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Government of Sāmoa
MINISTRY OF EDUCATION, SPORTS AND CULTURE

Sāmoa Secondary Leaving Certificate

MATHEMATICS

2018

QUESTION and ANSWER BOOKLET

Time allowed: 3 hours & 10 minutes

INSTRUCTIONS:

1. You have 10 minutes to read **before** you start writing.
2. Write your **Student Education Number (SEN)** in the space provided on the top left hand corner of this page.
3. Answer **ALL QUESTIONS**. Write your answers in the spaces provided in this booklet.
4. If you need more space for answers, ask the Supervisor for extra paper. Write your SEN on all extra sheets used and clearly number the questions. Attach the extra sheets at the appropriate places in this booklet.

NB: Formula Sheet is provided as a separate sheet.

CURRICULUM STRANDS	Page	Time (min)	Weighting
STRAND 1: ALGEBRA	2	22	12
STRAND 2: COORDINATE GEOMETRY	5	25	14
STRAND 3: GRAPHS AND FUNCTIONS	9	25	14
STRAND 4: SEQUENCE AND SERIES	12	25	14
STRAND 5: PROBABILITY	15	25	14
STRAND 6: CALCULUS	19	36	20
STRAND 7: TRIGONOMETRY	25	22	12
TOTAL		180	100

Check that this booklet contains pages 2-28 in the correct order and that none of these pages are blank.

HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

1. Solve for x : $\frac{x+5}{3} < 3(x-2)$

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SL 3

2. State why the expression in Numbe 1 is **not a linear equation**.

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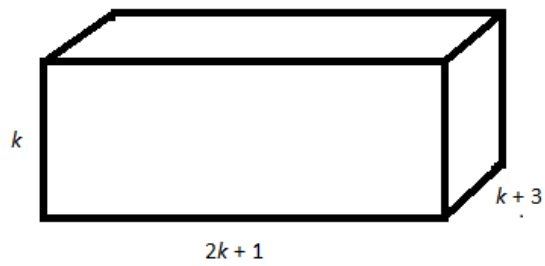
SL 1

3. State any basic law of indices.

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SL 1

A cuboidal container below has a height of k metres, a width of $(k + 3)$ metres and a length of $(2k + 1)$ metres.



4. Expand and fully simplify $k(2k + 1)(k + 3)$

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SL 2

5. The volume of the box in cubic metres is 20 times the height in metres ($V = 20k m^3$). Find the value of k correct to 2 decimal places.

