9	M	E	3	(	Q	)

Education Bureau

Territory-wide System Assessment 2016

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	$= \pi rl$
	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 shop manager records the number of mobile phones sold yesterday.
(ii) A student wants to know the total number of mobile phones owned by Hong Kong people.

	(i)	(ii)
A.	To compute the exact value	To compute the exact value
B.	To compute the exact value	To estimate
C.	To estimate	To compute the exact value
D.	To estimate	To estimate

2. Round off 1.040 95 to 3 significant figures.

A. 1.04
B. 1.041
C. 1.041 0
D. 1.040 00

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

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

4. The prices of an orange and a mango are \$3 and \$7 respectively. Betty pays not more than \$35 to buy x oranges and y mangos. Which of the following inequalities represents the relationship between x and y?

A. $3x + 7y > 35$
B. $3x + 7y < 35$
C. $3x + 7y \geq 35$
D. $3x + 7y \leq 35$

5. $(-5)^2 =$

A. 25.
B. – 25.
C. 10.
D. – 10.

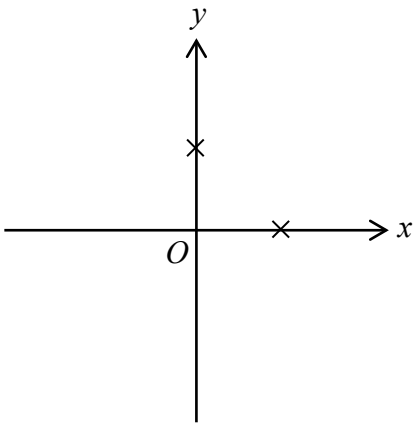
6. Determine whether each of the following is factorization or expansion.

(i)	$3x^3 + 16x^2 + 23x + 6$ $= (3x+1)(x+2)(x+3)$
(ii)	$(3x+1)(x+2)(x+3)$ $= 3x^3 + 16x^2 + 23x + 6$

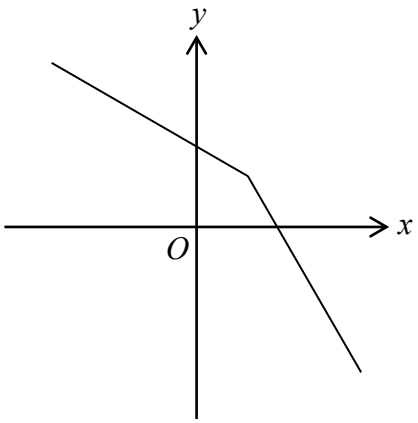
A. (i) Expansion (ii) Factorization
B. (i) Factorization (ii) Expansion
C. (i) Expansion (ii) Expansion
D. (i) Factorization (ii) Factorization

7. Which of the following may represent the graph of the equation $x + y - 1 = 0$?

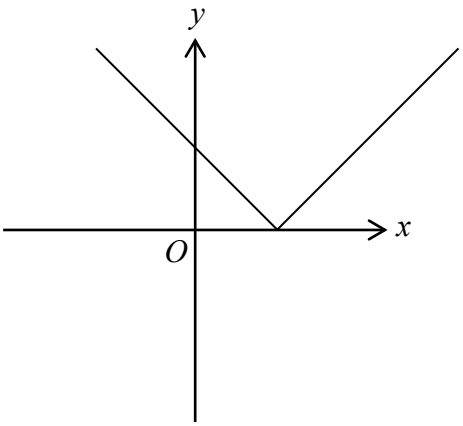
A.



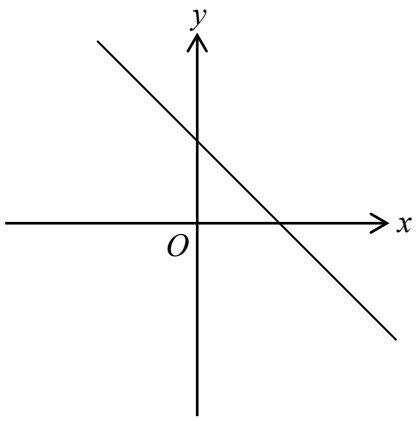
B.



