Till läraren

Välkommen till Kängurutävlingen – Matematikens hopp 2021
Cadet, för elever i årskurs 8–9 och gy kurs 1

- Tävlingen genomförs under perioden 18 mars – 15 maj. *Uppgifterna får inte användas tidigare.*
- När du redovisar antalet deltagare får du tillgång till facit och ett kalkylblad där du matar in elevernas svar. Du får då en sammanställning av klassens resultat. Sista dag för redovisning av antalet deltagare är den *15 maj.*
- Redovisa resultatet senast *20 maj.*
- *Tävlingen är individuell* och eleverna får arbeta i 60 minuter. De tre delarna ska genomföras vid *ett och samma tillfälle.*
- Eleverna behöver ha tillgång till papper för att kunna göra anteckningar och figurer. Linjal behövs inte.
- *Miniräknare eller sax får inte användas. Observera att telefoner, datorplattor och datorer inte heller får användas.*
- Läs igenom problemen själv i förväg så att eventuella oklarheter kan redas ut.
- Kontrollera att kopiorna blir tillräckligt tydliga så att nödvändiga detaljer syns.
- Besök *Kängurusidan* på ncm.gu.se/kanguru där vi publicerar eventuella rättelser och ytterligare information. Där finns också information om hur kalkylbladet fungerar.
- Samla in problemformulären efter tävlingen. Problemen får inte spridas utanför klassrummet förrän efter 20 maj, men ni får gärna arbeta med problemen i klassen.

Mikael Passares stipendium
Mikael Passare (1959–2011) var professor i matematik vid Stockholms universitet. Han hade ett stort intresse för matematikundervisning på alla nivåer och var den som tog initiativ till Kängurutävlingen i Sverige. Mikael Passares minnesfond har instiftat ett stipendium för att uppmärksamma elevers goda matematikprestationer. Information om hur du nominerar elever kommer tillsammans med facit och kommentarer.

Lycka till med årets Känguru!

e-post: kanguru@ncm.gu.se

För administrativa frågor, vänd dig till Ann-Charlotte Forslund:
Ann-Charlotte.Forslund@ncm.gu.se
031–786 69 85

För innehållsfrågor, vänd dig till Ulrica Dahlberg eller Peter Nyström:
Ulrica.Dahlberg@ncm.gu.se
Peter.Nystrom@ncm.gu.se

Svarsblankett

Markera ditt svar i rätt ruta

Uppgift	A	B	C	D	E	Poäng
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
					SUMMA	

Namn:.....

Klass:.....

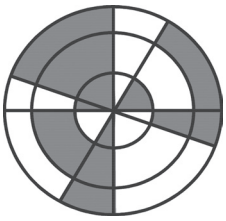
Kängurutävlingen – Matematikens hopp 2021
Cadet

Three points problems

1 Which of the following symbols for signs of the Zodiac has an axis of symmetry?

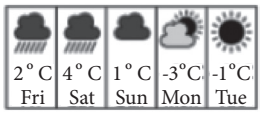
A  B  C  D  E 

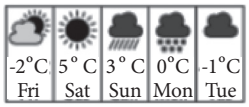
2 What percentage of the figure is shaded gray?

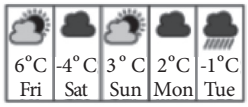


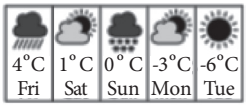
A 30 % B 35 % C 40 % D 45 % E 50 %

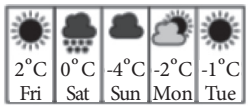
3 Sven looks at his weather app and notices that from day to day the predicted maximum temperature drops during the next five days. What could Sven's app show?

A 

B 

C 

D 

E 

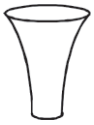
4 How many four-digit numbers have the property that their digits, from left to right, are consecutive and in ascending order?

A 5 B 6 C 7 D 8 E 9

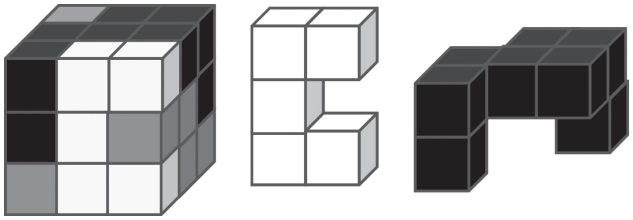
5 When the five pieces shown are fitted together correctly, the result is a rectangle with a calculation written on it. What is the answer to this calculation?

