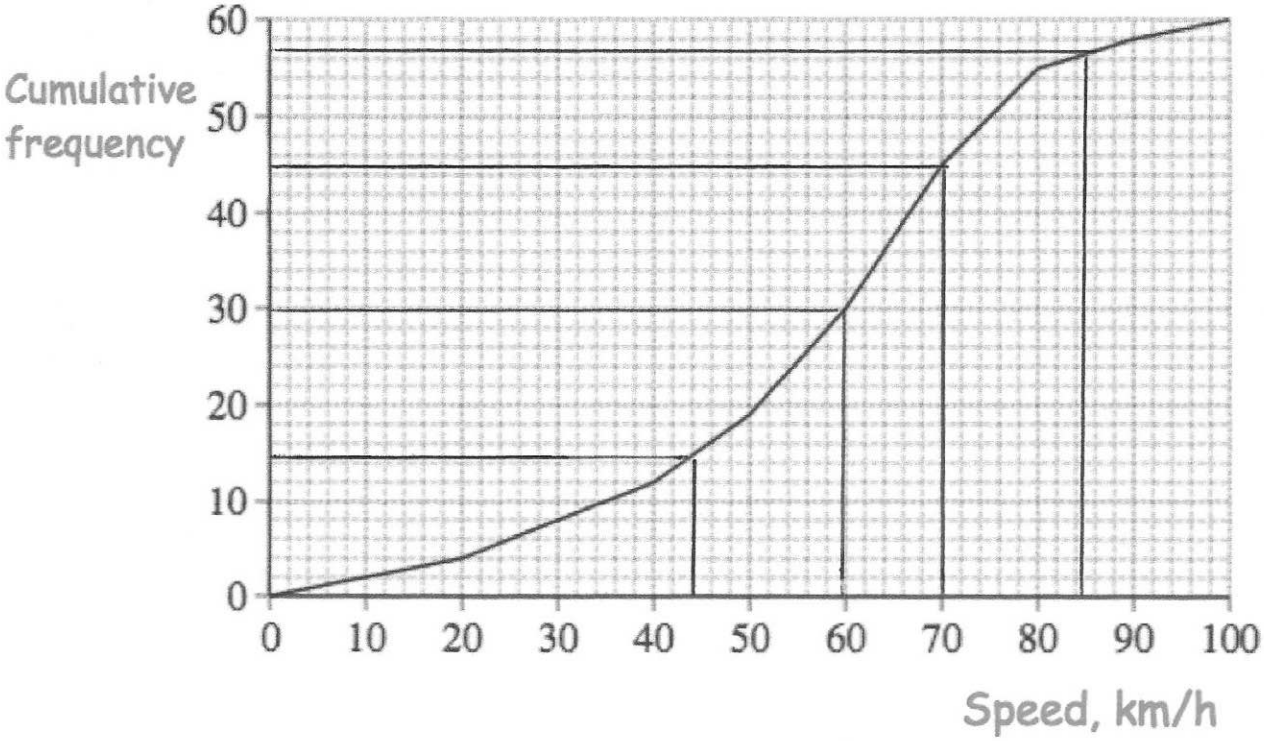
62

. The cumulative frequency diagram shows the distribution of speeds for 60 cars on a road.



(a) Estimate the median speed.

60 km/h

(1)

(b) Estimate the interquartile range of the speeds.

70 - 44

26 km/h

(2)

The speed limit on the road is 85 km/h.

(c) How many cars exceeded the speed limit?

if 56, then 4

if 57, then 3

.....

(2)

13 . A group of scientists want to estimate the number of eels in a lake.
They catch and ring 40 eels.
They return the 40 eels to the lake.
They then catch 180 eels and 23 are ringed.

Estimate the number of eels in the lake.

$$\frac{40}{y} = \frac{23}{180}$$

$$23y = 7200$$

$$y = 313.04\ldots$$

$$= 313$$

313

(2)

64. Factorise fully

$$w^2y + wy^2$$

$wy(w + y)$

$wy(w + y)$

(2)

65 . (a) x is an integer.

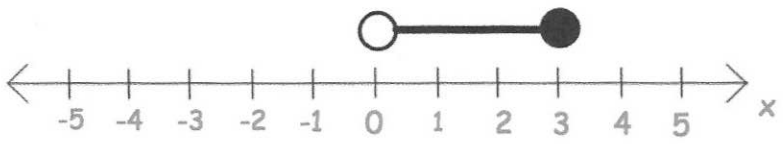
Write down all the solutions of the inequality $30 < 7x + 1 < 135$

$29 < 7x < 134$

$4.14.. < x < 19.14..$

5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 **(3)**

(b) Write down the inequality shown by the diagram.



