1  **(a)**  In 2018, Gretal earned $32 000.

   **(i)**  She paid tax of 24% on these earnings.

   Work out the amount she paid in tax in 2018.

   $ ................................................ [2]

   **(ii)**  In 2019, Gretal's earnings increased by 7%.

   Work out her earnings in 2019.

   $ ................................................ [2]

**(b)**  Gretal invests $5000 at a rate of 2% per year compound interest.

   Calculate the value of her investment at the end of 3 years.

   $ ................................................ [2]

**(c)**  One month, Gretal spent a total of $360 on presents.
   She spent $\frac{1}{5}$ of this total on presents for her parents.
   She spent $\frac{2}{3}$ of the remaining money on presents for her friends.
   She spent the rest of the money on presents for her sisters.

   Calculate the percentage of the $360 that she spent on presents for her sisters.

   ............................................ % [4]

**(d)** Arjun earned $36 515 in 2019.
This was an increase of 9% on his earnings in 2018.

Work out his earnings in 2018.

$ .................................................. [2]

**(e)** Arjun and Gretal each pay rent.

In 2018, the ratio of the amount each paid in rent was Arjun : Gretal = 5 : 7.
In 2019, the ratio of the amount each paid in rent was Arjun : Gretal = 9 : 13.

Arjun paid the same amount of rent in both 2018 and 2019.
Gretal paid $290 more rent in 2019 than she did in 2018.

Work out the amount Arjun paid in rent in 2019.

$ .................................................. [4]

**2** The heights, *h* metres, of the 120 boys in an athletics club are recorded.
The table shows information about the heights of the boys.

| Height (h metres) | $1.3 < h \leqslant 1.4$ | $1.4 < h \leqslant 1.5$ | $1.5 < h \leqslant 1.6$ | $1.6 < h \leqslant 1.7$ | $1.7 < h \leqslant 1.8$ | $1.8 < h \leqslant 1.9$ |
|---|---|---|---|---|---|---|
| Frequency | 7 | 18 | 30 | 24 | 27 | 14 |

**(a) (i)** Write down the modal class.

.................. $< h \leqslant$ .................. [1]

**(ii)** Calculate an estimate of the mean height.

............................................. m [4]

**(b) (i)** One boy is chosen at random from the club.

Find the probability that this boy has a height greater than 1.8 m.

.................................................. [1]

