ADA PINPOINT PACKS

61_to_81_Percent_Pinpoint_AI_Pack

Made for Grade6to8

AO1,2_and_3

ALL_Strands

Calc_Only

Created by A.D.A:

Pinpoints Automatic Differention Algorithmn

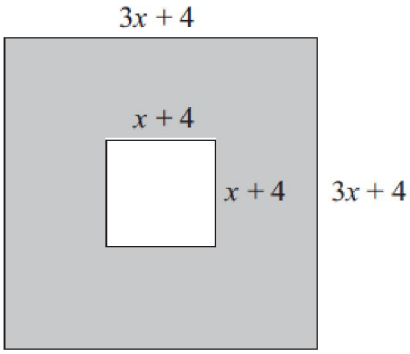
Designed and Programmed by

Tom Quilter, Anne Mcateer + Jon Hargreaves ... All maths teachers.

Question 1 (AO3): 38% of students got this right

13. A machine part is made by cutting a small square from the centre of a large square piece of steel.

The dimensions of the machine part are shown on the diagram.
All measurements are in cm.



The perimeter of the small square is two thirds of the perimeter of the large square.

Work out the length of a side of the small square.

..... cm

(Total 5 marks)

Question 2 (AO2): 38% of students got this right

16. The number of rabbits on a farm *n* months from now is R_n where

$R_0 = 200$

$R_{n+1} = 1.2R_n - 35$

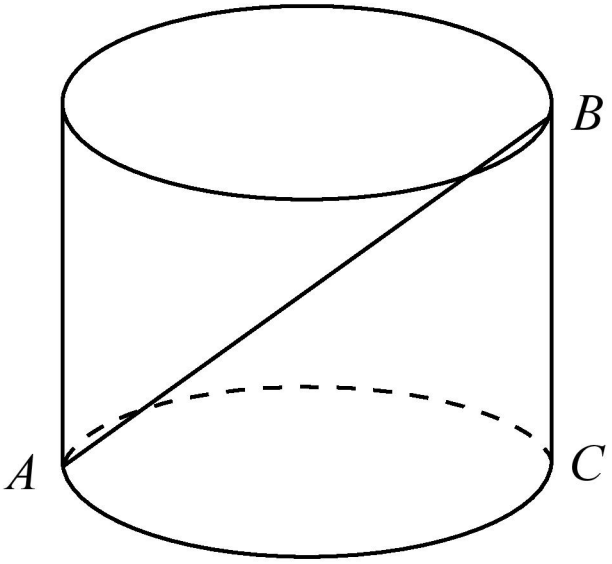
How many rabbits will there be on the farm 3 months from now?

.....

(Total 3 marks)

Question 3 (AO3): 36% of students got this right

12 The diagram shows a metal rod, AB, resting inside a cylindrical tin.



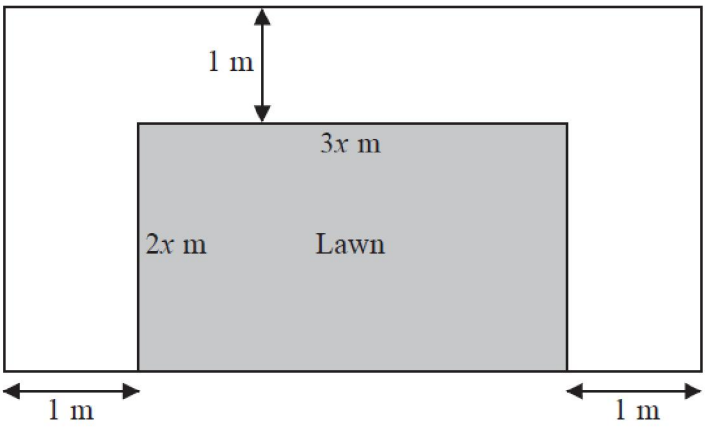
The tin is on a horizontal table.
AC is a diameter of the base of the tin.
B is on the top edge of the tin.
BC is vertical.

The radius of the base of the tin is 5 cm.
The volume of the tin is 1178 cm^3.

Find the angle between the rod and the base of the tin.
Give your answer correct to the nearest degree.

Question 4 (AO2): 36% of students got this right

9. A rectangular lawn has a length of $3x$ metres and a width of $2x$ metres.
The lawn has a path of width 1 metre on three of its sides.



The total area of the lawn and the path is 100 m^2

(*a*) Show that $6x^2 + 7x - 98 = 0$

(2)

Question 5 (AO1): 35% of students got this right

7 Liquid **A** has a density of 1.42 g/cm^3

7 cm^3 of liquid **A** is mixed with 125 cm^3 of liquid **B** to make liquid **C**.

Liquid **C** has a density of 1.05 g/cm^3

Find the density of liquid **B**.
Give your answer correct to 2 decimal places.

Question 6 (AO1): 34% of students got this right

25 Work out $(13.8 \times 10^{7}) \times (5.4 \times 10^{-12})$
Give your answer as an ordinary number.

Question 7 (AO1): 33% of students got this right

11 Jeff is choosing a shrub and a rose tree for his garden.
At the garden centre there are 17 different types of shrubs and some rose trees.

Jeff says,

"There are 215 different ways to choose one shrub and one rose tree."

Could Jeff be correct?
You must show how you get your answer.

(Total for Question 11 is 2 marks)

Question 8 (AO3): 32% of students got this right

22 Madelyn uses the quadratic formula to solve a quadratic equation.
She correctly substitutes values in the quadratic formula and obtains

$$x = \frac{-5 \pm \sqrt{25 - 24}}{6}$$

Determine the quadratic equation that Madelyn is solving.
Express your answer in the form $ax^2 + bx + c = 0$, where a, b and c are integers.

.....

(Total 3 marks)

Question 9 (AO2): 32% of students got this right

18 $(x - 8)(x + 4) = (x - a)^2 + b$ for all values of x.

Find the value of a and the value of b.

Question 10 (AO1): 31% of students got this right

15 (*c*) Starting with $x_0 = 1$, use the iteration formula $x_{n+1} = \dfrac{5}{x_n^2 + 7}$ three times to find an estimate for the solution of $x^3 + 7x - 5 = 0$

Question 11 (AO2): 30% of students got this right

18.