$0 < x \leq 3$

(2)

66. Solve

$$\frac{1}{x+3} - \frac{1}{x+1} = 2$$

$$\frac{(x+1)-(x+3)}{(x+3)(x+1)} = 2$$

$$\frac{-2}{x^2+4x+3} = 2$$

$$-2 = 2x^2 + 8x + 6$$

$$0 = 2x^2 + 8x + 8$$

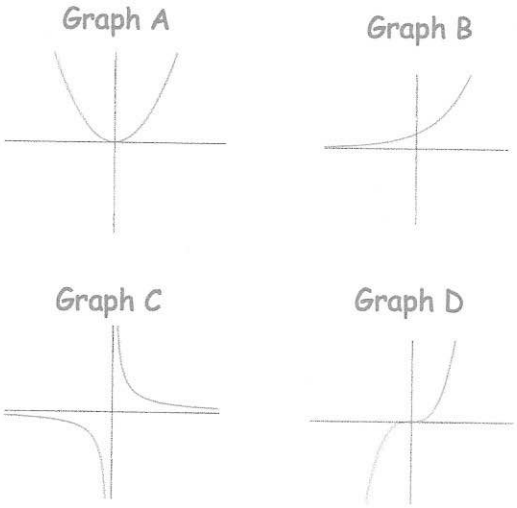
$$0 = x^2 + 4x + 4$$

$$0 = (x+2)(x+2)$$

$x = -2$

(5)

67. Match each graph to the correct equation



$y = x^2$ is graph **A**

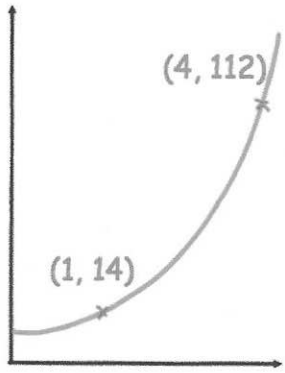
$y = x^3$ is graph D

$y = 2^x$ is graph B

$y = \frac{1}{x}$ is graph C

(2)

64.



The sketch shows a curve with equation
$y = ab^x$ where a and b are constants and $b > 0$

The curve passes through the points (1, 14) and (4, 112)

Calculate the value of a and b $y = ab^{3c}$

(1, 14) $14 = ab^1$

$14 = ab$ (1)

(4, 112) $112 = ab^4$ (2)

(2) ÷ (1)

$\frac{112}{14} = \frac{ab^4}{ab}$ $14 = 2a$

$a = 7$

a = 7

b = 2

$b^3 = 8$

$b = 2$

(3)

69. Write the numbers below in order.
Start with the smallest.

$\frac{11}{23}$ $0.4\dot{7}\dot{2}$ $\frac{5}{11}$

5/11, 0.4$\dot{7}\dot{2}$, 11/23

(3)

70.

An object is placed on a table.
It exerts a force of 22 newtons on the table.

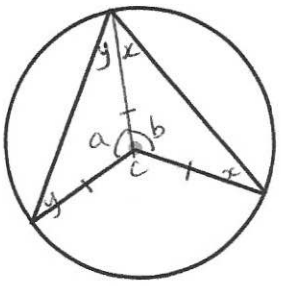
The pressure on the table is 500 newtons/m².
Calculate the area of the crate that is in contact with the table.
Include suitable units.

$A = \frac{F}{P} = \frac{22}{500} = 0.044m^2$ or $440cm^2$

$0.044m^2$ or $440cm^2$

(3)

71



Prove that the angle at the centre is twice the angle at the circumference.

$a = 180 - 2y$ (angles in a triangle)

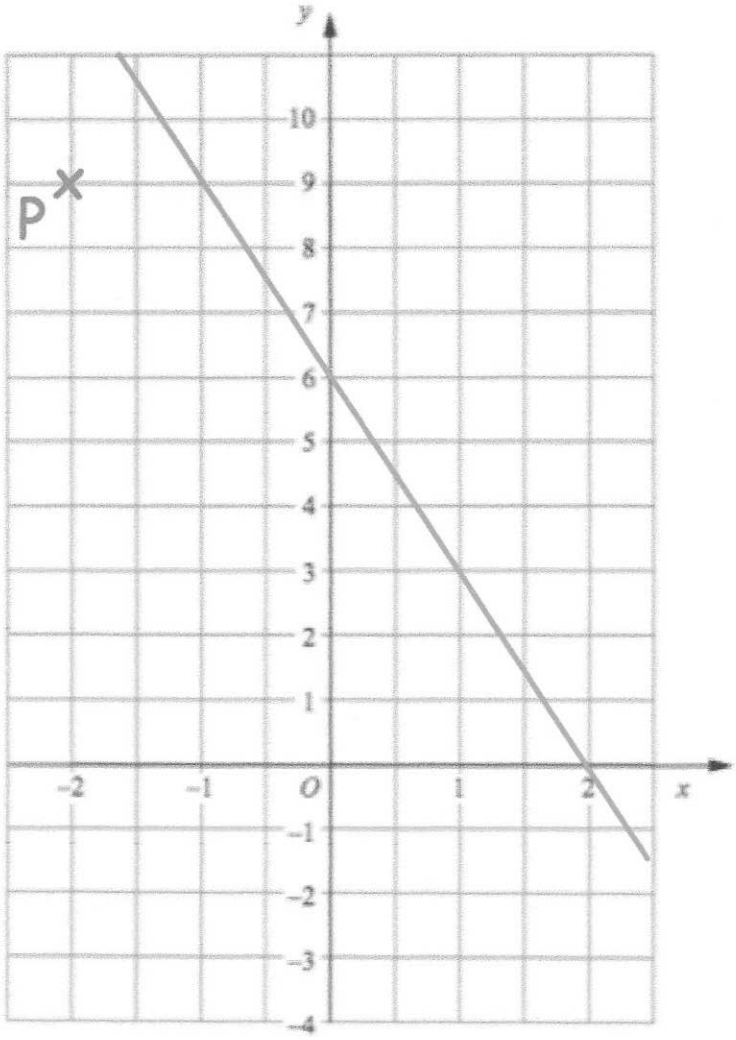
$b = 180 - 2x$ (" " " ")