**(ii)** Three boys are chosen at random from the club.

Calculate the probability that one of the boys has a height greater than 1.8 m and the other two boys each have a height of 1.4 m or less.
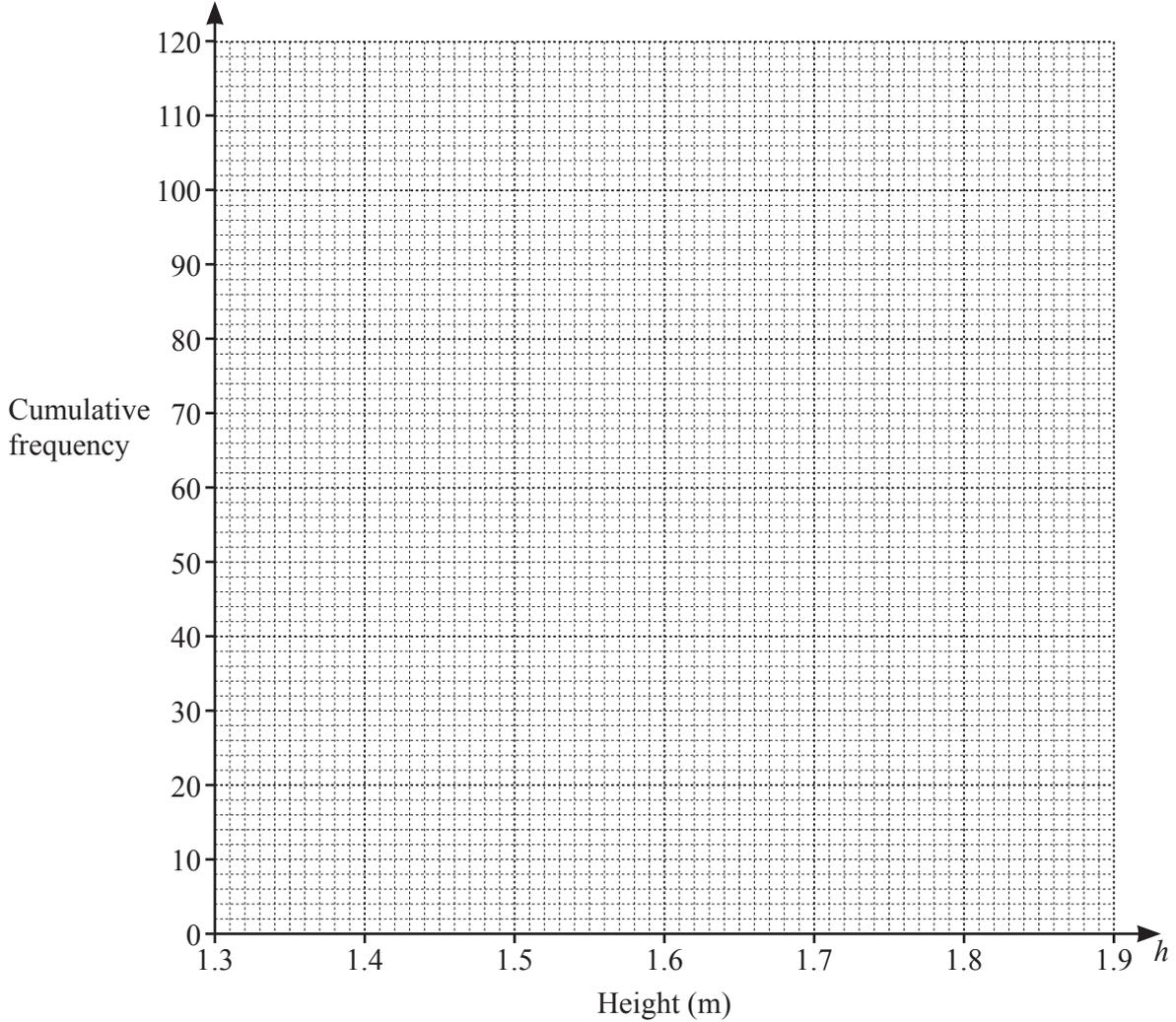
.................................................. [4]

**(c) (i)** Use the frequency table on page 4 to complete the cumulative frequency table.

| Height ($h$ metres) | $h \leqslant 1.4$ | $h \leqslant 1.5$ | $h \leqslant 1.6$ | $h \leqslant 1.7$ | $h \leqslant 1.8$ | $h \leqslant 1.9$ |
|---|---|---|---|---|---|---|
| Cumulative frequency | 7 | 25 | | | | |

[2]

**(ii)** On the grid, draw a cumulative frequency diagram to show this information.



[3]

**(d)** Use your diagram to find an estimate for

**(i)** the median height,

............................................... m [1]

**(ii)** the 40th percentile.

............................................... m [2]

**3** **(a)** $s = ut + \frac{1}{2}at^2$

Find the value of $s$ when $u = 5.2$, $t = 7$ and $a = 1.6$ .

