ADA PINPOINT PACKS

48_to_71_Percent_Pinpoint_AI_Pack

Made for Grade5to7_Paper3

AO1,2_and_3

ALL_Strands

Calc_Only

Created by A.D.A:

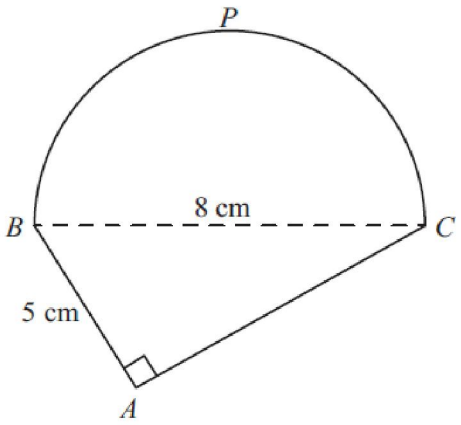
Pinpoints Automatic Differention Algorithmn

Designed and Programmed by

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

Question 1 (AO3): 52% of students got this right

10. Here is a shape.



BPC is a semicircle.
ABC is a right-angled triangle.
BC = 8 cm.
AB = 5 cm.

Work out the perimeter of the shape.
Give your answer correct to 3 significant figures.

..... cm

(Total 5 marks)

Question 2 (AO2): 51% of students got this right

7. The distance from the Earth to the Sun is 1.496×10^{11} metres.
The speed of light is 3×10^{8} metres per second.

(a) Show that, correct to 3 significant figures, light will take 0.139 hours to travel from the Sun to the Earth.

(3)

1 googol is 1×10^{100}

Danesh says,

> When I multiply 1.496×10^{11} by 6.68×10^{9}
> I get nearly 1 googol because $1.496 \times 10^{11} \times 6.68 \times 10^{9} = 9.99 \times 10^{99}$

Is Danesh correct?

(b) Give a reason for your answer.

.....

.....

(1)

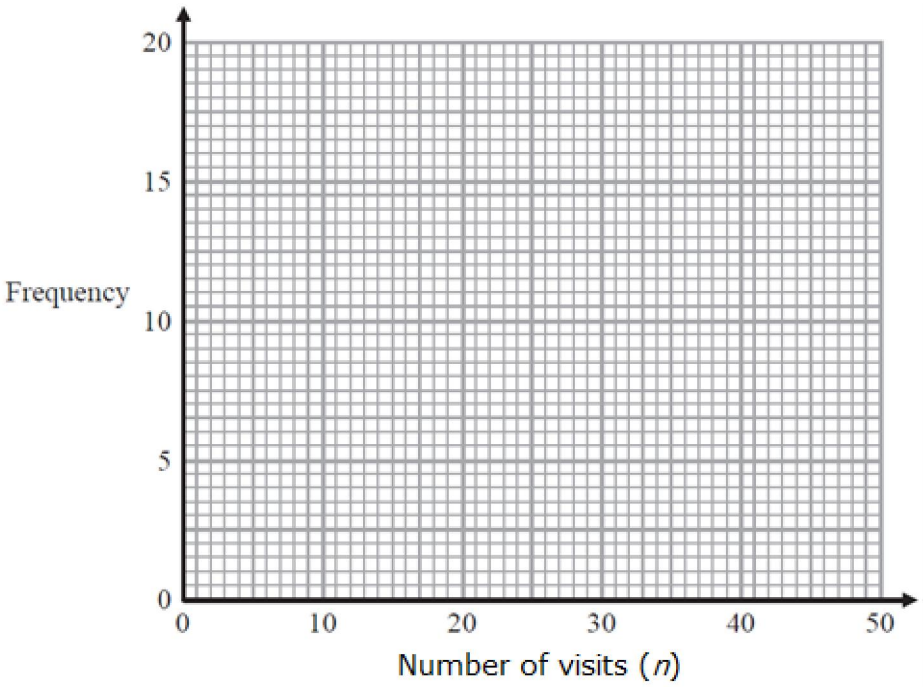
(Total for Question 7 is 4 marks)

Question 3 (AO3): 50% of students got this right

9. The frequency table contains information about 50 students and the number of times they visited the local park this year.

Number of visits (n)	Frequency
$0 < n \leq 10$	12
$10 < n \leq 20$	21
$20 < n \leq 30$	9
$30 < n \leq 40$	6
$40 < n \leq 50$	2

(a) Draw a frequency polygon, on the grid below, using this information.



(2)

*(b) Kate claims that at least a quarter of the students visited the park more than 20 times.

Is Kate's claim correct?
Explain your answer.

(2)

(Total 4 marks)

Question 4 (AO2): 49% of students got this right

2 In London, 1 litre of petrol costs 108.9p
In New York, 1 US gallon of petrol costs $2.83.

1 US gallon = 3.785 litres
£1 = $1.46

In which city is petrol better value for money, London or New York?
You must show your working.

Question 5 (AO1): 48% of students got this right

13. (a) Expand and simplify $(x + 2)(2x - 3)(3x + 1)$

.....