$C = 360 - (360 - 2x - 2y)$

$C = 2x + 2y$

∴ angle at centre is twice the angle at the circumference.

72.



(a) Find the equation of L.

$y = -3x + 6$

(3)

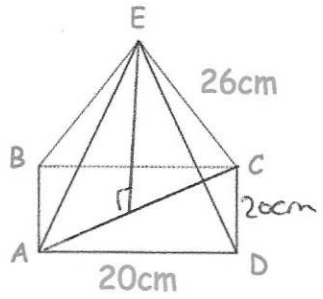
The point P has coordinates (–2, 9).

(b) Find an equation of the line that is parallel to L and passes through P.

$y = -3x + 3$

(2)

73. Shown below is a square based pyramid.
The apex E is directly over the centre of the base.



AD = 20cm
CE = 26cm

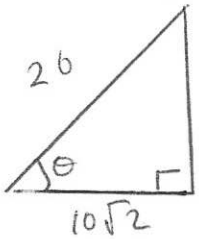
(a) Work out the length of AC

20^2+20^2
$=400+400$
$=800$

$AC=\sqrt{800}$
$AC=20\sqrt{2}$

28.3 cm
(to 1 dp) **(2)**

(b) Calculate angle CAE



$Am=10\sqrt{2}$
$\cos\theta=\frac{10\sqrt{2}}{26}$
$\theta=57.0485$

57.05 °
(to 2 dp) **(2)**

(c) Work out the height of the pyramid

$26^2-(10\sqrt{2})^2$
$=476$
$=\sqrt{476}$
$=21.817$

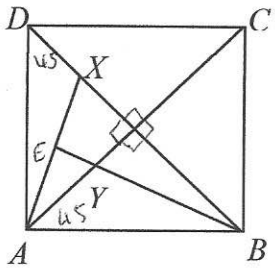
21.82 cm
(to 2 dp) **(2)**

(d) Calculate the volume of the pyramid

$V=\frac{1}{3}Ah$
$=\frac{1}{3}(20)^2(21.817)$

2908.99 cm³
(to 2 dp) **(2)**

74 . ABCD is a square, X is a point in the diagonal BD and the perpendicular from B to AX meets AC in Y.



Prove that triangles AXD and AYB are congruent.

$AB = AD$ (square)

$\angle BAC = \angle ADB = 45°$ (diagonals bisect right angle)

Let $\angle ABY = x$

$\angle AYB = 135 - x$

$\angle EYF = \angle AYB$ (vertically opposite)

(4)

$\angle AEB = \angle XEB = 90°$

XEYF is a kite since $\angle XEY = \angle XFY = 90°$

So $\angle EXF = 45 + x$

So $\angle DXA = 135 - x$ (angles on straight line add to 180°)

As angles in $\triangle AXD$ add to 180°, $\angle DAX = x$

$\therefore \triangle AYB$ is congruent to $\triangle AXD$ due to ASA

75. Hannah is baking two cakes.

One cake needs 1⅓ cups of milk.
Hannah has 1¼ cups of milk.

How much more milk does Hannah need?

$2\frac{2}{3}$ for 2 cakes

$2\frac{2}{3} - 1\frac{1}{4}$

$\frac{8}{3} - \frac{5}{4}$

$\frac{32}{12} - \frac{15}{12} = \frac{17}{12}$

$1\frac{5}{12}$ .....cups

(3)

76. In a box

the number of blue counters and the number green counters are in the ratio 7:4
the number of green counters and the number of red counters are in the ratio 3:1

The total number of counters in the bag is 444.

How many green counters are in the bag?

7 : 4 ×3 → 21 : 12

3 : 1 ×4 → 12 : 4

21 : 12 : 4

21
12
4
37

444 ÷ 37 = 12

12 × 12 = 144

144 green counters.