$s =$ .................................................. [2]

**(b)** Simplify.

**(i)** $3a - 5b - a + 2b$

.................................................. [2]

**(ii)** $\frac{5}{3x} \times \frac{9x}{20}$

.................................................. [2]

**(c)** Solve.

**(i)** $\frac{15}{x} = -3$

$x =$ .................................................. [1]

**(ii)** $4(5 - 3x) = 23$

$x =$ .................................................. [3]

**(d)** Simplify.
$$(27x^9)^{\frac{2}{3}}$$

.................................................... [2]

**(e)** Expand and simplify.
$$(3x - 5y)(2x + y)$$

.................................................... [2]

**4**



**(a)** Draw the image of triangle *T* after a reflection in the line $y = -1$. [2]

**(b)** Draw the image of triangle *T* after a rotation through 90° clockwise about (0, 0). [2]

**(c)** Describe fully the **single** transformation that maps triangle *T* onto triangle *A*.

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

................................................................................................................................................ [2]
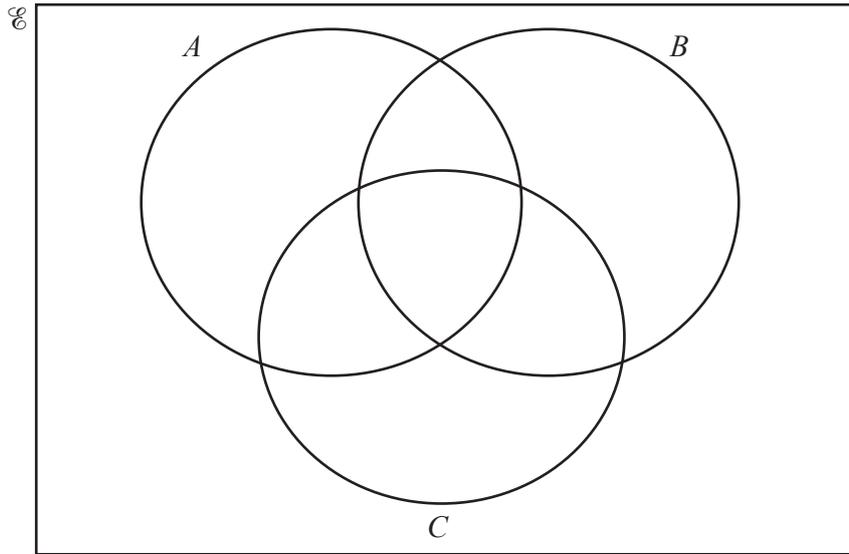
**9**

**5** *x* is an integer.

$\mathcal{E} = \{x : 41 \leqslant x \leqslant 50\}$

$A = \{x : x \text{ is an odd number}\}$

$B = \{x : x \text{ is a multiple of } 3\}$

$C = \{x : x \text{ is a prime number}\}$

**(a)** Complete the Venn diagram to show this information.



[3]

**(b)** List the elements of

**(i)** $A \cap C$,

.................................................. [1]

**(ii)** $(B \cup C)'$.

.................................................. [1]

**(c)** Find $\text{n}(A \cap B \cap C)$.

.................................................. [1]

**6**  Raheem makes baskets and mats.
Each week he makes $x$ baskets and $y$ mats.

He makes fewer than 10 mats.
The number of mats he makes is greater than or equal to the number of baskets he makes.

