Subject Entrance Tests

For entrance to

Nazarbayev University

Claire Powis

SET or SAT?

SET – Subject Entrance Tests for Nazarbayev University or UCL (London) foundation year

SAT – Entrance Tests for American Universities (slightly different format and content)

Admissions Criteria for NU

The requirements for admission to the University of Nazarbayev are the following (listed in priority order):

- English Proficiency Test and average academic score of 4.0+ for last two terms
- Good results in SET – Subject Entrance Tests;
- Official certificates of IELTS/ TOEFL with at least minimum admission score (5.5 – 7.5 depending on course)

Subject Entrance Tests

- An applicant must take two Subject Entrance Tests (SET) written in English.
- SET is multiple choice test of 30 questions which the applicant either passes or fails.
- The applicant must receive an average of 50% or over in both subject tests and no less than 43% in a single subject test (i.e. 13 points of 30).

Which Test?

- School of Engineering – Maths and Physics
- School of Natural Sciences (one of the following pair):
    - Chemistry and Biology
    - Maths and Physics
- Pre-medical preparation – Chemistry and Biology
- School of Social Sciences – Maths and Critical Thinking

Subject Entrance Tests - Rules

- Applicants must complete the tests without help from any other person.
- Applicants can use a dictionary to help them understand the questions, but MUST NOT use any maths or science textbooks or websites to help complete the test.
- The tests take one hour each.

Taking the Subject Entrance Tests

- The tests will be administered in March. Students must register for the tests by 30th January.
- Applicants who do not take the test under NU supervision may be re-tested when they start university.
- There is no opportunity to re-take the tests in the same academic year if the applicant does not reach the required standard.

The Mathematics Test

- There are 30 questions.
- The questions are multiple-choice.
- Applicants should answer as many questions as possible. It is not necessarily expected that they will be able to answer ALL the questions.
- Calculators should not be used.

The Mathematics Test

- 60 minutes is the maximum time allowed.
- Questions are written using standard English mathematical notation.
- Questions are on a range of topics based on the British Grade 10 and 11 mathematics curriculum
- Questions are designed to test mathematical understanding and thinking as well as methods and knowledge.

Issues

- Students need to be familiar with the notation used in the test
- There is only one sample test available
- There are no specific SET text books or practice materials – however ...
- I have been developing a program of study, collection of resources and practice tests to share with staff for the future

