General Instructions

- Reading time: 5 minutes
- Working time: 2 hours
- There will be a short break between Section 1 and Section 2
- Write using black or blue pen
- You may use a pencil to draw or complete diagrams
- Attempt ALL questions
- Calculators may be used in Section 2 only
- A formulae sheet is provided with this paper
- Write your Centre Number and Student Number at the top of pages 3, 31 and 33

Total marks – 100

Section 1
Pages 3–10

25 marks
Time allowed for this section is 30 minutes

Questions 1–25 25 marks

Section 2
Pages 11–36

75 marks
Time allowed for this section is 1 hour and 30 minutes

This section has TWO parts

Part A – Questions 26–80 55 marks
Part B – Questions 81–84 20 marks
Formulae

For use in both SECTION 1 and SECTION 2

Circumference of a circle = \( \pi \times \text{diameter} \) or \( 2 \times \pi \times \text{radius} \)

\[ C = \pi d \]
\[ C = 2\pi r \]

Area of a circle = \( \pi \times \text{radius squared} \)

\[ A = \pi r^2 \]

Area of a parallelogram = base \( \times \) perpendicular height

\[ A = bh \]

Area of a rhombus = half the product of the diagonals

\[ A = \frac{1}{2}xy \]

Area of a trapezium = half the perpendicular height \( \times \) the sum of the parallel sides

\[ A = \frac{1}{2}h(a + b) \]

Volume of a prism = base area \( \times \) height

\[ V = Ah \]

Volume of a cylinder = \( \pi \times \text{radius squared} \times \text{height} \)

\[ V = \pi r^2h \]

Simple interest = principal \( \times \) annual interest rate \( \times \) number of years

\[ I = PRT \]

Pythagoras' theorem states: In a right-angled triangle, the hypotenuse squared is equal to the sum of the squares of the other two sides

\[ c^2 = a^2 + b^2 \]
2009 School Certificate Test
Mathematics

Section 1

25 marks
Time allowed for this section is 30 minutes

Answer Questions 1–25 in the spaces provided

Each question is worth 1 mark

Calculators are NOT to be used in this section

There will be a short break between Section 1 and Section 2
Answer the questions in the spaces provided.

1  \[12 - 3 \times 2 = \]

2  \[a + a = \]

3  Helen is paid $210 for working a seven-hour shift.
What is her hourly rate of pay?

4  On the diagram below, mark with a cross the alternate angle to the one shaded.

5  A train timetable from Richmond to Town Hall is shown.

<table>
<thead>
<tr>
<th>Richmond to Town Hall</th>
<th>pm</th>
<th>pm</th>
<th>pm</th>
<th>pm</th>
<th>pm</th>
<th>pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richmond</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blacktown</td>
<td>6.24</td>
<td>7.06</td>
<td>7.25</td>
<td>7.36</td>
<td>7.53</td>
<td>7.55</td>
</tr>
<tr>
<td>Parramatta</td>
<td>7.09</td>
<td>7.24</td>
<td>7.39</td>
<td>7.54</td>
<td>8.03</td>
<td>8.09</td>
</tr>
<tr>
<td>Granville</td>
<td>7.12</td>
<td>7.28</td>
<td>7.42</td>
<td>7.58</td>
<td>8.05</td>
<td>8.12</td>
</tr>
<tr>
<td>Lidcombe</td>
<td>7.20</td>
<td>7.33</td>
<td>7.50</td>
<td>8.03</td>
<td>8.20</td>
<td>8.20</td>
</tr>
<tr>
<td>Strathfield</td>
<td>7.26</td>
<td>7.39</td>
<td>7.56</td>
<td>8.10</td>
<td>8.16</td>
<td>8.26</td>
</tr>
<tr>
<td>Redfern</td>
<td>7.37</td>
<td>7.51</td>
<td>8.07</td>
<td>8.22</td>
<td>8.37</td>
<td>8.37</td>
</tr>
<tr>
<td>Central</td>
<td>7.40</td>
<td>7.54</td>
<td>8.10</td>
<td>8.25</td>
<td>8.30</td>
<td>8.40</td>
</tr>
<tr>
<td>Town Hall</td>
<td>7.43</td>
<td>7.57</td>
<td>8.13</td>
<td>8.28</td>
<td>8.43</td>
<td>8.43</td>
</tr>
</tbody>
</table>

Nicole arrives at Richmond station at 6.28 pm to catch a train to Town Hall.
According to the timetable, what is the earliest time she can arrive at Town Hall?
6 Dale’s waist measures 102 centimetres. After going to the gym regularly, he loses 8 centimetres from his waist.