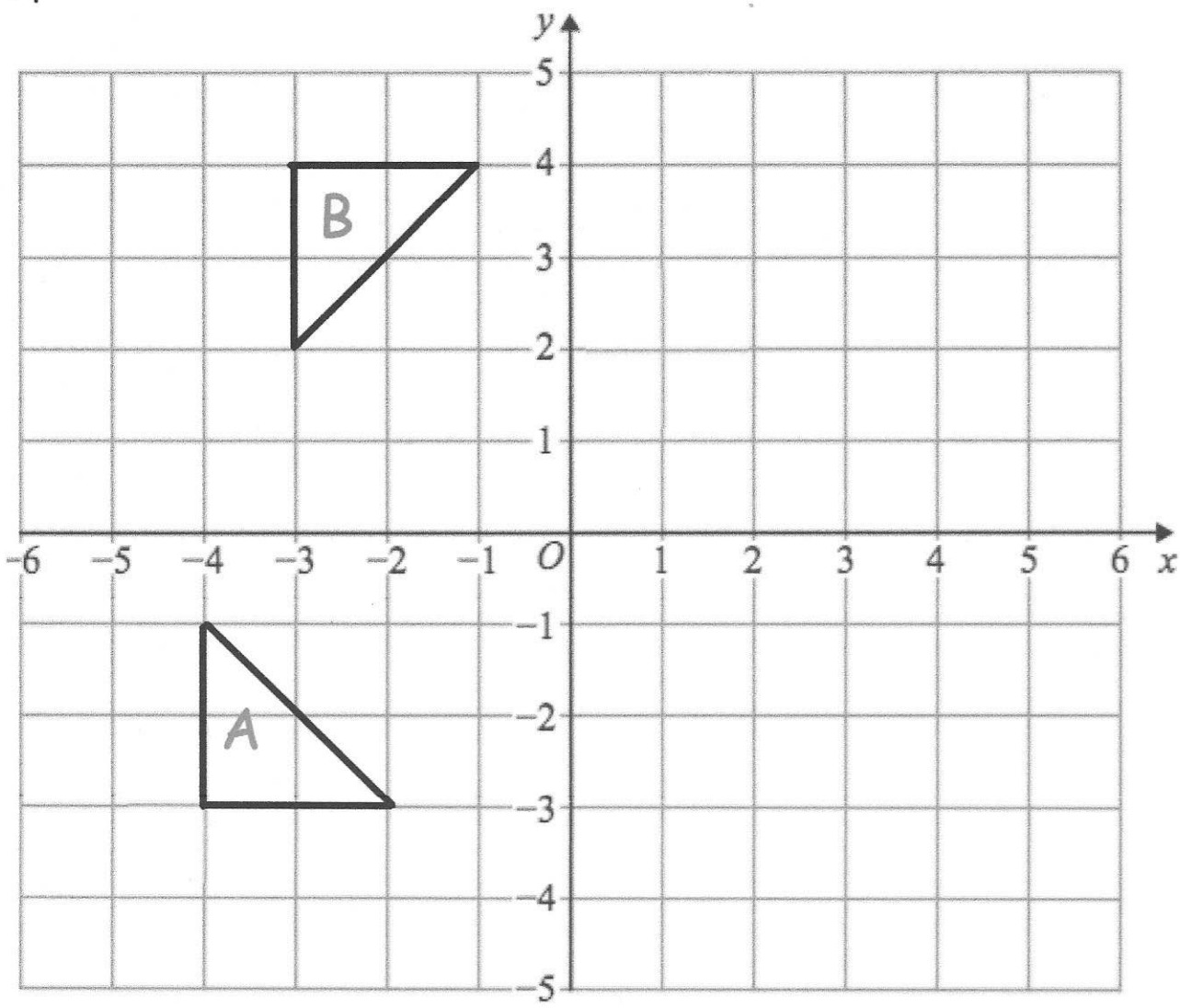
77. Write 32 in the form 4^n

$4^{5/2}$

$n = 2.5$

(2)

78.



Describe fully the single transformation that maps triangle A onto triangle B.