(3)

(b) Simplify $n^4 \div n^{\frac{1}{2}}$

.....

(1)

(Total for Question 13 is 4 marks)

Question 6 (AO3): 46% of students got this right

15. A cinema sells adult tickets and child tickets.

The total cost of 3 adult tickets and 1 child ticket is £30.
The total cost of 1 adult ticket and 3 child tickets is £22.

Work out the cost of an adult ticket and the cost of a child ticket.

adult ticket £.....

child ticket £.....

(Total for Question 15 is 4 marks)

Question 7 (AO1): 46% of students got this right

9 Francesco carried out a survey about the ages of the people in his office.

The table shows information about his results.

Age (a years)	Cumulative frequency
$20 < a \leqslant 30$	10
$20 < a \leqslant 40$	26
$20 < a \leqslant 50$	58
$20 < a \leqslant 60$	66
$20 < a \leqslant 70$	70

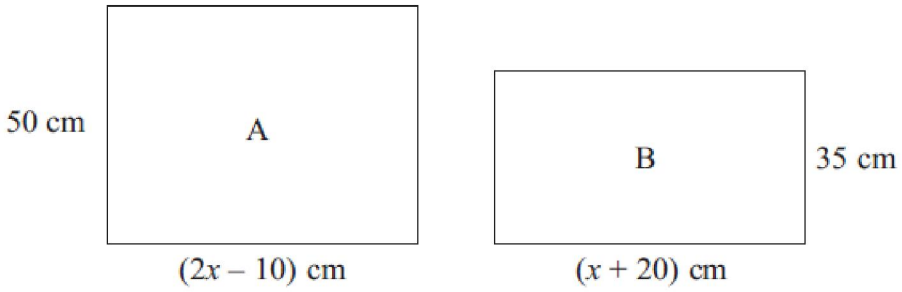
(a) Draw a cumulative frequency graph for this information.

Question 8 (AO1): 45% of students got this right

8 Make t the subject of $p = \sqrt{a + \frac{t}{2}}$

Question 9 (AO3): 44% of students got this right

13. The diagram gives information about two paintings, A and B.
Each painting is in the shape of a rectangle.



Painting A has an area 1725 cm^2 bigger than the area of painting B.

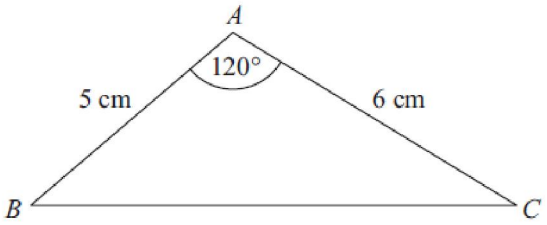
Work out the area of painting A.

.....cm^2

(Total 4 marks)

Question 10 (AO1): 43% of students got this right

11.



Calculate the length of the side *BC*.
Give your answer correct to 3 significant figures.

..... cm

(Total 3 marks)

Question 11 (AO1): 42% of students got this right

16. $x = 0.0\dot{1}\dot{5}$

Prove algebraically that x can be written as $\frac{1}{66}$

(Total 3 marks)

Question 12 (AO3): 41% of students got this right

10 The surface gravity of a planet can be worked out using the formula

$$g = \frac{6.67 \times 10^{-11} m}{r^2}$$

where

m kilograms is the mass of the planet
r metres is the radius of the planet

For the Earth and Jupiter here are the values of m and r.

Earth	Jupiter
$m = 5.98 \times 10^{24}$ $r = 6.378 \times 10^{6}$	$m = 1.90 \times 10^{27}$ $r = 7.149 \times 10^{7}$

Work out the ratio of the surface gravity of Earth to the surface gravity of Jupiter.
Write your answer in the form 1 : n.

Question 13 (AO2): 40% of students got this right

14. Here is a rectangular sheet of metal.
A square hole is cut out of the metal.

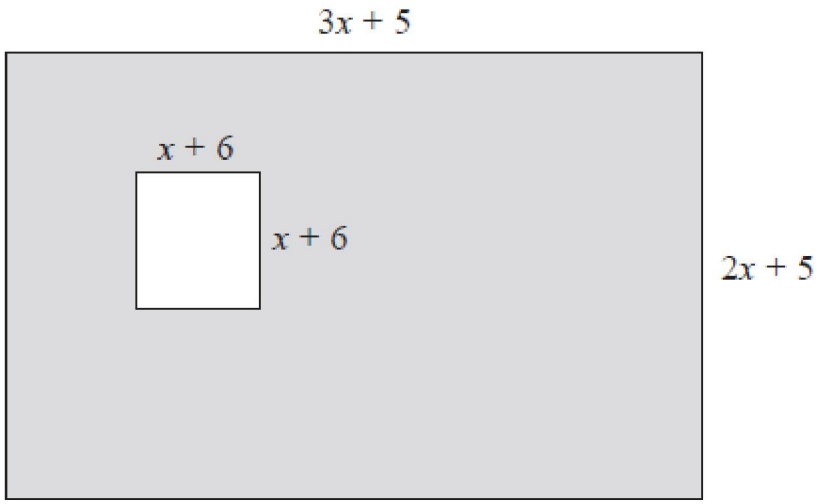


Diagram **NOT** accurately drawn

The length of the rectangle is $3x + 5$
The width of the rectangle is $2x + 5$
The square has sides of length $x + 6$
All measurements are in centimetres.

