2 8 8 9 9
5	0 9

According to the above diagram, which of the following is correct?

A. median = 31 , lower quartile = 22
B. median = 31 , lower quartile = 48
C. median = 30 , lower quartile = 22
D. median = 30 , lower quartile = 48

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

21. +100 represents moving 100 m to the east. Use positive numbers, negative numbers or zero to represent the following situations:

(i) Moving 200 m to the east
(ii) Moving 50 m to the west

22. In the following situations, are the values mentioned exact or estimated?

(i) There are 200 000 trees in Hong Kong now.
(ii) A tree expert examined 13 trees yesterday.

23. The diameter of the cross-section of an optical fibre is about 0.000 065 m. Use scientific notation to represent this number.

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

(i) A machine produces 90 cans of soft drinks hourly.
(ii) The weight of David is twice the weight of May.

25. Karen is x years old now and her age is three times John's age. After 4 years, John will be y years old. Write down an equation to represent the relationship between x and y.

26. Find the number of terms of the polynomial $-6+7x-5x^2+x^3$.

27. Expand $(a^2+b-2)(ab)$.

28. Factorize $4-9x^2$.

29. Factorize $3x^2+10x+3$.

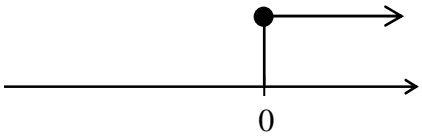
30. Simplify $\frac{3}{2a}-\frac{3}{4a}$.

31. In the **ANSWER BOOKLET**, fill in the boxes with $>$ or $<$ to express the relations between the numbers.

i. $\sqrt{2}$ $\square$ $\sqrt{3}$

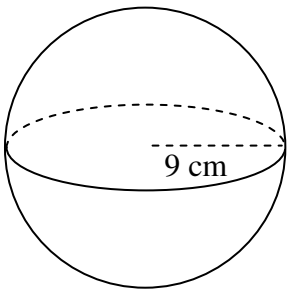
ii. $\frac{1}{\sqrt{3}}$ $\square$ $\frac{1}{\sqrt{2}}$

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

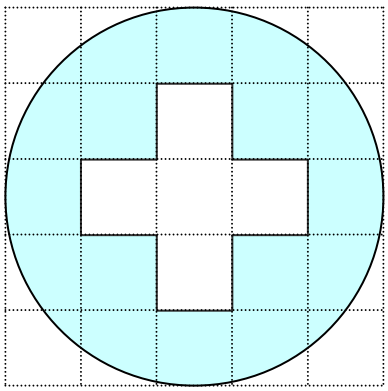


33. The area of a circle is $36\pi\,\text{cm}^2$. Find its radius.

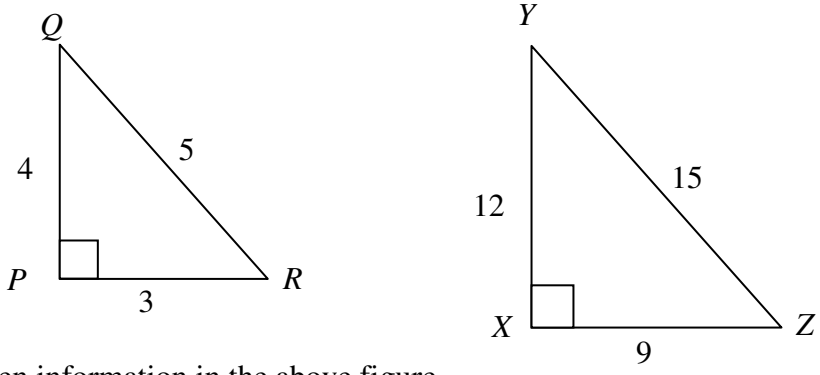
34. The figure shows a sphere of radius 9 cm. Find the volume of the sphere. Correct the answer to the nearest cm^3.



35. Draw **ALL** axes of symmetry of the following figure in the **ANSWER BOOKLET**. (**MORE THAN** one axis of symmetry)



36.



