

E Math (4048/01)

Requirement :	<u>Answer all questions</u>
Total marks :	80
Duration :	2 hour

1. (a) Simplify $3(2x-1)+1$.

Answer [1]

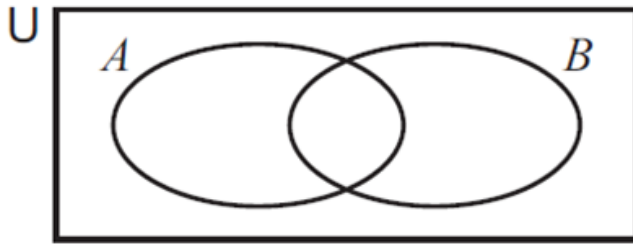
(b) Factorise $6x+18xy$.

Answer [1]

2. Factorise completely $4ax+12by-16ay-3bx$.

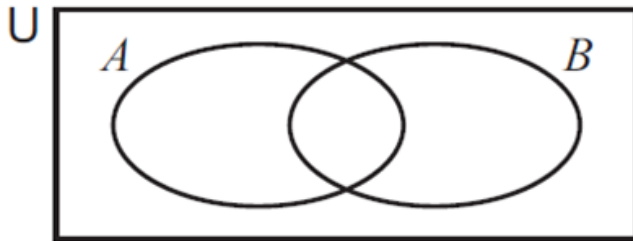
Answer [2]

3. (a) On the Venn diagram, shade the region which represents $A \cup B'$.



[1]

- (b) On the Venn diagram, shade the region which represent $A' \cap B'$.



[1]

4. n is a positive integer.

Show that, for all n , $(5n+1)^2 - (5n-1)^2$ is a multiple of 20.

Answer

[2]

5. Liu has 144 one-centimetre cubes.

He arranges all of the cubes into a cuboid.

The perimeter of the top of the cuboid is 22 cm.

Each side of the cuboid has a length greater than 2 cm.

Find the height of the cuboid.

Answer cm [2]

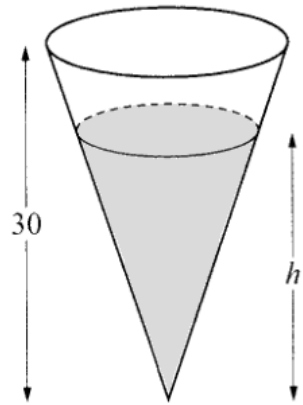
6. The area of triangle ABC is 58.6 cm^2 .

$AB = 18.7 \text{ cm}$ and $BC = 12.8 \text{ cm}$.

Find the two possible sizes of the angle ABC .

Answer or [2]

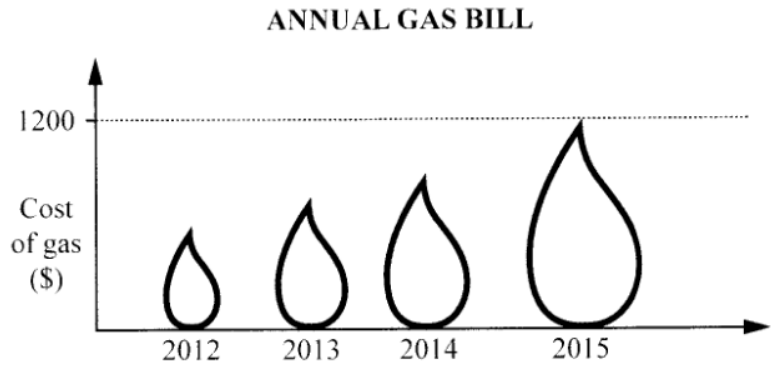
7. The diagram shows a cone of height 30 cm.



The volume of the liquid in the cone is half the volume of the cone.
 Calculate the depth, h centimetres, of the liquid.

Answer $h = \dots\dots\dots$ [2]

8. Anil draws this graph to show his annual gas bill for each of the last four years.



State one aspect of the graph that may be misleading and explain how this may lead to a misinterpretation of the graph.

Answer

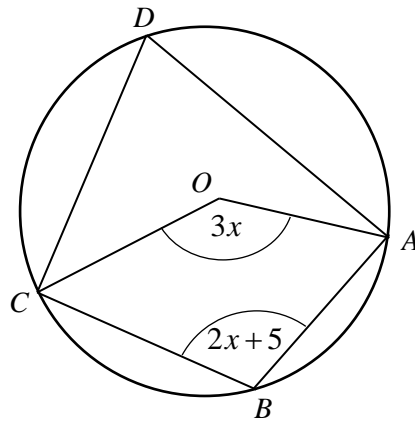
.....

..... [2]

9. Write as a single fraction in its simplest form $\frac{3}{(x-4)^2} - \frac{1}{4-x}$.

Answer [2]

10.



O is the centre of the circle passing through A , B , C and D .
 Angle $AOC = 3x^\circ$ and angle $ABC = (2x + 5)^\circ$.

(a) Find, in terms of x , angle ADC .

Answer [1]

(b) Find x .

Answer $x =$ [2]

11. (a) Express $9 - 8x + x^2$ in the form $p + (x + q)^2$.

Answer [2]

(b) Write down the coordinates of the minimum point of the graph of $y = 9 - 8x + x^2$.

Answer (.....,) [1]

12. In Singapore, Amy pays \$1.65 for one litre of diesel.
On a visit to Hawaii, she paid 4.48 US dollars for one gallon of diesel.