What is his new waist measurement?

.............................................................................................................................................
.............................................................................................................................................

7 Telegraph poles are to be placed 50 metres apart along the length of a one-kilometre road. A pole is to be placed at the start and at the end of the road.

How many telegraph poles are needed?

.............................................................................................................................................
.............................................................................................................................................

8 During a tennis match, information on Doug’s serve is recorded in the table shown.

<table>
<thead>
<tr>
<th>Type of serve</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault</td>
<td>25</td>
</tr>
<tr>
<td>Let</td>
<td>2</td>
</tr>
<tr>
<td>Good</td>
<td>50</td>
</tr>
<tr>
<td>Ace</td>
<td>13</td>
</tr>
</tbody>
</table>

What is the probability that Doug will serve an ace on his next serve?

.............................................................................................................................................
.............................................................................................................................................

9 A dress valued at $80 is discounted by $4.

What is the percentage discount on the dress?

.............................................................................................................................................
.............................................................................................................................................
10. $ABCD$ is a square with sides of length 5 units.

Write in the brackets the coordinates of point $C$.

![Diagram of square with labeled points A, B, D, and C with coordinates A(1, 2) and B(5, 2)]

11. This table shows admission prices at the movies.

<table>
<thead>
<tr>
<th></th>
<th>Monday, Wednesday, Thursday, Sunday</th>
<th>Friday, Saturday</th>
<th>Tuesday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>$16.00</td>
<td>$16.50</td>
<td>$10.00</td>
</tr>
<tr>
<td>Concession</td>
<td>$13.50</td>
<td>$14.00</td>
<td>$10.00</td>
</tr>
<tr>
<td>Child</td>
<td>$13.00</td>
<td>$13.50</td>
<td>$8.00</td>
</tr>
</tbody>
</table>

Two adults and three children intend to go to the movies.

How much would they save if they go on a Tuesday rather than a Wednesday?

.............................................................................................................................................

.............................................................................................................................................

12. Write 12.5% as a decimal.

.............................................................................................................................................

.............................................................................................................................................
13 The following step graph shows car parking costs.

![Car parking costs graph]

On leaving the car park at 1.15 pm, Kasey was charged $22.
What was the earliest time that Kasey could have entered the car park?

14 What is the cost of 20 litres of petrol at 139.9 cents per litre?
Answer to the nearest dollar.

15 There are 12 teams in a competition. Liz states that her team must therefore have a one in twelve chance of winning the competition.
Explain why Liz’s statement is incorrect.

16 The ratio of Luke’s height to Ben’s height is 11 : 12.
If the difference in their heights is 15 centimetres, how tall is Ben?
17. This triangular prism has a volume of 100 cm$^3$.

What is the value of $x$?

18. $ABCD$ is a square. The shaded area is 25 cm$^2$.

What is the perimeter of the square?

19. Convert 0.3 hours to minutes.
20 This is a plan of a property with an area of 740 m².

The property is in the shape of a trapezium. A fence is built along the boundary on Moss Street.

Calculate the length of the fence along Moss Street.

21 How many times must 4 be subtracted from $4^3$ to give an answer of zero?

22 A jar contains 50 nails. The jar and the nails together weigh 540 grams. When 25 nails are removed, the jar and the remaining nails now weigh 350 grams.

How much does the jar weigh when all the nails are removed?

23 The fraction $\frac{4}{\square}$ lies between the fractions $\frac{1}{2}$ and $\frac{2}{3}$.

Which whole number is represented by $\square$?
24  \( ABC \) is an equilateral triangle. \( BCDE \) is a square.

\[ \begin{array}{c}
\text{NOT TO SCALE}
\end{array} \]

What is the value of \( x \)?


25  A national park is in the shape of a square, each side measuring 160 km.

Towers are built at \( A \) and \( B \) to spot bushfires within the national park. Bushfires can be seen up to 120 km from the towers.

\[ \begin{array}{c}
\text{Scale:} \\
1 \text{ cm} = 20 \text{ km}
\end{array} \]

Using your geometrical instruments, shade the region where a bushfire can be seen from both towers \( A \) and \( B \).