C.



D.



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

A. $\frac{x}{10} < \frac{y}{10}$

B. $-\frac{x}{10} > -\frac{y}{10}$

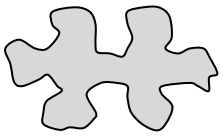
C. $10x > 10y$

D. $x - 10 < y - 10$

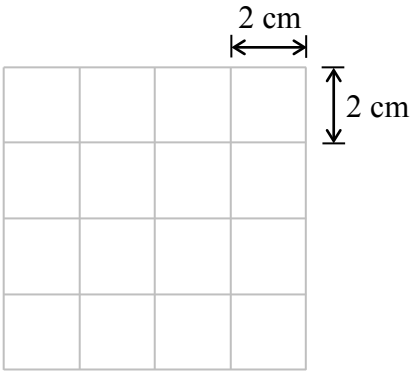
Go on to the next page

9. The width of a washing machine is 65 cm (correct to the nearest cm). Which of the following is the lower limit and upper limit of the actual width of the washing machine?

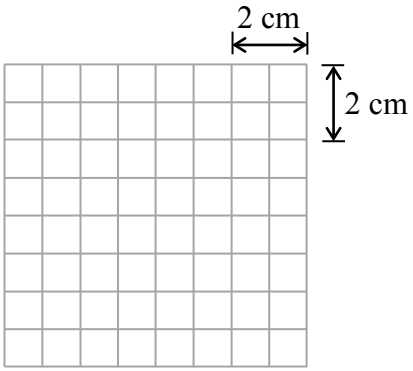
	Lower limit	Upper limit
A.	60 cm	70 cm
B.	64 cm	66 cm
C.	64.5 cm	65.5 cm
D.	64.95 cm	65.05 cm

10. Calvin needs to measure the area of the figure  . Which of the following graph papers can give a more accurate measurement?

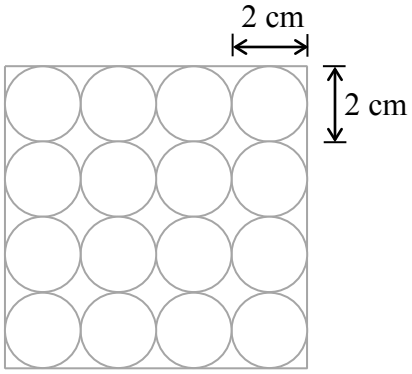
A.



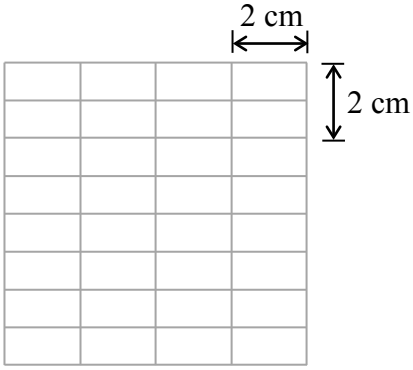
B.



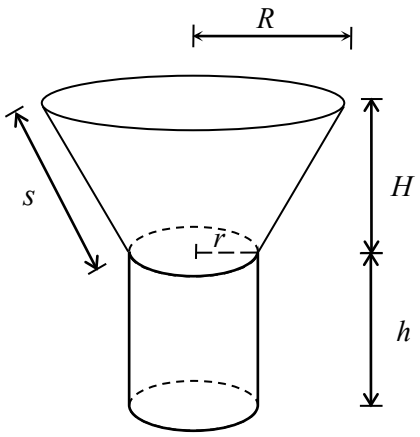
C.



D.



11.



The solid in the figure is formed by a frustum and a cylinder. The bases of the frustum are both circles. The unknowns are defined as follows:

Frustum	
R	Radius of the larger base
r	Radius of the smaller base
H	Height
s	Lateral height

Cylinder	
r	Base radius
h	Height

By considering the **dimensions**, determine which of the following could express the volume of the solid.

