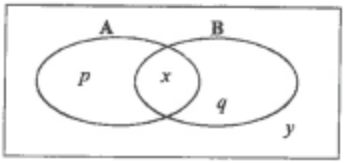
2 Given that $n(\xi) = 200$, $n(A) = 75$ and $n(B) = 35$.



(a) Express p in terms of x.

Answer (a) ..... [1]

(b) Find

(i) the smallest possible value of y,

Answer (b)(i) ..... [2]

(ii) the largest possible value of x,

Answer (b)(ii) ..... [1]

(iii) the value of q if $p = 45$.

Answer (b)(iii) $q =$ ..... [1]

3 (a) A car costs M120 000.
Limpho buys the car on hire purchase.
He pays 40% deposit and M1 365 monthly for 60 months.

(i) Find the amount of deposit paid.

Answer (a)(i) M ..... [1]

(ii) Find the extra cost of buying the car on hire purchase.

Answer (a)(ii) M ..... [2]

(iii) Calculate the percentage rate per year of simple interest Limpho is charged on hire purchase for the car.

Answer (a)(iii) ..... [3]

(b) M56 000 is invested at a rate of 3.2% **compound interest each quarter**.

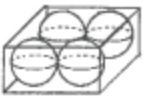
(i) Find, in its simplest form, an expression in terms of n, for the value of the investment after n years.

Answer (b)(i) M ..... [3]

(ii) Find the interest earned after 3 years.

Answer (b)(ii) M ..... [2]

4 The diagram shows 4 identical spherical balls packed into a box that is in the shape of a cuboid. The spheres are packed so that they touch two other spheres and four faces of the box. The radius of each sphere is 3 cm.



NOT TO SCALE

The volume V of a sphere radius r is $V = \frac{4}{3}\pi r^3$.

(a) State the number of vertices a cuboid has.

Answer (a) ..... [1]

(b) Calculate the volume of one ball.

Answer (b) ..... cm^3 [2]

(c) Calculate the volume of the box.

Answer (c) ..... cm^3 [2]

(d) Find the volume of unoccupied space in the box.

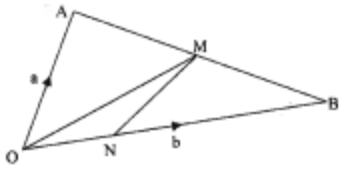
Answer (d) ..... cm^3 [1]

(e) Find the percentage of the volume of the box that is **not** occupied by the balls.

Answer (e) ..... % [2]

5 In the diagram, O is the origin $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$, and $ON : NB = 1 : 2$.

M is the midpoint of AB.



Express in terms of **a** and/or **b**, in its simplest form

(a) $\overrightarrow{AB}$,

Answer (a) $\overrightarrow{AB}$ = ... [1]

(b) the position vector of M,

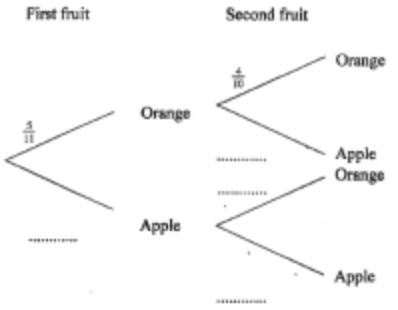
Answer (b) ..... [2]

(c) $\overrightarrow{MN}$.

Answer (c) $\overrightarrow{MN}$ = ... [3]

6 A box contains six apples and five oranges.
Mpho takes a fruit at random from the box without replacement.
He then takes a second fruit at random.

(a) Complete the tree diagram.



[3]

(b) Calculate the probability that Mpho takes

(i) two oranges,

Answer (b)(i) ..... [1]

(ii) at least one apple.

Answer (b)(ii) ..... [2]

(c) Mpho now takes six fruits, at random from the remaining without replacement.

Find the probability **that all** six fruits are oranges.

Answer (c) ..... [1]

7 On the 1st January 2000, Tau was x years old, Pitso was 5 years older than Tau while Neo was twice as old as Tau.

(a) Write expressions, in terms of x, for the ages of Pitso and Neo on the1st January 2000.