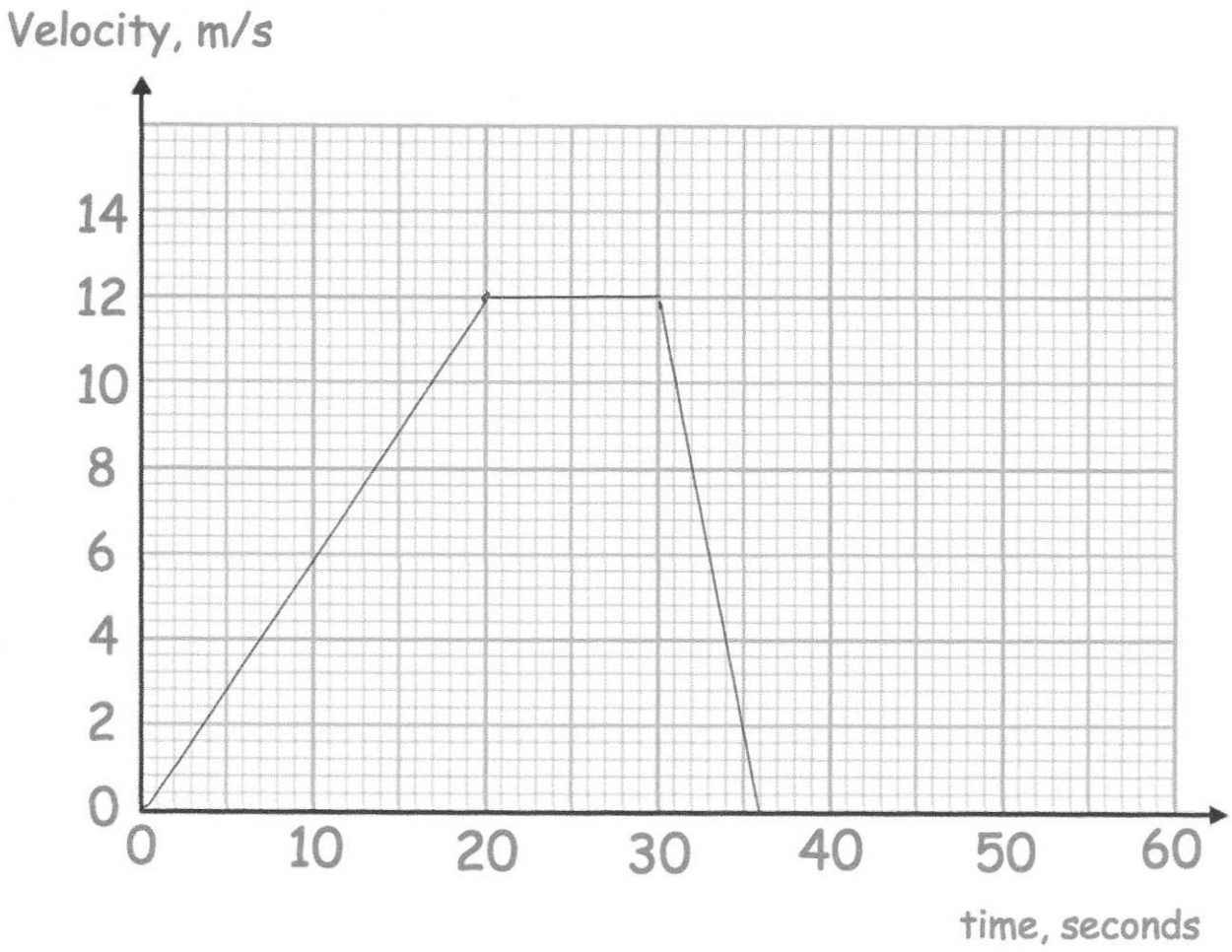
Rotation 90° clockwise using (0,0) as centre of rotation

(2)

79

. A remote control car drives in a straight line.
It starts from rest and travels with constant acceleration for 20 seconds reaching a velocity of 12m/s.
It then travels at a constant speed for 10 seconds.
It then slows down with constant deceleration of 2m/s^2.

(a) Draw a velocity time graph



(b) Using your velocity-time graph, work out the total distance travelled.

$\frac{1}{2}(a+b)h$

$\frac{1}{2}(36+10)\times 12$

276

.....m

(2)

90. The speed limit on a road is 50 mph.

A car drives 19 miles in 22 minutes.

Is the car breaking the speed limit?
You must show your workings.

$= 0.8636$ in 1 minutes.

$\times 60$

51.81 in 60 mins

51.81mph

∴ it is breaking the speed limit

(3)

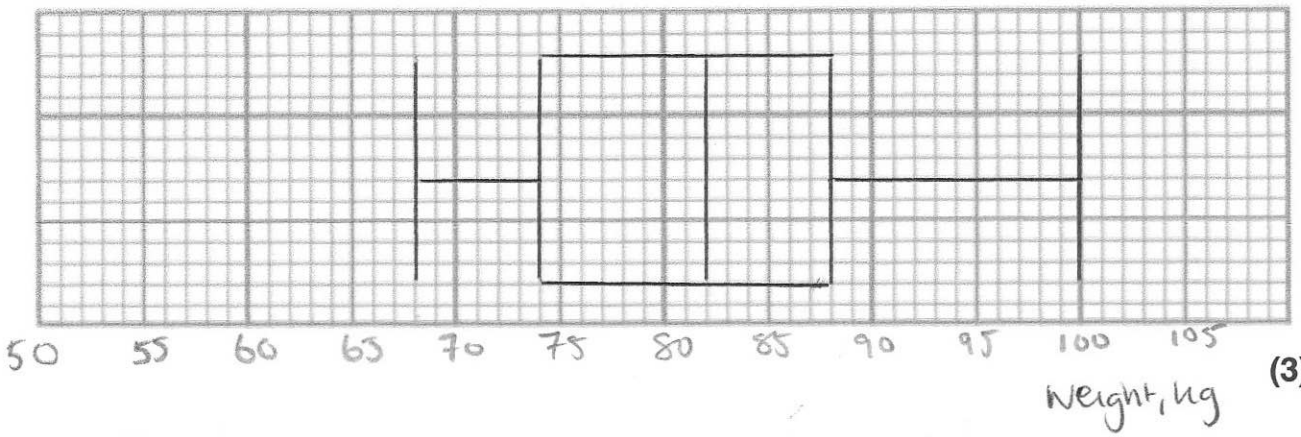
81 . The table gives information about the weights of 50 male rugby players.