A. $\frac{\pi}{3}\left[H(R^2+rR+r^2)+3r^2h\right]$

B. $\frac{\pi}{3}\left[(r+R)s+2rh+r^2+R^2\right]$

C. $\pi(r+R+2h+2H+s)$

D. $\pi(r+R)s$

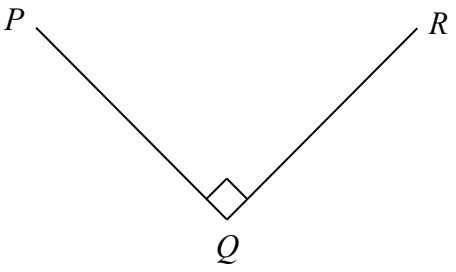
12. Which of the following represents a line segment shown in the figure?

A. P

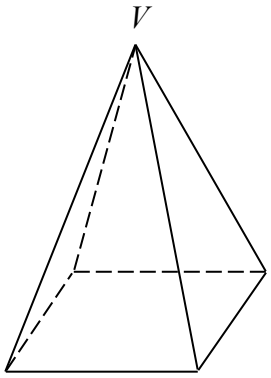
B. PQ

C. PQR

D. $\angle PQR$

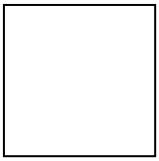


13. The figure shows a right pyramid. Its base is a square. Tony sketches a cross-section which is perpendicular to the base and passing through vertex V.



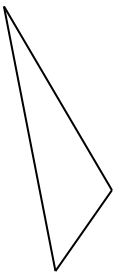
Which of the following could express the plane diagram of the cross-section?

A.

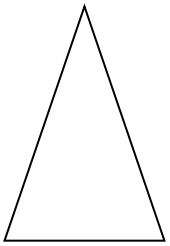


B.

C.

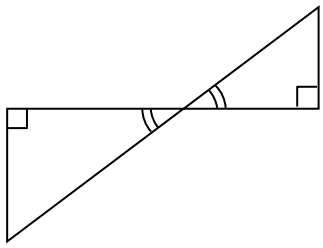


D.

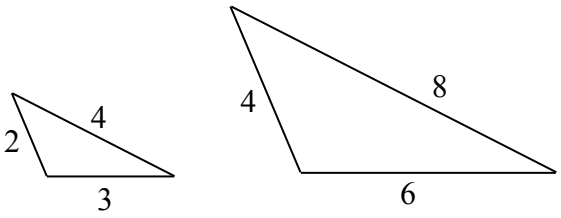


14. Which of the following pairs of triangles **CANNOT** be similar?

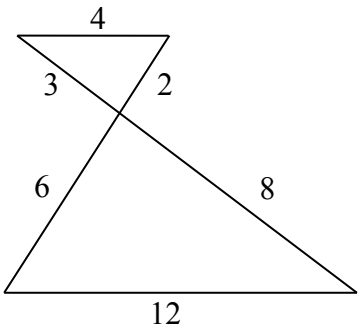
A.



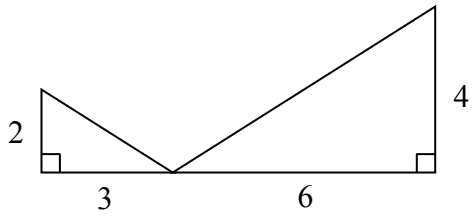
B.



C.

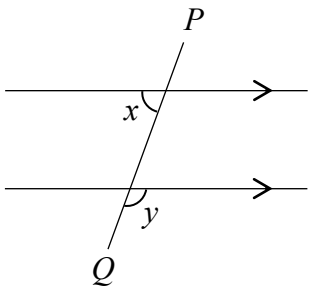


D.

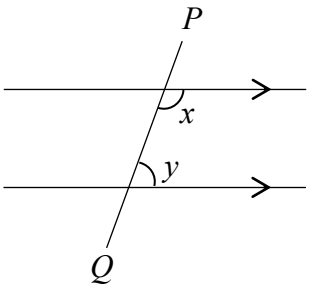


15. In each of the following figures, PQ is a straight line. Which figure shows that x and y are a pair of **alternate angles**?

