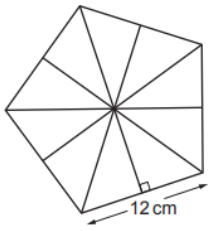
OCR GCSE Mathematics Calculator 2024 Higher Paper 3 Revision Worksheet

Question 5

The diagram shows a regular pentagon made using ten congruent right-angled triangles. The length of one side of the pentagon is 12 cm.



Not to scale

(a) Show that the area of the pentagon is 247.75 cm^2, correct to 2 decimal places.

(b) The regular pentagon is the base of a pyramid. The pyramid has volume 450 cm^3. The perpendicular height of the pyramid is h cm. Calculate the value of h.

(Volume of a pyramid = $\frac{1}{3}$ × area of base × perpendicular height)

Question 6

(a) Two numbers, A and B, are written as the product of their prime factors. $A = 2 \times 3 \times 7^2$, $B = 2^3 \times 7 \times 3$ Find the lowest common multiple (LCM) of A and B. **Give your answer as an ordinary number.**

(b) A number, R, is written as the product of its prime factors: $R = k \times 2^2 \times 3 \times 5$, where k is a prime number.

The highest common factor (HCF) of R and another number, P, is 26. **Find the value of k.**

Question 7

Two bags of fruit contain only apples and bananas.
In bag X, the ratio of apples to bananas is 5 : 7.
In bag Y, $\frac{5}{12}$ of the fruit are apples.

(a) Finley says

Bag X and bag Y contain the same number of apples.

Tick the correct statement.

- ☐ Finley is definitely correct
- ☐ Finley might be correct, or might not be correct
- ☐ Finley is definitely not correct

Show how you decided.

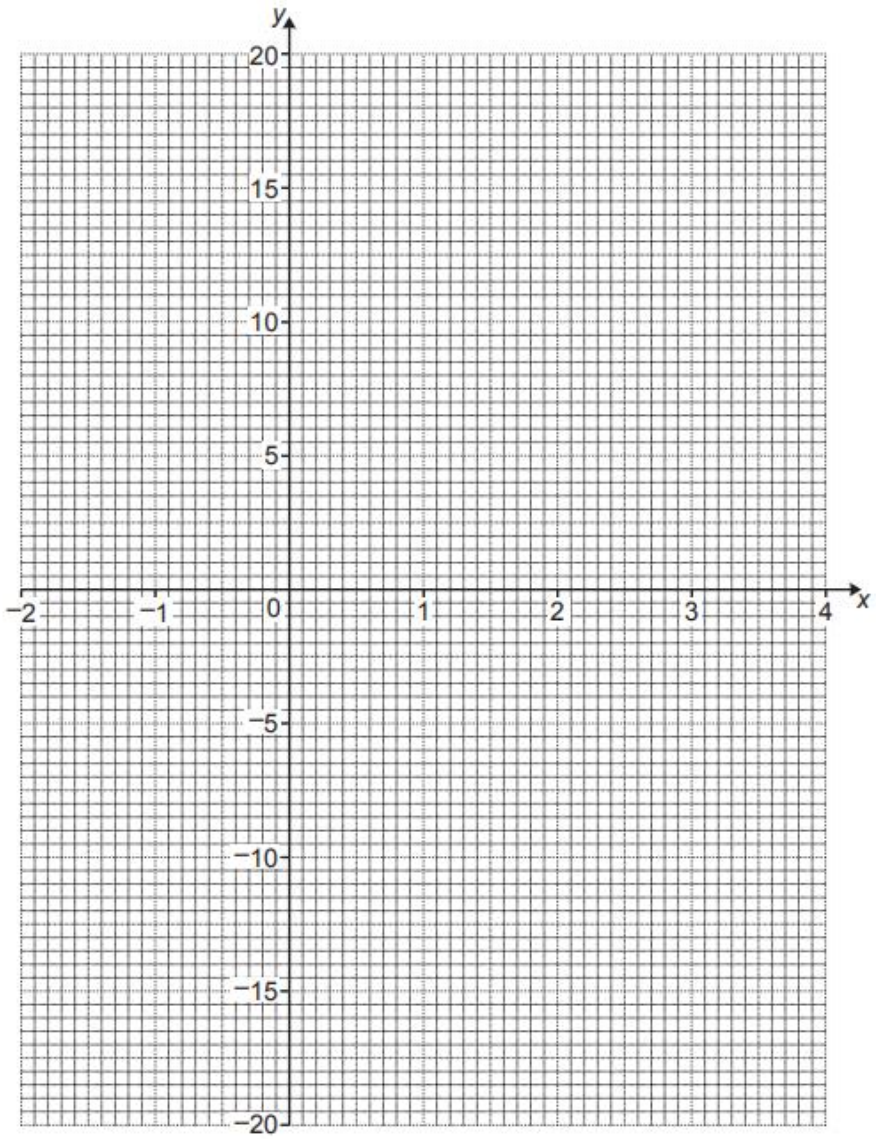
(b) Finley adds 4 apples to bag X. The ratio of apples to bananas is now 11 : 14. How many bananas are in bag X?