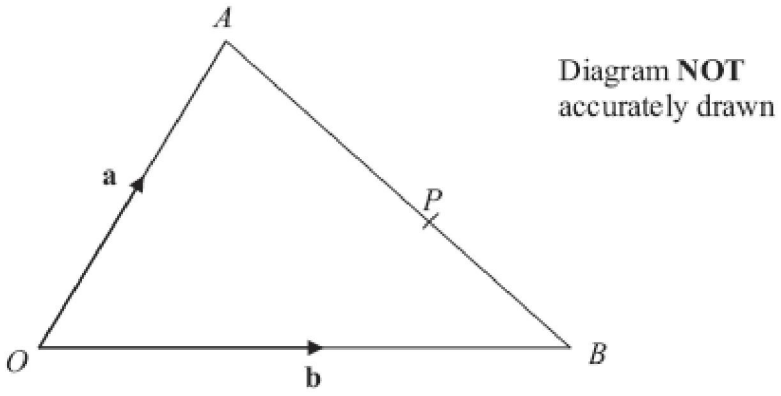


Diagram **NOT** accurately drawn

OAB is a triangle.

$\overrightarrow{OA} = \mathbf{a}$

$\overrightarrow{OB} = \mathbf{b}$

(a) Find the vector $\overrightarrow{AB}$ in terms of **a** and **b**.

$\overrightarrow{AB}$ = ...

(1)

P is the point on *AB* such that *AP* : *PB* = 3 : 2

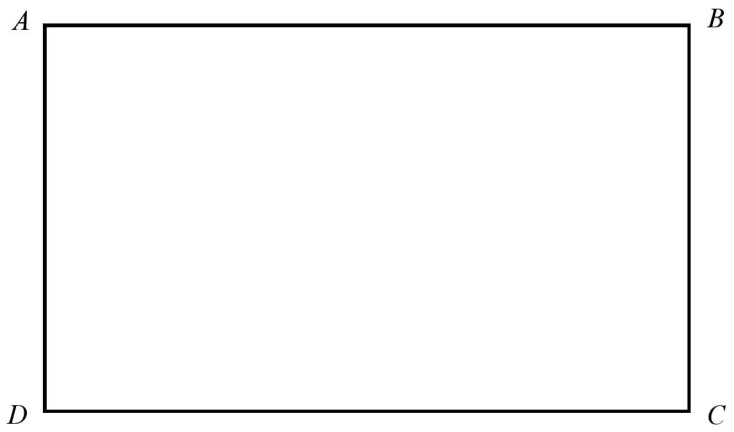
(b) Show that $\overrightarrow{OP} = \frac{1}{5}(2\mathbf{a} + 3\mathbf{b})$

(3)

(Total 4 marks)

Question 12 (AO1): 29% of students got this right

3 Here is an accurate scale drawing of a school playground.



1 cm represents 2 m

Asif is going to put a seat in the playground.

The seat has to be

less than 9 m from C
closer to BC than to AB
more than 4 m from AB

Show, by shading on the diagram, the region where Asif can put the seat.

Question 13 (AO3): 28% of students got this right

13. f is the function $f(x) = 2x + 5$.
g is the function $g(x) = x^2 - 25$.

(*d*) (i) Find $gf(x)$.
Give your answer as simply as possible.

$gf(x) =$ .....

(ii) Solve $gf(x) = 0$.

.....

(5)

(Total 9 marks)

Question 14 (AO1): 28% of students got this right

9 The functions f and g are such that

$$f(x) = 3(x - 4) \quad \text{and} \quad g(x) = \frac{x}{5} + 1$$

(*c*) Show that $ff(x) = 9x - 48$

Question 15 (AO2): 27% of students got this right

18. *ABC* is an isosceles triangle.

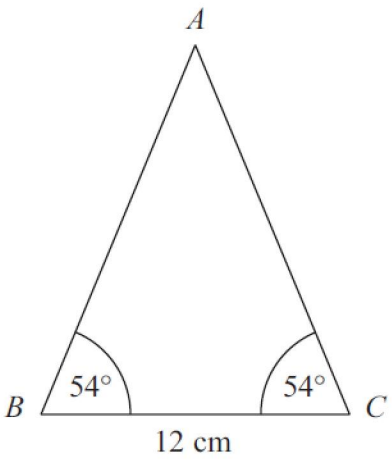


Diagram **NOT** accurately drawn

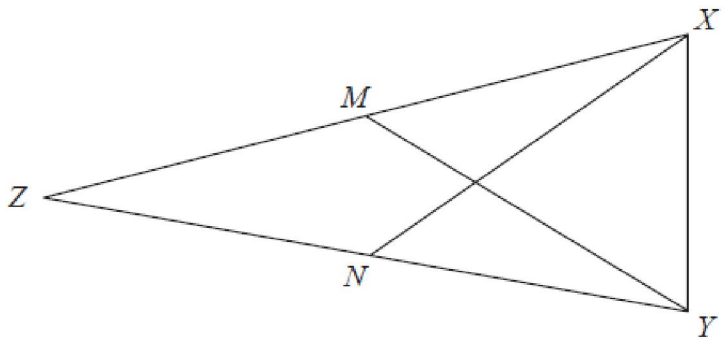
Work out the area of the triangle.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 18 is 4 marks)

Question 16 (AO2): 27% of students got this right

16. The diagram shows an isosceles triangle *XYZ*.



XZ = *YZ*

M is the midpoint of *XZ*.
N is the midpoint of *YZ*.

Prove that triangle *XMY* is congruent to triangle *YNX*.
Give reasons for each stage of your working.

