Sample of Mathematics Entrance Examination 2024

DATE:
SESSION:

1. You have 1 hour and 10 minutes for the exam.
2. Answer all questions.
3. No calculators are allowed.
4. For Open-ended questions 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) 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.

c) You cannot borrow another student's stationery or materials.

d) 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.

e) 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.

f) If you are caught cheating in the examination, you will be disqualified from the exam.

g) 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.

h) 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.

Applicant ID:

1. Find the angles of the triangle, $\angle A, \angle B$ and $\angle C$ respectively.
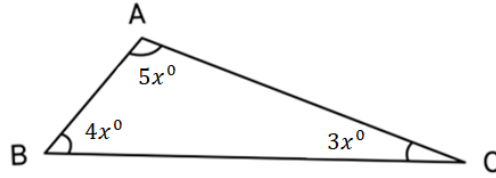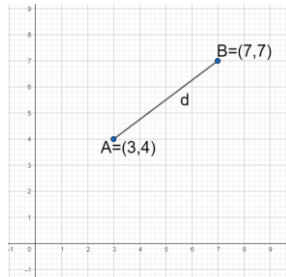

(2 marks)

| a) | $75, 60, 45$ | b) | $50, 40, 30$ | c) | $100, 80, 60$ | d) | $90, 60, 30$ |

2. If $t < 0$, and $t^2 - 2t - 35 = 0$, find the possible values of t?

(2 marks)

| a) | -7 and -5 | b) | -7 and 5 | c) | -5 | d) | 7 |

3. Find the distance between the points A(3, 4) and B(7, 7).

(2 marks)

| a) | 5 | b) | 25 | c) | $4\sqrt{2}$ | d) | $4\sqrt{3}$ |

4. A line in the xy-plane passes through the origin and has a slope of $\frac{2}{5}$.

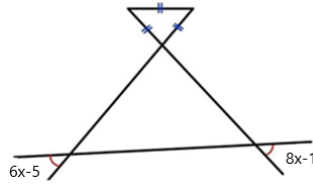   Which of the following points lies on the line?

(2 marks)

| a) | (2, 5) | b) | (1, 5) | c) | (5, 5) | d) | (10, 4) |

5. For what value of n is $-|n + 3|$ equal to 0?

(2 marks)

| a) | 3 | b) | 1 | c) | -3 | d) | There is no such value of n |

6. Find the value of x.

6x-5   8x-1

(2 marks)

| a) | 8 | b) | 9 | c) | 10 | d) | Ø |

7. Simplify

$$\frac{x-1}{5} + \frac{6x+14}{45} - \frac{4+3x}{9}$$

(2 marks)

| a) | $\dfrac{2x-1}{3}$ | b) | 1 | c) | $\dfrac{1}{3}$ | d) | $-\dfrac{1}{3}$ |

8. Evaluate

$$\sqrt[10]{2 \times 4 \times 11 \times 671 + 1}$$

(2 marks)

| a) | 8 | b) | 3 | c) | 4 | d) | 9 |

9. Find the intervals on which function is decreasing.
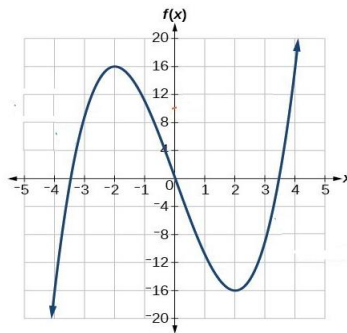
(2 marks)

| a) | $(-4; 4)$ | b) | $(-2; 2)$ | c) | $(-\infty; -2) \cup (2; \infty)$ | d) | $(-16; 16)$ |

10. If the triangle ABC is right angled at A. Given that AD is perpendicular to BC, AB = 5 cm, BC = 13 cm, and AC = 12 cm, find the length of AD.
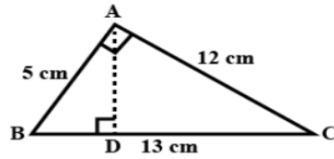
(4 marks)

a)	$\dfrac{25}{13}$	b)	$\dfrac{60}{13}$	c)	4	d)	3

11. If $x^2 + 8x + 3 = (x + a)^2 + b$ for all values of x.
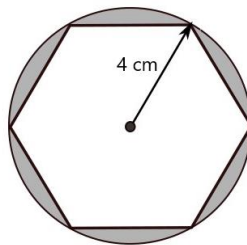
Find the possible values for a and b. (4 marks)

a)	$a = 2,$ $b = 3$	b)	$a = 2,$ $b = -13$	c)	$a = 4,$ $b = 3$	d)	$a = 4,$ $b = -13$

12. If $x = \dfrac{1}{\sqrt{5}+2}$ $x \in \mathbb{R}$, find the value of $x^2 + 4x - 1$.

(4 marks)

a)	-1	b)	0	c)	2	d)	-2

13. Find the area of the shaded region, if the radius of the circle is 4 cm.

(4 marks)

a)	$16\pi \; cm^2$	b)	$16\pi - 24\sqrt{3} \; cm^2$	c)	$16\pi - 48\sqrt{3} cm^2$	d)	$16 \; cm^2$

14. Solve for x.

$$\log_2(x - 3) + \log_2(x) = 2$$

(4 marks)

| a)	$x_1 = 4,$ $x_2 = -1$	b)	$x = 4$	c)	$x_1 = 1,$ $x_2 = -4$	d)	$x_1 = 1,$ $x_2 = 2$

15. In the right triangle, one angle measures α, where $\cos\alpha = \frac{3}{5}$.

Calculate the value of $\sin(90-\alpha)$.

(4 marks)

a)	$\frac{4}{5}$	b)	$\frac{3}{5}$	c)	$-\frac{1}{5}$	d)	1

16. Use the circle graph below showing the responses of 500 teens to a survey asking "Where would you like to live?" If you were to ask a randomly chosen teen this question, what is the experimental probability that the teen would say "large city"?

Where Would You Like to Live?
- Large city 155
- Small town 90
- Suburbs 100
- Rural/ranch 70
- Wilderness area 85
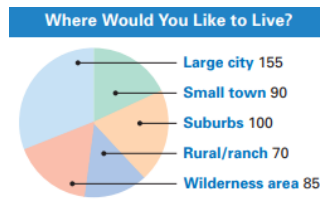
(4 marks)

a)	1.55	b)	0.155	c)	0.5	d)	0.31

17. An oil tank weighs 29000 kg when it is 40% full and 41000 kg when it is 60% full. What is the weight of the empty oil tank?

(4 marks)

A) 10000	B) 6000	C) 5000	D) 4000

18. Solve the trigonometric equation. You must show all your workings.

$$\cos 2x = \sin(2x - 30^0), \quad for\ 0^0 < x < 360^0$$

(6 marks)

19. An arithmetic progression and a convergent geometric progression each have first term 1. The sum of the second terms of the two progressions is $\frac{7}{3}$.
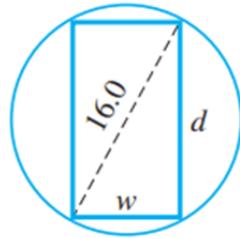
The sum of the third terms of the two progressions is $\frac{28}{9}$.

What is the sum to infinity of the geometric progression?

You must show all your workings.

(6 marks)

20. The strength S of a beam with a rectangular cross section is directly proportional to the product of the width w and the square of the depth d. Find the dimensions of the strongest beam that can be cut from a log with a circular cross section that is 16.0 m in diameter. You must show all your workings.

(8 marks)

END OF QUESTIONS