

Sample of Mathematics Entrance Examination 2021

DATE:
SESSION:

- 1. You have 1 hour and 10 minutes for the exam.**
- 2. Answer all questions.**
- 3. No calculators are allowed.**
- 4. Write your answers in the spaces below the questions. Answers with no evidence of calculations will not score any marks. Workings and answers written on any other page will not be marked.**

Please note additional requirements:

- a) You are not allowed to leave during the first 30 minutes or the last 15 minutes of the examination.
- b) If you are left handed or ambidextrous with left hand preference you should inform the invigilator before the start of the exam so that seating arrangements can fit your requirements.
- c) You are not allowed to talk, to whisper, to turn around or to look at another candidate's examination, all of which are offences and you will be penalized. If you commit this offence you will be given a single written warning; after which if you commit a further offence, you will be reported to an assessment board without a right of appeal or refund of the exam administration fee.
- d) No scrap paper may be used. All work must be written in the exam booklet.
- e) You can use non-erasable blue or black pen only. Any answers written in pencil may not be marked.
- f) You cannot use whiteout/correction fluid. If you use this material to correct any of your answers they may not be marked. If you make a mistake, you should simply draw a line through the mistake with pen and continue.
- g) You cannot borrow another student's stationery or materials.
- h) If your pen runs out of ink, you may request a replacement from the invigilator. No other stationery or materials may be provided for you by the invigilator.
- i) If you are found to have any unauthorized exam related materials during the examination this will constitute an offence and you will be disqualified from the exam.
- j) If you are caught cheating in the examination, you will be disqualified from the exam.
- k) Failure to show contents of your pockets or any other containers to the invigilators will be considered as an offence and you will be disqualified from the exam.
- l) All mobile phones and other electronic devices must be switched off and left at a place indicated by the invigilators. If you are found to have a mobile phone or other electronic device (switched on or off) on you during the exam, this will be considered as unauthorized examination materials and you will be disqualified from the exam without a right of appeal.
- m) Please note that marks cannot be appealed, candidates may only appeal procedural matters.

Applicant ID:

All questions on this paper must be answered.

For Multiple choice questions (1-17) select single answer choice.

For Questions 18-20 write the answers in the space below each question.

Working must be shown for all stages of the questions.

1. Find the n^{th} term for the following sequence

1 7 17 31 49

(2 marks)

A) $a_n = 2n^3 - 1$	B) $a_n = 2n^2 - 1$	C) $a_n = 1 - 2n^2$	D) $a_n = 2n^2 + 1$
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2. Seven machines produce 14 000 boxes in 5 hours.

How many boxes would 9 machines produce in 4 hours?

(2 marks)

A) 14000	B) 13600	C) 9600	D) 14400
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3. Write down **one** inequality to show the values of x which satisfy all three of the following inequalities:

$$x < 7, \quad -2 < x < 9, \quad 0 \leq x < 13$$

(2 marks)

A) $0 < x < 9$	B) $0 \leq x < 7$	C) $-2 < x < 13$	D) $-2 < x < 7$
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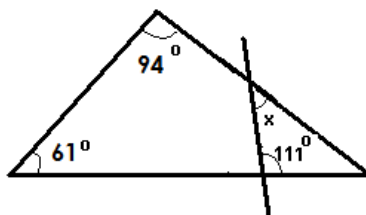
4. Simplify

$$\frac{x}{1-x} - \frac{1-x^2}{1+x^2} \left(\frac{1}{(x-1)^2} - \frac{x}{1-x^2} \right)$$

(2 marks)

A) $\frac{x+1}{1-x}$	B) $\frac{2x-1}{1-x}$	C) $\frac{1}{x-1}$	D) -1
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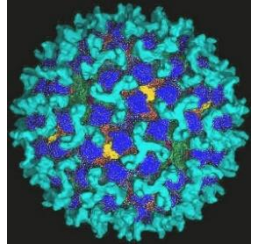
5. Find the size of angle x



(2 marks)

A) 36°	B) 48°	C) 40°	D) 44°
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6. A patient in hospital is very ill. Between 09.00 and 13.00 one day the number of viruses in his body goes up from 3.7×10^{10} to 7.3×10^{13} . Work out the increase in the number of viruses, giving your answer in standard form.



(2 marks)

A) 7.2963×10^{13}	B) 0.7296×10^{13}	C) 72963×10^{10}	D) 72.963×10^{15}
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7. Solve the equation

$$\frac{(3-2x)}{7} - \frac{(4x+5)}{6} = 2$$

(2 marks)

A) $x = -\frac{84}{40}$	B) $x = -\frac{101}{40}$	C) $x = 1$	D) $x = \frac{101}{40}$
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8. A cube has a total surface area of 864 cm^2 . What is the length of one edge of the cube?