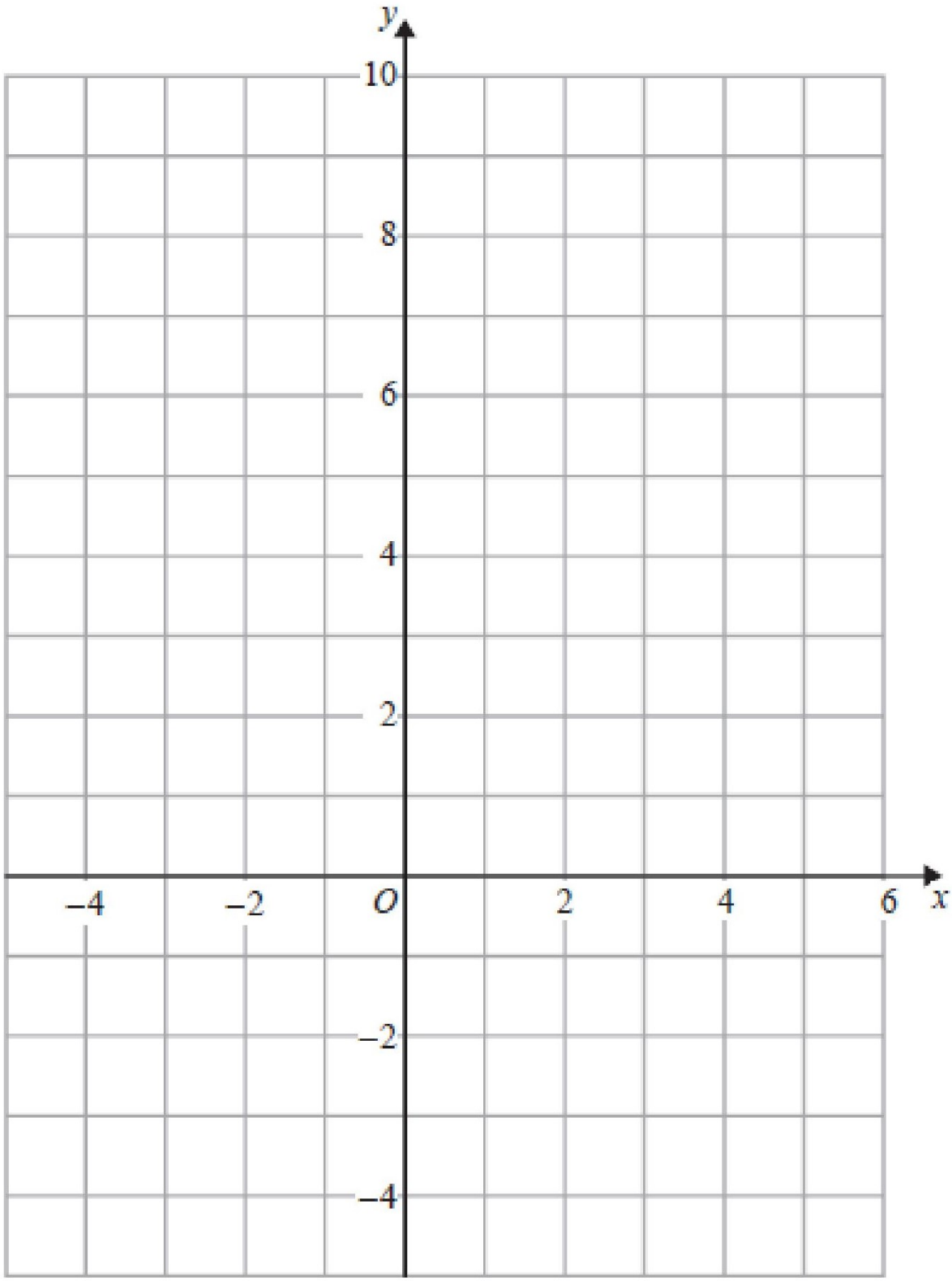
(Total 4 marks)

Question 17 (AO1): 26% of students got this right

10 On the grid, shade the region that satisfies all these inequalities.

$x + y < 4$ $y > x - 1$ $y < 3x$

Label the region **R**.



Question 18 (AO2): 26% of students got this right

3 3 of the 25 women have a shoe size of 7

Zoe says that if you choose at random one of the 25 women, the probability that she has either a shoe size of 7 or a dress size of 14 is $\frac{9}{25}$ because

$$\frac{3}{25} + \frac{6}{25} = \frac{9}{25}$$

(*b*) Is Zoe correct?
You must give a reason for your answer.

(1)

(Total for Question 3 is 2 marks)

Question 19 (AO3): 25% of students got this right

15. Two solid cones are mathematically similar.

Cone **A** has a volume of 120 cm^3
Cone **B** has a volume of 960 cm^3

Work out the ratio of the surface area of cone **A** to the surface area of cone **B**.

.....

(Total for Question 15 is 3 marks)

Question 20 (AO3): 24% of students got this right

19 The value of a is 2.7.
The value of b is 0.8.

The values of both a and b have been given correct to the nearest 0.1.

(a) Determine the upper bound for b.

.....

(1)

$$c = a + \frac{1}{b}$$

(b) Determine a lower bound for c.
Show all steps in your calculations.

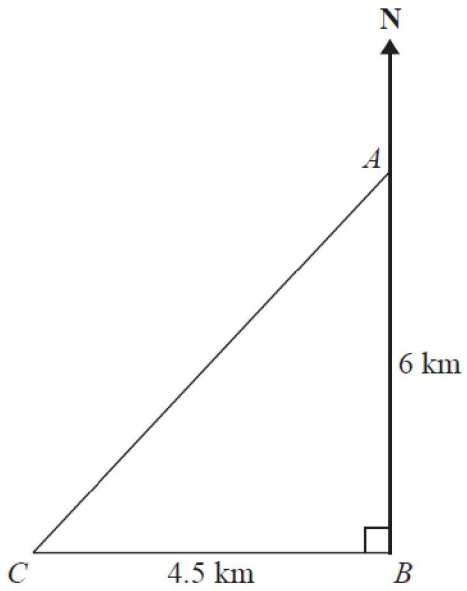
.....

(3)

(Total 4 marks)

Question 21 (AO1): 23% of students got this right

4. The diagram shows the positions of three turbines *A*, *B* and *C*.



(*b*) Calculate the bearing of *C* from *A*.
Give your answer correct to the nearest degree.

..... °

(4)

(Total 7 marks)

Question 22 (AO2): 23% of students got this right

25 Chloe has 40 marbles.

She has
18 green marbles
15 red marbles
7 blue marbles

Chloe will take two marbles at random.

