PINPOINT REVISION PACKS

80_to_100_Percent_Pinpoint_AI_Pack

Time Allocation = 83mins , Max = 73 Marks

Calculated Grade Boundaries:

Grade	Marks
8-	13
8	25
8+	37
9-	49
9	61
9+	73

Question 1 (AO1): (No Calc) 19% of students got this right (4 marks)

13 The table shows a set of values for x and y.

x	1	2	3	4
y	9	$2\frac{1}{4}$	1	$\frac{9}{16}$

y is inversely proportional to the square of x.

(a) Find an equation for y in terms of x.

.....

(2)

(b) Find the positive value of x when $y = 16$

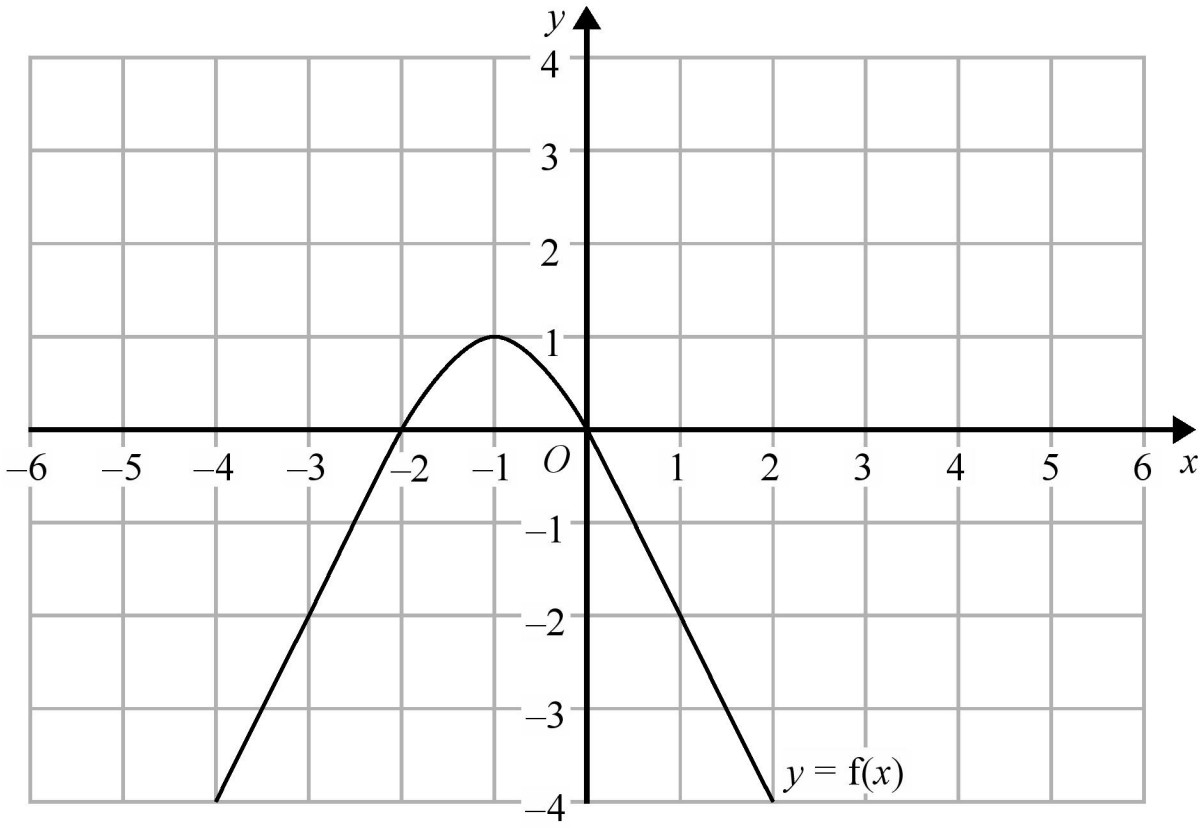
.....