End of Section 1
Section 2

75 marks
Time allowed for this section is
1 hour and 30 minutes

This section has TWO parts

Part A – Questions 26–80  55 marks
Part B – Questions 81–84  20 marks

Calculators may be used in this section

Do not commence Section 2 until you are instructed to do so
Part A

Questions 26–80        55 marks

Use the Section 2 – Part A Answer Sheet for Questions 26–80.

Instructions for answering multiple-choice questions

- For Questions 26–75, select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample:  \[ 2 + 4 = \]  (A) 2  (B) 6  (C) 8  (D) 9

- If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

- If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word correct and drawing an arrow as follows.

   correct

   A  B  C  D
26. What is $26.3 \times 0.76$ correct to two decimal places?

- (A) 19.89
- (B) 19.98
- (C) 19.99
- (D) 20.00

27. Which of the following is greatest in value?

- (A) $\frac{1}{2}$
- (B) 20%
- (C) $\frac{3}{10}$
- (D) 0.6

28. The top view of a solid is shown.

Which one of these solids does NOT have this top view?

- (A)
- (B)
- (C)
- (D)

29. Which of the following inequations is represented by the graph shown?

- (A) $x > -1$
- (B) $x \geq -1$
- (C) $x < -1$
- (D) $x \leq -1$
30  $O$ is the centre of a circle.

Which of the following have been drawn on the diagram?

(A) Chord and sector
(B) Tangent and chord
(C) Radius and tangent
(D) Diameter and tangent

31

$\sin x^\circ =$

(A) $\frac{3}{5}$  (B) $\frac{4}{5}$  (C) $\frac{3}{4}$  (D) $\frac{5}{4}$

32  $4a + 2a + 8 - 3 =$

(A) $11a$  (B) $6a^2 + 5$  (C) $6a - 11$  (D) $6a + 5$
33 Which rectangle is similar to the rectangle shown above?

(A)  
\[
\begin{array}{c}
10 \text{ cm} \\
9 \text{ cm}
\end{array}
\]

(B)  
\[
\begin{array}{c}
24 \text{ cm} \\
18 \text{ cm}
\end{array}
\]

(C)  
\[
\begin{array}{c}
16 \text{ cm} \\
9 \text{ cm}
\end{array}
\]

(D)  
\[
\begin{array}{c}
64 \text{ cm} \\
27 \text{ cm}
\end{array}
\]

34 Which of the following is true of all rectangles?

(A) The diagonals are equal.
(B) The diagonals are perpendicular.
(C) The diagonals are axes of symmetry.
(D) The diagonals bisect the angles at the vertices.

35 Which of the following gives the highest annual income?

(A) $652 per week
(B) $1300 per fortnight
(C) $2850 per month
(D) $33500 per year
36 What is the perimeter of the shape?

![Shape Diagram]

(A) 22  (B) 25  (C) 27  (D) 30

37 The area of a block of land is 3 hectares.

How many square metres is this?

(A) 3000  (B) 30 000  (C) 300 000  (D) 3 000 000

38 Evaluate \(ab^2\) given \(a = 2\) and \(b = -3\).

(A) \(-36\)  (B) \(-18\)  (C) 18  (D) 36

39 \(\frac{5m}{7} + \frac{2m}{7} =

(A) \(m\)  (B) \(7m\)  (C) \(\frac{7m}{14}\)  (D) \(\frac{7m^2}{7}\)

40 Which of the following is an expression for 3 more than the product of 6 and \(t\)?

(A) \(6t + 3\)  (B) \(3t + 6\)  (C) \(t + 9\)  (D) \(18t + 3\)

41 Lisa is 30 years old. In 10 years time she will be 20 years younger than William.

How old is William now?

(A) 40  (B) 45  (C) 50  (D) 60
42 John receives $1000 for his birthday. He invests the money at 5.2% per annum simple interest.

How much interest will he earn after three years?

(A) $52.00  (B) $156.00  (C) $164.25  (D) $1164.25

43 What is the area of this shape?

[Diagram: Triangle with sides 8 cm, 6 cm, and 20 cm.]

