Name .....

THE KING'S SCHOOL

2022

Year 9 Level 5.3
Assessment Task 4 (AT4)
November 2022

Mathematics

General Instructions

- Working time – 90 minutes
- Calculators approved by NESA may be used
- Marks for each question are indicated on the question paper
- Write using a black pen

Total marks: 77

Section I 10 marks

- Attempt Questions 1-10
- Use the Multiple Choice Answer Sheet provided
- Allow about 10 minutes for this section

Section II 67 marks

- Answer Questions 11-15 in the spaces provided
- In Questions 11-15, show relevant mathematical reasoning and/or calculations
- Allow about 80 minutes for this section

Examiners' Use Only					**Setter/Checker: ETR/MAS**
Question	**Algebra**	**Geometry**	**Measurement**	**Number**	**Total**
Section I					
1-10	**3, 4 / 2**	**5, 6, 7 / 3**	**8, 9, 10 / 3**	**1, 2 / 2**	**/ 10**
Section II					
11			**/ 15**		**/15**
12		**a / 5**		**b, c /5**	**/10**
13	**c, d / 8**			**a, b / 6**	**/14**
14	**/ 14**				**/14**
15	**/ 14**				**/14**
Total	**/ 38**	**/ 8**	**/ 18**	**/13**	**/77**

Section I

10 marks
Attempt Questions 1-10
Allow about 10 minutes for this section

Use the multiple-choice answer sheet for Questions 1-10.

---

1 13 364 written in scientific notation, correct to three significant figures, is:

A. 13 300

B. 1.33×10^4

C. 1.34×10^4

D. 1.33×10^5

2 Given $\sqrt{y} = 5\sqrt{6}$, the value of y is:

A. 5

B. 6

C. 30

D. 150

3 What is the gradient for the equation $2x + 4y = 10$?

A. -2

B. -0.5

C. 0.5

D. 2

4 The product of a number, and 2 less than the same number, is 8. What could be the original number?

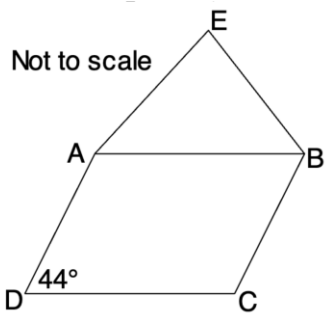
A. -2

B. 0

C. 2

D. 5

5 $ABCD$ is a rhombus with $\angle ADC = 44°$. ΔABE is an equilateral triangle. The size of $\angle EAD$ is:



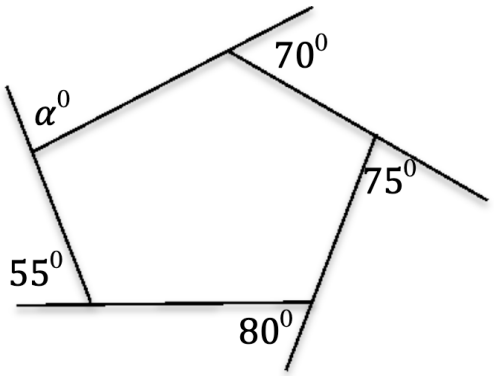
A. 44°

B. 60°

C. 104°

D. 196°

6 The size angle of angle $\alpha°$ is:



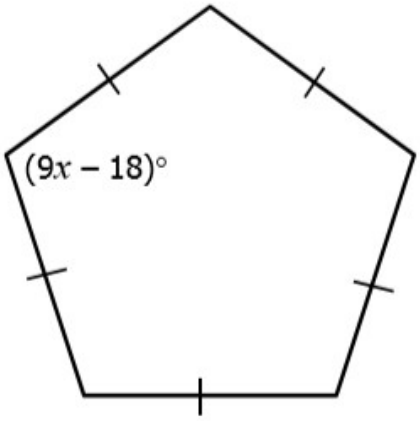
A. 70°

B. 75°

C. 80°

D. 95°

7 The diagram below shows a regular pentagon. What is the value of x?



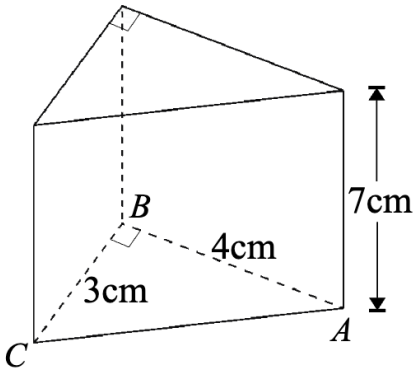
A. 10

B. 12

C. 14

D. 16

8 What is the surface area of the shape below?



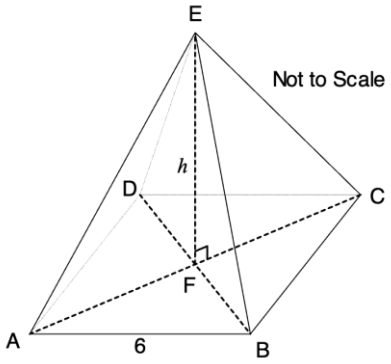
A. 42 cm^2

B. 61 cm^2

C. 96 cm^2

D. 108 cm^2

9 A pyramid with a square base has AB = 6 cm and $EF = h$ cm. EC is $\sqrt{82}$ cm.



The value of h is:

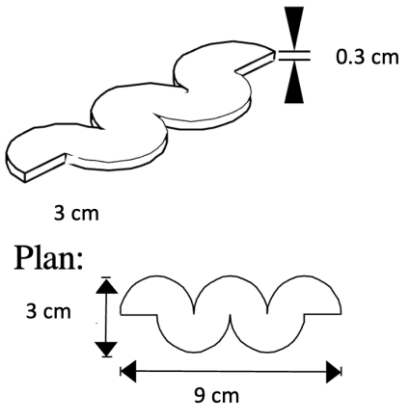
A. 5

B. 6

C. 7

D. 8

10 Badges have been designed as shown below.



All the curves in the design are semi-circles with the same radius. The thickness is 0.3 cm. The volume of the badge (to the nearest 1 decimal place) is:

A. 5.3 cm^3

B. 10.6 cm^3

C. 21.2 cm^3

D. 42.4 cm^3

End of Section I

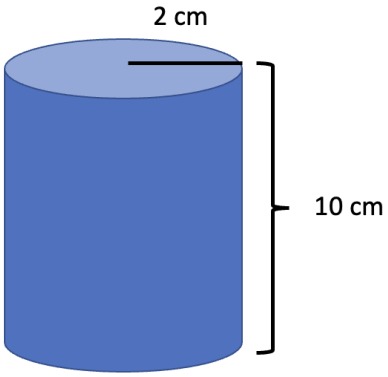
Name .....