The perimeter of the square hole is $\frac{3}{5}$ of the perimeter of the rectangle.

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

..... cm

(Total 5 marks)

Question 14 (AO1): 40% of students got this right

20. Here are the first 4 terms of a quadratic sequence.

7 18 33 52

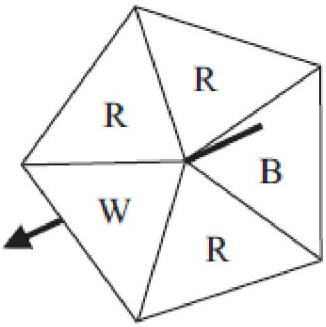
Find an expression, in terms of n, for the nth term of the sequence.

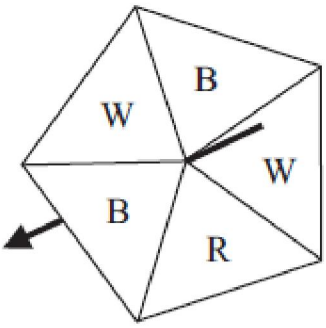
(Total 3 marks)

Question 15 (AO2): 39% of students got this right

10. Simon wants to raise money for charity.
He designs a game for people to play.

Simon uses two fair 5-sided spinners for the game.





People spin each spinner once.
A person wins the game when both spinners land on the same letter.

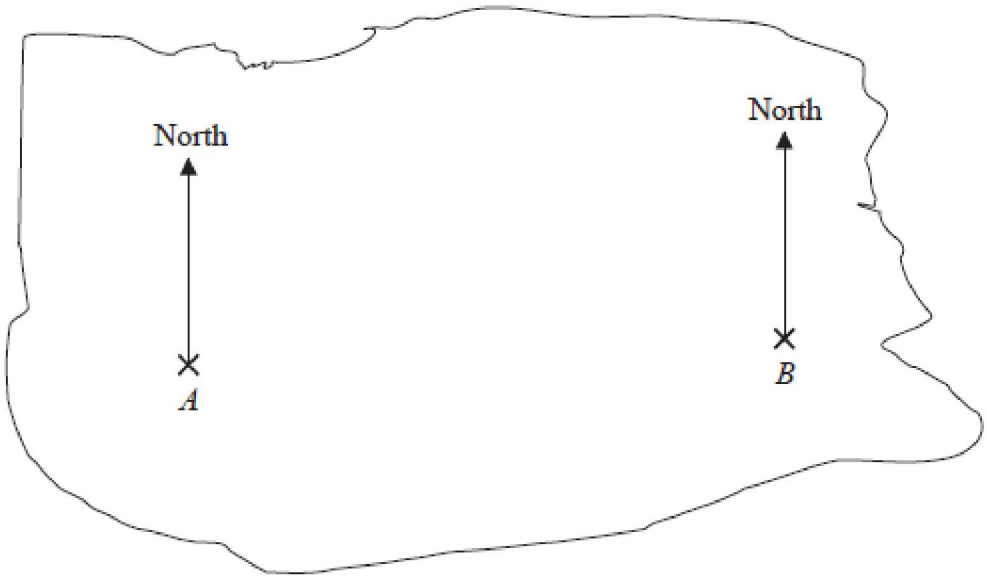
People pay 40p for each game they play. The prize for a win is £1.

Work out if Simon is likely to raise any money for charity with his game.

(Total 5 marks)

Question 16 (AO3): 38% of students got this right

11. The accurate scale drawing shows a map of an island.



A and *B* are points on the island.
The real distance, in kilometres, between *A* and *B* is 56 km.

Treasure is buried at point *C* on the island.
Point *C* is 35 km from *A* and on a bearing of 300° from *B*.

Mark the point *C* with a cross (X).

(Total for Question 11 is 5 marks)

Question 17 (AO1): 37% of students got this right

12 b The nth term of a different sequence is $2^n + 3$

(b) Show that 21 is **not** a term of this sequence.

(1)

Question 18 (AO2): 36% of students got this right

16. Clive wants to estimate the number of bees in a beehive.

Clive catches 50 bees from the beehive.
He marks each bee with a dye.
He then lets the bees go.

The next day, Clive catches 40 bees from the beehive.
8 of these bees have been marked with the dye.

(i) Work out an estimate for the number of bees in the beehive.

..... bees

(ii) Write down any assumptions you have made.

.....

.....

.....

.....

