Level 4

Mathematics
Examination 3

SAMPLE

Click here for detailed information about this publication.

About the Authors: Barbara Healy BSc BEd and William Paul Healy BSc BA Dip Ed are principal writers for Kilbaha Education. They are experienced classroom teachers of mathematics with specialised skills in writing assessment questions and detailed answers for all levels of mathematics. Together they have been creating mathematics content for Australian schools for more than 30 years. Teachers and parents use their highly regarded educational content on a regular basis.

https://kilbaha.com.au

LEVEL 4

MATHEMATICS EXAMINATION 3

Kilbaha Education
Quality educational content

Kilbaha Education

Quality educational content

Notes to Teachers

This is a Digital Publication supplied in both PDF and WORD formats with a school site licence to reproduce for students in both print and electronic formats.

- This examination is based on a syllabus containing topics for Year 10 Mathematics. Some of these topics are: (not all are necessarily included in this examination)

  working with indices, arithmetic and applications, surds, variation, similarity, circle properties, constructions and transformations, properties of 2D shapes, perimeter and area, surface area and volume, trigonometry, applications of trigonometry, expansion, factorisation and indices, linear functions, quadratic functions, transposition, substitution and fractions, probability, analysing data, cumulative frequency curves, bivariate data.

- Teachers should examine the questions to judge if they are suitable for their classes

- This is a 1.5 hour examination (total = 90 marks)

- The examination can be shortened if required by removing some of the questions

- A set of detailed answers with a marking scheme is supplied with this examination

- A multiple-choice answer sheet is supplied with this examination

- While every effort has been made to ensure the correctness of each question and answer, there is no guarantee of perfection. Please advise of you believe you have found an error.

Examination 3

LEVEL 4 MATHEMATICS

Reading time: 15 minutes
Total writing time: 1.5 hours

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of Marks
A	25	25	25
B	7	7	35
C	3	3	30

Directions to students

Materials
Question and answer book of 29 pages.
Working space is provided throughout the book.
You may use an approved calculator, ruler, protractor, set square and aids for curve sketching.
A formula sheet is provided.
Students may refer to two A4 pages of notes.

The Examination.
Ensure that you write your **name** in the space provided on the cover of this book.
Answer **all** questions.
There is a total of 90 marks available for the examination.
The marks for each part of each question are shown.
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
Angles in all diagrams are measured in degrees.
All written responses should be in English.

© KILBAHA PTY LTD

Level 4 Mathematics Formulas

Area of circle	πr^2
Circumference of circle	$2\pi r$
Area of rectangle	$L \times W$
Area of triangle	$\dfrac{1}{2}bh$
Area of parallelogram	bh
Area of trapezium	$\dfrac{1}{2}(a+b)h$
Volume of sphere	$\dfrac{4}{3}\pi r^3$
Volume of cylinder	$\pi r^2 h$
Volume of cone	$\dfrac{1}{3}\pi r^2 h$
Surface area of rectangular prism	$2(lh+lw+wh)$
Surface area of cylinder	$2\pi r^2 + 2\pi rh$
Surface area of sphere	$4\pi r^2$

Question 1

Which one of the following is a surd?

A. π

B. $\sqrt{3}$

C. $\sqrt{16}$

D. $2\sqrt{9}$

E. $\sqrt{a^2}$

Question 2

$\sqrt{12}$ equals

A. $2\sqrt{3}$

B. $3\sqrt{2}$

C. $6\sqrt{2}$

D. $2\sqrt{6}$

E. $4\sqrt{3}$

Question 1 (5 marks)

Simplify each of the following

a. $2\sqrt{32} + 4\sqrt{50}$

....

....

....

(2 marks)

b. $\dfrac{\sqrt{x^2 y}}{\sqrt{y}}$

....

....

....

(1 mark)

c. $\dfrac{3\sqrt{6}}{\sqrt{3} - 2}$

....

....

....