Section II
67 marks
Attempt Questions 11-15
Allow about 80 minutes for this section

- Answer the questions in the spaces provided.
- Your responses should include relevant mathematical reasoning and/or calculations.
- Extra writing paper will be provided by your teacher if required.

Question 11 (Measurement) (15 marks) **Marks**

(a) A closed cylinder has a height of 10 cm and a radius of 2 cm.



(i) What is the volume of the cylinder? Answer to 2 decimal places. **2**

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(ii) What is the surface area of the cylinder? Answer to 2 decimal places. **2**

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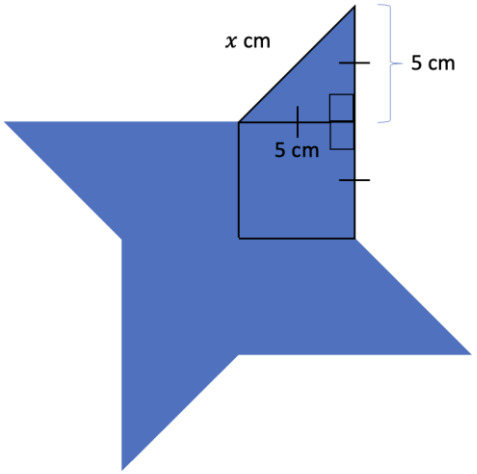
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Question 11 continues on the next page

Name .....

Question 11 (continued) **Marks**

(b) Naruto constructs the shuriken for his work. It is made of sections that are all the same.



(i) Find the value of x. Answer to 2 decimal places. **1**

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(ii) Find the area of one side of the shuriken. **2**

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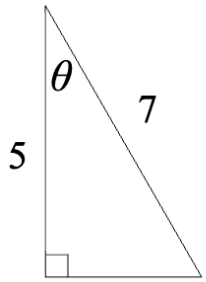
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Question 11 continues on the next page

Name .....

Question 11 (continued) **Marks**

(c) Find the value of θ. Give your answer to the nearest degree. **2**



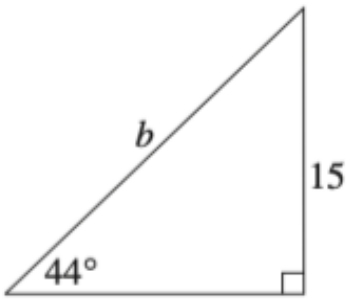
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(d) Find the value of b. Give your answer to the nearest 2 decimal places. **2**
All lengths are in cm.



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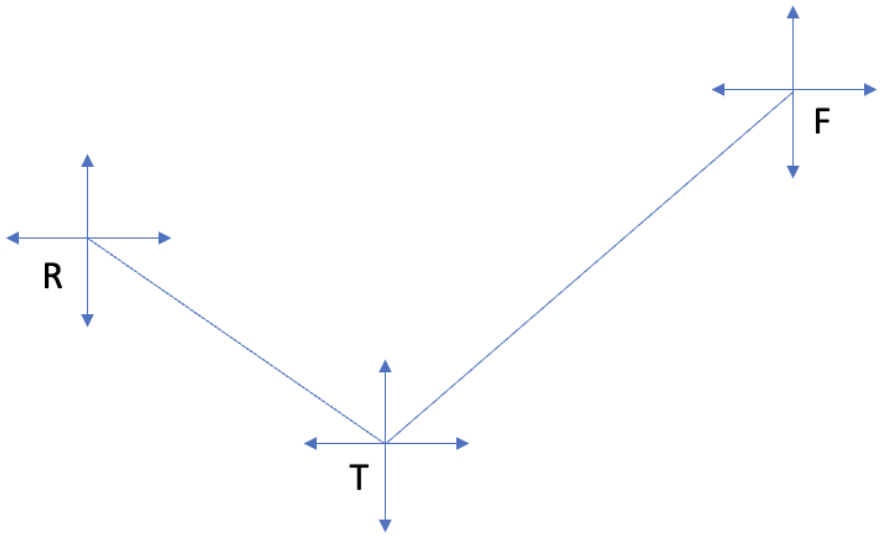
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Question 11 continues on the next page

Name .....

Question 11 (continued) **Marks**

(e) Rapunzel (R) and Flynn (F) both leave from a tower (T). Rapunzel walks on a bearing of 320^o for 5 km. Flynn walks on a bearing of 50^o for 10 km.



(i) Show that $\angle RTF = 90°$. **1**

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(ii) Find the distance between Rapunzel and Flynn. Leave your answer in exact form. **1**

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(iii) What is the bearing of Rapunzel from Flynn? Answer to the nearest degree. **2**

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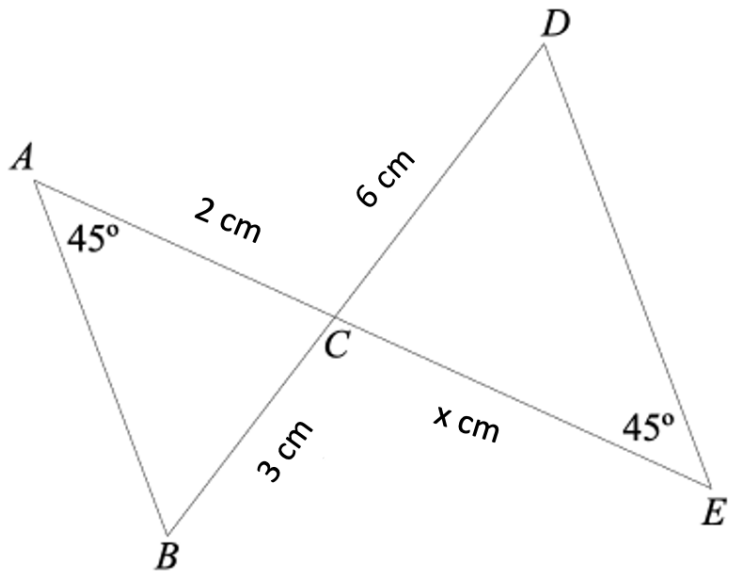
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End of Question 11

Name .....

Question 12 (Geometry and Number) (10 marks) **Marks**

(a) In the diagram below, C lies on the lines AE and BD.



(i) Prove that triangle ABC is similar to triangle EDC, giving clear reasons. **3**

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(ii) Find the value of x. You must give a reason. **2**

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Question 12 continues on the next page

Name .....