(Total 4 marks)

Question 19 (AO2): 35% of students got this right

19. Here is a triangle ABC.

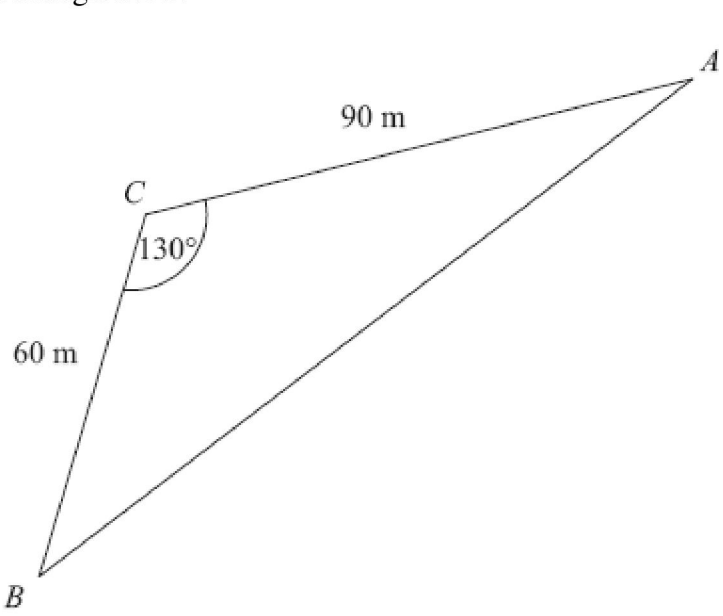


Diagram **NOT** accurately drawn

$AC = 90$ m.
$BC = 60$ m.
Angle $ACB = 130°$.

Calculate the perimeter of the triangle.
Give your answer correct to one decimal place.

..... m

(Total 4 marks)

Question 20 (AO3): 34% of students got this right

13 The price of a computer is reduced by 17.5%

The reduced price is £264

By how much is the price reduced?

[4 marks]

Answer £ _____

Question 21 (AO2): 34% of students got this right

8 When a drawing pin is dropped it can land point down or point up.

Lucy, Mel and Tom each dropped the drawing pin a number of times.

The table shows the number of times the drawing pin landed point down and the number of times the drawing pin landed point up for each person.

	Lucy	**Mel.**	**Tom**
point down	31	53	16
point up	14	27	9

Stuart is going to drop the drawing pin twice.

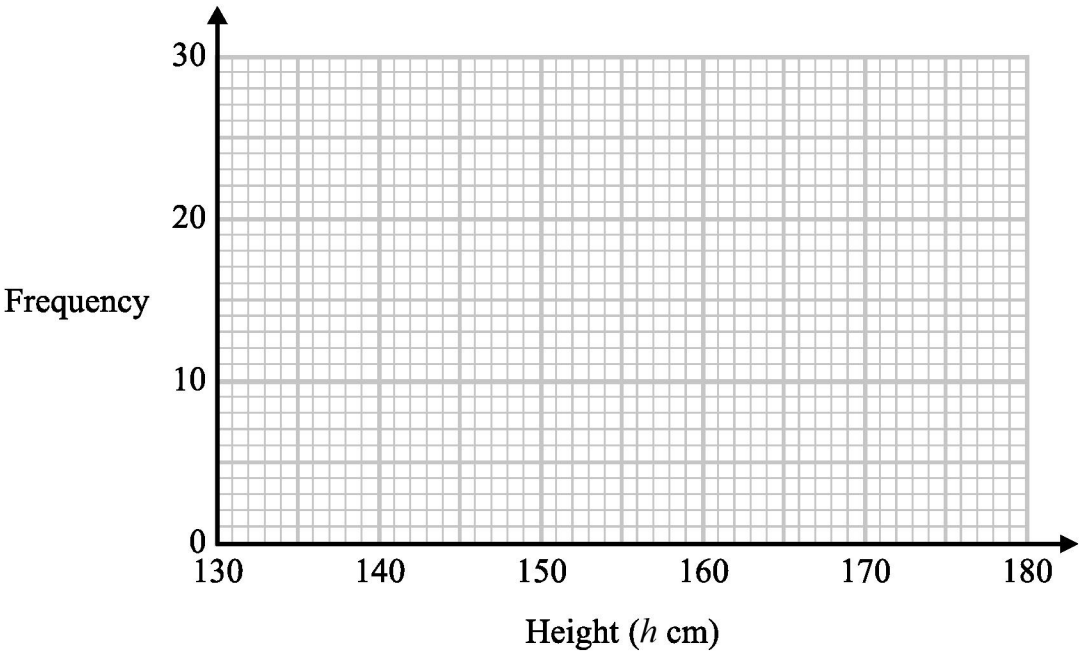
(*b*) Use all the results in the table to work out an estimate for the probability that the drawing pin will land point up the first time and point down the second time.

Question 22 (AO1): 33% of students got this right

19 The table shows information about the heights of 80 children.

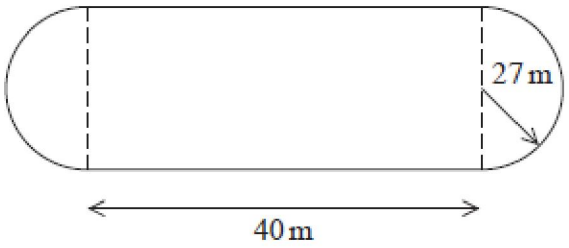
Height (h cm)	Frequency
$130 < h \leqslant 140$	4
$140 < h \leqslant 150$	11
$150 < h \leqslant 160$	24
$160 < h \leqslant 170$	22
$170 < h \leqslant 180$	19

(b) Draw a frequency polygon for the information in the table.