(2)

(Total for Question 13 is 4 marks)

Question 2 (AO1): 19% of students got this right (1 marks)

18 The graph of $y = f(x)$ is shown on the grid.



(*a*) On the grid, sketch the graph of $y = f(x - 1)$

Question 3 (AO2): (No Calc) 16% of students got this right (2 marks)

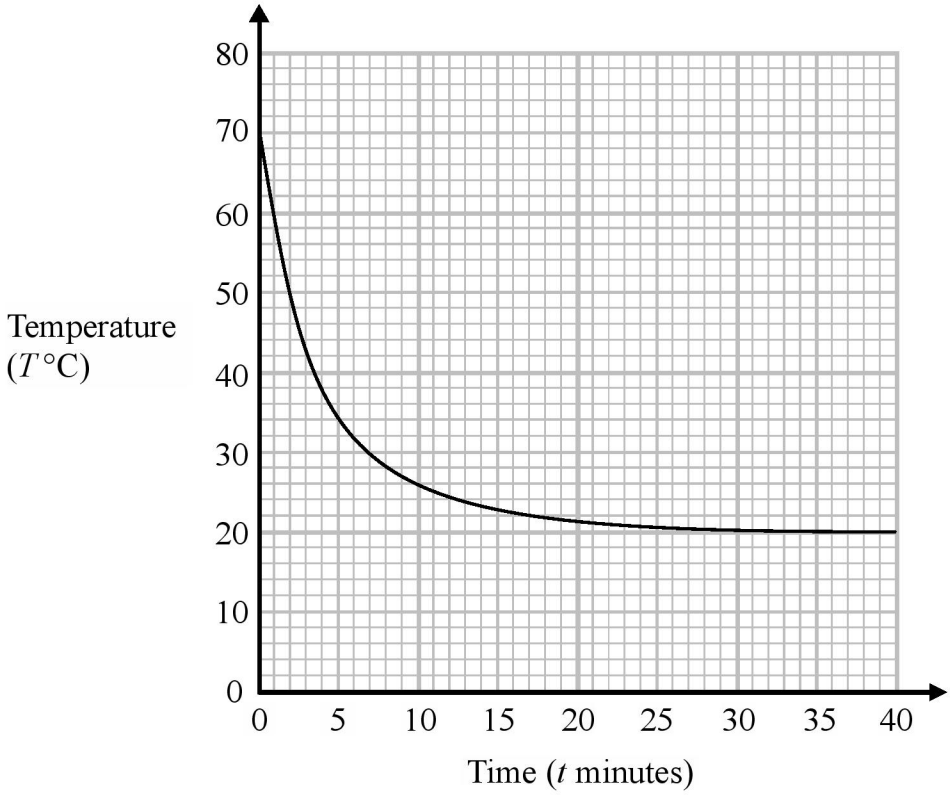
17 n is an integer.

Prove algebraically that the sum of $\frac{1}{2}n(n+1)$ and $\frac{1}{2}(n+1)(n+2)$ is always a square number.

(Total for Question 17 is 2 marks)

Question 4 (AO2): (No Calc) 15% of students got this right (2 marks)

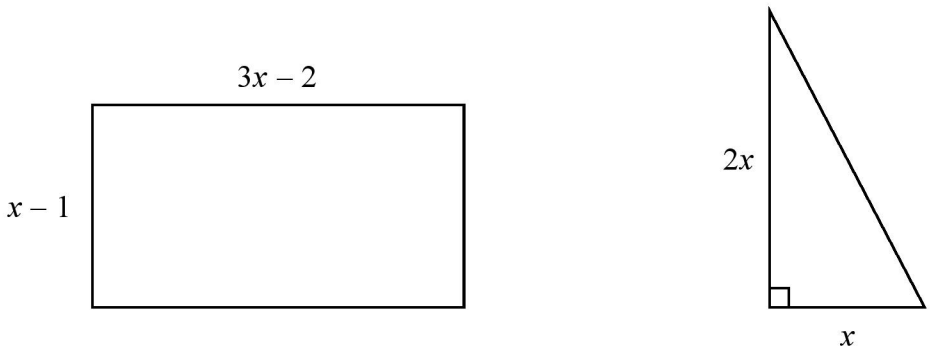
13 The graph shows the temperature, T °C, of the coffee in a cup at a time t minutes.



(*a*) Find an estimate for the gradient of the graph at time 5 minutes.