(2 marks)

SECTION C ANALYSIS TASKS
There are three questions worth 10 marks each.
Answer each question in the space provided. Show all working.
Write your final answer in the box where this is provided.

Question 1 (10 marks)
The cost of using a mobile phone from the *Funky Phone Company* is 50 cents per day fixed cost plus 60 cents for each phone call made.

a.   What would be the total cost in one week when I made 30 phone calls?

....

....

....

(1 mark)

b.   Set up an equation to show the cost for one week when I make *n* phone calls.

....

....

....

(1 mark)

c.   If my cost for one week is $111.50, how many phone calls did I make?

....

....

....

(2 marks)

LEVEL 4 MATHEMATICS

EXAMINATION 3

ANSWER SHEET

Kilbaha Education

Quality educational content
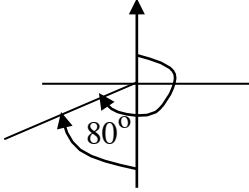
NAME _____

INSTRUCTIONS

- Write your name in the space provided above.

- Marks will **NOT** be deducted for incorrect answers.

- **NO MARK** will be given if more than **ONE** answer is completed for any question.

- All answers must be completed like **THIS** example.

A	B	C	D	E

SECTION A

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E
11	A	B	C	D	E
12	A	B	C	D	E

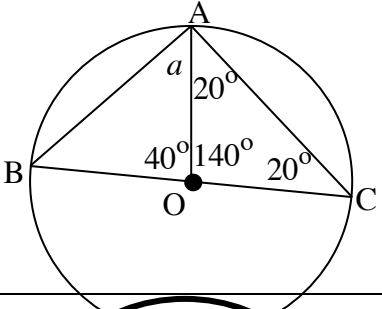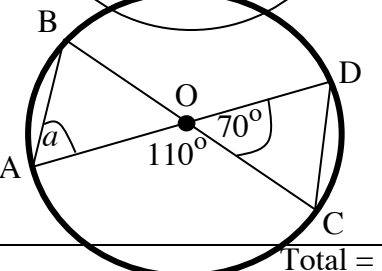| 13	A	B	C	D	E
14	A	B	C	D	E
15	A	B	C	D	E
16	A	B	C	D	E
17	A	B	C	D	E
18	A	B	C	D	E
19	A	B	C	D	E
20	A	B	C	D	E
21	A	B	C	D	E
22	A	B	C	D	E
23	A	B	C	D	E
24	A	B	C	D	E
25	A	B	C	D	E

1.   Answer B

π is irrational but not a surd.

$\sqrt{16} = 4$ (not a surd)

$2\sqrt{9} = 2 \times 3 = 6$ (not a surd)

$\sqrt{a^2} = a$ (not a surd)

$\sqrt{3}$ is a surd.

2.   Answer A

$\sqrt{12}$

$= \sqrt{4 \times 3}$

$= \sqrt{4} \times \sqrt{3}$

$= 2\sqrt{3}$

3.   Answer D

$4y^0 \times (4^{-2})^3$

$= 4 \times 1 \times 4^{-6}$

$= 4^{1-6}$

$= 4^{-5}$

4.   Answer C

$\dfrac{18a^2b^6c^5}{12ab^2c^3}$

$= \dfrac{3a^{2-1}b^{6-2}c^{5-3}}{2} = \dfrac{3ab^4c^2}{2}$

5.   Answer E

$I = \dfrac{k}{d^2}$

$\Rightarrow d^2 = \dfrac{k}{I} \Rightarrow d = \sqrt{\dfrac{k}{I}}$

6.   Answer C

To make a perfect square, add half the coefficient of x all squared.