Question 8

(a) Complete this table for $y = x^3 - 3x^2$.

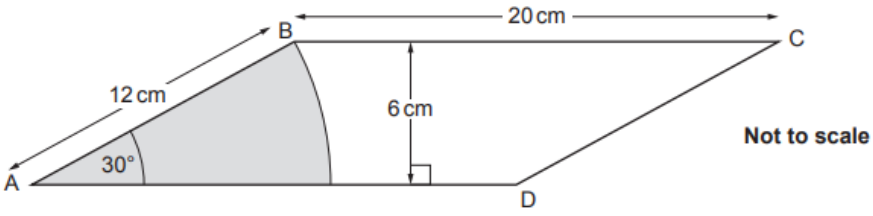
x	-2	-1	0	1	2	3	4
y	-20		0	-2	-4		16

(b) Draw the graph of $y = x^3 - 3x^2$ for values of x from -2 to 4.



(c) Use the graph to solve the equation $x^3 - 3x^2 = 5$.
Give your answer to **1** decimal place.

Question 9



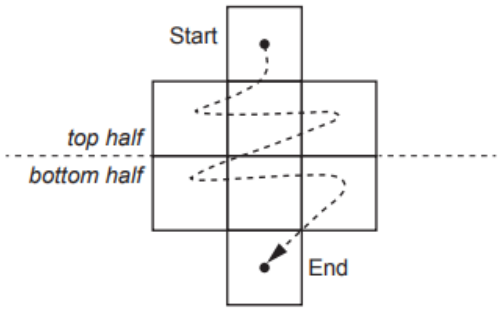
The diagram shows a shaded sector inside a parallelogram. The sector has an angle of 30°.
The parallelogram, ABCD, has length BC = 20 cm and AB = 12 cm.
The perpendicular distance between BC and AD is 6 cm.

(a) Show that the area of the sector is 37.7 cm^2, correct to 3 significant figures.

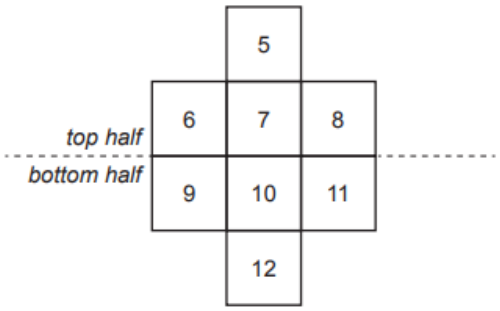
(b) Work out the percentage of the parallelogram that is not shaded.

Question 10

Eight consecutive numbers are written in ascending order in this grid, starting from the top and working left to right.