Question 5 (AO3): (No Calc) 14% of students got this right (5 marks)

23 Here is a rectangle and a right-angled triangle.



All measurements are in centimetres.
The area of the rectangle is greater than the area of the triangle.

Find the set of possible values of x.

.....

(Total for Question 23 is 5 marks)

Question 6 (AO1): (No Calc) 14% of students got this right (3 marks)

17 (*b*) Simplify fully $\dfrac{3-4x-4x^2}{2x^2-7x+3}$

Question 7 (AO1): (No Calc) 14% of students got this right (4 marks)

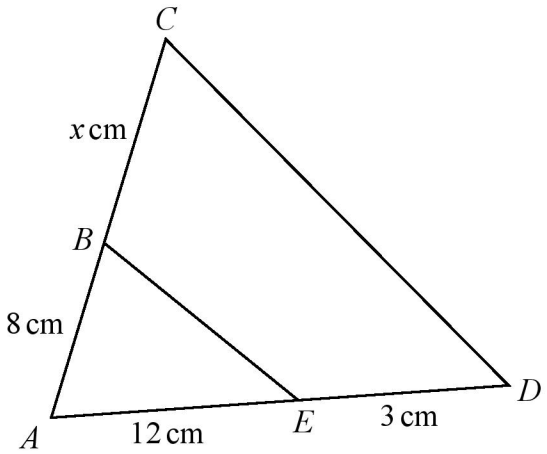
16 n is an integer greater than 1

Prove algebraically that $n^2 - 2 - (n - 2)^2$ is always an even number.

(Total for Question 16 is 4 marks)

Question 8 (AO3): (No Calc) 14% of students got this right (5 marks)

22 The two triangles in the diagram are similar.



There are two possible values of x.

Work out each of these values.
State any assumptions you make in your working.

(Total for Question 22 is 5 marks)

Question 9 (AO3): (No Calc) 13% of students got this right (4 marks)

14 White shapes and black shapes are used in a game.
Some of the shapes are circles.
All the other shapes are squares.

The ratio of the number of white shapes to the number of black shapes is 3:7

The ratio of the number of white circles to the number of white squares is 4:5

The ratio of the number of black circles to the number of black squares is 2:5

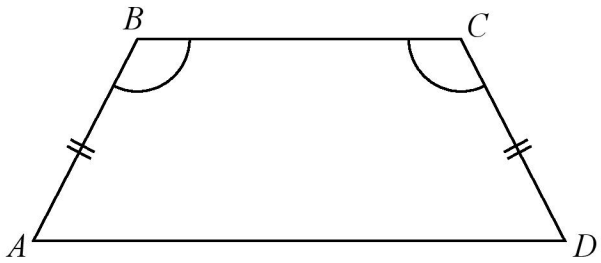
Work out what fraction of all the shapes are circles.

.....

(Total for Question 14 is 4 marks)

Question 10 (AO3): (No Calc) 11% of students got this right (4 marks)

21 $ABCD$ is a quadrilateral.



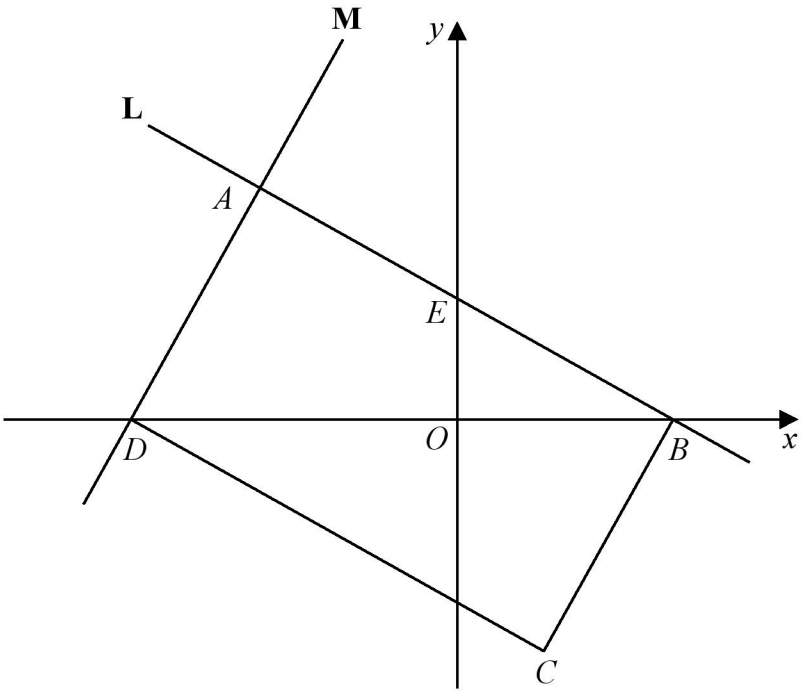
$AB = CD$.
Angle ABC = angle BCD.