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SL 3

6. What is the subject of the equation in Number 4?

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SL 1

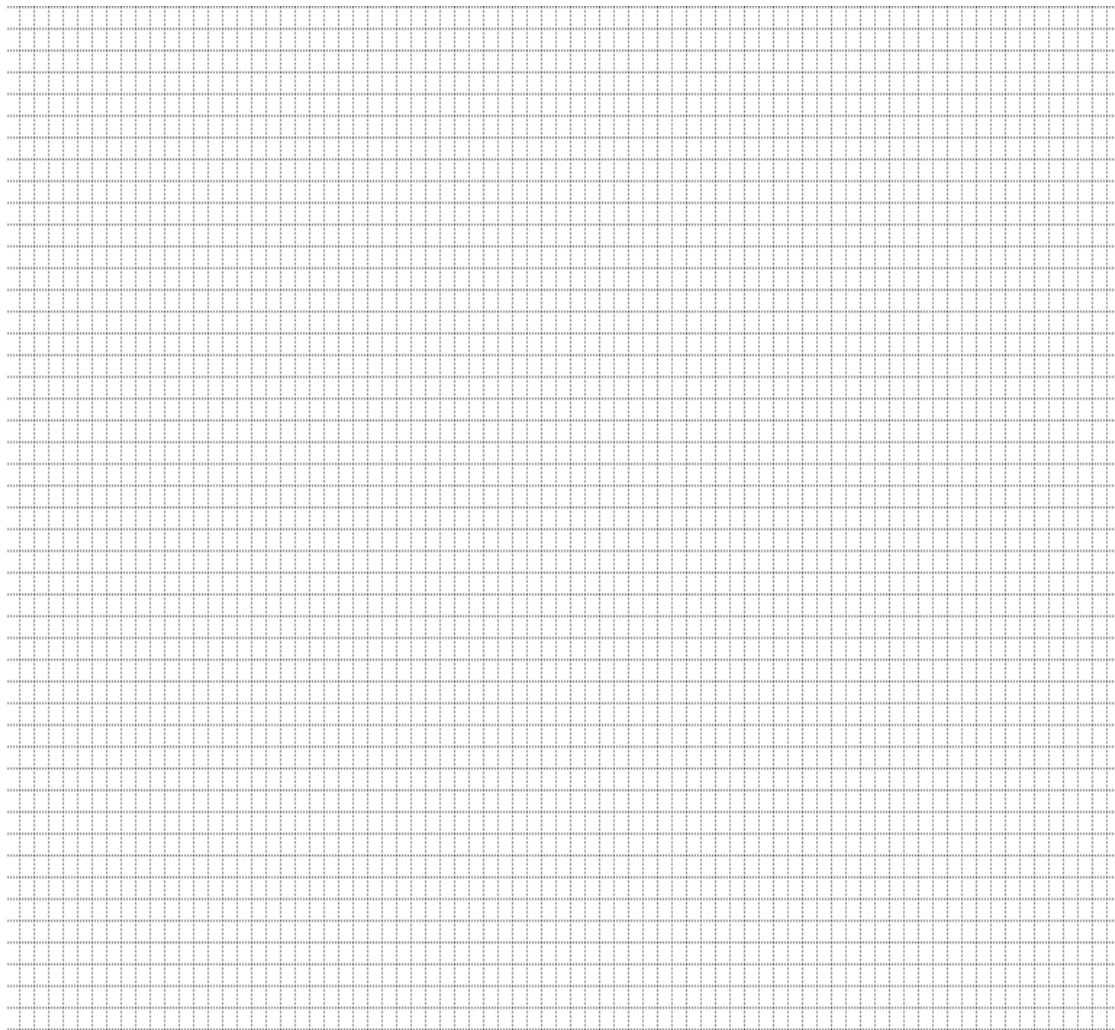
7. Give an example of a quadratic equation.