Answer (a) Pitso .....

Neo ..... [2]

(b) The product of Neo's age and Tau's age on the **1st January 2002** is the same as the square of Pitso's age on the **1st January 2000**.

Write down an equation in x and show that it simplifies to $x^2 - 4x - 21 = 0$.

Answer (b) ..... [4]

Answer (c)(i) ..... [3]

(ii) How old is Pitso on the 1st January 2002?

Answer (c)(ii) ..... [1]

(d) Neo's height, h metres, is one of the solutions of $h^2 + 8h - 17 = 0$.

(i) Solve $h^2 + 8h - 17 = 0$.

Show all your working and give your answers correct to 2 decimal places.

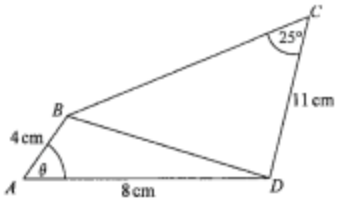
Answer (d)(i) $h =$ ....., $h =$ ..... [4]

(ii) Write down Neo's height in centimetres.

Answer (d)(ii) ..... cm [1]

8 The diagram shows a quadrilateral $ABCD$.

$AB = 4\,\text{cm}$, $AD = 8\,\text{cm}$, $CD = 11\,\text{cm}$, $B\hat{C}D = 25°$ and $B\hat{A}D = \theta$.



NOT TO SCALE

(a) Show that $BD = \sqrt{16(5 - 4\cos\theta)}\,\text{cm}$.

[3]

(b) Let $\theta = 40°$.

(i) Find the value of $\sin CBD$.

Answer (b)(i) $\sin CBD =$ ..... [3]

(ii) Find the value of the acute angle of CBD.

Answer (b)(ii) Angle CBD = ... [1]

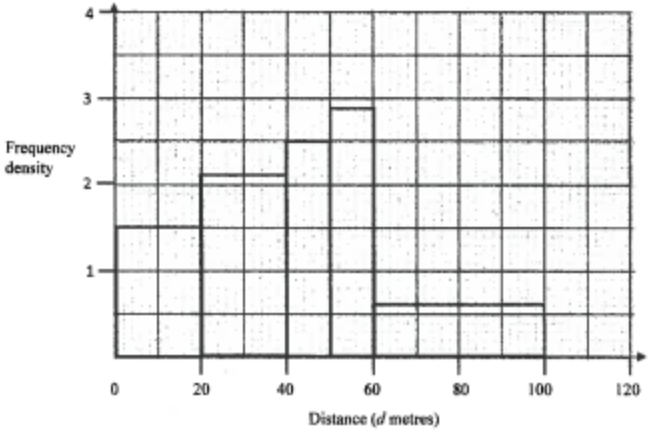
(iii) Work out the perimeter of $ABCD$.

Answer (b)(iii)..... cm [4]

(iv) Find the area of triangle ABD.

Answer (b)(iv)..... cm^2 [2]

9 The histogram shows the distance, d metres, ran by 150 students.



(a) Complete the table.

Distance (d m)	$0 < d \leqslant 20$	$20 < d \leqslant 40$	$40 < d \leqslant 50$	$50 < d \leqslant 60$	$60 < d \leqslant 100$
Frequency	30	42		20	

[2]

(b) Calculate an estimate of the mean.

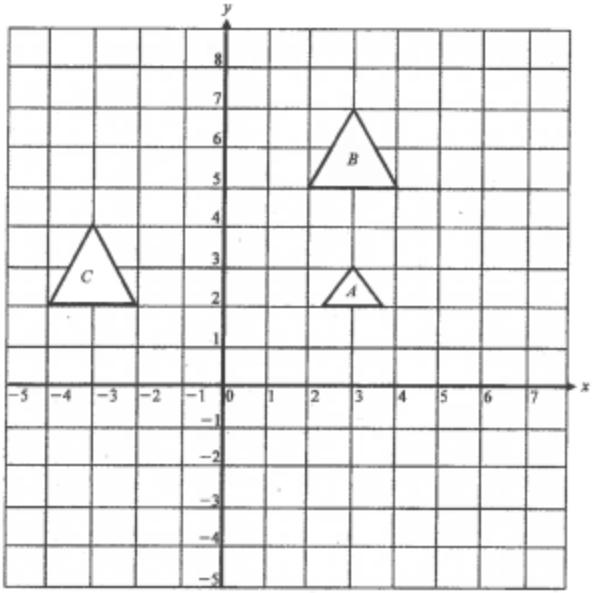
Answer (b) ..... m [4]

(c) 10% of the children ran further than y metres.