Question 12 (continued) **Marks**

(b) Mr Burns wants to save enough money to open a nuclear powerplant in Springfield. If he invests \$1500 into a bank at 10 % p.a compounded yearly for 15 years, how much money will Mr Burns have in total? Answer to 2 decimal places. **2**

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(c) The following table shows the Australian tax rates for individuals.

Taxable income	Tax on this income
\$0 – \$18 200	Nil
\$18 201 – \$37 000	19c for each \$1 over \$18 200
\$37 001 – \$87 000	\$3572 plus 32.5c for each \$1 over \$37 000
\$87 001 – \$180 000	\$19 822 plus 37c for each \$1 over \$87 000
\$180 001 and over	\$54 232 plus 45c for each \$1 over \$180 000

(i) Homer works at the local nuclear powerplant. He made \$95000 in the year. Homer also donated \$2000 to the local charity and had \$1000 in work-related expenses. What is Homer's taxable income? **1**

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(ii) Using the table above, how much tax does Homer need to pay? **2**

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End of Question 12

Name .....

Question 13 (Number and Algebra) (14 marks) **Marks**

(a) Simplify the following:

(i) $2\sqrt{3} + 3\sqrt{3}$ **1**

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(ii) $2\sqrt{5} \times 3\sqrt{4}$ **2**

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(b) Simplify $\frac{(a^{-4})^3 b^4}{a^9 (b^{-1})^3}$ and write your answer with positive indices: **3**

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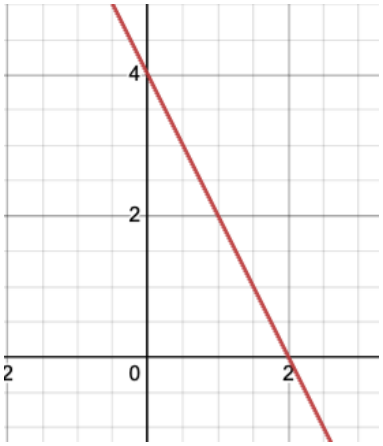
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Question 13 continues on the next page

Name .....

Question 13 (continued) **Marks**

(c) Dr Seuss was showing his students the line below.



(i) What is the gradient of the line? **1**

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(ii) What is the y-intercept of the line? **1**

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(iii) What is the equation of the line? **1**

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(iv) Does the point (2, 2) lie on the line? **1**

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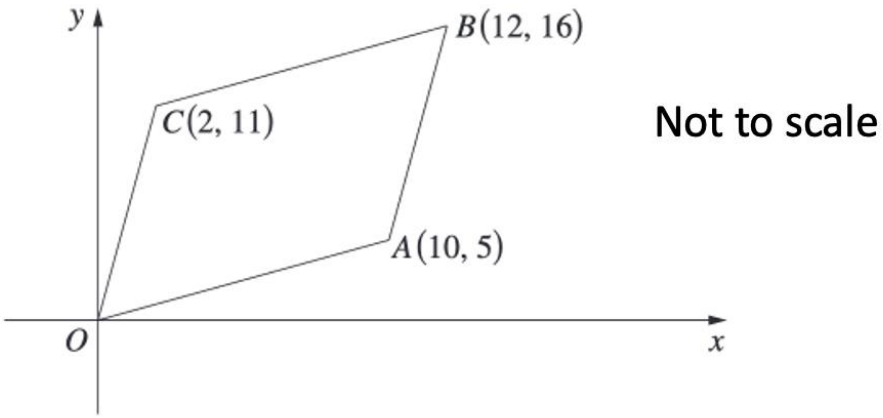
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Question 13 continues on the next page

Name .....

Question 13 (continued) **Marks**

(d) In the diagram below, A, B and C are the points (10, 5), (12, 16) and (2, 11) respectively.



(i) Calculate the distance AC. **1**

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(ii) Calculate the midpoint of AC. **1**

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(iii) Show that OB and AC are perpendicular. **2**

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End of Question 13

Name .....

Question 14 (Algebra) (14 marks) **Marks**

(a) Solve the following equations:

(i) $2x - 1 = 11$ **1**

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(ii) $x^2 - 9x = 0$ **2**

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(iii) $2x^2 + 5x + 2 = 0$ **2**

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(b) Fully factorise the following:

(i) $2x^2 - x$ **1**

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(ii) $ax^2 + ax + 2x + 2$ **2**

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Question 14 continues on the next page

Name .....

Question 14 (continued) **Marks**

(c) Fully simplify the following:

(i) $\frac{32}{2a+6} \div \frac{16}{(a+3)^2}$ **3**

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(ii) $\frac{12}{x^2-16} - \frac{3}{x+4}$ **3**

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End of Question 14

Name .....

Question 15 (Algebra) (14 marks) **Marks**

(a) Sketch $y = x^2$ and $y = 3x^2$ on the same set of axes. **2**

(b) Sketch $y = (x - 1)^2 + 4$, showing the vertex, axis of symmetry and y-intercept. **4**

Question 15 continues on the next page

Name .....

Question 15 (continued) **Marks**

(c) A parabola has the equation: $y = x^2 - 4x + 3$

(i) Show that the x-intercepts for the parabola are at $x = 3$ and $x = 1$. **2**

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(ii) Find the y-intercept of the parabola. **1**

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(iii) Sketch the parabola, showing the x-intercepts and y-intercept. **2**

Question 15 continues on the next page

Name .....

Question 15 (continued) **Marks**

(d) Hermione was on the phone trying to describe a parabola to Harry. **3**
However, Hermione had bad reception and parts of the conversation had been cut out.
Hermione says that "the $y = x^2$ has been shifted _____ by 16 units".
She also says, "the x-intercepts cuts at _____ and _____".
Harry didn't hear the exact x-intercepts but knew that **one** of the x-intercepts was between 2 and 4 (inclusive of 2 and 4).
The call then ended.

Given that the equation of a parabola is $y = a(x - h)^2 + c$, find the possible value(s) of a, h and c.

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End of Question 15

End of Assessment Task

Name .....

THE KING'S SCHOOL

2022

Year 9 Level 5.3
Assessment Task 4 (AT4)
November 2022

MULTIPLE CHOICE ANSWER SHEET

Select the alternative A, B, C or D that best answers the question and indicate your choice by filling in the appropriate response oval, completely.

					Examiner's Use Only	
1	A	B	C	D		
2	A	B	C	D	Number	/ 2
3	A	B	C	D		
4	A	B	C	D	Algebra	/ 2
5	A	B	C	D		
6	A	B	C	D		
7	A	B	C	D	Geometry	/ 3
8	A	B	C	D		
9	A	B	C	D		
10	A	B	C	D	Measurement	/ 3
					Total	**/10**

Name .....