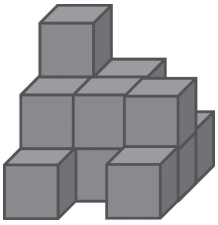
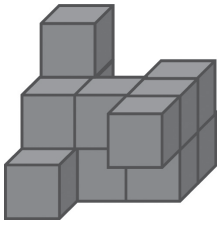
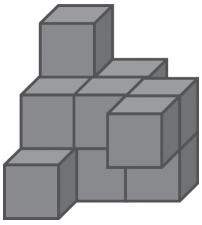
A -100 B -8 C -1 D 199 E 208

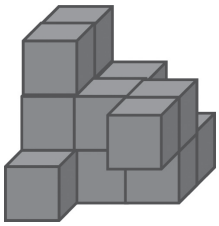
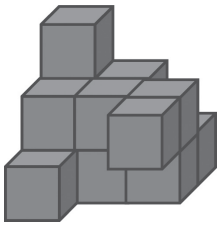
6 Each of the five vases shown has the same height and each has a volume of 1 litre. Half a litre of water is poured into each vase.
In which vase would the level of the water be the highest?

A  B  C  D  E 

7 A 3x3x3 cube is made from white, grey and black 1x1x1 cubes, as shown in the first diagram. The other two diagrams show the white part and the black part of the cube.
Which of the following diagrams shows the grey part?



A  B  C 

D  E 

8 A bike lock has four wheels numbered with the digits 0 to 9 in order. Each of the four wheels is rotated by 180° from the code shown in the first diagram to get the correct code. What is the correct code for the bike lock?

A  B  C 

D  E 

Four points problems

9 A rectangular chocolate bar is made of equal squares. Neil breaks off two complete strips of squares and eats the 12 squares he obtains. Later, Jack breaks off one complete strip of squares from the same bar and eats the 9 squares he obtains.
How many squares of chocolate are left in the bar?

A 72 B 63 C 54 D 45 E 36

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10 A jar one fifth filled with water weighs 560 g. The same jar four fifths filled with water weighs 740 g. What is the weight of the empty jar?

A 60 g B 112 g C 180 g D 300 g E 500 g

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11 Costa is building a new fence in his garden. He uses 25 planks of wood, each of which are 30 cm long. He arranges these planks so that there is the same slight overlap between any two adjacent planks. The total length of Costa's new fence is 6.9 metres.
What is the length in centimetres of the overlap between any pair of adjacent planks?

A 2,4 cm B 2,5 cm C 3 cm D 4,8 cm E 5 cm

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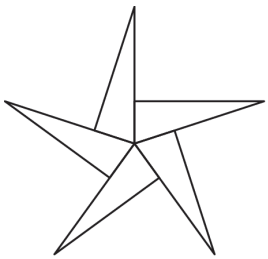
12 Five identical right-angled triangles can be arranged so that their larger acute angles touch to form the star shown in the diagram.



It is also possible to form a different figure by arranging more of these triangles so that their smaller acute angles touch. How many triangles are required for this figure?

A 10 B 12 C 18 D 20 E 24

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13 There are 20 questions in a quiz. Each correct answer scores 7 points, each wrong answer scores -4 points, while each question left blank scores 0 points. Eric took the quiz and scored 100 points. How many questions did he leave blank?

A 0 B 1 C 2 D 3 E 4

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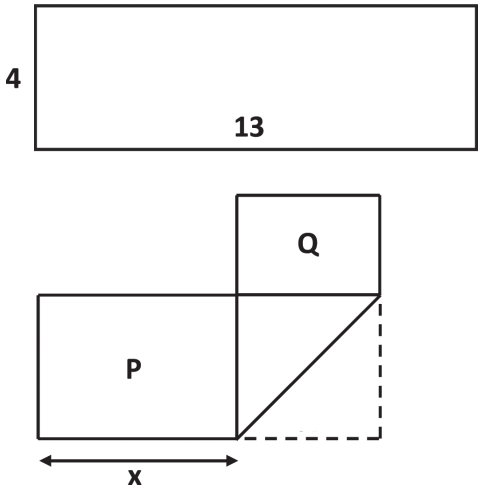
14 A rectangular strip of paper of dimensions 4 x 13 is folded as shown in the diagram.
Two rectangles are formed with areas P and Q where P = 2Q.
What is the value of x?

