

# ADA PINPOINT TOPIC PACKS

(1)Surds (9 Qns)

(2)Harder Surds (7 Qns)

(3)Calculate with Surds (0 Qns)

50\_to\_100\_Percent\_Pinpoint\_AI\_Pack

Time Allocation = 54mins , Max = 48 Marks

Calculated Grade Boundaries:

Grade	Marks
5-	4
5	7
5+	10
6-	13
6	16
6+	20
7-	23
7	26
7+	29
8-	32
8	36
8+	39
9-	42
9	45
9+	48



## Question 1 (AO1): (No Calc) 47% of students got this right (1 marks)

16. (b) Write  $\sqrt{45}$  in the form  $k\sqrt{5}$ , where  $k$  is an integer.

Question 2 (AO2): (No Calc) 46% of students got this right (2 marks)

14 Show that  $\frac{(4-\sqrt{3})(4+\sqrt{3})}{\sqrt{13}}$  simplifies to  $\sqrt{13}$

### Question 3 (AO1): 44% of students got this right (2 marks)

**20.** Expand  $(1 + \sqrt{2})(3 - \sqrt{2})$

Give your answer in the form  $a + b\sqrt{2}$  where  $a$  and  $b$  are integers.

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**(Total 2 marks)**

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## Question 4 (AO1): (No Calc) 42% of students got this right (3 marks)

19 (a) Work out the value of  $\sqrt{2}^4$

[1 mark]

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Answer \_\_\_\_\_

19 (b) Expand and simplify  $(\sqrt{2} + 3)^2$

[2 marks]

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Answer \_\_\_\_\_

## Question 5 (AO1): (No Calc) 39% of students got this right (6 marks)

17. (a) Rationalise the denominator of  $\frac{6}{\sqrt{5}}$

.....  
(2)

- (b) Expand and simplify  $(2 + \sqrt{10})(\sqrt{5} + \sqrt{20})$

.....  
(4)

(Total 6 marks)

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## Question 6 (AO2): (No Calc) 34% of students got this right (3 marks)

18. (b) Simplify  $\left(\frac{2}{\sqrt{2}}\right)^3$

Give your answer in the form  $a\sqrt{2}$  where  $a$  is an integer.

.....  
(3)

(Total 5 marks)

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## Question 7 (AO3): 28% of students got this right (3 marks)

21. A trapezium  $ABCD$  has an area of  $5\sqrt{6} \text{ cm}^2$ .

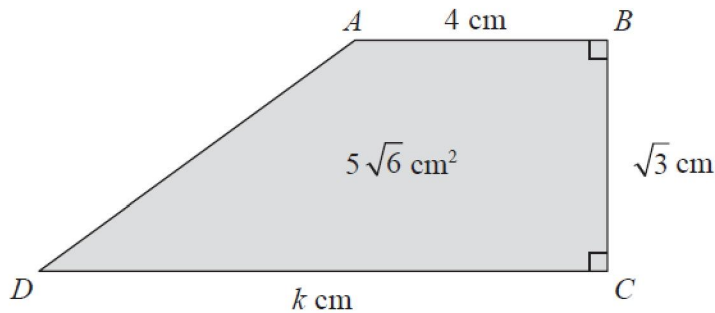


Diagram **NOT**  
accurately drawn

$$AB = 4 \text{ cm.}$$

$$BC = \sqrt{3} \text{ cm.}$$

$$DC = k \text{ cm.}$$

Calculate the value of  $k$ , giving your answer in the form  $a\sqrt{b} - c$ ,  
where  $a$ ,  $b$  and  $c$  are positive integers.  
Show each step in your working.

$$k = \dots\dots\dots$$

(Total 3 marks)

## Question 8 (AO2): 27% of students got this right (3 marks)

18 Simplify fully  $(\sqrt{a} + \sqrt{4b})(\sqrt{a} - 2\sqrt{b})$

## Question 9 (AO2): (No Calc) 24% of students got this right (3 marks)

20. Given that  $\frac{8-\sqrt{18}}{\sqrt{2}} = a + b\sqrt{2}$ , where  $a$  and  $b$  are integers,

find the value of  $a$  and the value of  $b$ .