Lowest	68kg
Lower Quartile	74kg
Median	82kg
Upper Quartile	88kg
Highest	100kg

IQR = 14kg

Range = 32kg

(a) Draw a box plot to show this information.



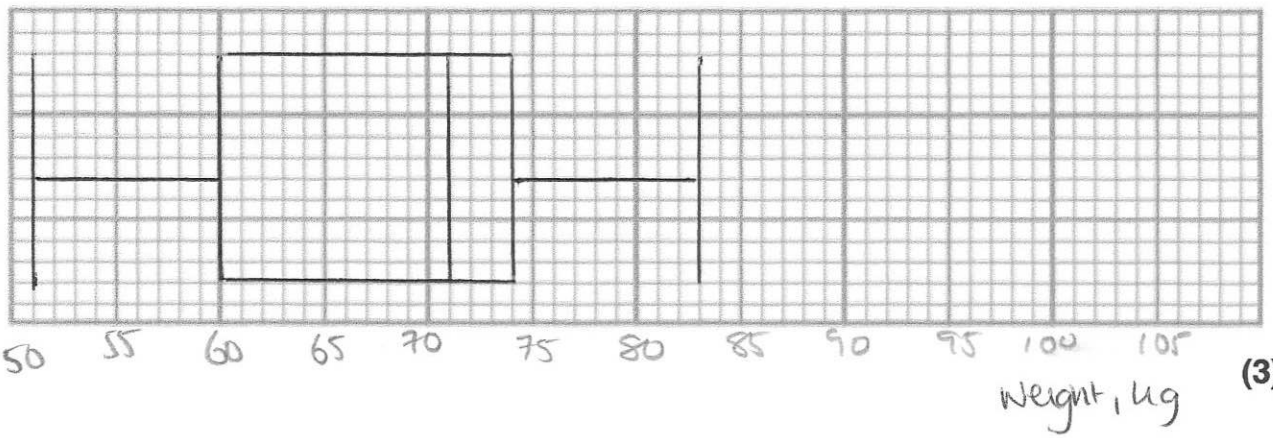
(3)

The weights of 50 female rugby players are also recorded.

The lightest female rugby player is 51kg. Upper = 74kg
The lower quartile is 60kg.
The median is 71kg.
The range and interquartile range for the female rugby players is the same as the male rugby players.

Highest = 83kg

(b) Draw a box plot to show this information.



(3)

82

(a) Factorise $y^2 - 13y + 36$

$(y-4)(y-9)$

(2)

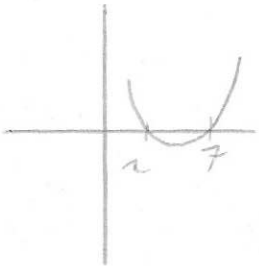
(b) Factorise $2w^2 - 9w + 4$

$(2w-1)(w-4)$

(2)

83. Solve the inequality $x^2 - 9x + 14 \leq 0$

$(x-2)(x-7)$



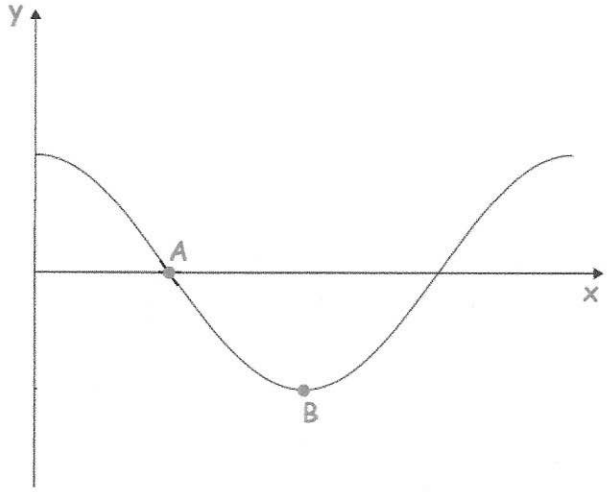
$2 \leq x \leq 7$

.....

(3)

Graph:
$y = \cos x$

84



(a) Write down the coordinates of the point A.