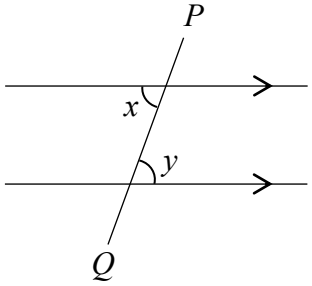
A.



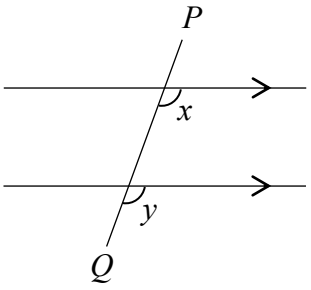
B.



C.

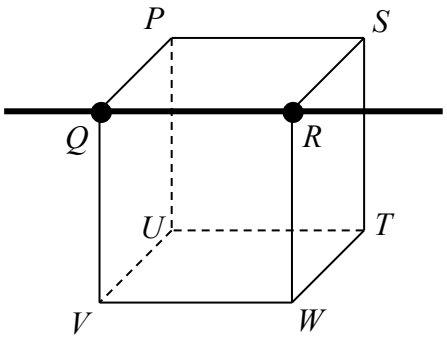


D.

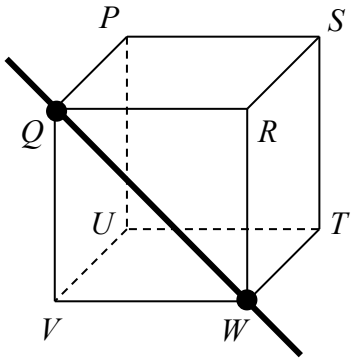


16. In the following figures, which thick line is an axis of rotational symmetry of cube *PQRSTUVW*?

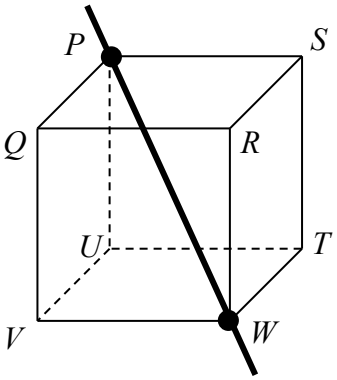
A.



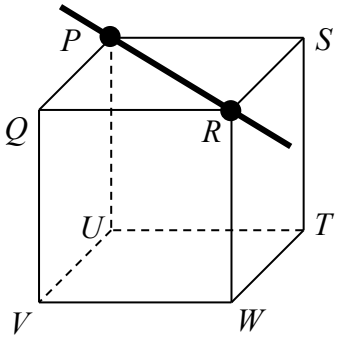
B.



C.

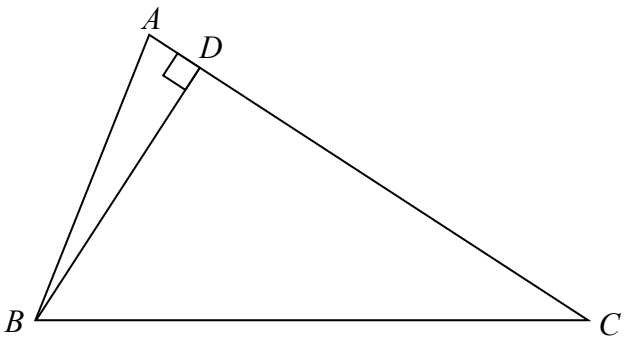


D.



17. In $\triangle ABC$, $BD \perp AC$. *BD* **MUST** be

A. an altitude of $\triangle ABC$.
B. a median of $\triangle ABC$.
C. an angle bisector of $\triangle ABC$.
D. a perpendicular bisector of $\triangle ABC$.



18. $A(2\ ,\ 8)$ and $B(5\ ,\ 12)$ are two points on a straight line L in a rectangular coordinate plane. Find the slope of L.