Prove that $AC = BD$.

(Total for Question 21 is 4 marks)

Question 11 (AO3): (No Calc) 11% of students got this right (4 marks)

19



ABCD is a rectangle.

A, *E* and *B* are points on the straight line **L** with equation $x + 2y = 12$
A and *D* are points on the straight line **M**.

$AE = EB$

Find an equation for **M**.

.....

(Total for Question 19 is 4 marks)

Question 12 (AO1): (No Calc) 10% of students got this right (5 marks)

20 Solve algebraically the simultaneous equations

$$x^2 + y^2 = 25$$
$$y - 3x = 13$$

.....

(Total for Question 20 is 5 marks)

Question 13 (AO3): (No Calc) 8% of students got this right (4 marks)

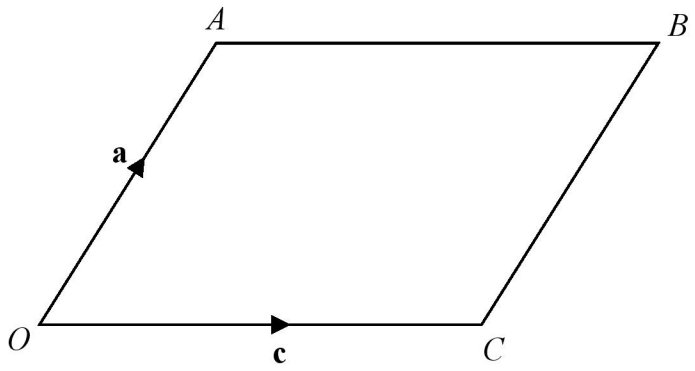
15 There are only n red balls and $(n + 1)$ blue balls in a bag.

Shamsa takes at random 2 balls from the bag.

Show that the probability that both balls are the same colour is $\frac{n}{2n+1}$

Question 14 (AO3): (No Calc) 8% of students got this right (4 marks)

19



OABC is a parallelogram.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$

X is the midpoint of the line *AC*.
OCD is a straight line so that $OC : CD = k : 1$

Given that $\overrightarrow{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$

find the value of *k*.

k = ...

(Total for Question 19 is 4 marks)

Question 15 (AO3): 8% of students got this right (2 marks)

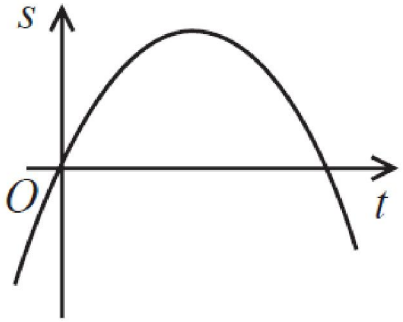
17. (a) Factorise $3(x - y)^2 - 2(x - y)$

.....

(2)

Question 16 (AO3): (No Calc) 7% of students got this right (4 marks)

14 A particle P is moving in a straight line.
O is a fixed point on the straight line.



The distance, s metres, of P from O at time t seconds is given by

$$s = 80t - 5t^2$$

Use algebra to find the greatest distance of P from O when $0 \leqslant t \leqslant 16$

Question 17 (AO3): (No Calc) 5% of students got this right (4 marks)

20 The table shows some values of x and y that satisfy the equation $y = a \cos x° + b$

x	0	30	60	90	120	150	180
y	3	$1 + \sqrt{3}$	2	1	0	$1 - \sqrt{3}$	-1

Find the value of y when $x = 45$

.....