According to the given information in the above figure,

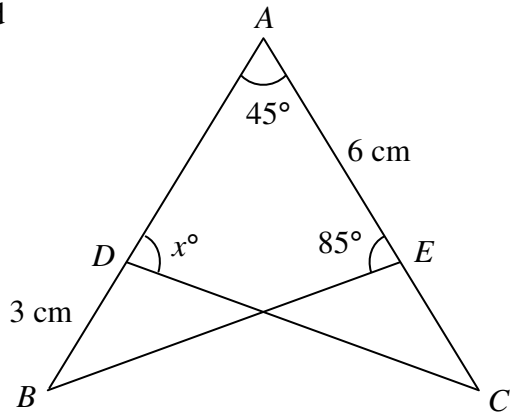
(a) identify whether $\triangle PQR$ and $\triangle XYZ$ are congruent or similar triangles, and

(b) choose the correct reason.

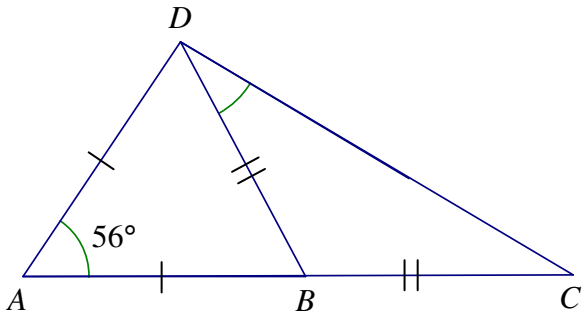
37. In the figure, $\triangle ABE \cong \triangle ACD$. Find

(a) the value of x,

(b) the length of AB.

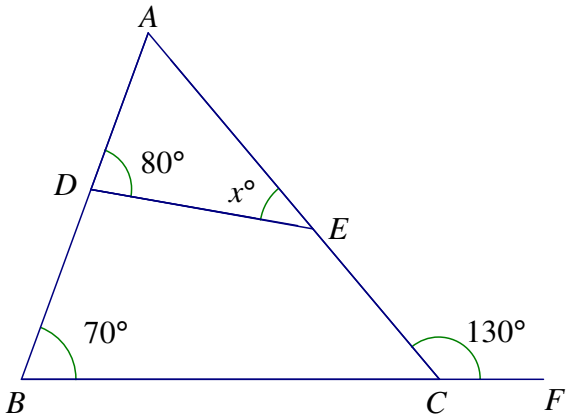


38. In the figure, ABC is a straight line, $AB = AD$ and $BC = BD$. Find $\angle BDC$.

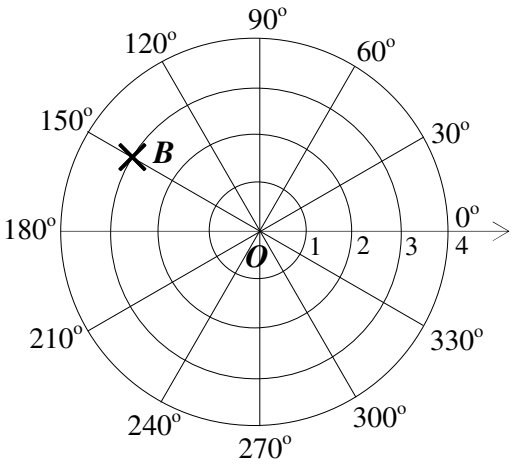


39. $A(3 , -1)$ and $B(-3 , 5)$ are two points in the rectangular coordinate plane. Find the coordinates of the mid-point of line segment AB.

40. In the figure, ADB, AEC and BCF are straight lines, $\angle ADE = 80°$, $\angle ABC = 70°$ and $\angle ACF = 130°$. Find the value of x.



41. Find the polar coordinates of point $\boldsymbol{B}$ in the figure.



42. Connie is doing a survey to analyze her classmates' participation in extra-curricular activities in this academic year. The survey is conducted in the following four stages.
Arrange these stages in correct order. For example: (1) → (2) → (3) → (4)

(1) Analyze graphs and data to reach conclusions.
(2) Organize the data of classmates' participation in various extra-curricular activities.
(3) Use suitable graphs to represent data.
(4) Give questionnaires to all classmates and collect their opinions.