Name .....

THE KING'S SCHOOL

2022

Year 9 Level 5.3
Assessment Task 4 (AT4)
November 2022

Mathematics

General Instructions

- Working time – 90 minutes
- Calculators approved by NESA may be used
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Total marks: 77

Section I 10 marks

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Section II 67 marks

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Examiners' Use Only					**Setter/Checker: ETR/MAS**
Question	**Algebra**	**Geometry**	**Measurement**	**Number**	**Total**
Section I					
1-10	**3, 4 / 2**	**5, 6, 7 / 3**	**8, 9, 10 / 3**	**1, 2 / 2**	**/ 10**
Section II					
11			**/ 15**		**/15**
12		**a / 5**		**b, c /5**	**/10**
13	**c, d / 8**			**a, b / 6**	**/14**
14	**/ 14**				**/14**
15	**/ 14**				**/14**
Total	**/ 38**	**/ 8**	**/ 18**	**/13**	**/77**

Section I

10 marks
Attempt Questions 1-10
Allow about 10 minutes for this section

Use the multiple-choice answer sheet for Questions 1-10.

---

1 13 364 written in scientific notation, correct to three significant figures, is:

A. 13 300

B. 1.33×10^4

C. 1.34×10^4

D. 1.33×10^5

1.3364×10^4

1.34×10^4 C

2 Given $\sqrt{y} = 5\sqrt{6}$, the value of y is:

A. 5

B. 6

C. 30

D. 150

$\sqrt{y} = \sqrt{25 \times 6}$

$= \sqrt{150}$

$\therefore y = 150$ D

3 What is the gradient for the equation $2x + 4y = 10$?

A. -2

B. -0.5

C. 0.5

D. 2

$4y = 10 - 2x$

$y = \frac{10}{4} - \frac{2}{4}x$

$y = 2.5 - 0.5x$

$\therefore$ B

4 The product of a number, and 2 less than the same number, is 8. What could be the original number?

A. -2

B. 0

C. 2

D. 5

$x(x-2) = 8$

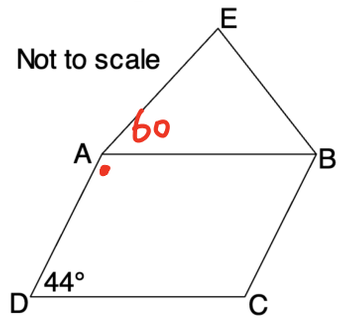
$x^2 - 2x - 8 = 0$

$(x-4)(x+2) = 0$

$\therefore x = 4, -2$

C

5 $ABCD$ is a rhombus with $\angle ADC = 44°$. ΔABE is an equilateral triangle. The size of $\angle EAD$ is:



A. 44°

B. 60°

C. 104°

D. 196°

$\bullet = 180 - 44$

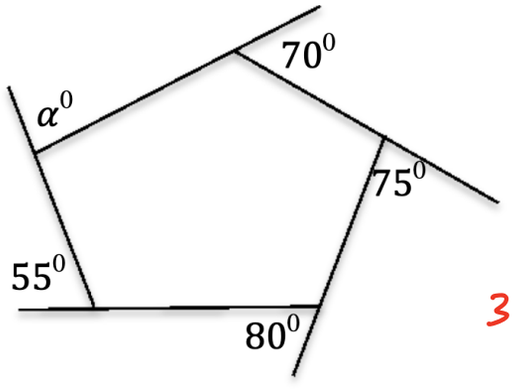
$= 136$

$\therefore 136 + 60$

$= 196°$

D

6 The size angle of angle $\alpha°$ is:



A. 70°

B. 75°

C. 80°

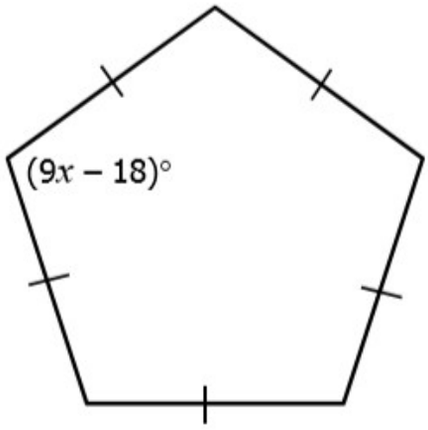
D. 95°

$360° =$ total ext $\angle$

$\therefore a = 360 - 70 - 75 - 80 - 55$

$= 80°$

7 The diagram below shows a regular pentagon. What is the value of x?



A. 10

B. 12

C. 14

D. 16

$\frac{180(n-2)}{n}$ = each ∠ int

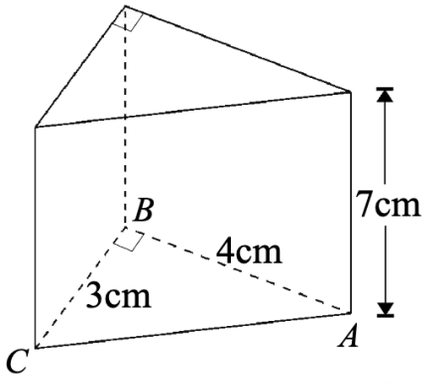
$n = 5$, ∴ $108°$

C

$9x - 18 = 108$

$9x = 126$, $x = \frac{126}{9} = 14$

8 What is the surface area of the shape below?



$AC = \sqrt{3^2 + 4^2}$

$= 5$

A. 42 cm²

B. 61 cm²

C. 96 cm²

D. 108 cm²

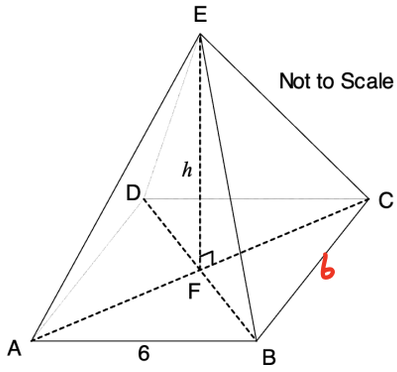
$2 \times (3 \times 4 \times \frac{1}{2}) + 3 \times 7 + 7 \times 4 + 5 \times 7$

2△ + □ + □ + □

$= 96$ cm²

C

9 A pyramid with a square base has $AB = 6$ cm and $EF = h$ cm. EC is $\sqrt{82}$ cm.



The value of h is:

A. 5

B. 6

C. 7

D. 8

$AC = \sqrt{6^2 + 6^2}$

$AC = \sqrt{72}$

$FC = \frac{1}{2}AC = \frac{1}{2}\sqrt{72}$

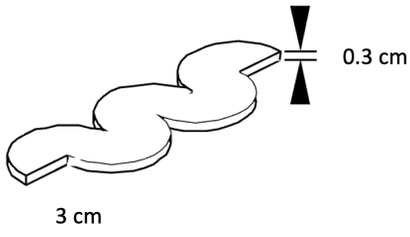
$EF^2 + FC^2 = EC^2$

$h^2 + \frac{1}{4}(72) = 82$

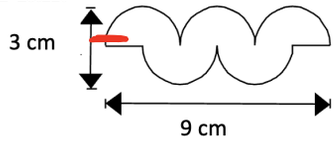
$h^2 = 64$

$h = 8$ (D)

10 Badges have been designed as shown below.



Plan:



Diameter = 3cm

$r = 1.5$ cm

All the curves in the design are semi-circles with the same radius. The thickness is 0.3 cm. The volume of the badge (to the nearest 1 decimal place) is:

A. 5.3 cm^3

B. 10.6 cm^3

C. 21.2 cm^3

D. 42.4 cm^3

5 semi circles $= 5 \times (\frac{1}{2} \times \pi \times 1.5^2)$

$= 17.67$

Vol $= 17.67 \times 0.3$ (thickness)

$= 5.3$ cm^3 (A)

End of Section I

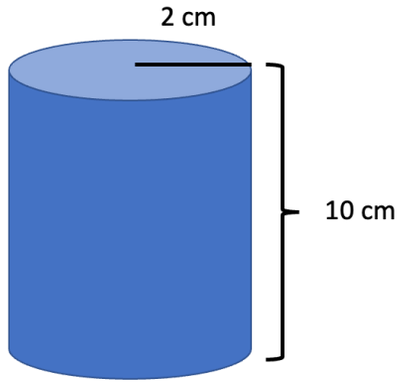
Name .....

Section II
75 marks
Attempt Questions 11-16
Allow about 80 minutes for this section

- Answer the questions in the spaces provided.
- Your responses should include relevant mathematical reasoning and/or calculations.
- Extra writing paper will be provided by your teacher if required.

Question 11 (Measurement) (15 marks) **Marks**

(a) A closed cylinder has a height of 10 cm and a radius of 2 cm.



(i) What is the volume of the cylinder? Answer to 2 decimal places. **2**

Im formula: $V = \pi r^2 h$

Im answer: $V = \pi \times 2^2 \times 10$

$= 125.66 \text{ cm}^3$

(ii) What is the surface area of the cylinder? Answer to 2 decimal places. **2**

Im formula: $SA = 2\pi r^2 + 2\pi r h$

$= 2 \times \pi \times 4 + 2 \times \pi \times 2 \times 10$

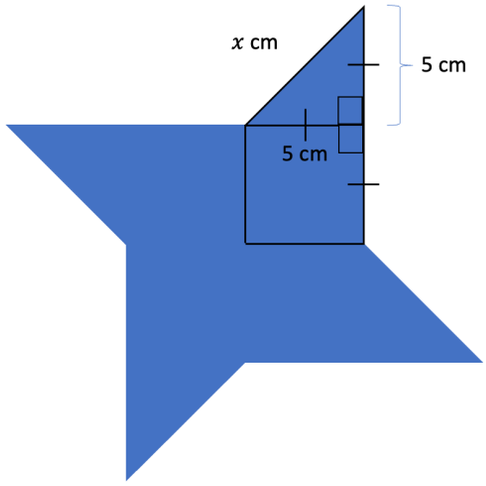
Im answer: $= 150.80 \text{ cm}^2$

Question 11 continues on the next page

Name .....

Question 11 (continued) **Marks**

(b) Naruto constructs the shuriken for his work. It is made sections that are all the same.



(i) Find the value of x. Answer to 2 decimal places. **1**

Pythag: $x = \sqrt{5^2+5^2}$

$= \boxed{7.07 \text{ cm}}$

(ii) Find the total area of the shuriken. **2**

1m for a component found.

$\triangle = 5 \times 5 \times \frac{1}{2} = 12.5 \text{ cm}^2$

$\square = 5 \times 5 = 25$

$\therefore$ $\square$ $\triangle$ $= 25 + 12.5 = 37.5$

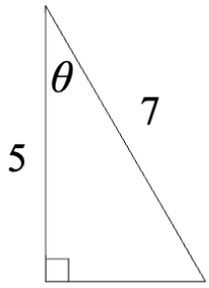
1m for final ans $= 37.5 \times 4 = \boxed{150 \text{ cm}^2}$

Question 11 continues on the next page

Name .....

Question 11 (continued) **Marks**

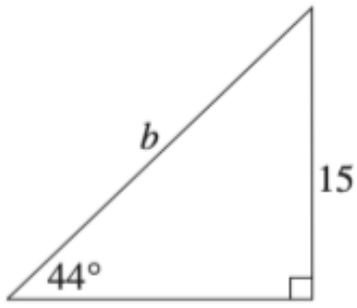
(c) Find the value of θ. Give your answer to the nearest degree. **2**



1m for correct trig ratio: $\cos\theta = \frac{5}{7}$

1m answer: $\theta = \cos^{-1}\left(\frac{5}{7}\right) = 44^\circ$

(d) Find the value of b. Give your answer to the nearest 2 decimal places. **2**



1m correct trig ratio: $\sin 44 = \frac{15}{b}$

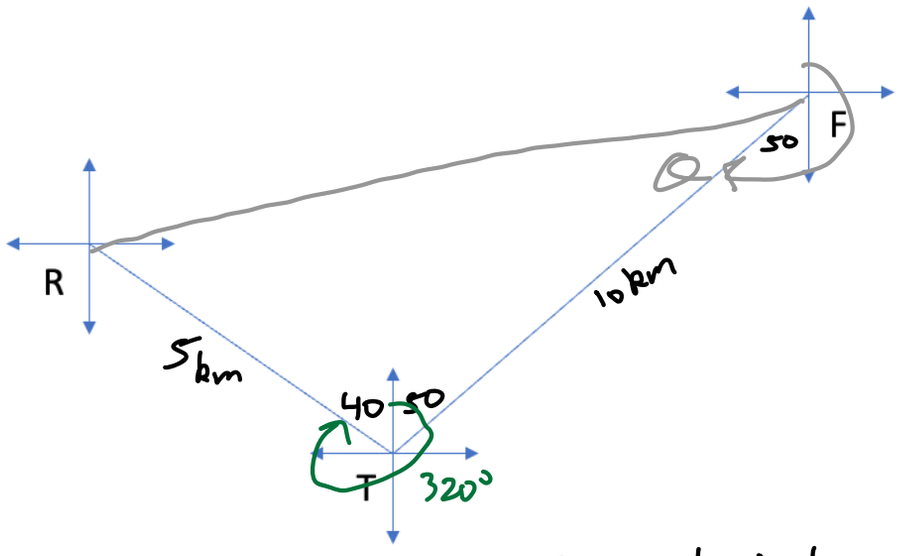
1m correct ans: $b = \frac{15}{\sin 44} = 21.59$ cm

Question 11 continues on the next page

Name .....