(A) 76 cm$^2$  (B) 132 cm$^2$  (C) 188 cm$^2$  (D) 216 cm$^2$

44 What is the value of $(4.7 \times 10^{-3}) \times (9.1 \times 10^7)$, written in scientific notation?

(A) $4.277 \times 10^5$  (B) $42.77 \times 10^4$  (C) $4.277 \times 10^2$  (D) 427 700

45 Factorise $-4m - 12$.

(A) $-4(m + 3)$  (B) $-4(m - 12)$  (C) $-4(m - 3)$  (D) $-4m(m + 3)$

46 Which of the following equations represents all the points that are four units to the left of the $y$-axis?

(A) $y = 4$  (B) $y = -4$  (C) $x = 4$  (D) $x = -4$
47 Which of the following graphs shows the greatest decrease in the price of petrol over a period of time?

(A)  
(B)  
(C)  
(D)  

48 Which of the following is an equation of a straight line?

(A) \( y = 2x + 1 \)  
(B) \( y = x^2 + 1 \)  
(C) \( y = x^3 + 1 \)  
(D) \( y = 2^x + 1 \)

49 One quarter of a number is \( \frac{1}{2} \).

What is the number?

(A) \( \frac{1}{8} \)  
(B) \( \frac{3}{4} \)  
(C) 2  
(D) 8
50 On a map, Sydney and Bathurst are 5 cm apart.

If the distance between the two cities is 200 km, what is the scale of the map?

(A) 1 : 40  (B) 1 : 40 000  (C) 1 : 400 000  (D) 1 : 4 000 000

51 The graph shows the number of pairs of shoes owned by a group of students.

If a student from this group is chosen at random, what is the probability that the student owns three pairs of shoes?

(A) \(\frac{3}{44}\)  (B) \(\frac{9}{44}\)  (C) \(\frac{1}{4}\)  (D) \(\frac{1}{3}\)

52 Which of the following is equivalent to \(2^4 \times 10^3 - 2^3\)?

(A) \(20^7 - 8\)  (B) \(20^{12} - 8\)  (C) \(2 \times 20^3 - 6\)  (D) \(16 \times 10^3 - 8\)

53 A taxi charge \(c\) in dollars was calculated by using the formula

\[c = 3.1 + 1.8k\]

where \(k\) is the distance travelled in kilometres.

Kiran caught a taxi and paid $36.40 for the journey.

How many kilometres did Kiran travel, correct to one decimal place?

(A) 17.1  (B) 18.5  (C) 34.7  (D) 68.6
54

What is the perimeter of this triangle, to the nearest centimetre?

(A) 20  (B) 24  (C) 25  (D) 26

55

Anne designed a birthday cake in the shape of the number 8.

She used circular cake pans with diameters of 20 cm, and cut out smaller circles with diameters of 6 cm.

The top of the cake is to be covered with icing.

What is the area of the surface to be covered?

(A) $91\pi \text{ cm}^2$  (B) $182\pi \text{ cm}^2$  (C) $364\pi \text{ cm}^2$  (D) $728\pi \text{ cm}^2$

56

Which of the following is a correct method to calculate the compound interest on $3000 at 4% per annum over two years compounded annually?

(A) $3000 \times 1.04 \times 2 - \$3000$

(B) $3000 \times 0.04 \times 2 - \$3000$

(C) $3000 \times 1.04 \times 1.04 - \$3000$

(D) $3000 \times 0.04 \times 0.04 - \$3000$
57  \(ABCD\) is a parallelogram.

![Diagram of parallelogram ABCD with angle DAB labeled 50°.]

What is the value of \(x\)?

(A) 30  (B) 40  (C) 50  (D) 60

58  Solve the equation \(-3(m - 2) = 18\).

(A) \(m = -8\)  (B) \(m = -\frac{16}{3}\)  (C) \(m = -\frac{20}{3}\)  (D) \(m = -4\)

59  On a flight, the percentage of passengers who flew First Class and Business Class is shown in this diagram.

![Diagram of airplane with percentages labeled: First Class 5%, Business Class 15%, and Economy Class.]

If 240 people flew Economy Class, how many people flew Business Class?

(A) 12  (B) 30  (C) 36  (D) 45
Which equation could be used to find the length $L$?

(A) $L = \frac{M}{\cos \alpha}$

(B) $L = \frac{M}{\sin \alpha}$

(C) $L = M \cos \alpha$

(D) $L = M \sin \alpha$

61 Plant $A$ has a height of 120 cm. Plant $B$ has a height of 100 cm. Plant $A$ grows 3 cm per day. Plant $B$ grows 5 cm per day.