Calculate an estimate of y.

Answer (c) ..... [3]

10 The diagram shows triangles A, B and C.



(a) **(i)** Plot and label the point T(5,7) on the grid. [1]

(ii) Rotate the point T through 90° clockwise about the origin. Label the image T'. [2]

(b) Describe fully the **single** transformation that maps

(i) triangle B onto triangle A,

.....

..... [3]

(ii) triangle B onto triangle C.

.....

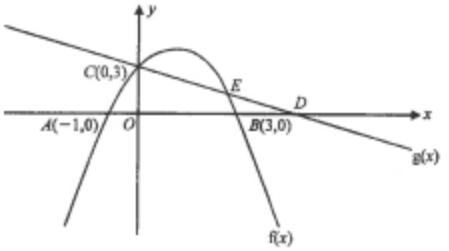
..... [2]

(c) On the grid, draw the image of

(i) triangle B after a reflection in the line $y = 2$. [2]

(ii) Triangle A after a stretch with scale factor 2 and invariant line the y-axis. [2]

11 The diagram shows the parabola, f(x), and the straight line, g(x).
Points A, B, C and D are the intercepts on the axes.
E is the point of intersection of the two graphs.



(a) D is the image of B after B has been translated two units to the right.

Write the co-ordinates of point D.

Answer (a) (....., ...) [1]

(b) Find the equation of the straight line through C and D.

Give your answer in the form $y = mx + c$.

Answer (b) $y =$ ..... [2]

(c) Find the equation of the parabola in the form $y = ax^2 + bx + c$.

Answer (c) $y =$ ..... [4]

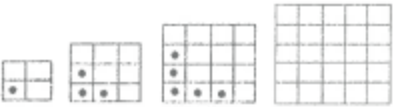
(d) Work out the coordinates of point E.

Answer (d) (....., ...) [4]

(e) Write down the values of x for which $f(x) \geqslant g(x)$.

Answer (e) ..... [2]

12 The diagram shows patterns with dotted and plain tiles.



pattern 1 pattern 2 pattern 3 pattern 4

(a) Complete the 4th pattern. [1]

(b) Complete the table below.

Pattern Number	1	2	3	4	5
Dotted tiles	1	3	5		
Plain tiles	3	6	11		

[2]

(c) Write an expression, in terms of n, for the number of dotted tiles in the nth pattern.

Answer (c) ..... [2]

(d) Find the number of dotted tiles in the 20th pattern.

Answer (d) ..... [1]

(e) How many more dotted tiles are in pattern $n + 7$ than in pattern n?

Answer (e) ..... [2]

[Turn over

(f) Write an expression, in terms of n, for the number of plain tiles in the nth pattern.

Answer (f) ..... [2]

(g) Find

(i) the pattern with 227 plain tiles.

Answer (g)(i) ..... [2]

(ii) the total number of tiles in pattern 65.

Answer (g)(ii) ..... [2]

13 $f(x) = 2^x$ and $g(x) = 2x + 3$.

(a) Find

(i) $f(3)$.

Answer (a)(i) ..... [1]

(ii) $g^{-1}(x)$.

Answer (a)(ii) $g^{-1}(x) =$ ..... [2]

(iii) $gf(x)$, in its simplest form.

Answer (a)(iii) ..... [2]

(b) Solve $f(x) = 8^{(x-1)}$.

Answer (b) $x =$ ..... [3]

(c) Given that $gh(x) = 6x + 1$, find $h(x)$.

Answer (c) ..... [3]