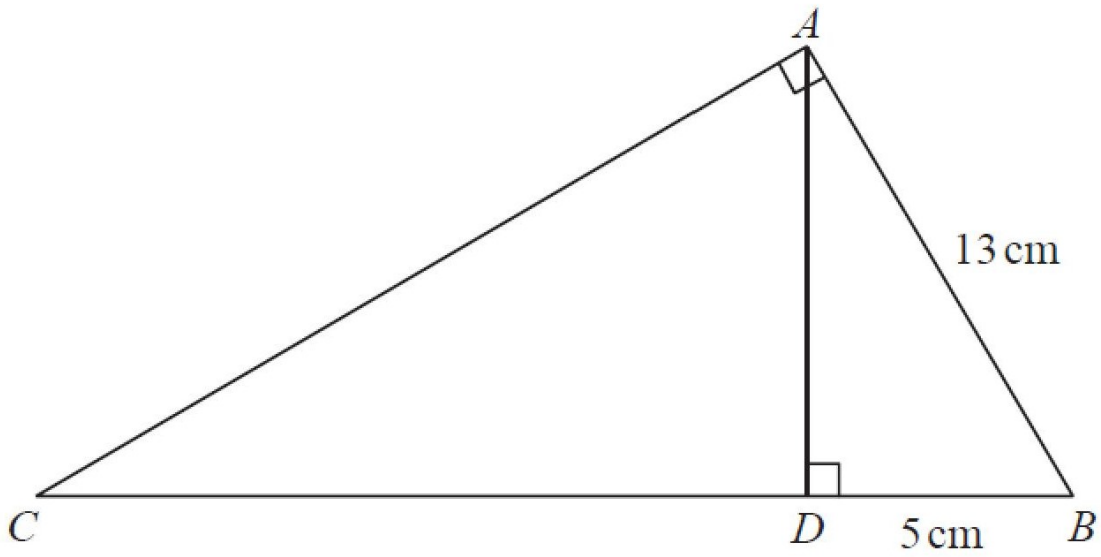
Determine the probability that the two marbles will have a **different** colour.
Show all steps in your calculations.

.....

(Total 4 marks)

Question 23 (AO3): 22% of students got this right

14 ABC and ABD are two right-angled triangles.



Angle BAC = angle ADB = 90°

AB = 13 cm
DB = 5 cm

Work out the length of CB.

Question 24 (AO2): 21% of students got this right

15 (*a*) Show that the equation $x^3 + 7x - 5 = 0$ has a solution between $x = 0$ and $x = 1$

Question 25 (AO1): 21% of students got this right

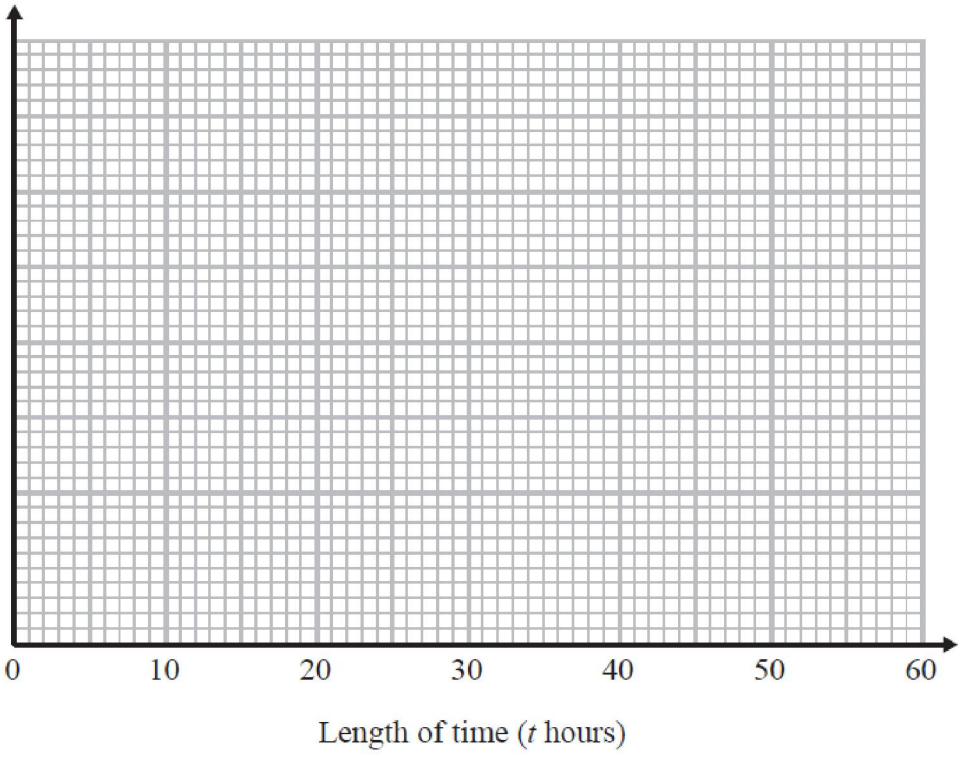
18. The table gives some information about the lengths of time, in hours, that some adults watched TV last week.

Length of time (t hours)	Frequency
$0 < t \leq 10$	8
$10 < t \leq 15$	15
$15 < t \leq 20$	11
$20 < t \leq 30$	10
$30 < t \leq 50$	6

(a) Work out an estimate for the mean length of time.

RETEST QUESTION

(b) Draw a histogram for the information in the table.



(3)

(Total for Question 18 is 7 marks)