43. The following table shows the training hours of 40 swimming team members during the last week.

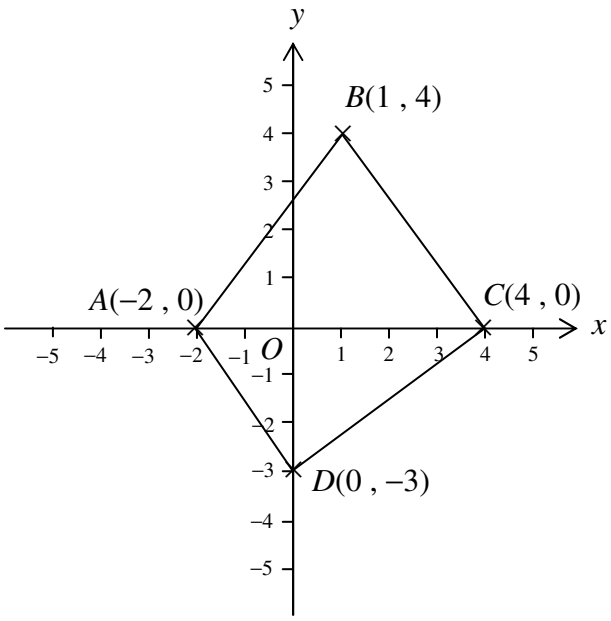
Training hours	1 – 3	4 – 6	7 – 9	10 – 12	13 – 15
Number of members	4	6	10	14	6

Find the mean training hours of the members for the last week.

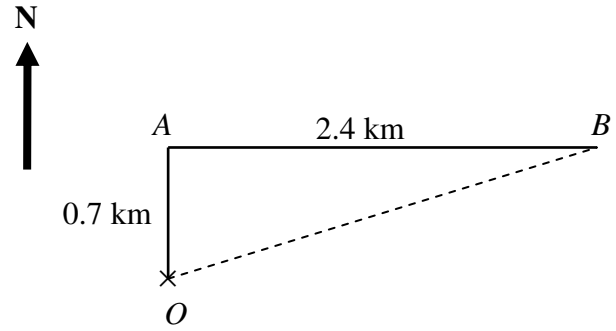
SECTION C: All working must be clearly shown.
Write the mathematical expressions, answers and statements/conclusions in the spaces provided in the ANSWER BOOKLET.

44. The marked price of a TV set is \$12 000. If it is sold at a discount of 15%, find the discount.

45. Find the area of quadrilateral *ABCD* in the rectangular coordinate plane.



46. At point *O*, a man starts walking due north for 0.7 km to point *A* and then walks due east for 2.4 km to point *B*. Find the distance between point *O* and point *B*.



47. Simplify $x^{12}\left(\frac{y}{x}\right)^3$ and express the answer with positive indices.

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

x	-2	0	2
y			1

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

49. A mixture weighs 20 g. It is a mixture of sand and rice. The weight of sand in the mixture is 8 g.

(a) Find the weight of sand : the weight of rice.

(b) Michael adds an extra amount of sand to the mixture so that the ratio of the weight of sand to rice is changed to 5 : 6. How many grams of sand should he add?

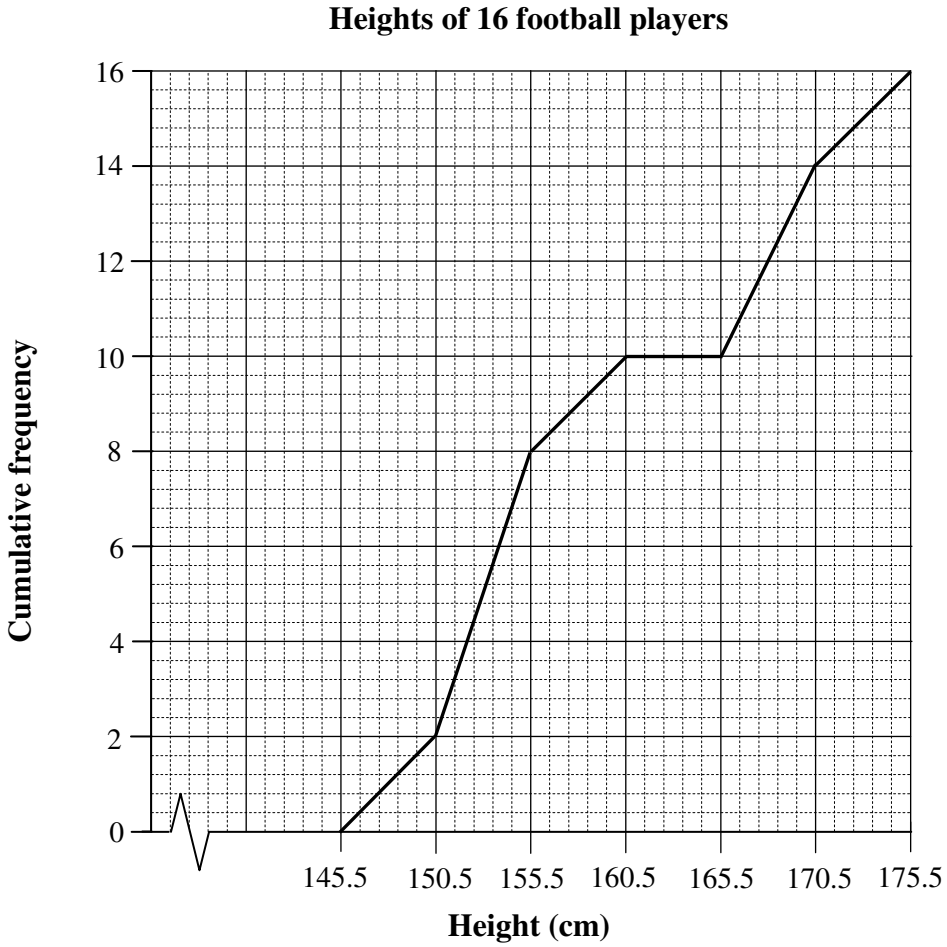
50. The table below shows the test marks of 8 students in Mathematics and Science.