(90 , 0)

(1)

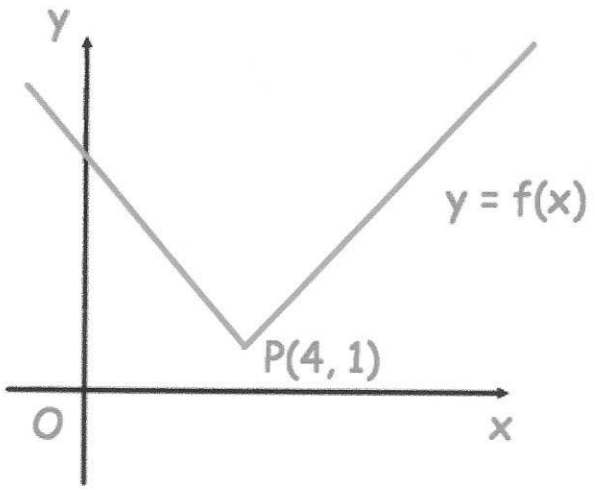
(b) Write down the coordinates of the point B.

(180 , -1)

(1)

85

Here is the graph of $y = f(x)$
The point P(4, 1) is a point on the graph.



What are the coordinates of the new position of P when the graph $y = f(x)$ is transformed to the graph of

(a) $y = -f(x)$

(4 , −1)
(1)

(b) $y = f(x) + 4$

(4 , 5)
(1)

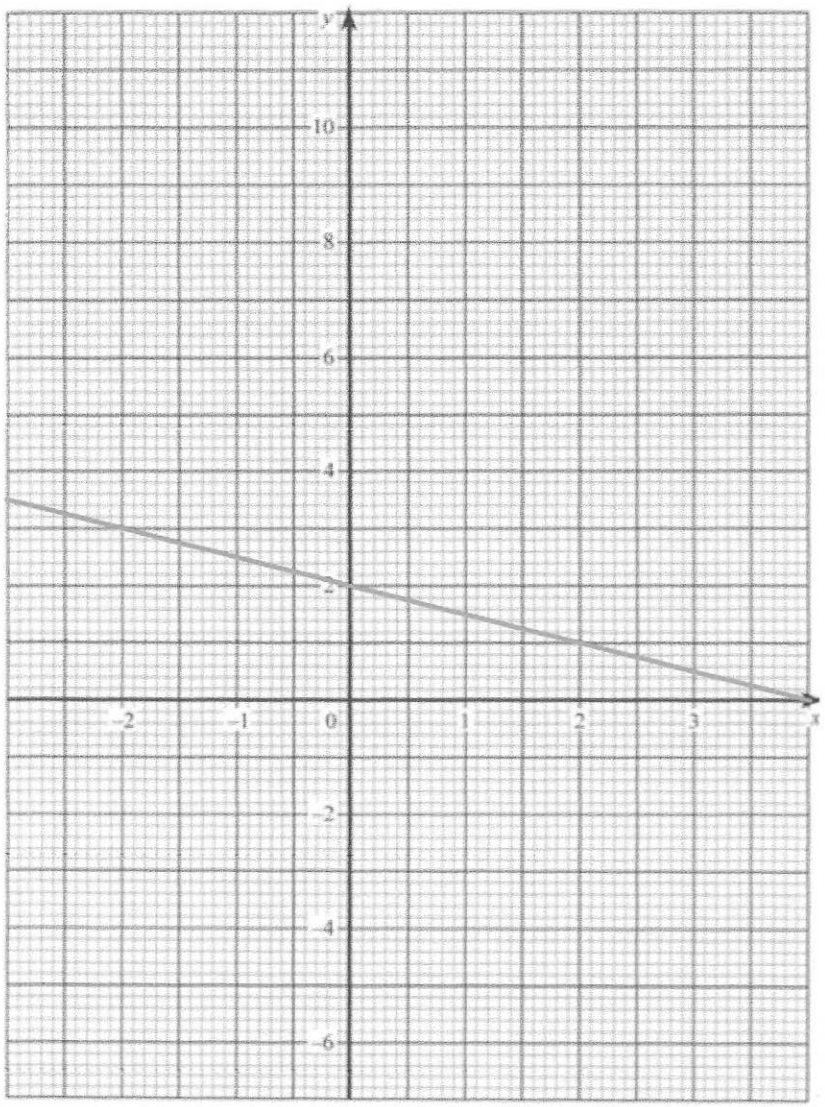
(c) $y = f(-x)$

(−4 , 1)
(1)

(d) $y = f(x + 5)$

(−1 , 1)
(1)

8b.



The straight line L has equation $y = -\frac{1}{2}x + 2$

(a) Write down the equation of a line parallel to L

$y = -\frac{1}{2}x + 4$

(1)

(b) Find an equation of the line that goes through the point (1, 6) and is perpendicular to L

Gradient = 2

$y = 2x + c$

$6 = 2(1) + c$

$6 = 2 + c$

$c = 4$

$y = 2x + 4$

(3)

87

. Prove $(2n + 9)^2 - (2n + 5)^2$ is always a multiple of 4

$(2n+9)(2n+19) - (2n+5)(2n+5)$

$= 4n^2 + 36n + 81 - (4n^2 + 20n + 25)$

$= 4n^2 + 36n + 81 - 4n^2 - 20n - 25$

$= 16n + 56$

$= 4(4n + 14)$

$\therefore$ a multiple of 4

(4)

88

. Martina has some coins.