(Total for Question 20 is 4 marks)

Question 18 (AO3): (No Calc) 5% of students got this right (3 marks)

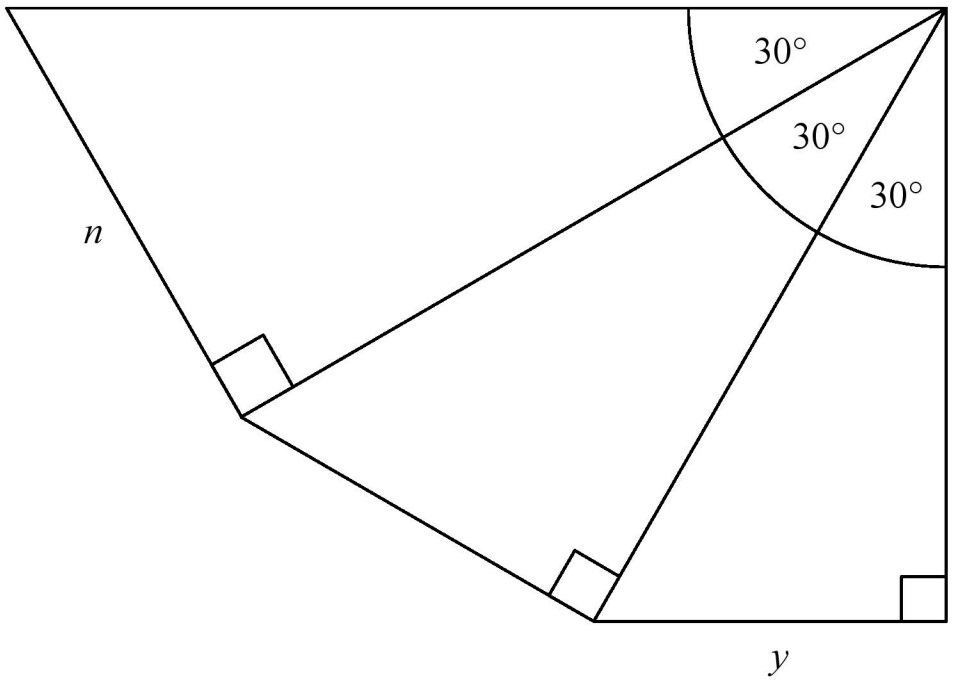
14 The ratio $(y + x) : (y - x)$ is equivalent to $k : 1$

Show that $y = \dfrac{x(k+1)}{k \quad 1}$

(Total for Question 14 is 3 marks)

Question 19 (AO3): 2% of students got this right (4 marks)

20

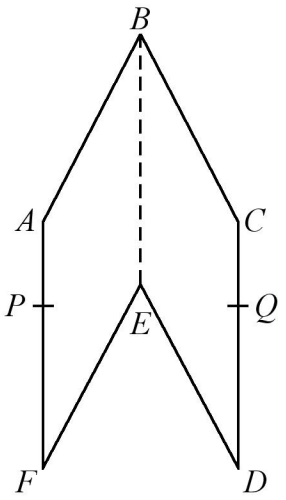


The diagram shows three right-angled triangles.

Prove that $y = \frac{3}{4}n$

Question 20 (AO3): (No Calc) 2% of students got this right (5 marks)

22 The diagram shows a hexagon *ABCDEF*.



ABEF and *CBED* are congruent parallelograms where $AB = BC = x$ cm.
P is the point on *AF* and *Q* is the point on *CD* such that $BP = BQ = 10$ cm.

Given that angle $ABC = 30°$,

prove that $\cos PBQ = 1 - \frac{(2-\sqrt{3})}{200} x^2$

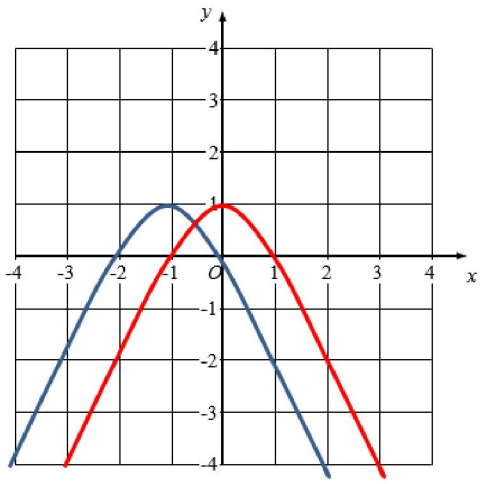
(Total for Question 22 is 5 marks)