Question 11 (continued) **Marks**

(d) Rapunzel (R) and Flynn (F) both leave from a tower (T). Rapunzel walks on a bearing of 320° for 5 km. Flynn walks on a bearing of 50° for 10 km.



(i) Show that $\angle RTF = 90°$. **1**

1m for logical reasoning

Using the diagram, bearing of 320° means
360 − 320 = 40° left. ∴ 40 + 50 [Flynn's bearing]
= 90°

(ii) Find the distance between Rapunzel and Flynn. Leave your answer in exact form. **1**

$\sqrt{5^2+10^2} = \sqrt{125}$ km

1m for correct ans :

(iii) What is the bearing of Rapunzel from Flynn? Answer to the nearest degree. **2**

Flynn to Rapunzel = 180 + 50 + θ

$\tan\theta = \frac{5}{10}$

θ = 27°

1m for θ

= 180 + 50 + 27

= 257°

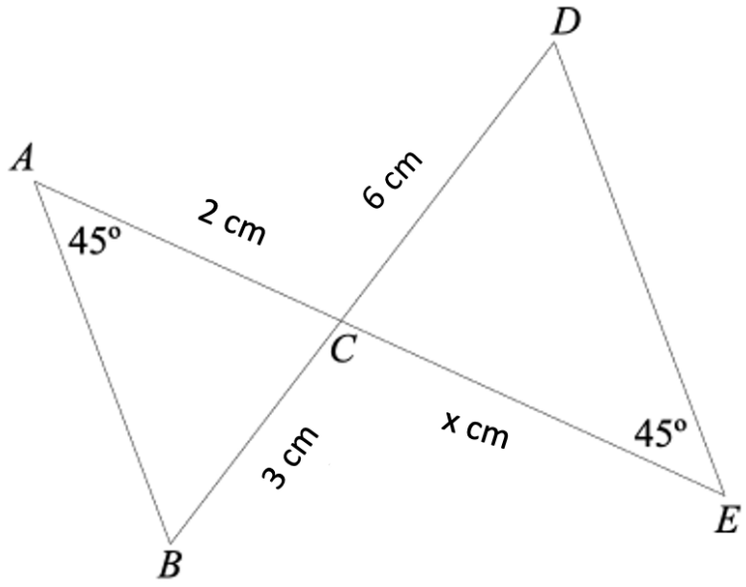
1m for correct final answer.

End of Question 11

Name .....

Question 12 (Geometry and Number) (15 marks) **Marks**

(a) In the diagram below, C lies on the lines AE and BD.



(i) Prove that triangle ABC is similar to triangle EDC, giving clear reasons. **3**

In $\triangle ABC$ & $\triangle EDC$

$\angle BAC = \angle CED = 45°$ (given) 1m

$\angle ACB = \angle ECD$ (vert opp $\angle$s are equal) 1m

$\therefore \triangle ABC \parallel\parallel \triangle EDC$ [2 angles equal] 1m

(ii) Find the value of x. You must give a reason. **2**

$\frac{x}{2} = \frac{6}{3}$ [similar $\triangle$s have sides in ratio]

$\therefore x = 4$ cm

1m for answer

1m for reason.

Question 12 continues on the next page

Name .....

Question 12 (continued) **Marks**

(b) Mr Burns wants to save enough money to open a nuclear powerplant in Springfield. If he invests $1500 into a bank at 10 % p.a compounded yearly for 15 years, how much money will Mr Burns have in total? Answer to 2 decimal places. **2**

1m for formula: $A = P(1+r)^n$

1m for ans: $A = 1500(1+10\%)^{15}$

$= \$6265.87$

(c) The following table shows the Australian tax rates for individuals.

Taxable income	Tax on this income
$0 – $18 200	Nil
$18 201 – $37 000	19c for each $1 over $18 200
$37 001 – $87 000	$3572 plus 32.5c for each $1 over $37 000
$87 001 – $180 000	$19 822 plus 37c for each $1 over $87 000
$180 001 and over	$54 232 plus 45c for each $1 over $180 000

(i) Homer works at the local nuclear powerplant. He made $95000 in the year. Homer also donated $2000 to the local charity and had $1000 in work-related expenses. What is Homer's taxable income? **1**

$95000 - 2000 - 1000 = \$92\,000$

(ii) Using the table above, how much tax does Homer need to pay? **2**

1m – for correct row: $19822 + 0.37(92000 - 87000)$

1m for final answer $= \$21\,672$

End of Question 12

Name .....

Question 13 (Number and Algebra) (14 marks) **Marks**

(a) Simplify the following:

(i) $2\sqrt{3} + 3\sqrt{3}$ **1**

$5\sqrt{3}$

(ii) $2\sqrt{5} \times 3\sqrt{4}$ **2**

1m for correct multiplication : $6\sqrt{20}$

1m for simplifying : $6 \times \sqrt{4} \times \sqrt{5}$

$= 6 \times 2 \times \sqrt{5}$

$= 12\sqrt{5}$

(b) Simplify $\frac{(a^{-4})^3 b^4}{a^9 (b^{-1})^3}$ and write your answer with positive indices: **3**

1m for correct power of power: $\frac{a^{-12} b^4}{a^9 b^{-3}}$

1m for positive indices: $\frac{b^3 b^4}{a^9 a^{12}}$

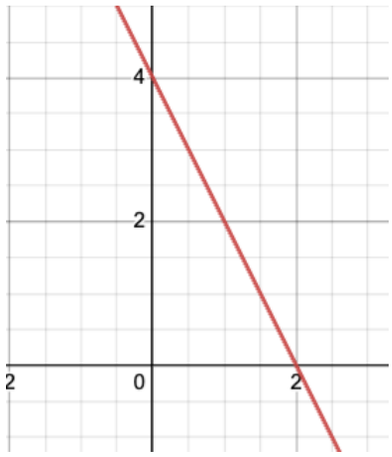
1m for simplified: $\frac{b^7}{a^{21}}$

Question 13 continues on the next page

Name .....