Question 26 (AO1): 20% of students got this right

17 The table gives information about the heights of 150 students.

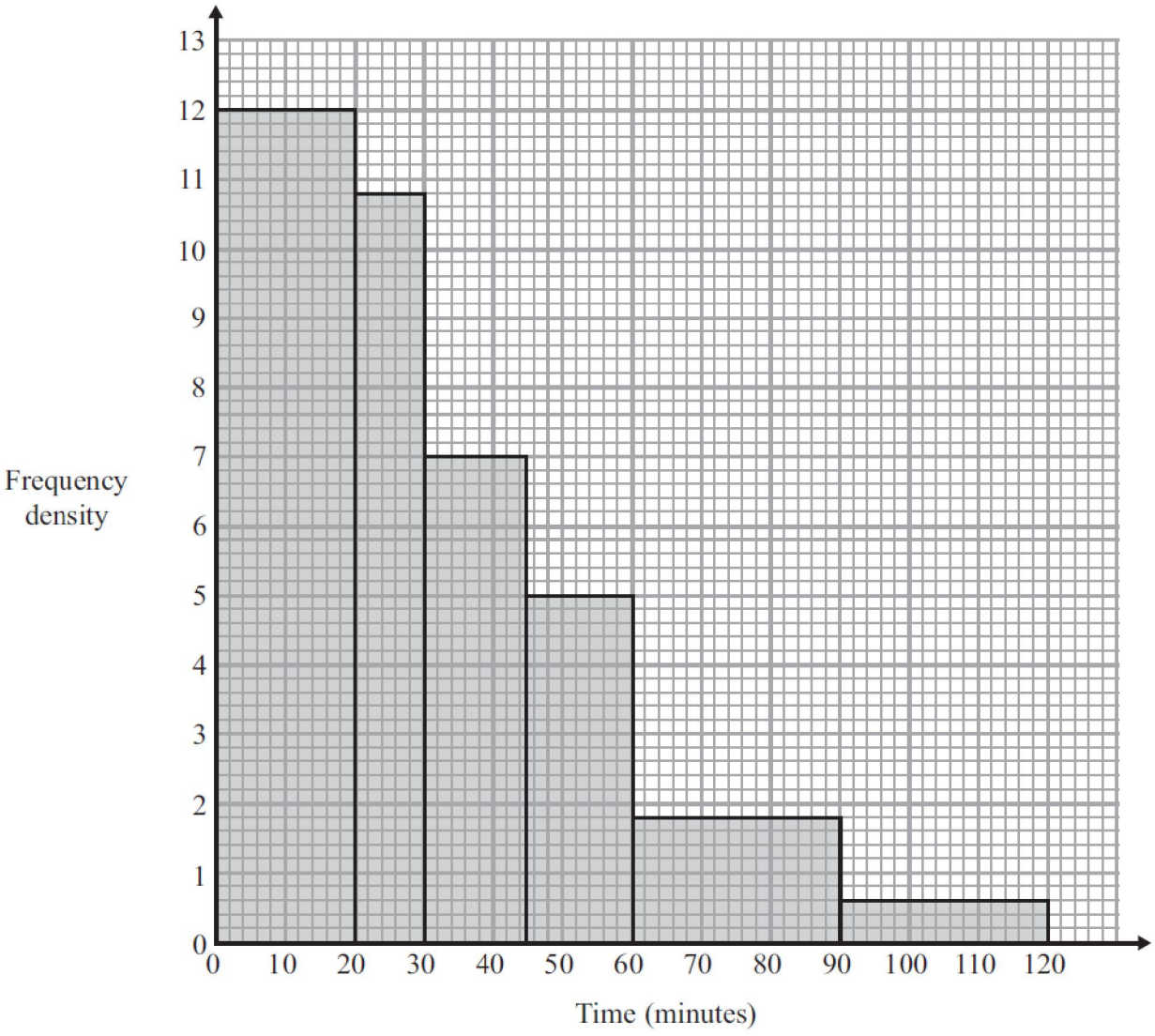
Height (h cm)	Frequency
$140 < h \leqslant 150$	15
$150 < h \leqslant 155$	30
$155 < h \leqslant 160$	51
$160 < h \leqslant 165$	36
$165 < h \leqslant 180$	18

(a) On the grid, draw a histogram for this information.

(b) Work out an estimate for the fraction of the students who have a height between 150 cm and 170 cm.

Question 27 (AO3): 19% of students got this right

27. The histogram shows information about the times, in minutes, that some passengers had to wait at an airport.



Work out the percentage of the passengers who had to wait for more than one hour.

(Total for Question 27 is 3 marks)

Answers to Qn 1 (AO3): 38% of students got this right

Question		Working	Answer	Mark	Notes
13.		$4(x + 4) = 4x + 16$ $4(3x + 4) = 12x + 16$ $4x + 16 = \frac{2}{3}(12x + 16)$ $12x + 48 = 24x + 32$ $12x = 16$	$5\frac{1}{3}$	5	M1 for a correct expression for at least one perimeter. M1 for "$4x + 16$" = $\frac{2}{3}$ "$(12x + 16)$" oe M1 for $12x + 48 = 24x + 32$ or $4x + 16 = 8x + \frac{32}{3}$ oe A1 for $\frac{4}{3}$ B1 ft for "$\frac{4}{3}$" + 4 **OR** M2 for $x + 4 = \frac{2}{3}(3x + 4)$ M1 for $3x + 12 = 6x + 8$ or $x + 4 = x + \frac{8}{3}$ oe A1 for $\frac{4}{3}$ B1 ft for "$\frac{4}{3}$" + 4

Answers to Qn 2 (AO2): 38% of students got this right

		16.	218	3	M1 for $1.2 \times 200 - 35$ (= 205) (oe) M1 for complete iterative method, e.g. 2 months: $1.2 \times$ "205" – 35 3 months: $1.2 \times$ "211"– 35 A1 for 218, accept 218.2

Answers to Qn 3 (AO3): 36% of students got this right

Question		Working	Answer	Mark	Notes
12			56	P1	for correct substitution into the formula for the volume of a cylinder, e.g. $\pi \times 5^2 \times h$ (= 1178)
				P1	for correct rearrangement to find the height e.g. $h = 1178 \div (\pi \times 5^2)$ (= 14.99876184)
				P1	(dep on P1) for correct use of tangent ratio, e.g. tan x = "14.99…" ÷ 10
				A1	for answer in the range 56 to 56.31

Answers to Qn 4 (AO2): 36% of students got this right

Question		Working	Answer	Mark	Notes
9.	(a)	$(3x + 2)(2x + 1) = 100$ $6x^2 + 4x + 3x + 2 = 100$	$6x^2 + 7x - 98 = 0$ *	2	M1 or $(2x \times 3x) + 2(2x + 1) + 3x = 100$ oe or $(2x \times 3x) + (2 \times 2x (\times 1)) + 1) + 3x + 1 + 1 = 100$ oe other partitions are acceptable but partitioning must go on to form a correct equation. A1 Accept $6x^2 + 7x + 2 = 100$ if M1 awarded

Answers to Qn 5 (AO1): 35% of students got this right

Question	Working	Answer	Mark	Notes
7		1.03	P1	for process to find the mass of either **A** or **C**, e.g. 7 × 1.42 (= 9.94) or (7 + 125) × 1.05 (= 138.6)
			P1	(dep) for a complete process to find the density of **B**, e.g. (“138.6” − “9.94”) ÷ 125
			A1	for answer in the range 1.029 to 1.03