How tall will they be when they are the same height?

(A) 135 cm  (B) 150 cm  (C) 165 cm  (D) 180 cm
Pamela has a music collection of 600 songs. The songs are stored on her computer, MP3 player and CDs in the ratio of 2:3:5 respectively.

How many songs are stored on her MP3 player?

(A) 60  (B) 120  (C) 180  (D) 200

What is the value of $x$?

(A) 50  (B) 65  (C) 80  (D) 115

What is the value of $x$?

(A) 30  (B) 40  (C) 50  (D) 60

What is the surface area of a cube with side length 8 cm?

(A) 64 cm$^2$  (B) 96 cm$^2$  (C) 384 cm$^2$  (D) 512 cm$^2$
Which of the following is correct about the interval \( AB \)?

(A) length = 5, gradient = \( \frac{4}{3} \)

(B) length = 5, gradient = \( \frac{3}{4} \)

(C) length = \( \sqrt{41} \), gradient = \( \frac{5}{4} \)

(D) length = \( \sqrt{41} \), gradient = \( \frac{4}{5} \)

Emma’s garden is in the shape of two semi-circles.

What is the perimeter of the garden, to the nearest metre?

(A) 28 (B) 34 (C) 71 (D) 119
68  Nathan left on a journey at 11 am. He travelled 234 km and arrived at his destination at 1:15 pm.

What was his average speed for the journey, to the nearest kilometre per hour?

(A) 72  (B) 74  (C) 104  (D) 109

69  Building X is 30 m in height. The angle of elevation from the top of building X to the top of building Y is 35°. The distance between the two buildings is 25 m.

What is the height of building Y to the nearest metre?

(A) 14 m  (B) 44 m  (C) 48 m  (D) 50 m

70  An integer can be a positive number or a negative number.

Which of the following statements about integers is always true?

(A) A negative added to a negative gives a positive.
(B) A negative divided by a negative gives a negative.
(C) A positive subtracted from a positive gives a negative.
(D) A negative subtracted from a positive gives a positive.
71  What is the volume of the solid shown?  
(A) 360 cm³  (B) 420 cm³  (C) 430 cm³  (D) 480 cm³

72  \(ABCD\) is a rectangle.

What is the area of \(ABCD\)?  
(A) 6 units²  (B) 8 units²  (C) 10 units²  (D) 12 units²
The table shows the cumulative frequency ($cf$) for a set of scores ($x$).

<table>
<thead>
<tr>
<th>$x$</th>
<th>$cf$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>19</td>
</tr>
</tbody>
</table>

Which of the following is correct about the scores?

(A) Mode = 5  (B) Mode = 19  (C) Median = 2  (D) Median = 3

Rebecca takes 6 minutes to eat a pizza. Angela takes 12 minutes to eat a pizza of the same size.

At these rates, how many minutes would it take Rebecca and Angela to eat one pizza together?

(A) $3 \frac{1}{3}$  (B) 4  (C) $7 \frac{1}{2}$  (D) 9

A wooden block is in the shape of a rectangular prism.

James cut the block to form the triangular prism shown.

Through which line was the block cut?

(A) $AC$  (B) $AH$  (C) $BE$  (D) $CF$
Instructions for answering Questions 76–80

- Questions 76–80 contain options a, b, c and d. Each option may be Correct or Incorrect. In each question, one, two, three or four options may be Correct.

- For Questions 76–80, fill in the response ovals on the Section 2 – Part A Answer Sheet to indicate whether options a, b, c and d are Correct or Incorrect. You must fill in either the Correct or the Incorrect response oval for each option.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 2 + 4 = 4 + 2</td>
<td>a. ●</td>
<td>○</td>
</tr>
<tr>
<td>b. 2 − 4 = 4 − 2</td>
<td>b. ○</td>
<td>●</td>
</tr>
<tr>
<td>c. 2 × 4 = 4 × 2</td>
<td>c. ●</td>
<td>○</td>
</tr>
<tr>
<td>d. 2 ÷ 4 = 4 ÷ 2</td>
<td>d. ○</td>
<td>●</td>
</tr>
</tbody>
</table>

- If you think you have made a mistake, put a cross through your answer and fill in your new answer.