$$a = \dots\dots\dots$$

$$b = \dots\dots\dots$$

(Total 3 marks)

Question 10 (AO3): (No Calc) 23% of students got this right (2 marks)

15. (a) Find the value of  $\sqrt[4]{27 \times 3 \times 10^8}$

.....  
(2)

## Question 11 (AO1): 21% of students got this right (2 marks)

- 18** Rationalise the denominator of  $\frac{10}{\sqrt{5}}$   
Give your answer in its simplest form.

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**(Total for Question 18 is 2 marks)**

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## Question 12 (AO1): 16% of students got this right (3 marks)

22.  $(a + \sqrt{8})^2$  can be written in the form  $c + d\sqrt{2}$ , where  $a$ ,  $c$  and  $d$  are integers.

Find, in terms of  $a$ , an expression for  $c$  **and** an expression for  $d$ .

$c = \dots\dots\dots$

$d = \dots\dots\dots$

(Total for Question 22 is 3 marks)

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Question 13 (AO2): (No Calc) 13% of students got this right (3 marks)

18. Show that  $\frac{4}{\frac{1}{\sqrt{3}} + \sqrt{3}}$  can be written as  $\sqrt{3}$

(Total for Question 18 is 3 marks)

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## Question 14 (AO2): (No Calc) 11% of students got this right (4 marks)

23 Work out the value of  $\frac{5}{\sqrt{3}} - \sqrt{6\frac{3}{4}}$

Give your answer in the form  $k\sqrt{3}$

[4 marks]

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Answer \_\_\_\_\_



Question 15 (AO1): (No Calc) 10% of students got this right (3 marks)

21 Show that  $\frac{2+\sqrt{3}}{7+\sqrt{12}}$  can be written  $\frac{8+3\sqrt{3}}{37}$

(Total for Question 21 is 3 marks)

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Question 16 (AO2): (No Calc) 10% of students got this right (5 marks)

19  $\frac{1 + \sqrt{2}}{(3 - \sqrt{2})^2}$  can be written in the form  $a + b\sqrt{2}$

Find the value of  $a$  and the value of  $b$ .

Answers to Qn 1 (AO1): (No Calc) 47% of students got this right

Question		Working	Answer	Mark	Notes
16.	(b)		$3\sqrt{5}$	1	B1 cao

Answers to Qn 2 (AO2): (No Calc) 46% of students got this right

Paper 1MA1: 1H			
Question	Working	Answer	Notes
14		Completes reasoning	<p>M1 Expansion of <math>(4 - \sqrt{3})(4 + \sqrt{3})</math> with at least 3 terms out of 4 correct or <math>4^2 - \sqrt{3} \times \sqrt{3}</math></p> <p>C1 for <math>\sqrt{13}</math> from correct working</p>
Question Order Created by Pinpoint Learnings Automatic Differentiation Algorithmn			

Answers to Qn 3 (AO1): 44% of students got this right

Question		Working	Answer	Mark	Notes
20		$3 - \sqrt{2} + 3\sqrt{2} - \sqrt{2}\sqrt{2}$	$1 + 2\sqrt{2}$	2	<p>M1 for 4 terms correct ignoring signs or 3 out of no more than 4 terms correct</p> <p>A1 cao</p>

Answers to Qn 4 (AO1): (No Calc) 42% of students got this right

19(a)	4	B1	
	Additional Guidance		

19(b)	$2 + 3 \quad 2 + 3 \quad 2 + 9$	M1	Allow one error
	$11 + 6 \quad 2$	A1	
	Additional Guidance		