Question 23 (AO3): 32% of students got this right

5. The diagram shows a cycle track.



The track has two straight sides each of length 40 m.
Each end of the track is a semicircle of radius 27 m.

The diameter of each wheel of Ian's bike is 590 mm.
Ian is going to ride his bike around the track once.

Calculate how many complete revolutions each wheel of his bike will make.

.....

(Total for Question 5 is 5 marks)

Question 24 (AO1): 31% of students got this right

15 On the grid show, by shading, the region defined by the inequalities

$x < 4$ $2x + y > 6$ $y > \frac{1}{3}x$

Label the region **R**.

Question 25 (AO3): 31% of students got this right

20. Azmol rolls a biased dice and spins a biased coin.

The probability that the coin will land on Heads is 0.55
The probability that the dice will land on 6 and the coin will land on Heads is 0.11

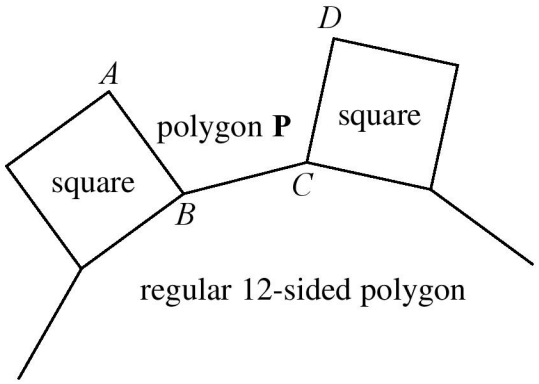
Work out the probability that the dice will land on 6 and the coin will land on Tails.

.....

(Total for Question 20 is 3 marks)

Question 26 (AO1): 30% of students got this right

5 In the diagram, *AB*, *BC* and *CD* are three sides of a regular polygon **P**.



Show that polygon **P** is a hexagon.
You must show your working.

(Total for Question 5 is 4 marks)

Question 27 (AO3): 30% of students got this right

18 Thelma spins a biased coin twice.
The probability that it will come down heads both times is 0.09

Calculate the probability that it will come down tails both times.

Answers to Qn 1 (AO3): 52% of students got this right

Question		Working	Answer	Mark	Notes
10.			23.8	5	M1 for $8^2 - 5^2$ or $AC^2 + 5^2 = 8^2$ M1 for $\sqrt{(8^2 - 5^2)}$ (=6.24(4..)) with least one of 8^2 or 5^2 correctly evaluated. M1 for 8π (=25.13 to 25.13(2…)) or $8\pi \div 2$ or 4π (=12.56(6…)) using $\pi = 3.14$ or better M1 for 5 + their AC + their arc PBC A1 for 23.7 – 23.9

Answers to Qn 2 (AO2): 51% of students got this right

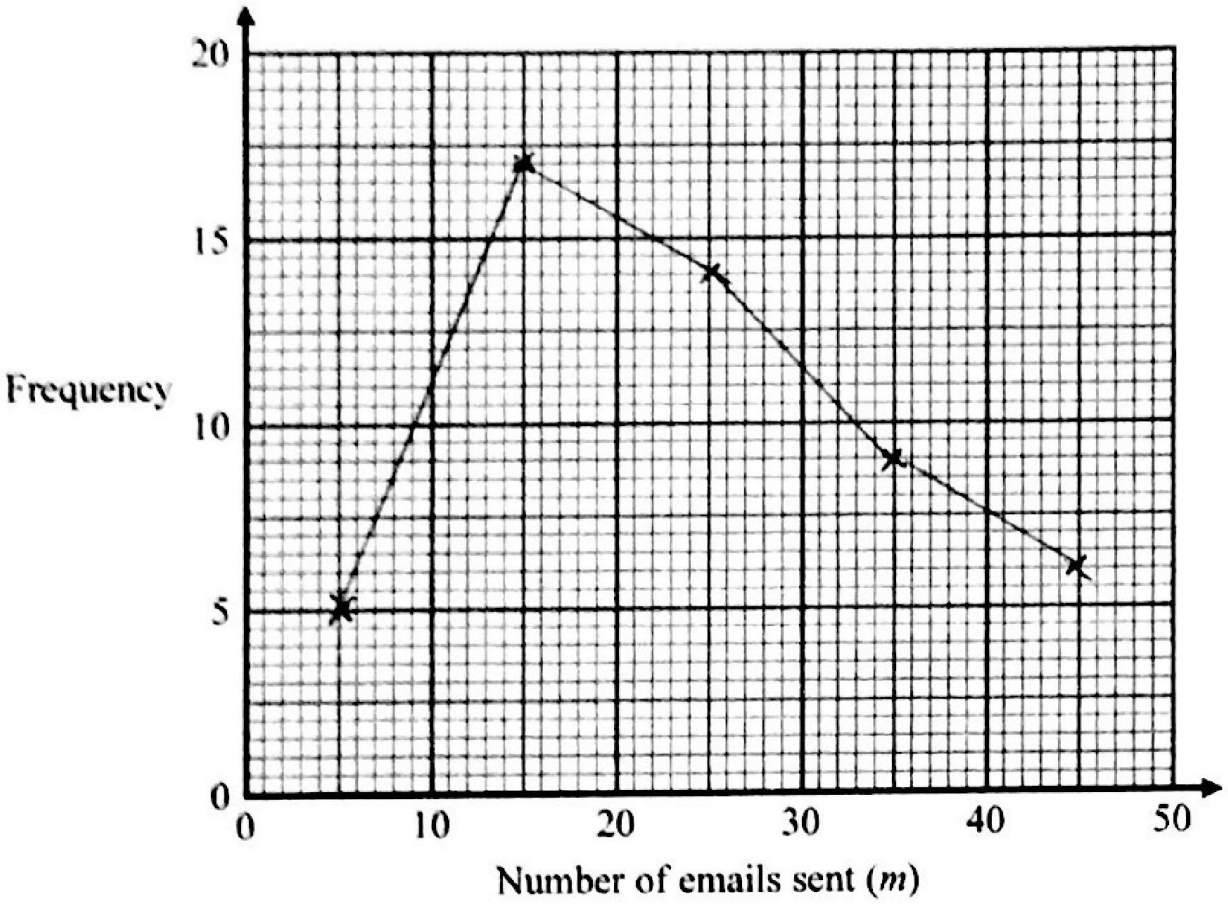
7(a)		Shown	M1	for distance ÷ speed to find time, e.g. $(1.496\times10^{11}) \div (3\times10^{8})$ (=498.666)
			M1	(dep) for conversion to hours, e.g. "498.666" ÷ (60 × 60)
			A1	0.1385185185…
(b)		Explanation	C1	Correct explanation, e.g. they have multiplied the indices rather than adding