Notation

- Decimals
- Multiplication
- Division
- Coordinates
- Trigonometry

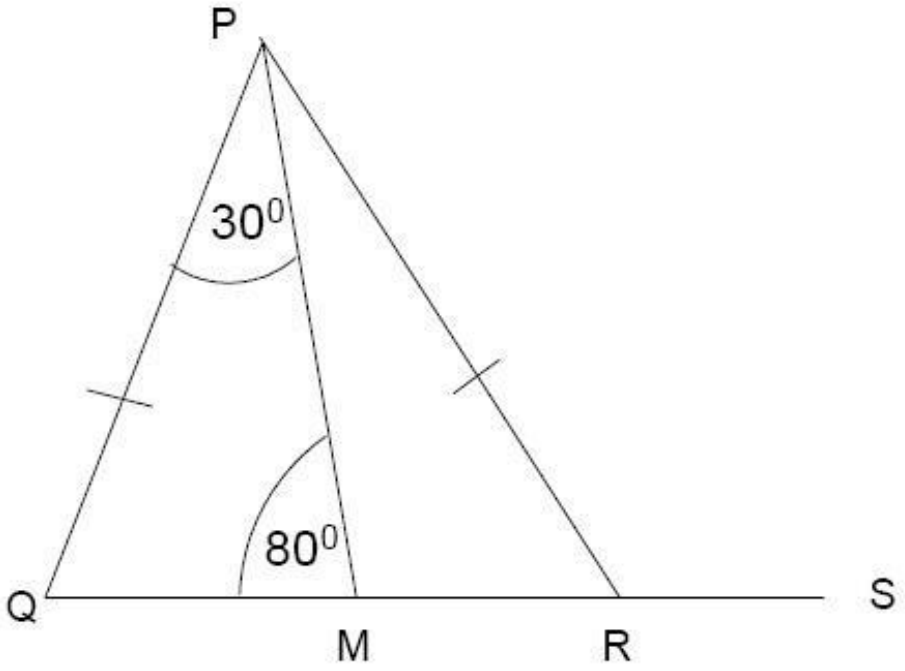
… and …

Question 1

- On a journey a certain weight of luggage is carried free, but there is a charge of $5 per kilogram for any additional luggage above this weight. Laa-laa's luggage, which weighs a total of 70kg, is overweight and she is charged $200. If Po's luggage weighs a total of 45kg, what will she have to pay ?

Question 2

- In the diagram PQ = PR, ∠QMP = 80° and ∠QPM = 30°. What is ∠RPM ?



Question 3

- What is the value of 21 x 101 – 21 – 101 ?

Question 4

- In the diagram below how many different routes are there from S to T which do not go through either of the points U and V more than once ?

Question 5

- What is the sum of all the first 20 even numbers ?

Question 6

$$\left(\left(\frac{1}{4}\right)^{-\frac{1}{4}}\right)^{\frac{1}{2}}$$

- Equals…

Question 7

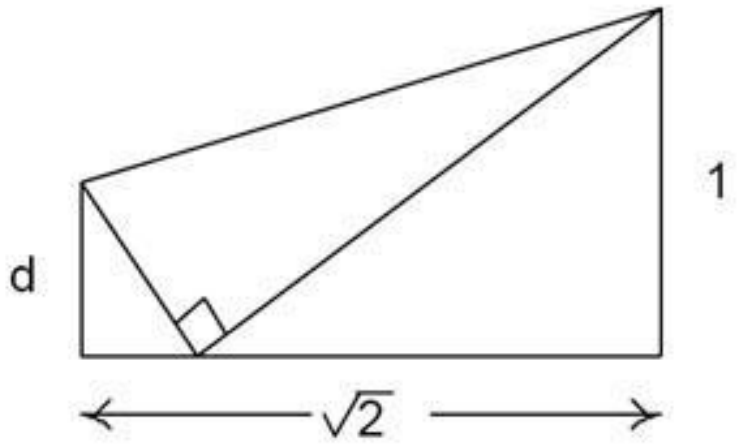
- Mary's height increased by 20% between her 5th birthday and her 10th birthday. It increased by 15% between her 10th birthday and her 15th birthday, and it increased by 10% between her 15th birthday and her 20th birthday. By how much did her height increase between her 5th birthday and her 20th birthday?

Question 8

- (1550 + 1551 + 1552 + ... + 1648 + 1649) – (150 + 151 + 152 + ... + 248 + 249) =

Question 9

- A rectangular sheet of paper with sides 1 and 2 has been folded once as shown, so that one corner just meets the opposite long edge. What is the value of the length d ?



Question 10

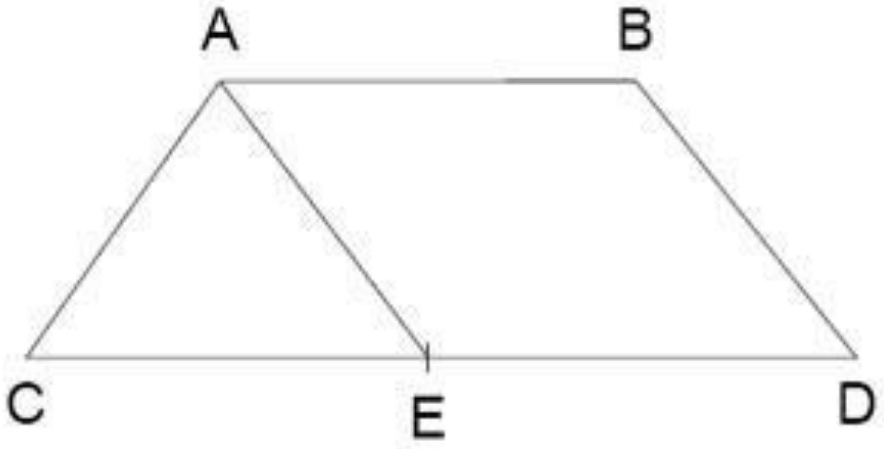
- When exactly is the value of the value of the product

  $$(1 + 1/2)(1 + 1/3)(1 + 1/4)....(1 + 1/n)$$

  equal to an integer?