$+\left(-\dfrac{6}{2}\right)^2 = +3^2 = +9$

7.   Answer D

$\dfrac{x(x-2)}{3} \times \dfrac{(x+6)(x-1)}{(x-2)} \div \dfrac{x(x+6)}{9}$

$= \dfrac{x(x-2)}{3} \times \dfrac{(x+6)(x-1)}{(x-2)} \times \dfrac{9}{x(x+6)}$

$= 3(x-1)$

$= 3x - 3$

8.   Answer E

$(x-5)^2 + 3(x-5) - 28$

Let $A = (x-5)$

$\therefore A^2 + 3A - 28 = (A+7)(A-4)$

$= (x-5+7)(x-5-4) = (x+2)(x-9)$

$\Rightarrow$ a factor is $(x-9)$

9.   Answer B

$3x + 4y - 2 = 0$

$\Rightarrow 4y = -3x + 2$

$\Rightarrow y = -\dfrac{3}{4}x + \dfrac{1}{2} \Rightarrow$ gradient $= -\dfrac{3}{4}$

10.   Answer E

Graph concave down $\therefore$ not A.

When $x = 0$, $y = 0$ $\therefore$ not B or C.

When $x = 1$, $y = 0$ $\therefore$ not D.

11.   Answer C

$\Delta = (-2)^2 - 4 \times 1 \times -9$

$\Rightarrow \Delta = 4 + 36 = 40$

$\Rightarrow \Delta > 0 \therefore$ two solutions

$\sqrt{40}$ is irrational so two irrational solutions.

12.   Answer C

Area $= \dfrac{60}{360} \times \pi \times 12^2$

$= 75.4 \text{ cm}^2$

13.   Answer B

$x^2 - 6x + 7 = 2x - 8$

$\Rightarrow x^2 - 8x + 15 = 0$

$\Rightarrow (x-5)(x-3) = 0$

$\Rightarrow x = 5$ and $x = 3$

14.   Answer D

S 80° W

$= 180^{\text{o}} + 80^{\text{o}}$

$= 260^{\text{o}}$ T

Question 1

a.

$2\sqrt{32} + 4\sqrt{50}$

$= 2\sqrt{16 \times 2} + 4\sqrt{25 \times 2}$

$= 2 \times 4 \times \sqrt{2} + 4 \times 5 \times \sqrt{2}$

$= 8\sqrt{2} + 20\sqrt{2}$

$= 28\sqrt{2}$

[2 marks]

b.

$\dfrac{\sqrt{x^2 y}}{\sqrt{y}}$

$= \dfrac{x\sqrt{y}}{\sqrt{y}}$

$= x$

[1 mark]

c.

$\dfrac{3\sqrt{6}}{\sqrt{3}-2} = \dfrac{3\sqrt{6}}{\sqrt{3}-2} \times \dfrac{\sqrt{3}+2}{\sqrt{3}+2} = \dfrac{3\sqrt{6}(\sqrt{3}+2)}{(\sqrt{3}-2)(\sqrt{3}+2)} = \dfrac{3\sqrt{18}+6\sqrt{6}}{3-4} = \dfrac{9\sqrt{2}+6\sqrt{6}}{-1} = -9\sqrt{2}-6\sqrt{6}$

[2 marks]

Total = 5 marks

Question 2

a.

$a = 90^o$ (angle subtended by diameter at the circumference)

[1 mark]

b.

$a = 54^o$ (angle subtended by arc at the circumference is half the angle subtended by the same arc at the centre)

[1 mark]

c.

$a = 120^o$ (opposite angles of a cyclic quadrilateral are supplementary)

[1 mark]

d.

OA, OC are equal radii. Therefore, Δ OAC is an isosceles triangle. $\therefore \angle$ OAC $= 20^o$

$\therefore \angle$ AOC $= 140^o$ $\therefore \angle$ AOB $= 40^o$

$\therefore \angle$ BAO $+ \angle$ ABO $= 140^o$

But these are equal angles since Δ OBA is isosceles (equal radii) $\therefore a = 70^o$

[1 mark]

e.