<table>
<thead>
<tr>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ●</td>
<td>○</td>
</tr>
</tbody>
</table>

- If you change your mind and have crossed out what you consider to be the right answer, then indicate your intended answer by writing the word ‘answer’ and drawing an arrow as follows.

<table>
<thead>
<tr>
<th>answer</th>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ●</td>
<td></td>
<td>○</td>
</tr>
</tbody>
</table>
A cube is cut in half to form two identical rectangular prisms.

Indicate whether each of the following statements is correct or incorrect.

a. The volume of each prism is half the volume of the cube.

b. The surface area of each prism is half the surface area of the cube.

c. The number of vertices in each prism is equal to the number of vertices in the cube.

d. The number of faces on each prism is equal to the number of faces on the cube.

The ratio of boys to girls is 2 : 5.

Indicate whether each of the following statements is correct or incorrect.

a. There are 2 boys for every 5 girls.

b. There could be 10 boys and 25 girls.

c. For every 7 children, 5 are girls.

d. The difference between the number of boys and girls could be 30.

Students were asked to provide an equation to represent the following table of values.

<table>
<thead>
<tr>
<th></th>
<th>x</th>
<th>0</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>3</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

Indicate whether each of the following equations is correct or incorrect.

a. $y = 4x + 3$

b. $y = 5x + 1$

c. $y = x^2 + 7$

d. $y = x^3 + 3$
This dot plot shows the ages of children in a doctor’s waiting room.

Indicate whether each of the following statements is correct or incorrect.

a. The mode is 3.
b. The mean is 4.
c. The median is 7.
d. The outlier is 13.

The triangle shown at Position 1 can be moved to Position 2, using a pair of transformations.

In order to move the triangle from Position 1 to Position 2, indicate whether each of the following transformations is correct or incorrect.

a. A reflection followed by a rotation.
b. A translation followed by a rotation.
c. A reflection followed by a translation.
d. A translation followed by a translation.
A rectangular area is to be tiled using square tiles.

(a) The cost to lay the tiles is $4050. What is the cost per square metre? 

(b) Tiles measuring 300 mm × 300 mm are to be used to cover this area.

(i) Complete: 300 mm = ......................... m.

(ii) Show, with calculations, that 30 tiles will fit along side CD.

(iii) The tiler buys enough tiles to cover the whole area plus an extra 10% to allow for breakages. Show, with calculations, that the tiler buys a total of 1980 tiles.
Question 82 (5 marks)

(a) Consider the information in the following diagram.

Maria correctly found the value of $x$, giving reasons.

Complete her solution.

$\angle ACB = 60^\circ$, (Angles in an .............................................................. triangle)

$\therefore x = 120$ (....................................................................................................)

(b)

$OP = OQ$ (equal radii of circle)

$\therefore x = \ldots$ (base angles of isosceles triangle)

$\therefore y = \ldots$ (..........................................................................................)
Question 83 (5 marks)

The hand spans of students in a class were measured. The results are displayed in the frequency histogram below.

(a) Draw the frequency polygon on the frequency histogram above.  

(b) What is the range of the measurements of the hand spans?  

...............................................................................................................................  

(c) A glove manufacturer finds this sample is representative of the population.  

Would the mean, median or mode be the most useful measure to the glove manufacturer?  

...............................................................................................................................  

(d) The mean hand span is 21.75 cm. When the teacher’s hand span is included, the total length of all the hand spans is 462 cm.  

By first stating the number of students in the class show, by calculations, that the teacher’s hand span is 27 cm.  

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Question 84 (5 marks)

A pattern of designs is formed using squares.

The number of squares of different size in each design is shown in the table below.

<table>
<thead>
<tr>
<th>Design</th>
<th>Number of different sized squares</th>
<th>Numerical expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>$1^2$</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>$1^2 + 2^2$</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>$1^2 + 2^2 + 3^2$</td>
</tr>
</tbody>
</table>

(a) How many squares of different size are in the fourth design in this pattern? 1

Question 84 continues on page 35
Question 84 (continued)

(b) A design has 91 squares of different size.

What is the side length of its largest square?

(c) The difference in the number of squares in two consecutive designs is 400.

What is the side length of the smaller of these two designs?

(d) Now consider a 3 cm cube made of unit cubes with sides of 1 cm.

How many cubes of different size are there in this cube?

(e) Find an expression for the total number of cubes of all sizes in a cube of side length \( n \) centimetres.

End of test