Question 13 (continued) **Marks**

(c) Dr Seuss was showing his students the line below.



(i) What is the gradient of the line? **1**

$m = \frac{-4}{2} = -2$

(ii) What is the y-intercept of the line? **1**

$b = 4$

(iii) What is the equation of the line? **1**

$y = mx + b$

$y = -2x + 4$

(iv) Does the point (2, 2) lie on the line? **1**

From the graph, (2,2) does NOT lie on the line.

OR $y = -2x + 4$

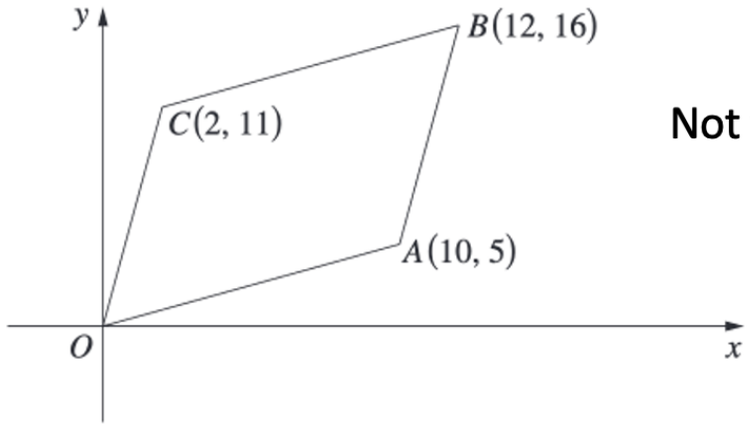
LHS $= 2$, RHS $= -2(2) + 4 = 0$ $\therefore$ LHS $\neq$ RHS $\therefore$ not l.i.e

Question 13 continues on the next page

Name .....

Question 13 (continued) **Marks**

(d) In the diagram below, A, B and C are the points (10, 5), (12, 16) and (2, 11) respectively.



Not to scale

(i) Calculate the distance AC. **1**

$AC = \sqrt{(10-2)^2 + (5-11)^2}$

$= 10$ units

(ii) Calculate the midpoint of AC. **1**

Midpoint $AC = \left(\frac{2+10}{2}, \frac{11+5}{2}\right) = (6, 8)$

(iii) Show that OB and AC are perpendicular. **2**

$m_{OB} = \frac{16-0}{12-0} = \frac{4}{3}$ $m_{AC} = \frac{11-5}{2-10} = -\frac{6}{8} = -\frac{3}{4}$

$m_{OB} \times m_{AC} = \frac{4}{3} \times \frac{-3}{4}$ $\therefore -1$

$\therefore OB \perp AC$

1m for m_{OB} or m_{AC} 1m for $m_{OB} \times m_{AC} = -1$

End of Question 13

Name .....

Question 14 (Algebra) (14 marks) **Marks**

(a) Solve the following equations:

(i) $2x - 1 = 11$ **1**

$2x = 12$

$\boxed{x = 6}$

(i) $x^2 - 9x = 0$ **2**

$x(x - 9) = 0$

$\therefore x = 0, \quad x = 9$ 1m per answer

(ii) $2x^2 + 5x + 2 = 0$ **2**

$2x \times 1$, $x \times 2$ $\therefore (2x+1)(x+2)$

$\boxed{x = \frac{-1}{2}, \quad x = -2}$ 1m per answer.

(b) Fully factorise the following:

(i) $2x^2 - x$ **1**

$x(2x - 1)$

(ii) $ax^2 + ax + 2x + 2$ **2**

$ax(x+1) + 2(x+1)$ 1m

$(x+1)(ax+2)$ 1m

Question 14 continues on the next page

Name .....

Question 14 (continued) **Marks**

(c) Fully simplify the following:

(i) $\frac{32}{2a+6} \div \frac{16}{(a+3)^2}$ **3**

Im for doing ÷ correctly: $\frac{32}{2a+b} \times \frac{(a+3)^2}{16}$

Im for factorise: $\frac{32}{2(a+3)} \times \frac{(a+3)^2}{16}$

Im for simplified: $\boxed{a+3}$

(ii) $\frac{12}{x^2-16} - \frac{3}{x+4}$ **3**

Im for diff of squares: $\frac{12}{(x-4)(x+4)} - \frac{3}{(x+4)}$

Im for same denom: $\frac{12}{(x-4)(x+4)} - \frac{3(x-4)}{(x+4)(x-4)}$

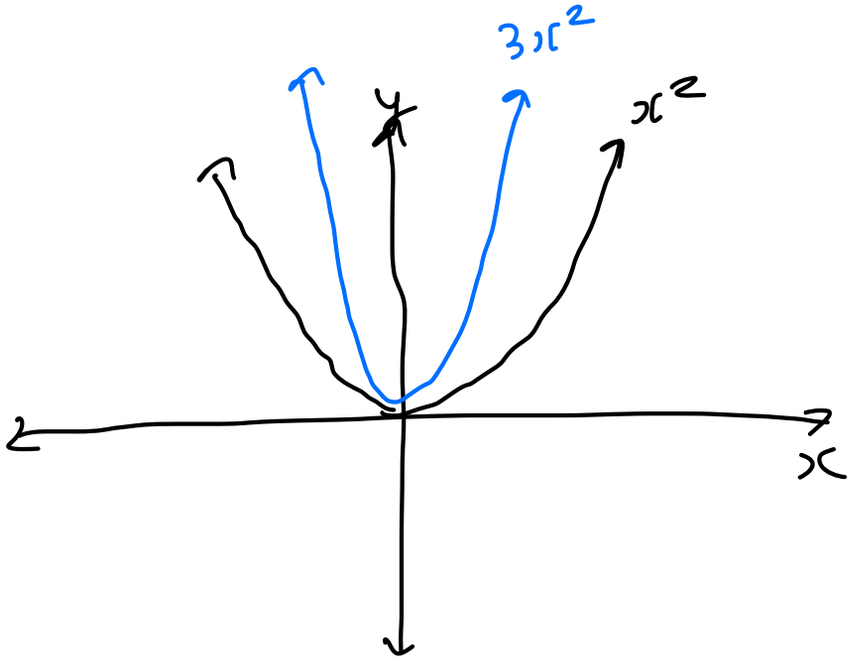
Im fully simplified: $\frac{12-3x+12}{(x-4)(x+4)} = \boxed{\frac{-3x}{(x-4)(x+4)}}$

End of Question 14

Name .....