**(a)**  One of the inequalities that shows this information is  $y < 10$.
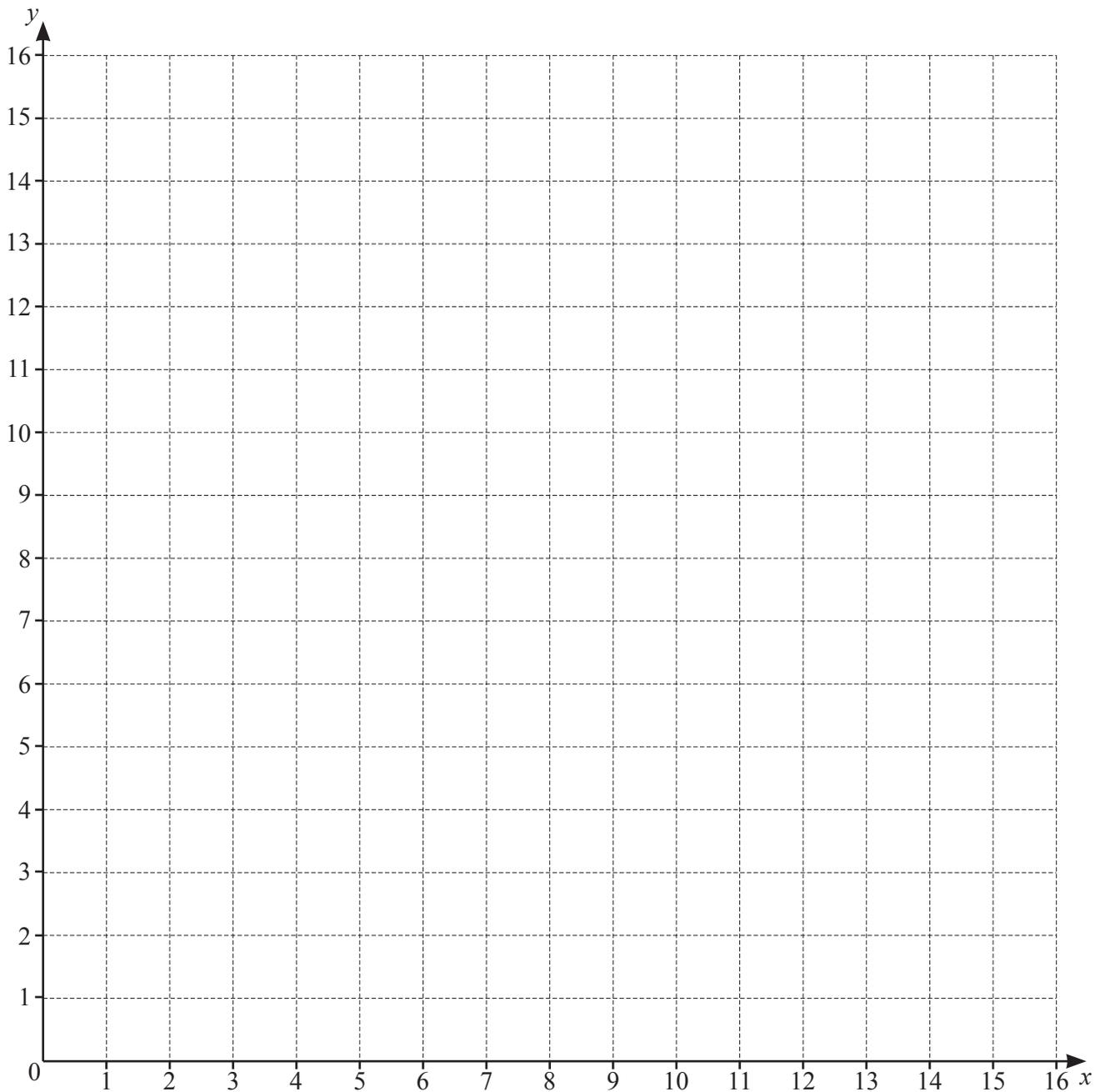
Write down the other inequality.

.................................................. [1]

**(b)**  He takes $2\frac{1}{4}$ hours to make a basket and $1\frac{1}{2}$ hours to make a mat.
Each week he works for a maximum of 22.5 hours.

Show that  $3x + 2y \leqslant 30$.

[2]