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SL 1

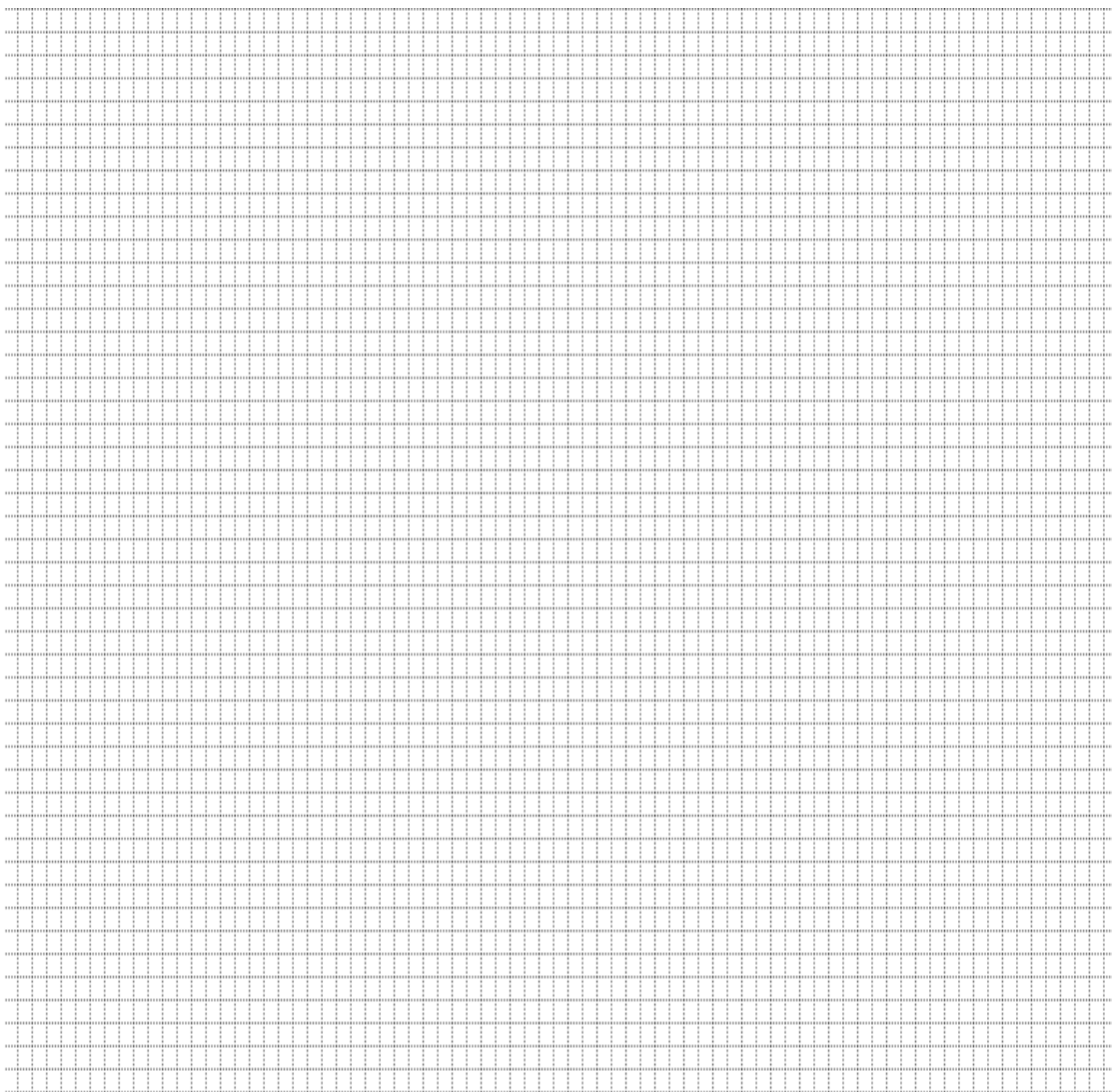
8. A (3, 5) and B (-4, 2) are two points. C is a point on the line $x = 1$. ABC is a right – angled triangle. AB is the hypotenuse.

Find the possible pairs of coordinates for the point C. Use the grid below to help you in figuring out your answers.



SL 4

9. Find the value of h so that the points A (2, 7), B (5, h) and C (9, -3) are collinear. Plotting points is **NOT** sufficient. Round your answer to 2 decimal places.