Answers to Qn 3 (AO3): 50% of students got this right

9 The frequency table gives information about the numbers of emails sent by 51 teachers on Monday.

Number of emails sent (m)	Frequency
$0 < m \leqslant 10$	5
$10 < m \leqslant 20$	17
$20 < m \leqslant 30$	14
$30 < m \leqslant 40$	9
$40 < m \leqslant 50$	6

(a) On the grid below, draw a frequency polygon for this information.



(2)

*(b) Nalini says that at least a quarter of these teachers sent more than 30 emails.

Is Nalini correct?
You must explain your answer.

Answers to Qn 4 (AO2): 49% of students got this right

Part	Working an or answer examiner might expect to see	Mark	Notes
2	Cost of 1 litre of petrol in NY = $\$\frac{2.83}{3.785}$ = \$0.7476…	1	This mark is given for finding out the cost of a litre of petrol in New York in dollars
	Cost of 1 litre of petrol in NY = $\frac{0.7476...}{1.46}$ p = 51.2p	1	This mark is given for finding out the cost of a litre of petrol in New York in pence
	Petrol; is better value for money in New York (0.51.2 < 108.9p)	1	This mark is given for a correct conclusion supported by working

Answers to Qn 5 (AO1): 48% of students got this right

13	(a)		$6x^3 + 5x^2 - 17x - 6$	M1	for multiplying out two brackets with at least three terms out of four correct
				M1	(dep M1) for a complete method
				A1	cao
	(b)		$n^{\frac{7}{2}}$	B1	oe

Answers to Qn 6 (AO3): 46% of students got this right

15 A cinema sells adult tickets and child tickets.

The total cost of 3 adult tickets and 1 child ticket is £30
The total cost of 1 adult ticket and 3 child tickets is £22

Work out the cost of an adult ticket and the cost of a child ticket.

$3a + c = 30 \quad \times 3$

$a + 3c = 22 \quad \times 1$

$9a + 3c = 90$

$-a + -3c = -22$

$8a = 68$

$a = 8.5 \quad (£8.50)$

$8.5 + 3c = 22$

$3c = 13.5$

$c = 4.5 \quad (£4.50)$

Answers to Qn 7 (AO1): 46% of students got this right

Question		Working	Answer	Mark	Notes
9	(a)		Correct graph	B1	for 5 or 6 points plotted correctly
				B1	for their points joined by a curve or line segments provided no gradient is negative.