$\angle$ AOC $= 110^o$ (angles in a straight line)

$\angle$ ABC $= 55^o$ (angle subtended at the circumference)

$a = 55^o$ (base angle of isosceles triangle)

[1 mark]

Total = 5 marks

Question 1

a. total cost = $350 + (60 \times 30)$ $= 350 + 1800$ $= 2150$ cents $= \$21.50$ [1 mark]	**b.** $C = 350 + 60n$ [1 mark]
c. $11150 = 350 + 60n$ $\Rightarrow 1115 = 35 + 6n$ $\Rightarrow 1080 = 6n$ $\Rightarrow n = \dfrac{1080}{6}$ $\Rightarrow n = 180$ [2 marks]	**d.** $C = 560 + 30n$ [1 mark]
e. $560 + 30n = 350 + 60n$ $\Rightarrow 30n = 210$ $\Rightarrow 3n = 21$ $\Rightarrow n = 7$ [2 marks]	**f.** $C = 560 + (30 \times 7)$ $\Rightarrow C = 560 + 210$ $\Rightarrow C = 770$ cents $\Rightarrow C = \$7.70$ [1 mark]

g.
We should not change phone companies. My friend makes an average of 14 calls per week. Once she makes more than 7 calls, her phone company is cheaper. I make an average of 5 calls per week. If I make less than 7 calls per week, my phone company is cheaper.   [2 marks]

Total = 10 marks

Kilbaha Education
Mathematics Examinations
High Schools

Kilbaha Education (Est. 1978) (ABN 47 065 111 373) **PO Box 2227** **Kew Vic 3101** **Australia**	**Tel: (03) 9018 5376** **Email: kilbaha@gmail.com** **Web: https://kilbaha.com.au**

SCHOOL ORDER NUMBER (required)_____**DATE**_____

NAME_____

SCHOOL_____

ADDRESS_____

POSTCODE_____**TEL**_____

EMAIL _____

Please mark (X) those required.

- *Kilbaha Mathematics Exams for high schools with detailed answers.*
- *For use with students in Years 6, 7, 8, 9, 10, 11 depending on ability levels*
- *School site licence for each exam.*
- *Print and use in hard copy with all students.*
- *Copy and distribute to all students for electronic use on all devices.*
- *All 12 exams are supplied in WORD format for easy editing and PDF format for easy printing.*
- *Teachers can create their own exams by mixing and matching questions and detailed answers*
- *Each of the three exams for each level covers topics from current mathematics curricula.*
- *Each exam has different questions.*
- *All exams are 1.5 hours with 15 minutes reading time.*
- *Samples of each exam can be downloaded from the website https://kilbaha.com.au*

	Level 1 Mathematics **Exam 1** with detailed answers supplied in both WORD and PDF formats	$30
	Level 1 Mathematics **Exam 2** with detailed answers supplied in both WORD and PDF formats	$30
	Level 1 Mathematics **Exam 3** with detailed answers supplied in both WORD and PDF formats	$30
	Level 2 Mathematics **Exam 1** with detailed answers supplied in both WORD and PDF formats	$30
	Level 2 Mathematics **Exam 2** with detailed answers supplied in both WORD and PDF formats	$30
	Level 2 Mathematics **Exam 3** with detailed answers supplied in both WORD and PDF formats	$30
	Level 3 Mathematics **Exam 1** with detailed answers supplied in both WORD and PDF formats	$30
	Level 3 Mathematics **Exam 2** with detailed answers supplied in both WORD and PDF formats	$30
	Level 3 Mathematics **Exam 3** with detailed answers supplied in both WORD and PDF formats	$30
	Level 4 Mathematics **Exam 1** with detailed answers supplied in both WORD and PDF formats	$30
	Level 4 Mathematics **Exam 2** with detailed answers supplied in both WORD and PDF formats	$30
	Level 4 Mathematics **Exam 3** with detailed answers supplied in both WORD and PDF formats	$30

Total Amount = $_____ (All prices include GST)

Email to kilbaha@gmail.com