(2 marks)

A) 13	B) 6	C) 11	D) 12
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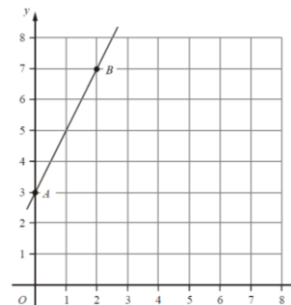
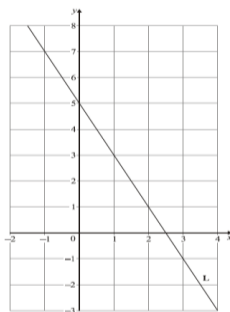
9. Find the value of n

$$16^5 \times 8^4 = 4^3 \times 2^n$$

(2 marks)

A) $n = 24$	B) $n = 8$	C) $n = 16$	D) $n = 26$
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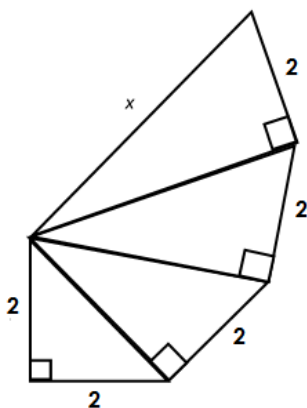
10. Find the equations of the following lines and solve the system of linear equations.



(4 marks)

A) $x = 0.5, y = 4$	B) $x = 0, y = 3$	C) $x = 2, y = 1$	D) $x = 2, y = 7$
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11. In the diagram below all measurements given are 2 cm. Find the value of x .



(4 marks)

A) $x = \sqrt{10}$	B) $x = 3\sqrt{5}$	C) $x = 2\sqrt{2}$	D) $x = 2\sqrt{5}$
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12. Find a and b so that

$$\frac{1}{a} + \frac{1}{b} = \frac{5}{8}$$

(4 marks)

A) $a = 2, b = 8$	B) $a = 5, b = 2$	C) $a = 8, b = 5$	D) $a = 1, b = 8$
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13. Fifty tickets were sold for a concert. Some tickets were sold at \$80 each and the rest at \$120 each. The total amount of money spent on tickets was \$5200. What percentage of the tickets sold were \$80 tickets?

(4 marks)

A) 30%	B) 40%	C) 80%	D) 50%
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14. Simplify, where $\tan(x)$ and $\cot(x)$ are trigonometric functions

$$(\tan x + \cot x)^2 - (\tan x - \cot x)^2$$

(4 marks)

A) 5	B) 4	C) 1	D) $2\tan x$
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15. Solve given logarithmic equation

$$\log_2(54 - x^3) = \log_2(x^3)$$

(4 marks)

A) $x = 3$	B) $x = 4$	C) $x = 2$	D) $x = -2$
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16. Given that

$$\frac{dy}{dx} = 3x^2 - 4x + 2$$

and $y = 5$ when $x = 1$, find y in terms of x .

(4 marks)

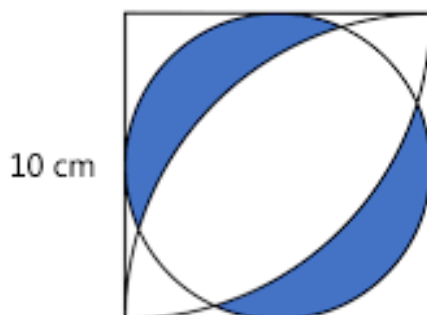
A) $y = 6x - 4$	B) $y = x^3 - 2x^2 + 2x + 4$	C) $y = x^3 - 2x^2 + x + 5$	D) $y = 3x^3 - 2x^2 + 2x + 4$
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17. A line l_1 has equation $y = 7 - 6x$. A second line l_2 is perpendicular to l_1 and passes through the point $P(-12; 5)$. Find the equation of l_2 .

(4 marks)

A) $y = -6x + 3$	B) $y = -\frac{1}{6}x + 3$	C) $y = -\frac{1}{6}x + 2$	D) $y = \frac{1}{6}x + 5$
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18. Find the area of the shaded region.



(8 marks)

19. If x_1 and x_2 are the roots of the equation $2x^2 - 3ax - 2 = 0$ then calculate

$$\frac{1}{x_1^3} + \frac{1}{x_2^3}$$

(6 marks)

20. The functions f and g are given

$$f(x) = 3x^2 + 12x + 4, \quad g(x) = x^3 + 6x^2 + 9x - 8$$

What is the complete set of values of x for which one of the functions is increasing and the other decreasing?

(6 marks)