A. $\frac{7}{20}$

B. $\frac{20}{7}$

C. $\frac{3}{4}$

D. $\frac{4}{3}$

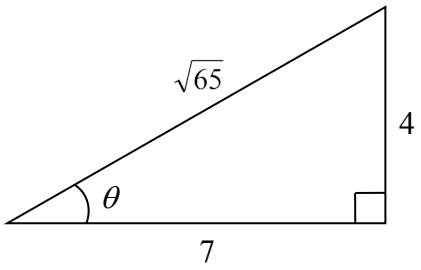
19. Find the value of $\cos\theta$ in the figure.

A. $\frac{\sqrt{65}}{7}$

B. $\frac{7}{\sqrt{65}}$

C. $\frac{4}{\sqrt{65}}$

D. $\frac{\sqrt{65}}{4}$



20. The following table shows the unemployment rate of a country from 2008 to 2014.

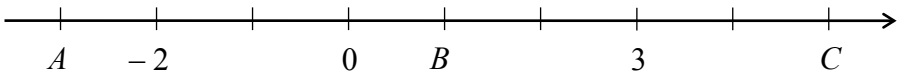
Year	2008	2009	2010	2011	2012	2013	2014
Unemployment rate (%)	3.5	5.3	4.3	3.4	3.3	3.4	2.9

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

A. Broken line graph
B. Stem-and-leaf diagram
C. Scatter diagram
D. Cumulative frequency curve

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

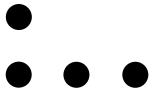
21. Write down the numbers represented by A, B and C on the number line below.



22. Round off $8.990\,4$ to 3 decimal places.

23. In a bag of 12 marbles, 5 are red, and the rest are green. Find the ratio of the number of red marbles to the number of green marbles.

24. Figure 1 to Figure 4 consist of 2, 3, 4 and 5 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. Simplify $(4a+5)+(7a-3)$.

26. Expand $m(m+2)$.

27. Factorize $x^2 - 16$.

28. Simplify $\left(\frac{3}{2x}\right)\left(\frac{2}{3x}\right)$.

29. Make H the subject of the formula $G = \frac{H+3}{2}$.

30. Solve the inequality $x - 10 \leq 20$.

31. In the following figures, Figure B is formed by filling four parts of Figure A with the same colour as shown. Determine from the figures the number of axes of symmetry of Figure A and Figure B respectively.

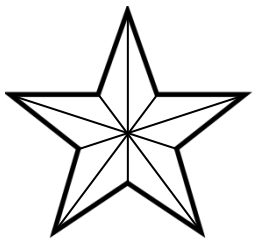


Figure A

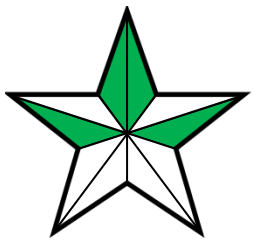
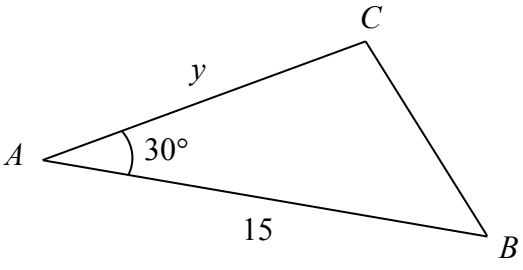
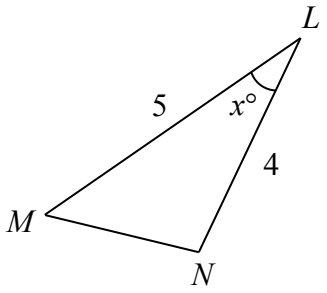


Figure B

32.



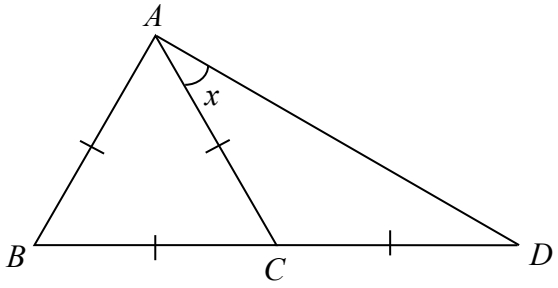


In the figure, $\triangle ABC \sim \triangle LMN$. Find

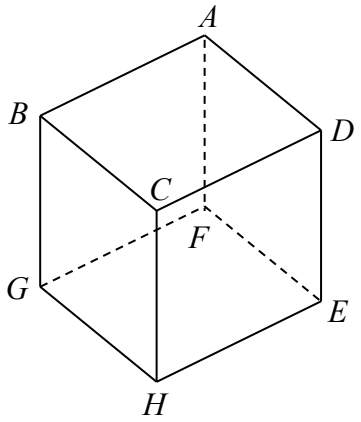
(a) the value of x,

(b) the value of y.