Student	**Mathematics (marks)**	**Science (marks)**
A	2	2
B	5	4
C	8	6
D	10	10
E	12	11
F	14	16
G	15	18
H	18	18

(a) The marks of Student A to Student F are indicated on the scatter diagram in the **ANSWER BOOKLET**. Complete the diagram with the marks of Student G and Student H.

(b) According to the completed diagram, what is the relationship between their marks in the two subjects?

51. The following cumulative frequency polygon shows the heights of 16 football players.



(a) How many players are shorter than 160.5 cm?

(b) How many players whose heights are between 150.5 cm and 155.5 cm?

(c) The first class interval is 146 cm — 150 cm. If only 3 players are taller than James, which class interval should James' height belong to?

52. Figure 1: There is an empty rectangular tank. The volume of fruit juice in the bottle is 250 mL.
Figure 2: The juice is completely poured into the tank and the rise in the water level is AB.

Estimate the capacity of the tank and explain your estimation method.

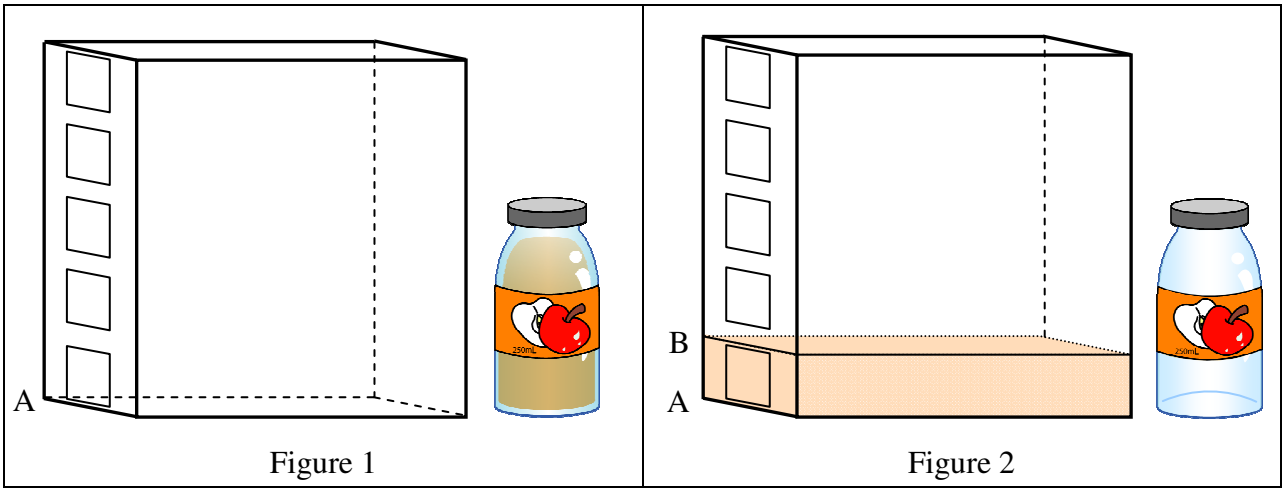


Figure 1 Figure 2

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