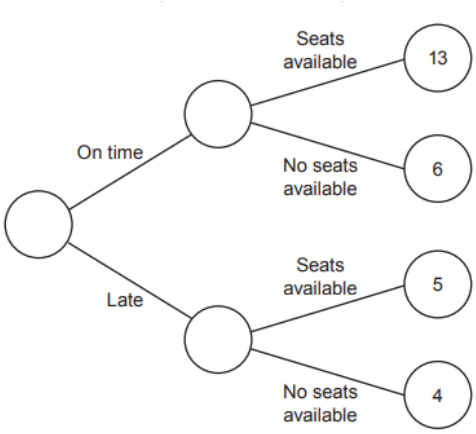


(a) Kareem writes the numbers 5 to 12 in the grid.



(a) Kareem writes the numbers 5 to 12 in the grid. Show that for Kareem's grid, the sum of the numbers in the top half of the grid is 16 less than the sum of the numbers in the bottom half of the grid.

(b) Use algebra to prove that for any set of eight consecutive numbers written in this grid in the same way, the sum of the numbers in the top half of the grid is 16 less than the sum of the numbers in the bottom half of the grid.



Question 11

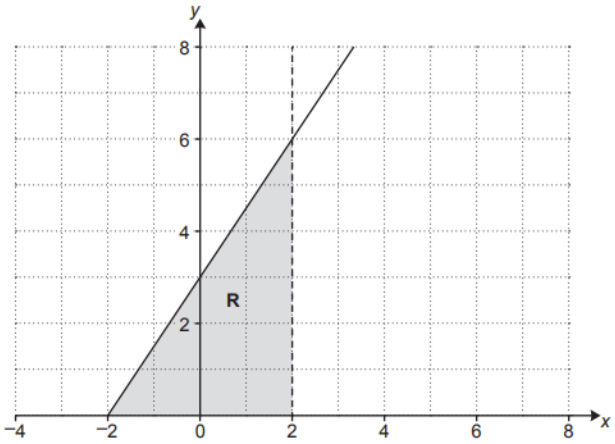
Jack travels to work each day by train. He records whether the train is on time or late and whether there are seats available or not. The results are shown on a frequency tree.

(a) Find the relative frequency of there being no seats available on Jack's train journey.

(b) Jack says: "If the train is late, travellers are less likely to find seats available than if the train was on time." Does Jack's data suggest he is correct? Show how you decide.

Question 12

The region **R** is shown on this grid.



The region **R** is defined by three inequalities.
The first inequality is given below.

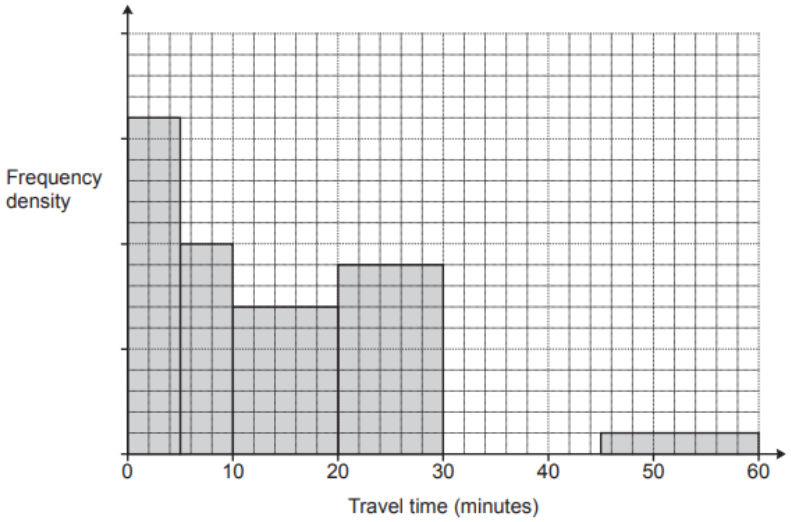
Complete the second inequality and write down the third inequality needed to define region **R**.

$y \geqslant 0$

$2y$ ..... $3x + 6$

.....

[3]



Question 13

A group of students record the time taken to travel to school. All students in the group took less than an hour to travel to school. Some of their results are recorded on this histogram. 16 students took less than 5 minutes to travel to school.

(a) How many students took less than 20 minutes to travel to school?