Answers to Qn 6 (AO1): 34% of students got this right

Part	Working or answer an examiner might expect to see	Mark	Notes
25	$13.8 \times 5.4 \times 10^{7} \times 10^{-12}$ $= 74.52 \times 10^{-5}$ $= 7.452 \times 10^{-4}$	1	This mark is given for the digits 7452 seen
	0.000 745 2	1	This mark is given for the correct answer only

Answers to Qn 7 (AO1): 33% of students got this right

Question 11 (Total 2 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	215 ÷17 = 12.6	P1	This mark is given for a process to find the number of rose trees
	No, 12.6 is not a whole number (and a whole number of plants must be bought)	C1	This mark is given for a correct conclusion, supported by correct reasoning

Answers to Qn 8 (AO3): 32% of students got this right

22			$3x^2 + 5x + 2 = 0$	3	M1 for finding a correct coefficient M1 for a method to find a and c or b and c A1 $3x^2 + 5x + 1 = 0$ or $a = 3$, $b = 5$, $c = 2$

Answers to Qn 9 (AO2): 32% of students got this right

Question	Working	Answer	Mark	Notes
18		2, −36	P1	for process to expand $(x - 8)(x + 4)$ or $(x - a)^2$
			P1	for process to find value of a (may be implied by $a = 2$)
			A1	cao

Answers to Qn 10 (AO1): 31% of students got this right

Part	Working or answer an examiner might expect to see	Mark	Notes
15 (c)	$x_1 = 0.625$	1	This mark is given for the first correct iteration
	$x_2 = 0.6765327696$	1	This mark is given for the second correct iteration
	$x_3 = 0.6704483001$	1	This mark is given for the third correct iteration

Answers to Qn 11 (AO2): 30% of students got this right

Question		Working	Answer	Mark	Notes
18.	(a)		**b – a**		B1 for **b** − **a** or − **a** + **b** oe
	(b)	$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ $\overrightarrow{OP} = \mathbf{a} + \frac{3}{5}(\mathbf{b} - \mathbf{a})$ $\overrightarrow{OP} = \frac{1}{5}(2\mathbf{a} + 3\mathbf{b})$	proof		M1 for $\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$ oe or $\overrightarrow{OP} = \overrightarrow{OB} + \overrightarrow{BP}$ oe M1 for $\overrightarrow{AP} = \frac{3}{5}(\mathbf{b} - \mathbf{a})$ oe or $\overrightarrow{BP} = \frac{2}{5}(\mathbf{a} - \mathbf{b})$ oe A1 for $\mathbf{a} + \frac{3}{5}(\mathbf{b} - \mathbf{a})$ or $\mathbf{b} + \frac{2}{5}(\mathbf{a} - \mathbf{b})$ oe leading to given answer with correct expansion of brackets seen

Answers to Qn 12 (AO1): 29% of students got this right

Question	Working	Answer	Mark	Notes
3		Correct region	B1	for an arc of radius 4.5 cm centred on *C*
			B1	for a correct angle bisector drawn at angle *ABC*
			B1	for a line drawn 2 cm from *AB*
			C1	for the correct region shaded; accept any consistent shading

Answers to Qn 13 (AO3): 28% of students got this right

13.	(d)(i)	$(2x+5)^2-25$ $4x^2+10x+10x+25$ oe	$4x^2+20x$	5	M1 B1 for correct expansion of $(2x+5)^2$ A1 for a correct fully or partially factorised expression
	(d) (ii)	$4x(x+5)\ (=0)$ or $x(4x+20)\ (=0)$ or $2x(2x+10)\ (=0)$ or $x(x+5)\ (=0)$	$x=0,\ x=-5$		M1 for, e.g., $\frac{-20\pm\sqrt{20^2-4\times4\times0}}{2\times4}$ A1 for both solutions

Answers to Qn 14 (AO1): 28% of students got this right

Paper 1MA1: 2H			
Question	**Working**	**Answer**	**Notes**
9 (c)		$9x - 48$ shown	M1 for method to find composite function A1 for working leading to $9x - 48$

Answers to Qn 15 (AO2): 27% of students got this right

18 *ABC* is an isosceles triangle.

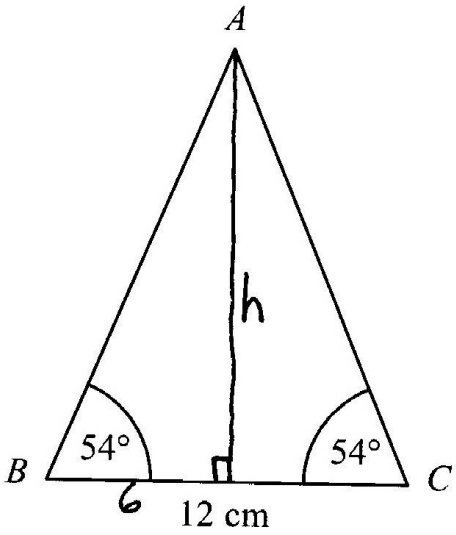
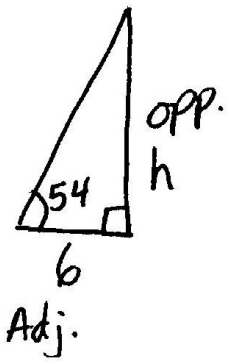


Diagram **NOT** accurately drawn

Work out the area of the triangle.
Give your answer correct to 3 significant figures.