Answers to Qn 1 (AO1): (No Calc) 19% of students got this right

Question 13 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$y = \frac{k}{x^2}$ Substituting, $9 = \frac{k}{1^2}$ or $2\frac{1}{4} = \frac{k}{2^2}$ or $1 = \frac{k}{3^2}$ or $2\frac{9}{16} = \frac{k}{4^2}$ so $k = 9$	M1	This mark is given for a method to find an equation for y in the form $y = \frac{k}{x^2}$ and thus the constant k
	$y = \frac{9}{x^2}$	A1	This mark is given for the correct answer only
(b)	$16 = \frac{9}{x^2}$ so $x^2 = \frac{9}{16}$, $x = \sqrt{\frac{9}{16}}$	M1	This mark is given for a method to substitute $y = 16$ into the proportional formula and rearrange
	$x = \frac{3}{4}$	A1	This mark is given for the correct answer only

Answers to Qn 2 (AO1): 19% of students got this right

Question	Working	Answer	Mark	Notes
18 (a)	Translation 		B1	for graph translated 1 unit in the positive x-direction

Answers to Qn 3 (AO2): (No Calc) 16% of students got this right

Question 17 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{1}{2}(n^2 + n + n^2 + n + 2n + 2)$	1	This mark is given for expanding the brackets
	$= \frac{1}{2}(2n^2 + 4n + 2) \; = \; n^2 + 2n + 1$ $= (n + 1)^2$ which is square for all integer values of n	1	This mark is given for a complete proof with reference to $(n + 1)^2$ being square for all integers n

Answers to Qn 4 (AO2): (No Calc) 15% of students got this right

Question	Working	Answer	Mark	Notes
13 (a)		–3	M1	for drawing a tangent at the point where t = 5 and applying a method to find the gradient
			A1	for answer in the range –3.5 to –2.5

Answers to Qn 5 (AO3): (No Calc) 14% of students got this right

Question 23 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(x-1)(3x-2) = 3x^2 - 5x + 2$ $\frac{1}{2}2x^2 = x^2$	1	This mark is given for deriving expressions for the areas of both the rectangle and triangle
	$2x^2 - 5x + 2 > 0$	1	This mark is given for finding an inequality
	$(2x-1)(x-2) > 0$	1	This mark is given for finding a method to solve the inequality
	$x > 2$ and $x > \frac{1}{2}$	1	This mark is given for finding the two critical values
	$x > 2$ only (since $x - \frac{1}{2} < 0$)	1	This mark is given for the correct answer only

Answers to Qn 6 (AO1): (No Calc) 14% of students got this right

Question	Working	Answer	Mark	Notes
17 (b)		$\frac{3+2x}{3-x}$	M1	for $(3 + 2x)(1 - 2x)$ oe
			M1	for $(2x - 1)(x - 3)$ oe
			A1	for cancelling correctly to leave $\frac{3+2x}{3-x}$ oe

Answers to Qn 7 (AO1): (No Calc) 14% of students got this right

Question 16 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(n-2)^2 = n^2 - 4n + 4$	C1	This mark is given for a correct expansion of $(n-2)^2$
	$n^2 - 2 - n^2 + 4n - 4$	C1	This mark is given for a correct expansion of $n - 2 - (n-2)^2$
	$2(2n - 3)$	C1	This mark is given for reducing the expression to $(2n - 3)$
	$2(2n-3)$ always even since it has a factor of 2 for all values of n	C1	This mark is given for a correct conclusion supported by working shown

Answers to Qn 8 (AO3): (No Calc) 14% of students got this right

Question 22 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{8}{12} \times 15 = 10$	1	This mark is given for finding a scale factor
	$x = 10 - 8 = 2$	1	This mark is given for the correct answer only
	$(12 + 3) \times 1.5$	1	This mark is given for finding another scale factor
	$x = 22.5 - 8 = 14.5$	1	This mark is given for the correct answer only
		1	This mark is given for describing both assumptions for similarity