## Answers to Qn 5 (AO1): (No Calc) 39% of students got this right

17.	(a)	$\frac{6}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$	$\frac{6\sqrt{5}}{5}$	2	M1 $\frac{6}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ A1 cao
	(b)	$\frac{2\sqrt{5} + \sqrt{10}}{2\sqrt{20} + \sqrt{10}} \frac{\sqrt{5}}{\sqrt{20}}$ $\frac{2\sqrt{5} + \sqrt{50}}{2\sqrt{20} + \sqrt{200}}$ $2\sqrt{5} + 5\sqrt{2} + 4\sqrt{5} + 10\sqrt{2}$	$\frac{6\sqrt{5} + 1}{5\sqrt{2}}$	4	M1 for 3 of no more than 4 correct terms of expansion, (may be shown in a table or without + signs) $2\sqrt{5} + \sqrt{10}\sqrt{5} + 2\sqrt{20} + \sqrt{10}\sqrt{20}$ (or equivalent) M1 or $\sqrt{50}$ or $\sqrt{(10 \times 5)}$ or $\sqrt{200}$ or $\sqrt{(20 \times 10)}$ M1 $5\sqrt{2}$ or $10\sqrt{2}$ or $4\sqrt{5}$ A1 cao

Answers to Qn 6 (AO2): (No Calc) 34% of students got this right

Question		Working	Answer	Mark	Notes
18	(b)		$2\sqrt{2}$	3	<p>M1 for cubing</p> <p>M1 for a correct method to rationalise</p> <p>A1 for <math>2\sqrt{2}</math> (accept <math>a = 2</math>)</p>



## Answers to Qn 7 (AO3): 28% of students got this right

21.		$(A =)$ $0.5 \times (4 + k) \times \sqrt{3} (= 5\sqrt{6})$ $k + 4 = \frac{10\sqrt{6}}{\sqrt{3}}$ $(k =) 2 \times \frac{5\sqrt{6}}{\sqrt{3} - 4}$ or $(k =) \frac{5\sqrt{6} - 2\sqrt{3}}{0.5\sqrt{3}}$ oe	$(k =) 10\sqrt{2} - 4$	3	M1 $4\sqrt{3} + 0.5(k - 4) \times \sqrt{3}$ oe M1 correctly isolating k A1 Accept $2(5\sqrt{2} - 2)$ but don't accept $10\sqrt{2} - 4$ followed by $5\sqrt{2} - 2$
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Answers to Qn 8 (AO2): 27% of students got this right

Paper 1MA1: 2H			
Question	Working	Answer	Notes
18	$(\sqrt{a} + 2\sqrt{b})(\sqrt{a} - 2\sqrt{b})$ $\sqrt{a} \times \sqrt{a} - 2\sqrt{a}\sqrt{b}$ $+ 2\sqrt{b}\sqrt{a} - 2\sqrt{b} \times 2\sqrt{b}$	$a - 4b$	M1 for expansion of brackets or $\sqrt{4b} = 2\sqrt{b}$  M1 for $a$ or $(-4b)$  A1 cao
Question Order Created by Pinpoint Learnings Automatic Differentiation Algorithmn			

Answers to Qn 9 (AO2): (No Calc) 24% of students got this right

Question	Working	Answer	Mark	Notes
20.	$\frac{8 - \sqrt{18}}{\sqrt{2}} = \frac{8}{\sqrt{2}} - \frac{\sqrt{18}}{\sqrt{2}}$ $= \frac{8}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} - \frac{\sqrt{18}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ $\frac{8\sqrt{2}}{2} - 3$	$a = -3$ $b = 4$	3	<p>M1 for attempt to rationalise denominator,  e.g. <math>\frac{8}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} - \frac{\sqrt{18}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}</math> or <math>\frac{8 - \sqrt{18}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}</math></p> <p>Or <math>8 - \sqrt{18} = \sqrt{2}(a + b\sqrt{2})</math> (oe)</p> <p>A2 for <math>-3 + 4\sqrt{2}</math></p> <p>(A1 for <math>-3</math>, A1 for <math>4</math>)</p>

## Answers to Qn 10 (AO3): (No Calc) 23% of students got this right

15	(a)		300	B1	for correct use of indices rules, e.g. sight of 3 from $\sqrt[4]{27 \times 3}$ or sight of $10^2$
				B1	for 300, $3 \times 10^2$ oe