$\tan 54 = \frac{h}{6}$

$h = 6\tan 54$

$h = 8.258291523\text{cm}$

work out the height

$A = \frac{1}{2} b \times h$

$= \frac{1}{2} \times 12 \times 8.258291523$

$= 49.54974\ldots$

$\approx 49.5\ \text{cm}^2$ (3SF)

Answers to Qn 16 (AO2): 27% of students got this right

			16.	4	M1 for angle *MXY* = angle *NYX* Reason = 'base angles of an isosceles triangle are equal' (oe) M1 for *MX* = *NY* Reason = 'M and N divide the equal sides XZ and YZ in equal parts' (oe) C1 for either reason quoted above or '*XY* is common' C1 for All reasons correct and SAS seen

Answers to Qn 17 (AO1): 26% of students got this right

Paper 1MA1: 3H			
Question	**Working**	**Answer**	**Notes**
10		Region R	M1 for one line correctly drawn M1 for two or more lines correctly drawn A1 for a correct region indicated between two correct lines A1 fully correct region indicated with all lines correct

Answers to Qn 18 (AO2): 26% of students got this right

Question 3 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(b)	No , categories are not mutually exclusive (a woman could be in both categories)	C1	This mark is given for a correct statement

Answers to Qn 19 (AO3): 25% of students got this right

15		1:4	M1 M1 A1	for method to find the volume scale factor, e.g. 960 ÷ 120 (=8) (dep M1) for a complete process to find the area sf $(\sqrt[3]{\text{“8”}})^2$ oe

Answers to Qn 20 (AO3): 24% of students got this right

19	(a)		0.85	1	B1 cao
	(b)		3.8-3.83	3	B1 2.65 or 0.85 M1 for $2.65+\frac{1}{0.85}$ A1 3.8(2)-3.83 or $\frac{1301}{340}$ from a correct method seen

Answers to Qn 21 (AO1): 23% of students got this right

Question		Working	Answer	Mark	Notes
4	(b)		217	4	M1 for use of appropriate trig ratio eg tan $CAB = \frac{4.5}{6}$ $(= 0.75)$, sin $CAB = \frac{4.5}{"7.5"}$ $(= 0.6)$, cos $CAB = \frac{6}{"7.5"}$ $(= 0.8)$ M1 for inverse trig shown correctly e.g. $CAB = \tan^{-1}\frac{4.5}{6}$ $(= 0.75)$, $CAB = \sin^{-1}\frac{4.5}{"7.5"}$ $(= 0.6)$, $CAB = \cos^{-1}\frac{6}{"7.5"}$ $(= 0.8)$ A1 for 36.8 to 37 (or 53 to 53.2 if identified as ACB) B1ft for bearing 180 + "36.8" if "36.8" is not 40–50

Answers to Qn 22 (AO2): 23% of students got this right

25		$\frac{18}{40}\times\frac{22}{39}+\frac{15}{40}\times\frac{25}{39}+\frac{7}{40}\times\frac{33}{39}$ or $1-(\frac{18}{40}\times\frac{17}{39}+\frac{15}{40}\times\frac{14}{39}+\frac{7}{40}\times\frac{6}{39})$ or $\frac{18}{40}\times\frac{15}{39}+\frac{18}{40}\times\frac{7}{39}+\frac{15}{40}\times\frac{18}{39}$ $+\frac{15}{40}\times\frac{7}{39}+\frac{7}{40}\times\frac{18}{39}+\frac{7}{40}\times\frac{15}{39}$	$\frac{1002}{1560}$	4	B1 for a second 'branch' probability seen (could be seen in a tree) M1 for a product of any first and second stage correct probabilities M1 for a complete method to find the required probability A1 for $\frac{1002}{1560}$ oe Note if decimals used they must be correct to 2 decimal places SC with replacement B2 for $\frac{1002}{1600}$ oe B0 M1 $\frac{18}{40}\times\frac{22}{40}$ or $\frac{15}{40}\times\frac{25}{40}$ or $\frac{7}{40}\times\frac{33}{40}$ M1 $\frac{18}{40}\times\frac{22}{40}+\frac{15}{40}\times\frac{25}{40}+\frac{7}{40}\times\frac{33}{40}$ A0

Answers to Qn 23 (AO3): 22% of students got this right

Paper 1MA1: 2H			
Question	**Working**	**Answer**	**Notes**
14		33.8	P1 for recognition of similar triangles or equal ratio of sides P1 for process to find *CB*, eg. $\frac{5}{13} = \frac{13}{CB}$ A1 for 33.8

Answers to Qn 24 (AO2): 21% of students got this right

Part	Working or answer an examiner might expect to see	Mark	Notes
15 (a)	f(0) = –5 and f(1) = 3,	1	This mark is given for showing the sign changes between f(0) and f(1)
	Thus since there is a sign change, the solution is between $x = 0$ and $x = 1$	1	This mark is given for a correct comment

Answers to Qn 25 (AO1): 21% of students got this right

18 The table gives some information about the lengths of time, in hours, that some adults watched TV last week.

Length of time (t hours)	Frequency	mp × f	f · d
$0 \leqslant t < 10$ 5×	8	40	0.8
$10 \leqslant t < 15$ 12.5×	15	187.5	3
$15 \leqslant t < 20$ 17.5×	11	192.5	2.2
$20 \leqslant t < 30$ 25 ×	10	250	1
$30 \leqslant t < 50$ 40 ×	6	240	0.3
	50	910	

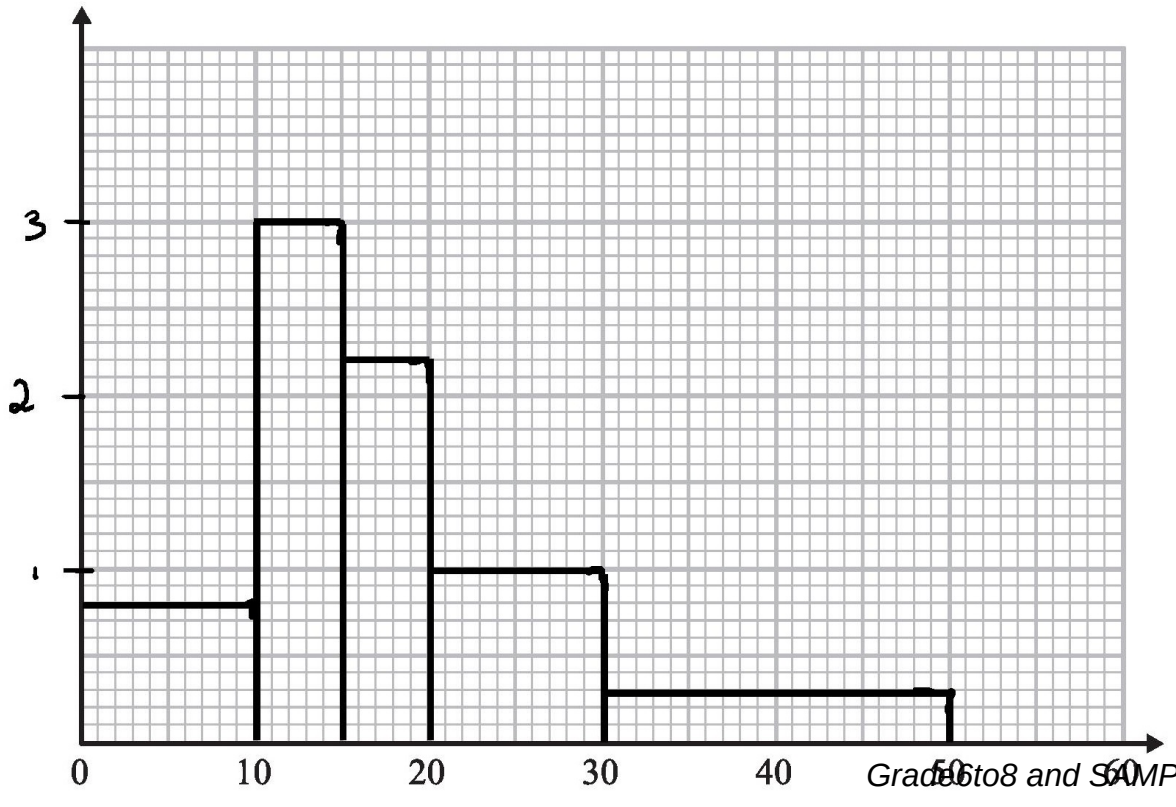
(a) Work out an estimate for the mean length of time.