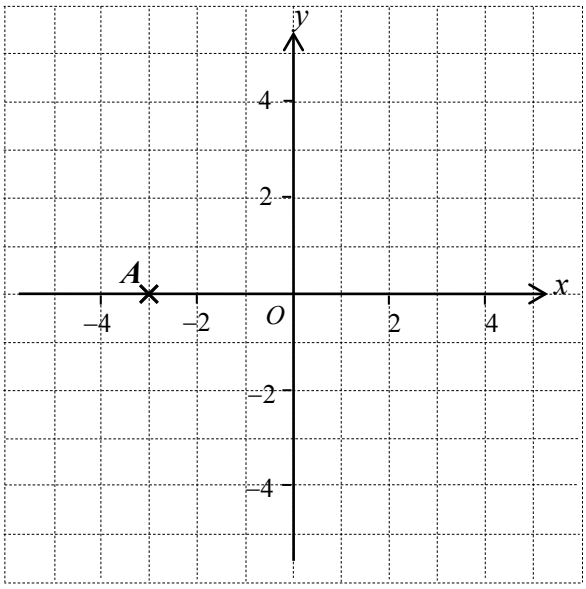
33. In the figure, $\triangle ABC$ is an equilateral triangle. BCD is a straight line, $AC = CD$ and $\angle DAC = x$. Find x.



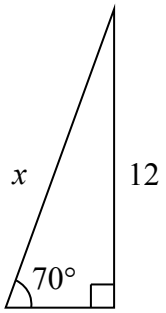
34. The figure shows a cube $ABCDEFGH$. By using the vertices in the figure, name the angle between the plane $DCHE$ and the horizontal plane $ABCD$.



35. Find the coordinates of point A in the figure.



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



37. A shopping mall manager is doing a survey on the number of people entering and leaving the mall. The survey is conducted in the following four stages.

    (1) Organise the record of the number of people entering and leaving the mall at different time intervals into a table.
    (2) Analyse the charts and draw conclusions.
    (3) Record the number of people entering and leaving the mall at different time intervals.
    (4) According to the table, present the data by using suitable charts.

    Arrange these stages in correct order. For example: (1) → (2) → (3) → (4)

38. The following data show the temperatures (°C) recorded in 5 different districts:

    15, 16, 14, 17, 12

    Find the median of the above data.

39. Mary joins a drawing competition. The following table shows the weight of each marking item and her marks in these items.

	Marking item		
	Drawing skills	Main idea	Use of materials
Mark	78	80	90
Weight	50%	30%	20%

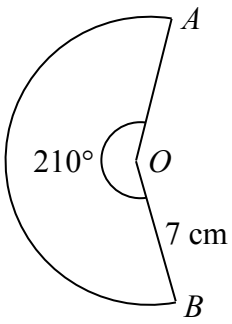
    Find the weighted mean mark of Mary.

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

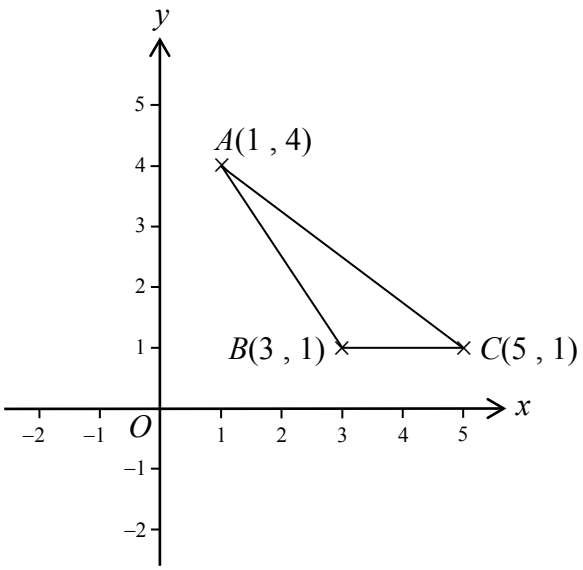
40. Simplify $y^6\left(\frac{3}{y}\right)^2$ and express the answer with positive index.