Question 15 (Algebra) (14 marks) **Marks**

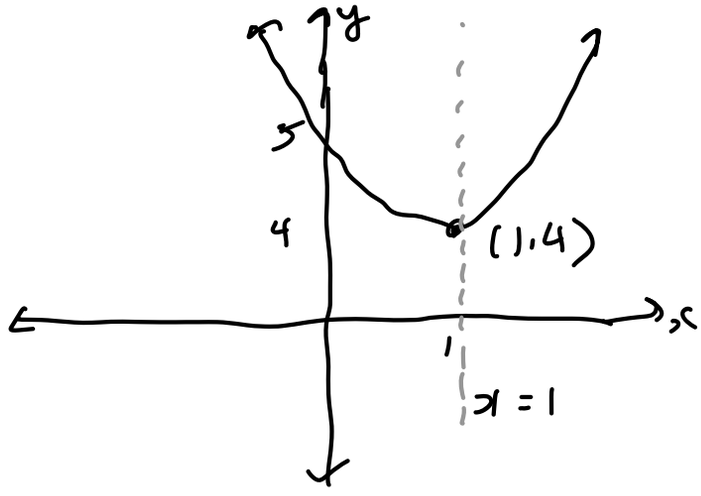
(a) Sketch $y = x^2$ and $y = 3x^2$ on the same set of axes. **2**



2m if both correct

1m if one correct.

(b) Sketch $y = (x-1)^2 + 4$, showing the vertex, axis of symmetry and y-intercept. **4**



vertex (1,4) 1m

axis of symmetry : $x = 1$ 1m

y int: at $x = 0$

$y = (0-1)^2 + 4$

$y = 5$ 1m

1m for correct concavity

Question 15 continues on the next page

Name .....

Question 15 (continued) **Marks**

(c) A parabola has the equation: $y = x^2 - 4x + 3$

(i) Show that the x-intercepts for the parabola are at $x = 3$ and $x = 1$. **2**

Im for saying x int at $y = 0$

ie: $x^2 - 4x + 3 = 0$

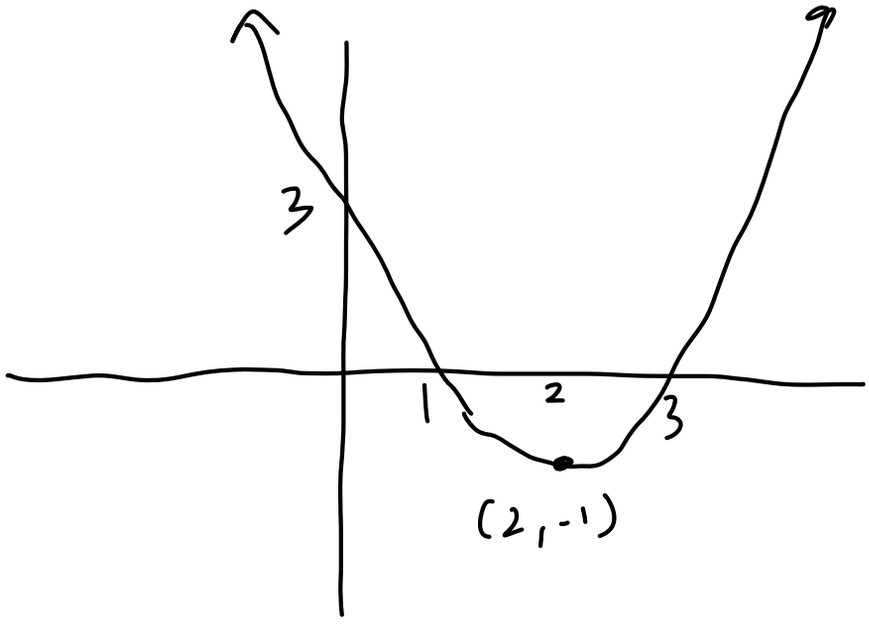
Im for factorising $(x-3)(x-1) = 0$

& null factor: $\therefore x = 3,\ x = 1$

(ii) Find the y-intercept of the parabola. **1**

at $x = 0$, $y = 0 - 0 + 3 = 3$

(ii) Sketch the parabola, showing the x-intercepts and y-intercept. **2**



2m if all features correct. 1m if only some features correct.

Question 15 continues on the next page

Name .....

Question 15 (continued) **Marks**

(e) Hermione was on the phone trying to describe a parabola to Harry. **3**
However, Hermione had bad reception and parts of the conversation had been cut out.
Hermione says that "the $y = x^2$ has been shifted _____ by 16 units".
She also says, "the x-intercepts cuts at _____ and _____".
Harry didn't hear the exact x-intercepts but knew that **one** of the x-intercepts was between 2 and 4 (inclusive of 2 and 4).
The call then ended.

Given that the equation of a parabola is $y = a(x-h)^2 + c$, find the possible value(s) of a, h and c.

If you shift x^2 left or right, it only has ONE x intercept. But Q says TWO.
If you shift it up, there will be NO x int. ∴ It's shifted down

∴ $y = a(x-h)^2 - 16$ (Im for $c = -16$)
it isn't shifted left or right. ∴ $h = 0$
$y = ax^2 - 16$ (Im for $h = 0$)
at $y = 0$,
$ax^2 = 16$
$x^2 = \frac{16}{a}$ → $x = \pm\frac{4}{\sqrt{a}}$

$2 \leq \frac{4}{\sqrt{a}} \leq 4$

$\frac{1}{2} \geq \frac{\sqrt{a}}{4} \geq \frac{1}{4}$ $\quad 2 \geq \sqrt{a} \geq 1$

$4 \geq a \geq 1$

∴ $1 \leq a \leq 4$ Im

End of Question 15

End of Assessment Task

Name .....

THE KING'S SCHOOL

2022

Year 9 Level 5.3
Assessment Task 4 (AT4)
November 2022

MULTIPLE CHOICE ANSWER SHEET

Select the alternative A, B, C or D that best answers the question and indicate your choice by filling in the appropriate response oval, completely.

					Examiner's Use Only	
1	A	B	C	D		
2	A	B	C	D	Number	/ 2
3	A	B	C	D		
4	A	B	C	D	Algebra	/ 2
5	A	B	C	D		
6	A	B	C	D		
7	A	B	C	D	Geometry	/ 3
8	A	B	C	D		
9	A	B	C	D		
10	A	B	C	D	Measurement	/ 3
					Total	**/10**

Name .....