Question 11

- The diagram shows a trapezium ABCD, whose base length CD is twice the top length AB. If CD is twice CE, what fraction does the area of the triangle take of the area of the trapezium?

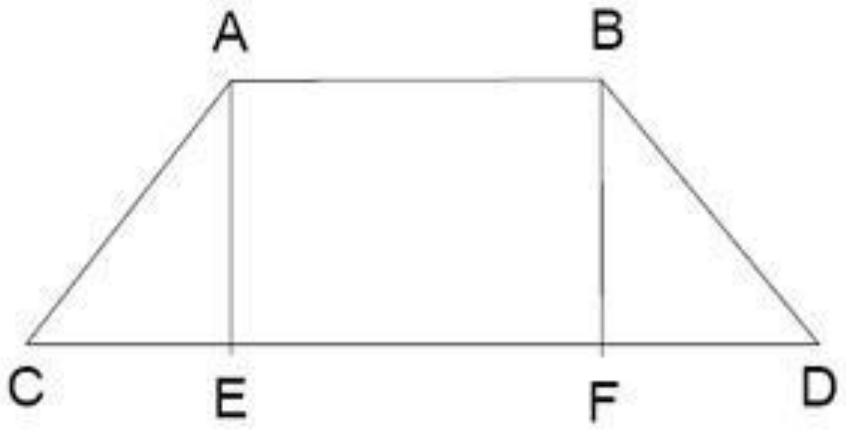


Question 12

- In a right angled triangle the longest side has length 13cm, and one of the shorter sides has length 7cm. Which of the following approximations is closest to the length of the remaining side ?
- 10 cm
- 10.5 cm
- 11 cm
- 11.5 cm
- 12 cm

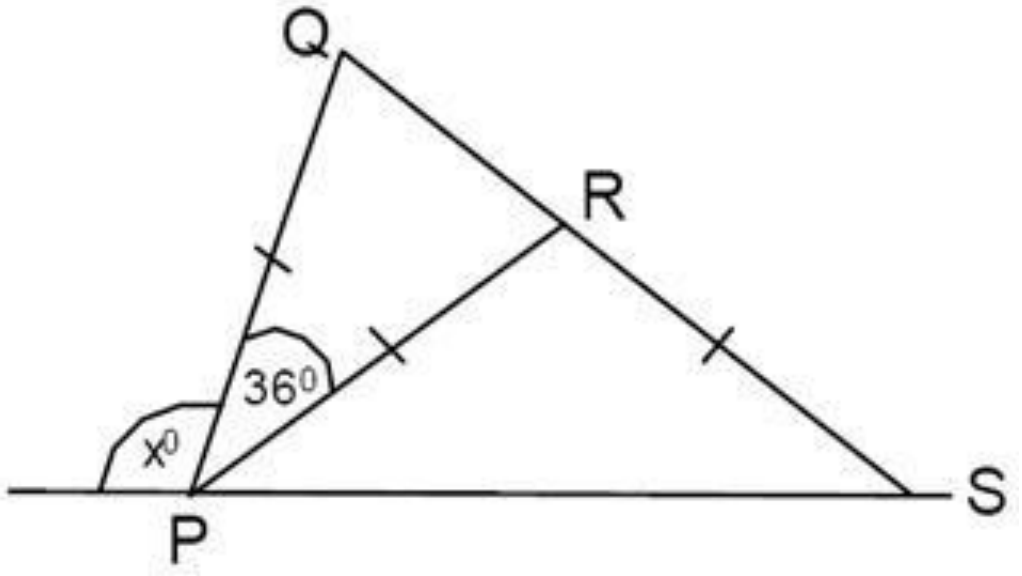
Question 13

- ABCD is a trapezium. The length of CE is ¼ the length of CD, and FD = CE. If the area of each triangle is 1 cm^2 what is the area of the trapezium ?