Answers to Qn 8 (AO1): 45% of students got this right

Question	Working	Answer	Mark	Notes
8		$t = 2(p^2 - a)$	M1	for correct first step, e.g. $p^2 = a + \frac{t}{2}$
			M1	for isolating term in t or dealing with the fraction, e.g. $p^2 - a = \frac{t}{2}$ or $2p^2 = 2a + t$
			A1	for $t = 2(p^2 - a)$ or $t = 2p^2 - 2a$

Answers to Qn 9 (AO3): 44% of students got this right

	13.	$50(2x - 10) - 35(x + 20) = 1725$ $100x - 500 - 35x - 700 = 1725$ $65x - 1200 = 1725$ $65x = 1725 + 1200 = 2925$ $x = 2925 \div 65 = 45$ (A =) $50 \times 80 = 4000$	4000	4	M1 for $50(2x - 10) - 35(x + 20) = 1725$ (oe) M1 for an attempt to reducing to the form $65x = b$, $b > 0$ or (x =) 45 M1 for $50 \times (2 \times$ "45" $- 10)$ or $35 \times$ ("45" $+ 20) + 1725$ A1 cao

Answers to Qn 10 (AO1): 43% of students got this right

Question		Working	Answer	Mark	Notes
11.			9.54	3	M1 for (BC^2=) 52 + 62 – 2 × 5 × 6 × cos 120° M1 for correct order of evaluation or 91 A1 for 9.53 – 9.54

Answers to Qn 11 (AO1): 42% of students got this right

16.		$x = 0.0151515...$ $1000x = 15.151515...$ $10x = 0.151515....$ $990x = 15$ $x = \frac{15}{990} = \frac{1}{66}$ **OR** $100x = 1.51515...$ $x = 0.01515...99x = 1.5$ $x = \frac{1.5}{99}$ $= \frac{15}{990} = \frac{1}{66}$	Proof	3	M1 for ($x =$) $0.0151515(...)$ or $1000x = 5.151515(\ldots)$ or $00x = 1.51515(...)$ or $10x = 0.151515(\ldots)$ M1 for two recurring decimals the difference of which is a rational number C1 (dep on M2 scored) for completing the proof by subtracting and cancelling to give a correct fraction

Answers to Qn 12 (AO3): 41% of students got this right

Paper 1MA1: 3H			
Question	**Working**	**Answer**	**Notes**
10		1 : 2.53	P1 for substituting values to find surface gravity of either Earth (= 9.805..) or Jupiter (= 24.796..) P1 for complete process A1 for 1 : 2.528 to 2.53

Answers to Qn 13 (AO2): 40% of students got this right

14.			12	5	M1 for writing a correct expression for the perimeter of the square or the rectangle e.g. $4(x + 6)$ or $10x + 20$ or for the semi-perimeter M1 for equating the two (semi) perimeters correctly M1 for resolving the fraction e.g. $20x + 120 = 30x + 60$ or for rearranging the equation to the form. $a = bx + c$ M1 for $10x + 60 = 120$ or $24 = 2x + 12$ or $x = 6$ A1 cao

Answers to Qn 14 (AO1): 40% of students got this right

20.			$2n^2 + 5n$	3	M1 for correct deduction from differences, e.g. 2nd difference of 4 implies $2n^2$ M1 for use of first differences A1

Answers to Qn 15 (AO2): 39% of students got this right

10.		$\frac{3}{5}\times\frac{1}{5}+\frac{1}{5}\times\frac{2}{5}+\frac{1}{5}\times\frac{2}{5}=\frac{7}{25}$ oe $\frac{7}{25}\times £1 = 28p$ 40p > 28p **OR** e.g. 200 games 200 × 40p = £80 "$\frac{7}{25}$" × 200 × £1 = £56 £80 > £56	Yes, with justification	5	M1 or $\frac{3}{5}\times\frac{1}{5}$ or $\frac{1}{5}\times\frac{2}{5}$ or $\frac{1}{5}\times\frac{2}{5}$ M1(dep) for $\frac{3}{5}\times\frac{1}{5}+\frac{1}{5}\times\frac{2}{5}+\frac{1}{5}\times\frac{2}{5}$ A1 for $\frac{7}{25}$ oe M1 for "$\frac{7}{25}$" × £1 OR "$\frac{7}{25}$" × n × £1 **and** n × 40p C1 f.t. (dep on M3) for correct conclusion with fully correct justification based on expected profit per game or expected profit for a particular number of games

Answers to Qn 16 (AO3): 38% of students got this right

11		× marked	M1 M1 M1 M1 A1	Measures length AB and uses figure in next step or uses 56 and 35 to get scale factor for a complete method to find correct scaled length for 35 km Draws an arc from A of "5" Draws a bearing of 300° from B Clearly indicates intersection as required point

Answers to Qn 17 (AO1): 37% of students got this right

12 b The nth term of a different sequence is $2^n + 3$

(b) Show that 21 is **not** a term of this sequence.

$n = 3$: $2^3 + 3 = 11$
$n = 4$: $2^4 + 3 = 19$
$n = 5$: $2^5 + 3 = 35$

Hence 21 is not a term in the sequence

(1)

Answers to Qn 18 (AO2): 36% of students got this right

Question		Working	Answer	Mark	Notes
16.	(i)		250	4	M1 for 50/8 (=6.25) or 8/50 (= 0.16) or 40/8 (=5) or 8/40 (= 0.2) or $\frac{50}{n}=\frac{8}{40}$ oe M1 for 50 × 40 ÷ 8 or 50 × 5 or 6.25 × 40 or 50 ÷ 0.2 oe A1 cao
	(ii)		assumption		B1 for correct mathematical assumption, e.g. fixed population, takes random sample