SL 3

10. Calculate the **distance** between the points (4,-5) and (1, 3).

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SL 2

11. Find the **equation** of the line joining the points (4, -5) and (1, 3).

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SL 2

12. State the rule for gradients of perpendicular lines.

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SL 1

13. State the rule for gradients of parallel lines.

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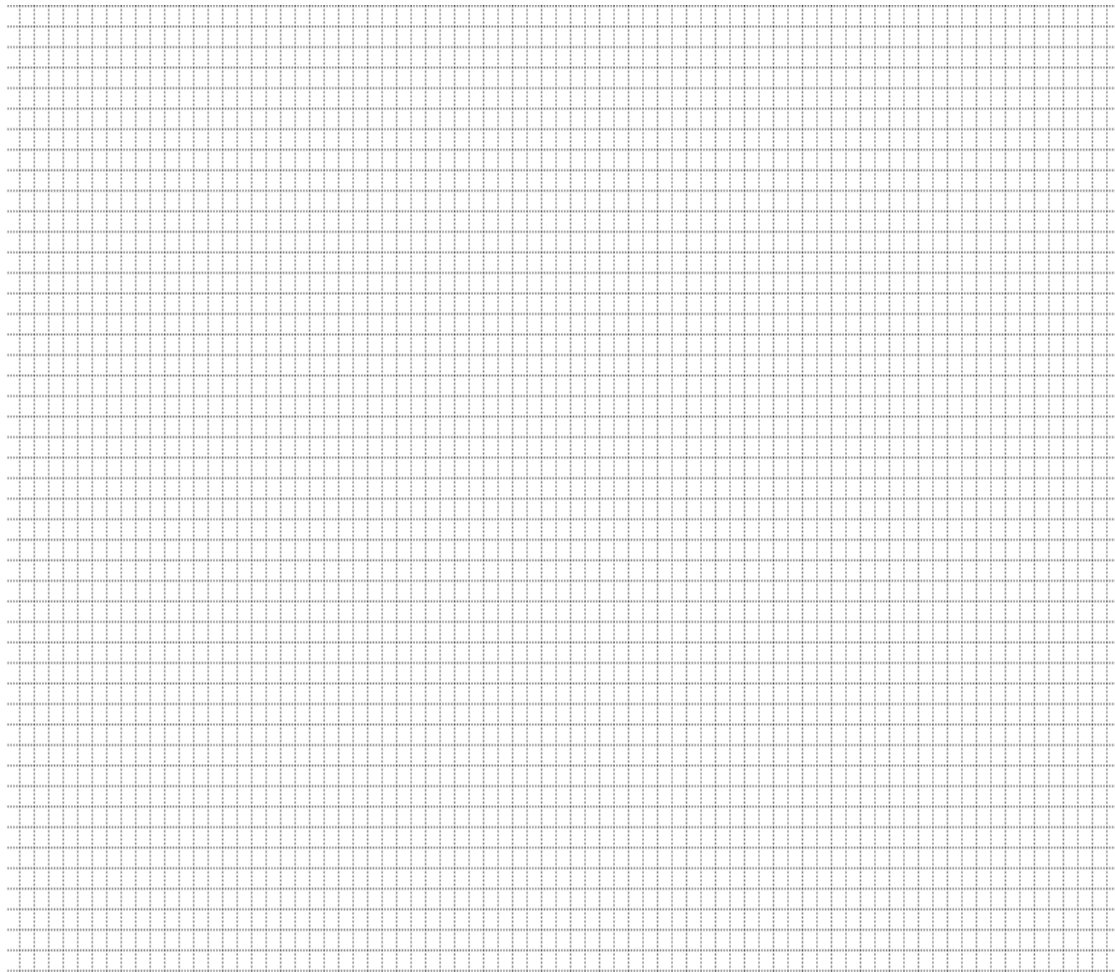
SL 1

14. State the Pythagoras theorem.

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SL 1

15. Plot the graph of $y = 5x - 4x^2 - x^3$ showing clearly the co-ordinates of all the intercepts and turning points.



SL 4

16. Identify or name the type of function in Number 15, the one you have just drawn.

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SL 1

17. Your graph in Number 15 should have TWO turning points. Give the co-ordinates of the two turning points. Round your answers to 2 decimal places.

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SL 2

18. The limit of the function $f(x) = 5x - 4x^2 - x^3$ as x approaches 0 is 0. What is the meaning of this?

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SL 1

19. Find the limit of the function $f(x) = 5x - 4x^2 - x^3$ as x approaches infinity.

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SL 1

20. Show that the rational function $y = \frac{3x+1}{x-2}$ can be written as $y = 3 + \frac{7}{x-2}$

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SL 3

21. From the list of equations of functions given below, **circle the equation of the inverse of the function $y = a^x$.**

$y = mx + c$, $y = ax^2 + bx + c$, $y = \log_a x$, $y = e^{ax}$

SL 1

22. For the function $y = e^x$, give the corresponding y values for $x=0$ and $x=1$

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SL 1

23. In an arithmetic sequence, $t_3 = 4$ and $t_4 = 8$. Find the n^{th} term formula for the sequence.

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SL 2

Sione has a 4000 word assignment to write. He begins his assignment on the 3rd of July and writes 175 words. Each day he writes 75 words more than he did the previous day.

24. How many words will he write on the **6 July**?

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SL 2

25. How many words will he have written in total at the end of the first 5 days?

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SL 2

The sum of the first n terms of a geometric sequence is $\frac{8(1-0.2^n)}{0.8} = 9.99936$

26. What is the first term of the sequence?

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SL 1

27. What is the common ratio?

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SL 1

28. How many terms are being added? (find n)

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SL 3

29. State the **condition for the common ratio r** for a geometric series to have a sum to infinity, S_{∞} .

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SL 1

30. A finite geometric series is written as $1 + 3 + 5 + 7$.
Write this series in sigma notation form.

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SL 1

31. State the formula for the sum to infinity of a geometric series.(i.e. $S_{\infty} =$)

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SL 1

The blood pressure of all students in a school where Malia is a nurse, is approximately normally distributed, with mean 113 mm Hg, and standard deviation 10.3 mm Hg.