Question 14

- In the diagram PQ = PR = RS. What is the size of angle x?

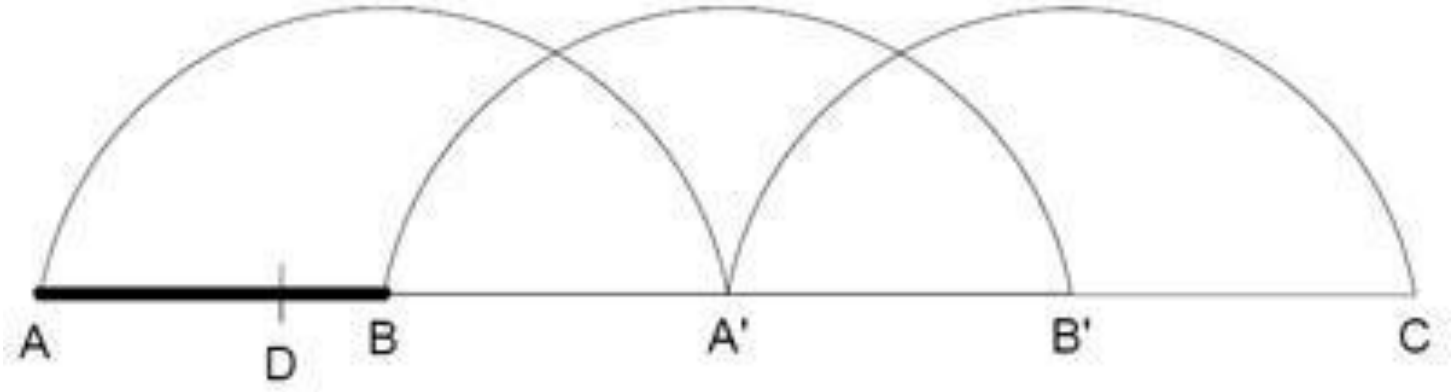


Question 15

- Ima Divvy used her calculator and divided a number by 40 instead of 8. What should she do now to obtain the correct answer ?
- Divide by 40
- Divide by 8
- Multiply by 5
- Multiply by 320
- Divide by 5

Question 16

- A pencil AB lying on a table is given a half turn about the end B (so that A moves to A') and then a half-turn about A' (so that B moves to B'), and finally a half-turn about B' (so that A' moves to C). The point D of the pencil is three-quarters of the way from A to B. What is the ratio of the total distance moved by A and D?



Question 17

- Which of these numbers is odd ?

- $1^4 + 1$
- $3^4 + 2$
- $5^4 + 3$
- $7^4 + 5$
- $11^4 + 7$

Question 18

- The sum of six consecutive odd numbers is 60. What is the smallest of the six numbers ?

Question 19

- The integer part of a positive number is the part before the decimal point; The decimal part of a positive number is the part after the decimal point. For example the integer part of 3.72 is ‘3’ and the decimal part is ‘0.72’. Which of the following numbers has a decimal part equal to exactly one-fifth of the integer part ?
- 2.5
- 3.6
- 4.6
- 5.8
- 6.2

Question 20

- If $|x| < 0.5$, $(4 - 8x)^{-\frac{1}{2}} =$

- $\frac{1}{2}(1 + x + 3x^2/2 + \ldots)$
- $\frac{1}{2}(1 - x + 3x^2/2 + \ldots)$
- $\frac{1}{2}(1 + x - 3x^2/2 + \ldots)$
- $2(1 + x + 3x^2/2 + \ldots)$
- $\frac{1}{2}(1 + x + 3x^2/2)$

Question 21

- For each real number x, let [x] be the biggest integer which is less than or equal to x. What can you say about the following three equations ?
- (i) $[p + 3] = [p] + 3$
  (ii) $[p + q] = [p] + [q]$
  (iii) $[5p] = 5\,[p]$
- all three equations are true for all real numbers p and q.
- equations (i) and (iii) are true for all real number p.
- the three equations are true only when p and q are integers.
- equations (i) and (ii) are true for all real number p and q.
- equations (ii) and (iii) are false for most values of p and q.