Martina has to pay 60p for a car park ticket.
She selects 3 coins at random, without replacement, from her pocket.

Work out the probability that she has chosen the exact price of the ticket.

$P(20,20,20) = \frac{3}{8} \times \frac{2}{7} \times \frac{1}{6} = \frac{1}{56}$

$P(50,5,5) = \frac{1}{8} \times \frac{2}{7} \times \frac{1}{6} = \frac{1}{168}$

(50, 5, 5)
(5, 50, 5) or (5, 5, 50)

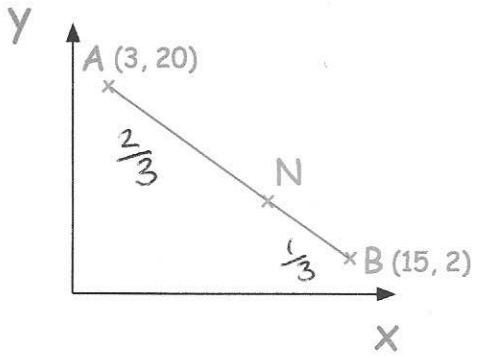
$\frac{1}{56} + \frac{1}{168} + \frac{1}{168} + \frac{1}{168} = \frac{1}{28}$

1/28

(4)

89

. A is the point with coordinates (3, 20)
B is the point with coordinates (15, 2)
N is a point of the line AB such that AN : NB = 2 : 1



Find the coordinates of the point N.

$15 - 3 = 12$

$\frac{2}{3}$ of $12 = 8$

$\therefore$ x coordinate is $3 + 8 = 11$

y coordinate

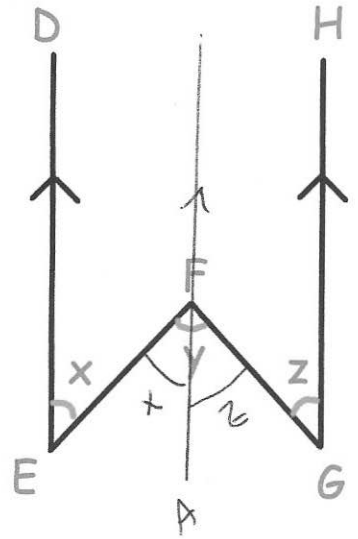
$2 - 20 = -18$

$\frac{2}{3}$ of $-18 = -12$

y coordinate is $20 - 12 = 8$

$N = (11, 8)$

90. In the diagram below, the lines ED and GH are parallel.



Prove that $x + z = y$

$\angle DEF = \angle EFA$ as alternate angles are equal

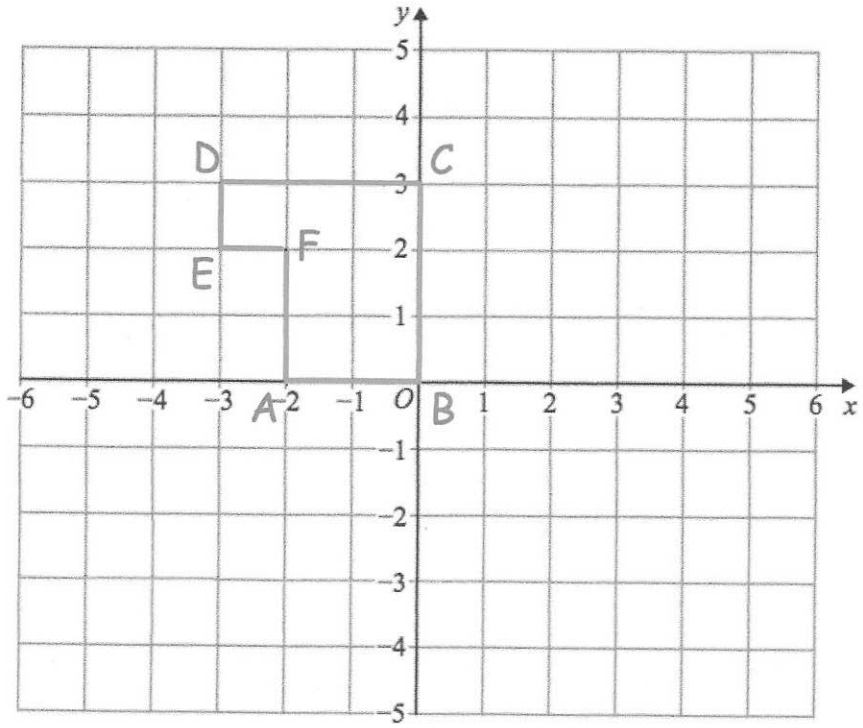
$\angle HGF = \angle GFA$ as alternate angles are equal

$\angle EFG = x + z$

$\therefore y = x + z$

(3)

91. Here is shape ABCDEF



Describe fully a **single** transformation so that only vertex F is invariant.

Rotation of 180° degrees with centre of rotation (-2,2)