Answers to Qn 9 (AO3): (No Calc) 13% of students got this right

Question 14 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{3}{3+7} \times \frac{4}{4+5} = \frac{3}{10} \times \frac{4}{9} = \frac{12}{90} = \frac{2}{15}$	P1	This mark is given for a process to find the proportion of shapes which are white circles
	$\frac{7}{3+7} \times \frac{2}{2+5} = \frac{7}{10} \times \frac{2}{7} = \frac{2}{10} = \frac{1}{5}$	P1	This mark is given for a process to find the proportion of shapes which are black circles
	$\frac{2}{15} + \frac{1}{5}$	P1	This mark is given for a process to find the proportion of all shapes which are circles
	$\frac{1}{3}$	A1	This mark is given for the correct answer only

Answers to Qn 10 (AO3): (No Calc) 11% of students got this right

Question 21 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$ABC = BCD$	C1	This mark is given for comparing triangles ABC and BCD (given in the diagram)
	$AB = CD$	C1	This mark is given for stating that line $AB = CD$ (given in the diagram)
	$BC = BC$ (common)	C1	This mark is given for stating that line BC is common to both triangles ABC and BCD
	$ABC \equiv DCB$ [SAS] and thus $AC = BD$	C1	This mark is given for a conclusion to the proof showing that the two triangles have a common angle and two common sides; thus $AC = BD$

Answers to Qn 11 (AO3): (No Calc) 11% of students got this right

Question 19 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$B = (12, 0)$, $E = (0, 6)$ Gradient of **L** $= -\frac{1}{2}$	1	This mark is given for rearranging to find a gradient or positions of B and E
	$A = (-12, 12)$	1	This mark is given for finding the position of A
	Gradient of **M** $= 2$	1	This mark is given for a finding the gradient of **M**
	Equation of **M** is $y = 2x + 36$	1	This mark is given for the correct answer only

Answers to Qn 12 (AO1): (No Calc) 10% of students got this right

Question 20 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$y - 3x = 13$, so $y = 3x + 13$ $x^2 + (3x + 13)^2 = 25$	M1	This mark is given for the substitution of $y = 3x + 13$ into $x^2 + y^2 = 25$
	$x^2 + 9x^2 + 39x + 39x + 169 = 25$	M1	This mark is given for the expansion of $x^2 + (3x + 13)^2 = 25$
	$10x^2 + 78x + 144 = 0$	M1	This mark is given for forming a quadratic equation equal to zero
	$2(5x^2 + 39x + 72) = 0$ $2(5x + 24)(x + 3) = 0$	M1	This mark is given for a method to solve the quadratic equation
	$x = -3, \quad y = 4$ $x = -\frac{24}{5}, \ y = -\frac{7}{5}$	A1	This mark is given for a pair of correct solutions only

Answers to Qn 13 (AO3): (No Calc) 8% of students got this right

Question	Working	Answer	Mark	Notes
15		Conclusion from accurate algebra	C1	for method to find probability of two red, e.g. $\frac{n}{2n+1}\times\frac{n-1}{2n}$ or two blue, e.g. $\frac{n+1}{2n+1}\times\frac{n}{2n}$ or different colours, e.g. $\frac{n+1}{2n+1}\times\frac{n}{2n}$ or $\frac{n}{2n+1}\times\frac{n+1}{2n}$
			C1	for probability of two of the same colour, e.g. $\frac{n}{2n+1}\times\frac{n-1}{2n}+\frac{n+1}{2n+1}\times\frac{n}{2n}$ or $1-\left[\frac{n+1}{2n+1}\times\frac{n}{2n}+\frac{n}{2n+1}\times\frac{n+1}{2n}\right]$
			C1	for method to reduce to a single fraction
			C1	for showing that the probability is $\frac{n}{2n+1}$