- 32.** What proportion of the students, chosen at random from Malia's school, would be expected to have blood pressure between 113 mm Hg and 120 mm Hg?

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SL 2

- 33.** There are 719 students at Malia's school. How many students would be expected to have blood pressure less than 115 mm Hg?

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SL 3

34. Identify by explaining whether blood pressure of students in Malia's school follows a normal probability curve

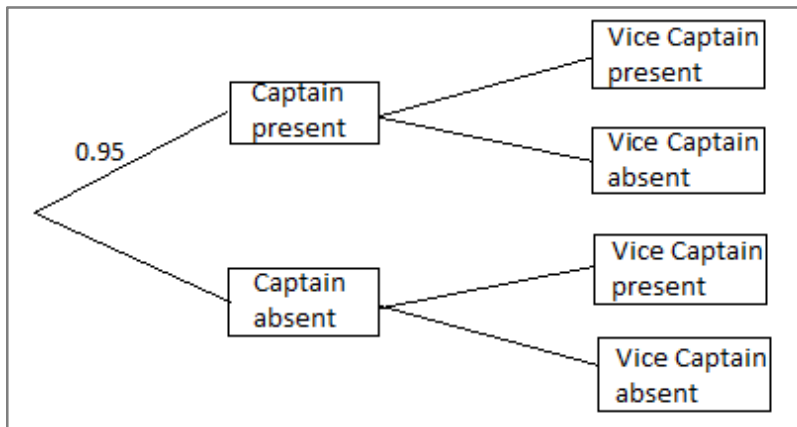
SL 1

35. What is the shape of a normal probability curve as mentioned in Number 34 above?

SL 1

There is a special team's award presented at a school assembly. There is no prior warning about the award. The rugby team is to receive the award. The award must be accepted by the Captain or, if the Captain is absent, by the Vice Captain. The Captain is present at assembly 95% of the time. The Vice Captain of the team is present at assembly 93% of the time that the Captain is present and 75% of the time the Captain is absent.

Some of the information is shown on the probability tree below.



36. Calculate the probability that both the Captain and the Vice Captain will be present at the assembly when the award is being presented.

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SL 1

37. Calculate the probability that the award will be presented to the team at the assembly (at least the captain or vice-captain is present at the assembly).

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SL 4

An experiment is done where a die is rolled and a coin is tossed at the same time.

38. Name or give an example of an **event** from this experiment.

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SL 1

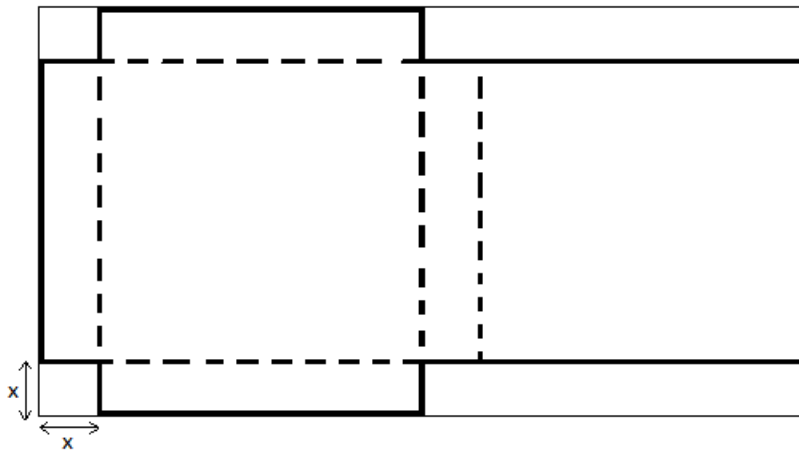
39. Calculate the probability of getting **a head and an even number**.

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SL 1

Tala has a sheet of rectangular cardboard that measures 45 cm by 60 cm. He wants to bend the cardboard to make a closed box that he can use to farm worms for his garden.