Question 22

- If $y = xe^x$ then $dy/dx =$

- xe^x
- $x + e^x$
- $x + xe^x$
- $e^x + xe^x$
- None of these

Question 23

- If c is a constant, what is $\int (2 - 3x^2)^2 \, dx$

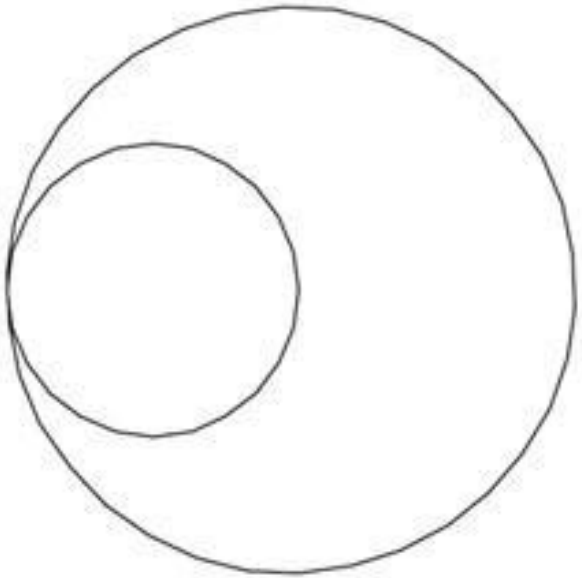
- $-24x^2 + 36x^3 + c$
- $4x - 12x^3 + 9x^5 + c$
- $4 - 4x^2 + 9x^4/4 + c$
- $4x - 4x^3 + 9x^5/5 + c$
- None of these

Question 24

- Observe that $18 = 4^2 + 1^2 + 1^2 + 0^2$. How many of the first fifteen positive integers can be written as the sum of the squares of four integers ?

Question 25

- In the diagram below the smaller circle touches the larger circle and goes through the centre of the larger circle. What fraction of the area of the larger circle is outside the smaller circle ?



Question 26

- If $y = \sin(x^2)$ then $dy/dx =$

- $\cos(x^2)$
- $2x.\sin(x^2)$
- $2\sin(x)$
- $2x.\cos(x)$
- $2x.\cos(x^2)$

Question 27

- $(x - 1)(x^4 + 1)(x^2 + 1)(x + 1) =$

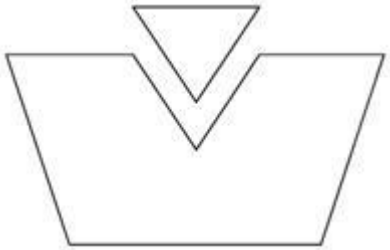
- $x^8 + 1$
- $x^8 + x^6 + x^4 + x^2 + 1$
- $x^8 - 1$
- $x^8 + x^7 + x^6 + x^5 + x^4 + x^3 + x^2 + x + 1$
- $x^8 - x^6 + x^4 - 1$

Question 28

- If $x^2 - 3x + 1 = 0$, what is the value of …
- $x^2 + (1/x)^2$?

Question 29

- The expression 3 @ 7 $\rightarrow$ 4 is a short way of writing the statement “it is possible to fit a 3-sided polygon and a 7-sided polygon together (without overlap) to make a 4-sided polygon”. This statement is correct (as shown in the diagram below). Which of the following is a statement which is NOT correct ?



- 3 @ 5 $\rightarrow$ 4
- 3 @ 6 $\rightarrow$ 4
- 3 @ 8 $\rightarrow$ 4
- 4 @ 6 $\rightarrow$ 4
- 4 @ 8 $\rightarrow$ 4

Question 30

- Consider the triangle of numbers below :

				1				
			1	1	1			
		1	2	3	2	1		
	1	3	X	7	X	3	1	
1	4	10	16	Y	16	10	4	1

- X and Y equal:
- 10 and 32
- 5 and 19
- 6 and 13
- 4 and 19
- 6 and 19