Answers to Qn 19 (AO2): 35% of students got this right

19.		$c^2 = 60^2 + 90^2 - 2 \times 60 \times 90 \times \cos 130^\circ$ $c^2 = 3600 + 8100 - 10\,800 \times -0.6427876$ $c^2 = 11\,700 + 6942.106$ $c^2 = 18642.106$ $c = \sqrt{18642.106} = 136.536$ Perimeter $= 60 + 90 + 136.536$	286.5	4	M1 for substituting values correctly into cosine rule formula e.g. $60^2 + 90^2 - 2 \times 60 \times 90 \times \cos 130^\circ$ M1 for correct order of evaluation A1 for finding value of missing side in range 136 to 137 A1 for answer in range 286 to 287

Answers to Qn 20 (AO3): 34% of students got this right

13 The price of a computer is reduced by 17.5%

The reduced price is £264

By how much is the price reduced?

[4 marks]

264 ÷ 82.5 or 3.2

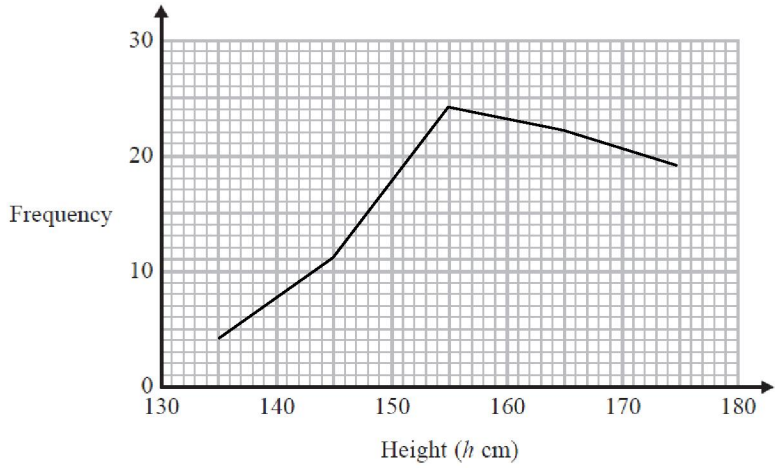
3.2 × 17.5 = 56

Answer £ 56

Answers to Qn 21 (AO2): 34% of students got this right

Part	Working or answer an examiner might expect to see	Mark	Notes
8 (b)	$\frac{100}{150} \times \frac{50}{150} = \frac{2}{3} \times \frac{1}{3}$	1	This mark is given for a probability of point down multiplied by the probability of point up
	$\frac{2}{9}$	1	This mark is given for the correct answer only

Answers to Qn 22 (AO1): 33% of students got this right

Part	Working an or answer examiner might expect to see	Mark	Notes
19 (b)		2	These marks are given for a fully correct frequency polygon with line segments joining the points (135, 4), (145, 11), (155, 24), (165, 22) and (175, 19) (1 mark is given if any points are incorrect)

Answers to Qn 23 (AO3): 32% of students got this right

5		134	P1 P1 P1 P1 A1	Process to find the distance around one or both ends of the track, e.g. $\pi \times 54$ (= 169.6460033) or $(\pi \times 54) \div 2$ (=84.82300165) (dep on P1) complete process to find the total length of the track, e.g. $40 \times 2 +$ "169.6460033" (=249.6460033) Process to find the circumference of wheel, e.g. $\pi \times 590$ (=1853.539666 mm) or $\pi \times 0.59$ (= 1.85353966 m) Complete process to find the number of revolutions in consistent units, e.g. "249.64…" ÷ "1.85…" or unrounded answer of 134.6860863 cao

Answers to Qn 24 (AO1): 31% of students got this right

Question	Working	Answer	Mark	Notes
15		Region identified	B1	for $x = 4$ **or** $2x + y = 6$ **or** $y = \frac{1}{3}x$
			B1	for $x = 4$ **and** $2x + y = 6$ **and** $y = \frac{1}{3}x$
			A1	for lines drawn and correct region identified by either shading in or out; the letter R is not required, but necessary if no shading

Answers to Qn 25 (AO3): 31% of students got this right

20		0.09	P1 P1 A1	for start to process e.g. 0.11 ÷ 0.55 (= 0.2) oe (dep P1) for complete process “0.2” × (1 – 0.55) oe oe

Answers to Qn 26 (AO1): 30% of students got this right

Question 5 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$180-\frac{360}{12}=150$	M1	This mark is given for a complete method to find the interior angle of the dodecagon
	at B or C, $360-150-90=120$	M1	This mark is given for a complete method to find the interior angle of polygon **P**
	$180-\frac{360}{x}=120,\quad \frac{360}{x}=60,\quad x=6$	A1	This mark is given for using the interior and to find out the number of sides of polygon **P**
	Polygon **P** has 6 sides, so is a hexagon	C1	This mark is given for a complete solution, fully supported by accurate figures

Answers to Qn 27 (AO3): 30% of students got this right

Paper 1MA1: 3H			
Question	**Working**	**Answer**	**Notes**
18		0.49	P1 for $\sqrt{0.09}$ P1 for (1-"$\sqrt{0.09}$")² A1 cao