A sketch of the outline of the net is given below. The box does not have flaps.



40. Calculate the maximum volume of the box that he could make from the sheet of cardboard. Round your final answer to the nearest cm^3 .

SL 4

A function f is given by $f(x) = x^3 - 3x + 3$

41. Find the gradient of f at the point where $x = 1$.

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SL 1

42. Give the y – coordinate of this point where $x = 1$, and $f'(1) = 0$.

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SL 1

43. The point we refer to in Number 42 above has a special name.
What is this name?

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SL 1

44. Find the second derivative of the function f (i.e. $f''(x)$)

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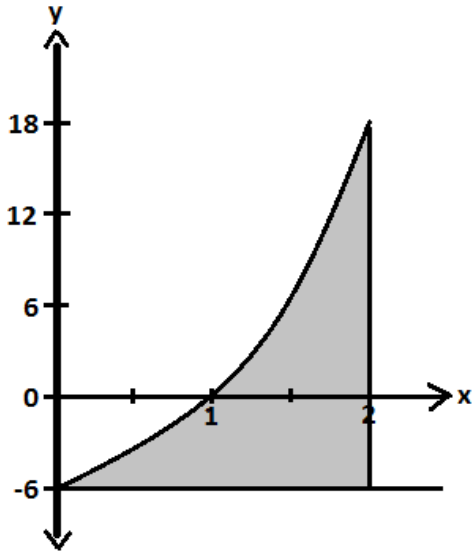
SL 1

45. The volume of a balloon is increasing at the rate of $2t + 1 \text{ cm}^3$ per second. Initially the volume is 12 cm^3 . Express the volume in terms of t where t is in seconds.

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SL 2

Karen is a landscape gardener. She sketches the plan for the new garden on her computer. The equations of the three edges of the garden are $y = 6x^2 - 6$, $x = 2$ and $y = -6$. She has to calculate the area of the garden to find the amount of fertilizer needed. The garden is the part that is shaded on the diagram below. x and y are in metres.



46. Calculate the area of the garden.

SL 3

47. Evaluate the definite Integral $\int_1^6 12x - 3x^2 dx$

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SL 2

48. Identify the limits of integration in Number 47 above.

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SL 1

49. State an application of the definite integral.

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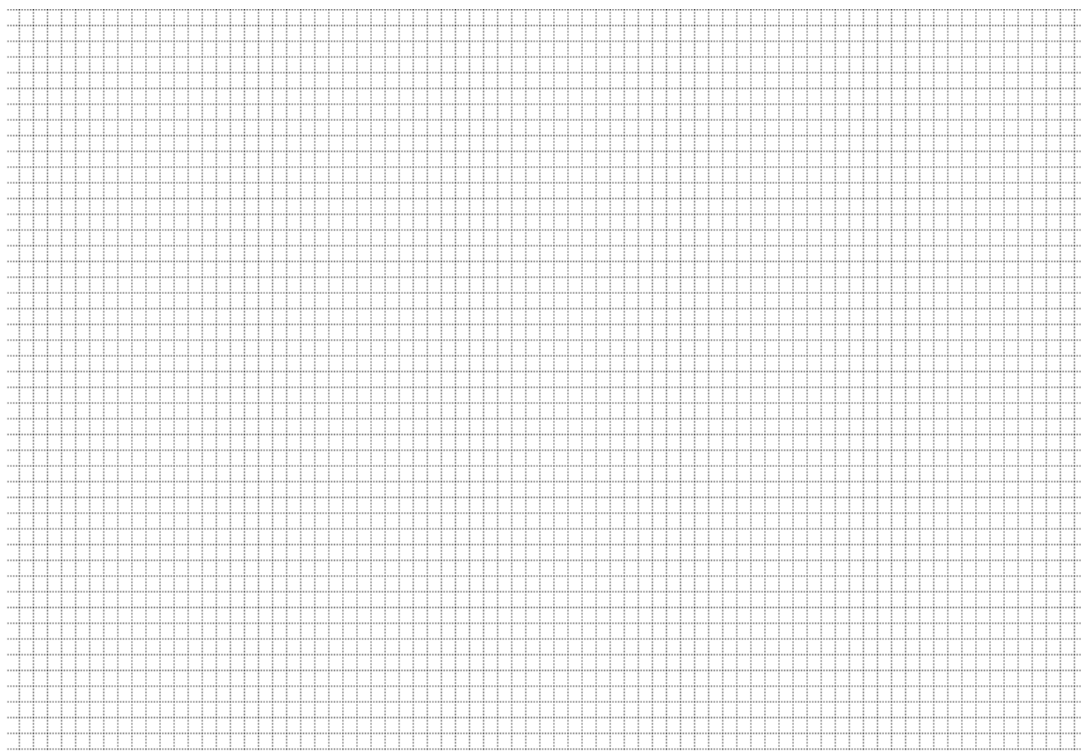
SL 1