(b) 9 students took between 30 and 45 minutes to travel to school. Add these students' results to the histogram.

Answer Key

Question 5

(a) Area of regular pentagon:

- Each triangle has base 12 cm and the angle at the centre is 36° (since 360°/10 = 36° for 10 triangles).
- Area of one triangle = $\frac{1}{2} \times 12 \times 12 \times \sin(36°)$ = approximately 42.75 cm^2
- Total area = 10 × 42.75 = 427.5 cm^2
- But for a regular pentagon, using formula: $\frac{5}{4}a^2\cot\left(\frac{\pi}{5}\right)$, where a = 12 cm
- $\cot(\pi/5) \approx 1.37638$
- Area = $\frac{5}{4} \times 144 \times 1.37638 = 247.75$ cm^2 (rounded to 2 decimal places)

(b) Volume = $\frac{1}{3} \times 247.75 \times h = 450$

- $247.75h/3 = 450$
- $h = \frac{450 \times 3}{247.75} = 5.45$ cm (rounded to 2 decimal places)

Question 6

(a) LCM: Take the highest power of each prime: $2^3 \times 3 \times 7^2 = 8 \times 3 \times 49 = 1176$

(b) HCF is 26 = 2 × 13, so k = 13

Question 7

(a) Finley might be correct, or might not be correct. The ratio or fraction does not tell us the actual numbers, only the proportions. If the total number of fruits in each bag is different, the number of apples can be the same or different.

(b) Let original apples = 5x, bananas = 7x. After adding 4 apples: apples = 5x + 4, bananas = 7x. New ratio: (5x + 4)/7x = 11/14 → Cross-multiplied: 14(5x+4) = 11×7x → 70x + 56 = 77x → 77x - 70x = 56 → 7x = 56 → x = 8

- Bananas = 7x = 56

Question 8

(a) The table is for $y = x^3 - 3x^2$:

x	-2	-1	0	1	2	3	4
y	-20	0	-2	-4	0	18	28

(b) (Graph to be drawn; not possible here)

(c) From the graph, the solution to $x^3 - 3x^2 = 5$ is approximately x = 3.7

Question 9

(a) Area of sector = $\frac{30}{360} \times \pi \times 12^2 = \frac{1}{12} \times \pi \times 144 = 37.7$ cm^2 (to 3 significant figures)

(b) Area of parallelogram = base × height = 20 × 6 = 120 cm^2

- Percentage not shaded = $\frac{120-37.7}{120} \times 100 = 68.6$ % (to 1 decimal place)

Question 10

(a) Sum of top half: 5 + 6 + 7 + 8 = 26; bottom half: 9 + 10 + 11 + 12 = 42; 42 - 26 = 16

(b) Let numbers be n, n+1, ..., n+7. Top half: n + (n+1) + (n+2) + (n+3) = 4n + 6. Bottom half: (n+4) + (n+5) + (n+6) + (n+7) = 4n + 22. Difference: (4n+22)-(4n+6)=16.

Question 11

(a) Total journeys = 13+6+5+4 = 28. No seats available = 6+4 = 10. Relative frequency = 10/28 = 0.357 (rounded to 3 decimal places)

(b) On time: seats available = 13, no seats = 6; late: seats available = 5, no seats = 4. On time: 6/(13+6) = 6/19 ≈ 0.316; late: 4/(5+4) = 4/9 ≈ 0.

444. So, Jack is correct because the proportion of no seats is higher when the train is late.

Question 12

Second inequality: $2y \leq 3x + 6$ Third inequality: $x \geq 0$

Question 13

(a) Frequency density for 0–5 mins: height = 3.2, width = 5, area = 16 students. For 5–10 mins: height = 2.4, width = 5, area = 12. For 10–20 mins: height = 1.6, width = 10, area = 16. Total = 16 + 12 + 16 = 44 students.

(b) For 30–45 mins: width = 15, 9 students, frequency density = 9/15 = 0.

6. Add a bar of height 0.6 from 30 to 45 mins.