910 ÷ 50 = 18.2

18.2 hours

(4)

(b) Draw a histogram for the information in the table.

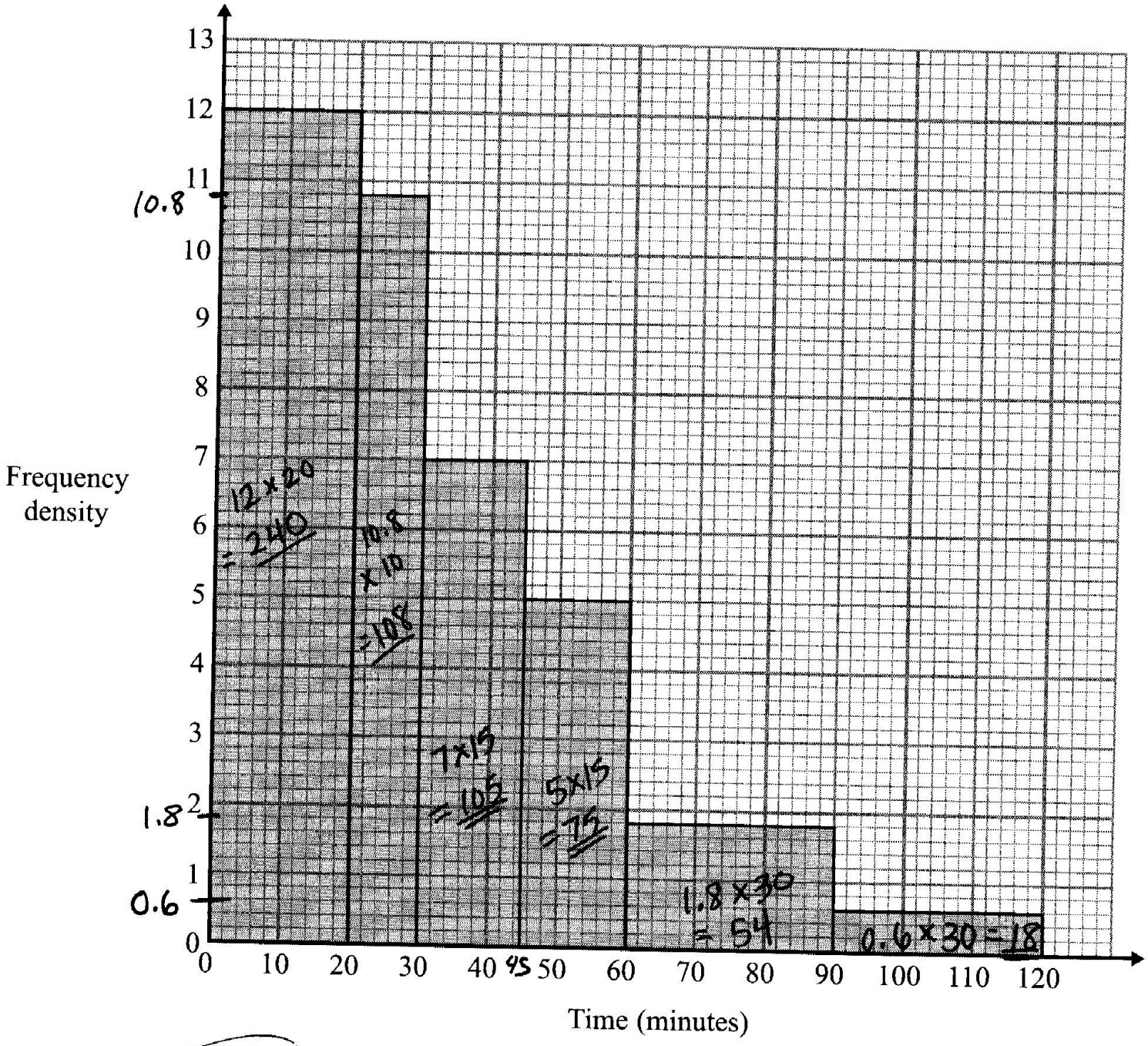


Answers to Qn 26 (AO1): 20% of students got this right

Paper: 1MA1/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
17 (b)		$\frac{123}{150}$	M1	for a method to find number of students in interval, eg $30 + 51 + 36 + \frac{1}{3} \times 18$ (= 123) or $150 - 15 - \frac{2}{3} \times 18$ (= 123)
			A1	for $\frac{123}{150}$ oe or 0.82 or 82%

Answers to Qn 27 (AO3): 19% of students got this right

27 The histogram shows information about the times, in minutes, that some passengers had to wait at an airport.



Work out the percentage of the passengers who had to wait for more than one hour.

$$\frac{54+18}{240+108+105+75+54+18} = \frac{72}{600} = 0.12$$