41. Peter deposits \$15 625 in a bank. The interest rate is 4% p.a. compounded yearly. Find the amount he will receive after 3 years.

42. In the figure, the radius of sector OAB is 7 cm and reflex $\angle AOB = 210°$. Find the area of the sector. Give the answer correct to the nearest 0.1 cm^2.



43. Find the area of $\triangle ABC$ in the figure.



44. Complete the table for the equation $x + 3y - 3 = 0$ in the **ANSWER BOOKLET**.

x	-3	0	3
y	2		

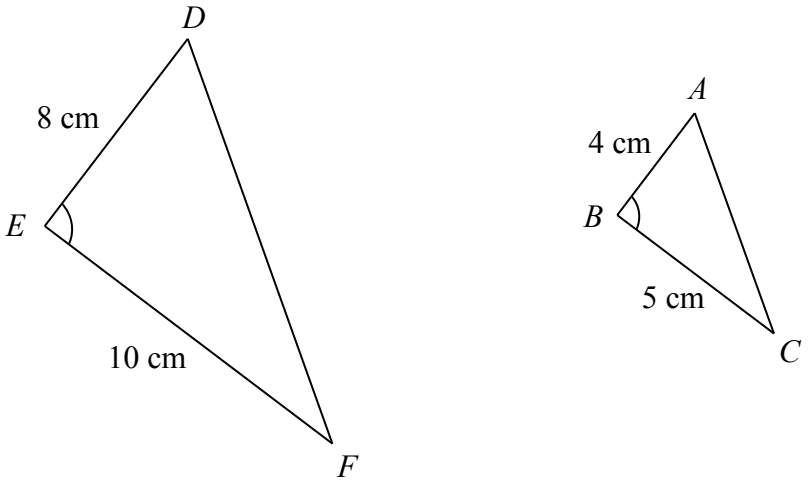
According to the table, draw the graph of this equation on the rectangular coordinate plane given in the **ANSWER BOOKLET**.

45. A basketball team has 5 players. Their heights (cm) are as follows:

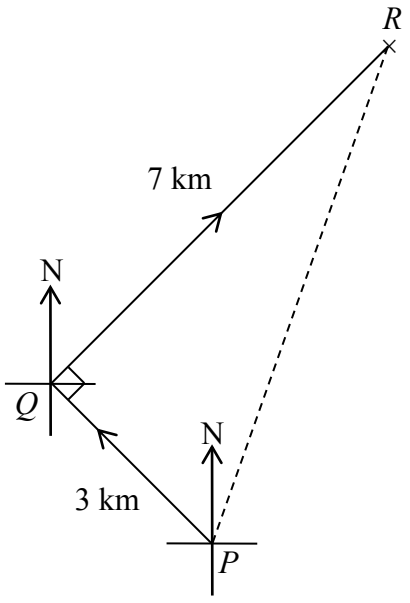
166, 167, 168, 187, 187

It is given that the mode of the heights of the 5 players is 187 cm.
Hence the team coach said, 'More than half of the 5 players are 187 cm tall.'
Is the coach's statement misleading? Explain your answer.

46. In the figure, $\angle DEF = \angle ABC$, $DE = 8$ cm, $EF = 10$ cm, $AB = 4$ cm and $BC = 5$ cm. Prove that $\triangle DEF \sim \triangle ABC$.



47. In the figure, Kitty walks 3 km due northwest from P to Q. She then turns 90° and walks 7 km due northeast from Q to R. Find $\angle QPR$ and give the answer correct to the nearest 0.1°.



END OF PAPER

Do not write on this page.

Answers written on this page will not be marked.

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