## Answers to Qn 11 (AO1): 21% of students got this right

18			$2\sqrt{7}$	2	M1 for multiplication of denominator and numerator by $\sqrt{7}$ A1 cao
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Answers to Qn 12 (AO1): 16% of students got this right

22		$c = a^2 + 8$ $d = 4a$	P1 A1 A1	Process to expand $(a + \sqrt{8})^2$ given at least 3 terms correct $c = a^2 + 8$ $d = 4a$
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## Answers to Qn 13 (AO2): (No Calc) 13% of students got this right

18		$\sqrt{3}$	C1	first step shown towards simplifying, e.g. $\frac{4\sqrt{3}}{1+\sqrt{3}\sqrt{3}}$
			C1	simplifies denominator, e.g. $\frac{4\sqrt{3}}{1+3}$
			C1	conclusion to get result

Answers to Qn 14 (AO2): (No Calc) 11% of students got this right

Alternative method 1		
$\frac{5}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \text{ or } \frac{5\sqrt{3}}{3}$	M1	oe $5 - \sqrt{3} \sqrt{6\frac{3}{4}} = 3k$
$(\sqrt{6\frac{3}{4}} = \sqrt{\frac{27}{4}} =)$ $\frac{\sqrt{27}}{2} \text{ or } \frac{3\sqrt{3}}{\sqrt{4}} \text{ or } \frac{3\sqrt{3}}{2}$	M1	
$(\frac{5\sqrt{3}}{3} - \frac{3\sqrt{3}}{2} =)$ $\frac{10\sqrt{3}}{6} - \frac{9\sqrt{3}}{6}$	M1dep	oe dep on M1 M1 Any correct common denominator with at least one numerator correct $\frac{10\sqrt{3}}{2} - \frac{9\sqrt{3}}{2} = 3k$
$\frac{1\sqrt{3}}{6} \text{ or } \frac{\sqrt{3}}{6} \text{ or } \frac{1}{6} \sqrt{3}$	A1	oe but must be $k\sqrt{3}$

Question Order Created by Pinpoint Learnings Automatic Differentiation Algorithm			



Answers to Qn 15 (AO1): (No Calc) 10% of students got this right

21 Show that  $\frac{2+\sqrt{3}}{7+\sqrt{12}}$  can be written  $\frac{8+3\sqrt{3}}{37}$

$$\begin{aligned}\frac{2+\sqrt{3}}{7+\sqrt{12}} \times \frac{7-\sqrt{12}}{7-\sqrt{12}} &= \frac{14+7\sqrt{3}-2\sqrt{12}-\sqrt{3}\sqrt{12}}{49-12} \\ &= \frac{14+7\sqrt{3}-2\sqrt{12}-\sqrt{3}\sqrt{12}}{37}\end{aligned}$$

$$\sqrt{12} = \sqrt{4}\sqrt{3} = 2\sqrt{3}$$

So

$$\begin{aligned}\frac{2+\sqrt{3}}{7+\sqrt{12}} &= \frac{14+7\sqrt{3}-2(2\sqrt{3})-\sqrt{3}(2\sqrt{3})}{37} \\ &= \frac{8+3\sqrt{3}}{37}\end{aligned}$$

(Total for Question 21 is 3 marks)

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Answers to Qn 16 (AO2): (No Calc) 10% of students got this right

Question	Working	Answer	Mark	Notes
19		$a = \frac{23}{49}$ $b = \frac{17}{49}$	M1  M1  M1  A1  A1	for method to expand $(3 - \sqrt{2})^2$ $(= 11 - 6\sqrt{2})$  for method to rationalise the denominator, e.g. multiplying by $\frac{11 + 6\sqrt{2}}{11 + 6\sqrt{2}}$  (dep M1) for method to expand correctly either the numerator or the denominator, e.g. $23 + 17\sqrt{2}$ or $121 - 72 (= 49)$  for $a = \frac{23}{49}$  for $b = \frac{17}{49}$