Answers to Qn 14 (AO3): (No Calc) 8% of students got this right

Question 19 (Total 3 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
	$\overline{OX} = \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{c}$	P1	This mark is given for the first step to solve the problem
	$\overline{OD} = \overline{OX} + \overline{XD} = \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{c} + 3\mathbf{c} - \frac{1}{2}\mathbf{a}$ $\overline{CD} = \overline{OD} - \overline{OC} = 3.5\mathbf{c} - \mathbf{c} = 2.5\mathbf{c}$	P1	This mark is given for a process to find a vector expression for $\overline{CD}$
	$\overline{OC} : \overline{CD} = k : 1 = \mathbf{c} + 2.5\mathbf{c}$	P1	This mark is given for a process to find the value of k (using ratios)
	$k = \frac{1}{2.5} = \frac{2}{5}$	A1	This mark is given for the correct answer only

Answers to Qn 15 (AO3): 8% of students got this right

17	(a)		$(x - y)(3x - 3y - 2)$	M1	identify $x - y$ as a common factor , e.g. $(x - y)(\ldots\ldots\ldots)$
				A1	oe

Answers to Qn 16 (AO3): (No Calc) 7% of students got this right

Question	Working	Answer	Mark	Notes
14		320	P1	for factorising to get $5(16t - t^2)$ or $5t(16 - t)$ or for a sketch of the graph of $s = 80t - 5t^2$
			P1	for $-5[(t - 8)^2 - 64]$ oe or identify turning point at $t = 8$ from their graph
			P1	(dep P1) for substitution of $t = 8$ into $s = 80t - 5t^2$
			A1	cao

Answers to Qn 17 (AO3): (No Calc) 5% of students got this right

Question 20 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	When $x = 90$, $a \cos x° = 0$ so $b = 1$	1	This mark is given for finding the value of b
	When $x = 0$, $a \cos x° = 2$ so $a = 2$	1	This mark is given for finding the value of a
	When $x = 45$, $2 \cos x° + 1 = 2 \times \frac{1}{\sqrt{2}} + 1$	1	This mark is given for finding an expression for $2 \cos x° + 1$ when $x = 45$
	$1 + \sqrt{2}$	1	This mark is given for the correct answer only

Answers to Qn 18 (AO3): (No Calc) 5% of students got this right

Question 14 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(y + x) = k(y - x)$	1	This mark is given for setting up an equations from the information given
	$ky - y = x + kx$	1	This mark is given for isolating x and y on opposite sides
	$y(k - 1) = k(x + 1)$ so $y = \frac{k(x+1)}{k-1}$	1	This mark is given for using correct algebra to reach a conclusion

Answers to Qn 19 (AO3): 2% of students got this right

Question	Working	Answer	Mark	Notes
20		Proof	B1	for using any correct trig value for 30°, e.g. $\sin 30 = 0.5$, $\cos 30 = \frac{\sqrt{3}}{2}$ or $\tan 30 = \frac{1}{\sqrt{3}}$
			M1	for hypotenuse of small triangle = $2y$ or hypotenuse of large triangle = $2n$
			A1	for method to find the hypotenuse of middle triangle, e.g. $\sqrt{(2n)^2 - n^2}$ $(=\sqrt{3}n)$
			A1	for a correct equation linking y and n and correct working leading to the given result

Answers to Qn 20 (AO3): (No Calc) 2% of students got this right

Question 22 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\cos 30° = \frac{\sqrt{3}}{2}$	B1	This mark is given for a correct statement about the value of cos 30° (seen anywhere)
	$PQ^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos PBQ$ $= 200 - 200 \cos PBQ$	M1	This mark is given for applying the cosine rule to find an expression for PQ^2
	$AC^2 = x^2 + x^2 - 2 \times x \times x \times \cos 30°$ $= 2x^2 - 2x^2 \frac{\sqrt{3}}{2}$ $= 2x^2(1 - \frac{\sqrt{3}}{2})$ $= (2 - \sqrt{3})x^2$	M1	This mark is given for applying the cosine rule to find an expression for AC^2
	$\cos PBQ = \frac{200 - PQ^2}{200} = 1 - \frac{PQ^2}{200}$	M1	This mark is given for rearranging to find an expression for cos PBQ
	$\cos PBQ = 1 - \frac{PQ^2}{200} = 1 - \frac{AC^2}{200}$ $= 1 - \frac{(2-\sqrt{3})}{200} x^2$	A1	This mark is given for a conclusion of proof with all working seen