50. Find the equations of the tangent and normal to the curve $y = x^2 + x - 6$ at the point $(1, -4)$.



SL 3

51. Sketch the graph of $y = 4 \cos(x + 30^\circ)$ where $-120^\circ \leq x \leq 240^\circ$ showing translations (shifts) with appropriate labels across both axes.



SL 4

52. Determine the amplitude, period, horizontal and vertical shifts of the trigonometric function $y = 4 \cos(x + 30^\circ)$

SL 3

53. Solve this trigonometric equation for $0^\circ \leq \theta \leq 360^\circ$ $\cos 2\theta = 0.8$

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SL 3

54. Convert $\frac{\pi}{4}$ radians to degrees.

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SL 1

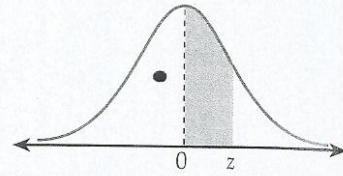
55. State the formula that determines the length of an arc of a circle.

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SL 1

Normal distribution

Each entry gives the probability that the standardised normal random variable, Z , lies between 0 and z , shaded in the diagram.



Differences

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359	4	8	12	16	20	24	28	32	36
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754	4	8	12	16	20	24	28	32	36
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141	4	8	12	15	19	22	27	31	35
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517	4	8	11	15	19	22	26	30	34
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879	4	7	11	14	18	22	25	29	32
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224	3	7	10	14	17	21	24	27	31
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549	3	6	10	13	16	19	23	26	29
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852	3	6	9	12	15	18	21	24	27
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133	3	6	8	11	14	17	19	22	25
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389	3	5	8	10	13	15	18	20	23
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621	2	5	7	9	12	14	16	18	21
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830	2	4	6	8	10	12	14	16	19
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015	2	4	5	7	9	11	13	15	16
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177	2	3	5	6	8	10	11	13	14
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319	1	3	4	6	7	8	10	11	13
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441	1	2	4	5	6	7	8	10	11
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545	1	2	3	4	5	6	7	8	9
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633	1	2	3	3	4	5	6	7	8
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706	1	1	2	3	4	4	5	6	6
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767	1	1	2	2	3	4	4	5	5
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817	0	1	1	2	2	3	3	4	4
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857	0	1	1	2	2	2	3	3	4
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890	0	1	1	1	2	2	2	3	3
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916	0	0	1	1	1	2	2	2	2
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936	0	0	1	1	1	1	1	2	2
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952	0	0	0	1	1	1	1	1	1
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964	0	0	0	0	1	1	1	1	1
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974	0	0	0	0	0	1	1	1	1
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981	0	0	0	0	0	0	0	0	1
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986	0	0	0	0	0	0	0	0	1
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990	0	0	0	0	0	0	0	0	0
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993	0	0	0	0	0	0	0	0	0
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995	0	0	0	0	0	0	0	0	0
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997	0	0	0	0	0	0	0	0	0
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998	.4998	0	0	0	0	0	0	0	0	0
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	0	0	0	0	0	0	0	0	0
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	0	0	0	0	0	0	0	0	0
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	0	0	0	0	0	0	0	0	0
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.5000	.5000	0	0	0	0	0	0	0	0	0
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	0	0	0	0	0	0	0	0	0

STUDENT EDUCATION NUMBER									

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(For Scorers only)

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