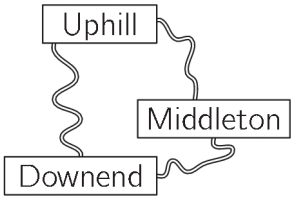


A 5 B 5,5 C 6 D 6,5 E $4\sqrt{2}$

15 A box of fruit contains twice as many apples as pears. Christy and Lily divided them up so that Christy had twice as many pieces of fruit as Lily.
Which one of the following statements is always true?

A Christy got at least one pear.
B Christy got twice as many apples as pears.
C Christy got twice as many apples as Lily.
D Christy got as many apples as Lily got pears.
E Christy got as many pears as Lily got apples.

16 Three villages are connected by paths as shown.
From Downend to Uphill the detour via Middleton is 1 km longer than the direct path.
From Downend to Middleton the detour via Uphill is 5 km longer than the direct path.
From Uphill to Middleton the detour via Downend is 7 km longer than the direct path.
How long is the shortest of the three direct paths between the villages?



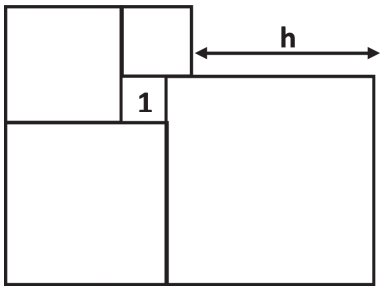
A 1 km B 2 km C 3 km D 4 km E 5 km

Five points problems

17 A soccer ball is made of white hexagons and black pentagons, as seen in the picture. There are a total of 12 pentagons. How many hexagons are there?

A 12 B 15 C 18 D 20 E 24

18 Five squares are positioned as shown. The small square indicated has area 1. What is the value of h?

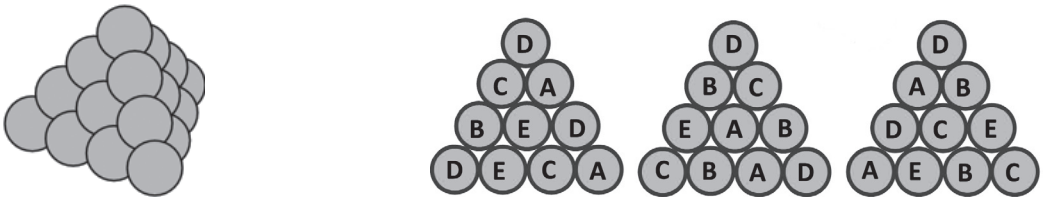


A 3 B 3,5 C 4 D 4,2 E 4,5

19 In a particular fraction the numerator and denominator are both positive. The numerator of this fraction is increased by 40 %.
By what percentage should its denominator be decreased so that the new fraction is double the original fraction?

A 10 % B 20 % C 30 % D 40 % E 50 %

20 A triangular pyramid is built with 20 cannon balls, as shown. Each cannon ball is labelled with one of A, B, C, D or E. There are four cannon balls with each type of label. The picture shows the labels on the cannon balls on three of the faces of the pyramid. What is the label on the hidden cannon ball in the middle of the fourth face?



A A B B C C D D E E

21 The 6-digit number *2ABCDE* is multiplied by 3 and the result is the 6-digit number *ABCDE2*. What is the sum of the digits of this number?

A 24 B 27 C 30 D 33 E 36

22 A box contains only green, red, blue and yellow counters. There is
always at least one green counter amongst any 27 counters chosen from the box;
always at least one red counter amongst any 25 counters chosen;
always at least one blue amongst any 22 counters chosen and
always at least one yellow amongst any 17 counters chosen.
What is the largest number of counters that could be in the box?

A 27 B 29 C 51 D 87 E 91

23 2021 coloured kangaroos are arranged in a row and are numbered from 1 to 2021. Each kangaroo is coloured either red, grey or blue. Amongst any three consecutive kangaroos, there are always kangaroos of all three colours. Bruce guesses the colours of five kangaroos. These are his guesses:

Kangaroo 2 is grey;
Kangaroo 20 is blue;
Kangaroo 202 is red;
Kangaroo 1002 is blue;
Kangaroo 2021 is grey.

Only one of his guesses is wrong.
What is the number of the kangaroo whose colour he guessed incorrectly?

A 2 B 20 C 202 D 1002 E 2021

24 In a tournament each of the six teams plays one match against every other team. In each round of matches, three take place simultaneously. A TV station has already decided which match it will broadcast for each round, as shown in the diagram.
In which round will team D play against team F?

1	2	3	4	5
A – B	C – D	A – E	E – F	A – C
–	–	–	–	–
–	–	–	–	–

A 1 B 2 C 3 D 4 E 5