**(c)** On the grid, draw three straight lines and shade the **unwanted** regions to show these inequalities.
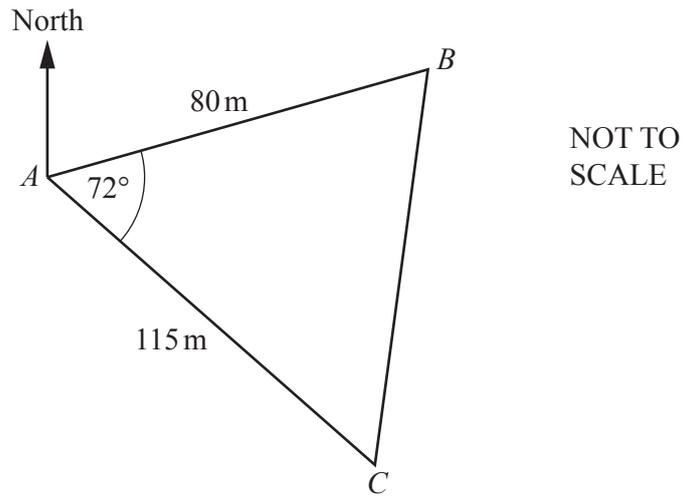


[5]

**(d)** He makes $40 profit on each basket he sells and $28 profit on each mat he sells.

Calculate the maximum profit he can make each week.

$ .................................................. [2]

**7**

North

B

80 m

NOT TO
SCALE

A

72°

115 m

C

The diagram shows the positions of three points *A*, *B* and *C* in a field.

**(a)** Show that *BC* is 118.1 m, correct to 1 decimal place.

[3]

**(b)** Calculate angle *ABC*.

Angle *ABC* = ................................................. [3]

**(c)** The bearing of *C* from *A* is 147°.

Find the bearing of

**(i)** *A* from *B*,

.................................................. [3]

**(ii)** *B* from *C*.

.................................................. [2]

**(d)** Mitchell takes 35 seconds to run from *A* to *C*.

Calculate his average running speed in kilometres per hour.

........................................ km/h [3]

**(e)** Calculate the shortest distance from point *B* to *AC*.

.............................................. m [3]

**8** **(a)** **(i)** On the axes, sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



[2]

**(ii)** Describe fully the symmetry of the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

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

.................................................................................................................................... [2]

**(b)** Solve $4 \sin x - 1 = 2$ for $0° \leqslant x \leqslant 360°$.

$x = $ ........................ and $x = $ ........................ [3]

**(c) (i)** Write $x^2 + 10x + 14$ in the form $(x+a)^2 + b$.

.................................................. [2]

**(ii)** On the axes, sketch the graph of $y = x^2 + 10x + 14$, indicating the coordinates of the turning point.



[3]

**9**



NOT TO
SCALE

The diagram shows a sector of a circle with centre $O$, radius 8 cm and sector angle 165°.
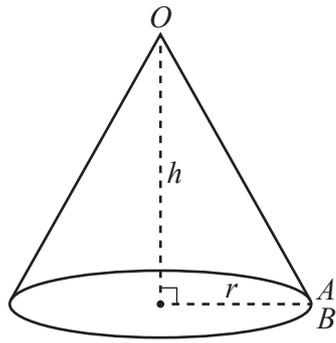
**(a)** Calculate the total perimeter of the sector.

.............................................. cm  [3]

**(b)** The surface area of a sphere is the same as the area of the sector.

Calculate the radius of the sphere.

.............................................. cm  [4]

**(c)**



NOT TO
SCALE

A cone is made from the sector by joining *OA* to *OB*.

**(i)** Calculate the radius, *r*, of the cone.

*r* = .......................................... cm  [2]

**(ii)** Calculate the volume of the cone.

.......................................... cm³  [4]

**10** **(a)** A rhombus *ABCD* has a diagonal *AC* where *A* is the point $(-3, 10)$ and *C* is the point $(4, -4)$.

     **(i)** Calculate the length *AC*.

.................................................. [3]

     **(ii)** Show that the equation of the line *AC* is $y = -2x + 4$.

[2]

     **(iii)** Find the equation of the line *BD*.

.................................................. [4]

**(b)** A curve has the equation $y = x^3 + 8x^2 + 5x$.

**(i)** Work out the coordinates of the two turning points.

(.................... , ....................) and (.................... , ....................) [6]

**(ii)** Determine whether each of the turning points is a maximum or a minimum.
Give reasons for your answers.

[3]