1 US dollar = 1.242 Singapore dollars.

1 gallon = 3.785 litres.

Is diesel cheaper in Singapore or Hawaii?

You must show your calculations.

Answer [3]

13. One day, John used this formula to estimate the air temperature at different heights above sea level.

$$T = 21 - \frac{h}{120},$$

where T is the temperature in degrees Celsius,
and h is the height, in metres, above sea level.

- (a) A light aircraft records the air temperature as 0°C .

Use the formula to estimate the height of the aircraft above sea level.

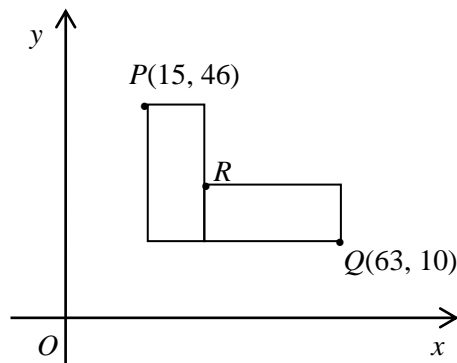
Answer m [1]

- (b) Two jet aircrafts are flying at different heights.
The difference in the temperatures at their two heights is 25°C .

Estimate the difference between the heights of the two aircrafts.

Answer m [2]

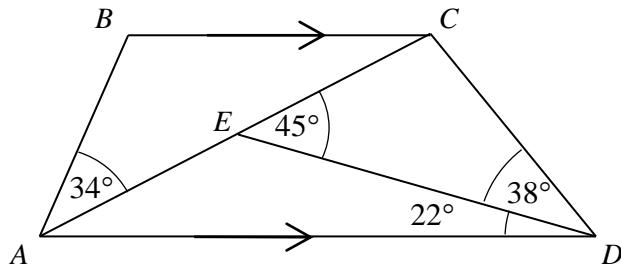
14. The diagram shows two congruent rectangles.
The sides are horizontal and vertical.
Point P has coordinates $(15, 46)$ and Q has coordinates $(63, 10)$.



Find the coordinates of R .

Answer (.....,) [2]

15.



$ABCD$ is a trapezium.

AEC is a straight line.

Angle $BAC = 34^\circ$, angle $DEC = 45^\circ$, angle $CDE = 38^\circ$ and angle $ADE = 22^\circ$.

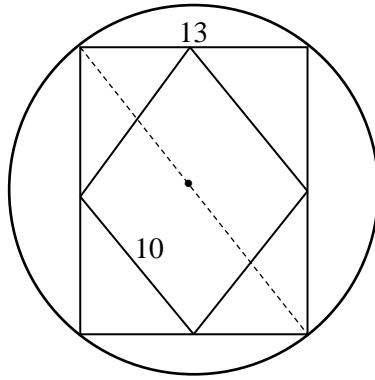
- (a) Calculate the reflex angle ABC .
Give a reason for each step of your working.

Answer reflex angle $ABC = \dots\dots\dots$ [4]

- (b) Explain why a semicircle, with AD as diameter, does not pass through C .

Answer $\dots\dots\dots$
 $\dots\dots\dots$ [1]

16. The diagram shows a rhombus drawn inside a rectangle inside a circle.



The rhombus has sides of length 10 cm.
The length of the shorter side of the rectangle is 13 cm.

- (a) Calculate the circumference of the circle.

Answer cm [2]

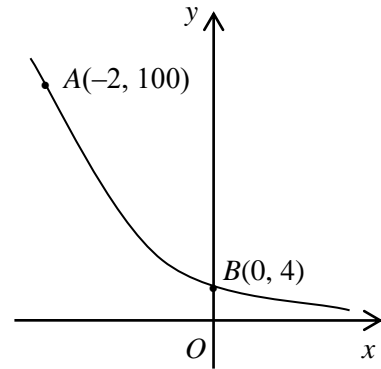
- (a) Calculate the area of the rectangle.

Answer cm² [2]

17. The sketch shows the graph of $y = ka^{-x}$.

The points $A(-2, 100)$ and $B(0, 4)$ lie on the graph.

(a) Find the values of k and a .



Answer $k = \dots\dots\dots$

$a = \dots\dots\dots$ [2]

(b) A straight line is drawn from A to B .
Find the equation of the line AB .

Answer $\dots\dots\dots$ [2]

18. (a) Express 784 as a product of its prime factors.

Answer $\dots\dots\dots$ [2]

(b) Using your answer to part (a), explain why 784 is a perfect square.

Answer $\dots\dots\dots$
 $\dots\dots\dots$ [1]

(c) m and n are both prime numbers.

Find the values of m and n so that $784 \times \frac{m}{n}$ is a perfect cube.

Answer $m = \dots\dots\dots$

$n = \dots\dots\dots$ [1]

19. The table shows information collected by Huma about her driving in 2015.

Total distance driven in 2015	19629 km
Average price paid for petrol	\$2.42 per litre
Average petrol consumption of her car	6.7 litres per 100 km

(a) Calculate the total amount Huma paid for petrol in 2015.

Answer \$ [2]

(b) The total distance driven in 2015 is 35% more than she drove in 2014.

Calculate the total distance she drove in 2014.

Answer km [2]

20. A map of western Europe has a scale of 1 : 2 500 000.

(a) The length of the river Rhine on the map is 49.3 cm.

Calculate the actual length, in kilometres, of the river Rhine.

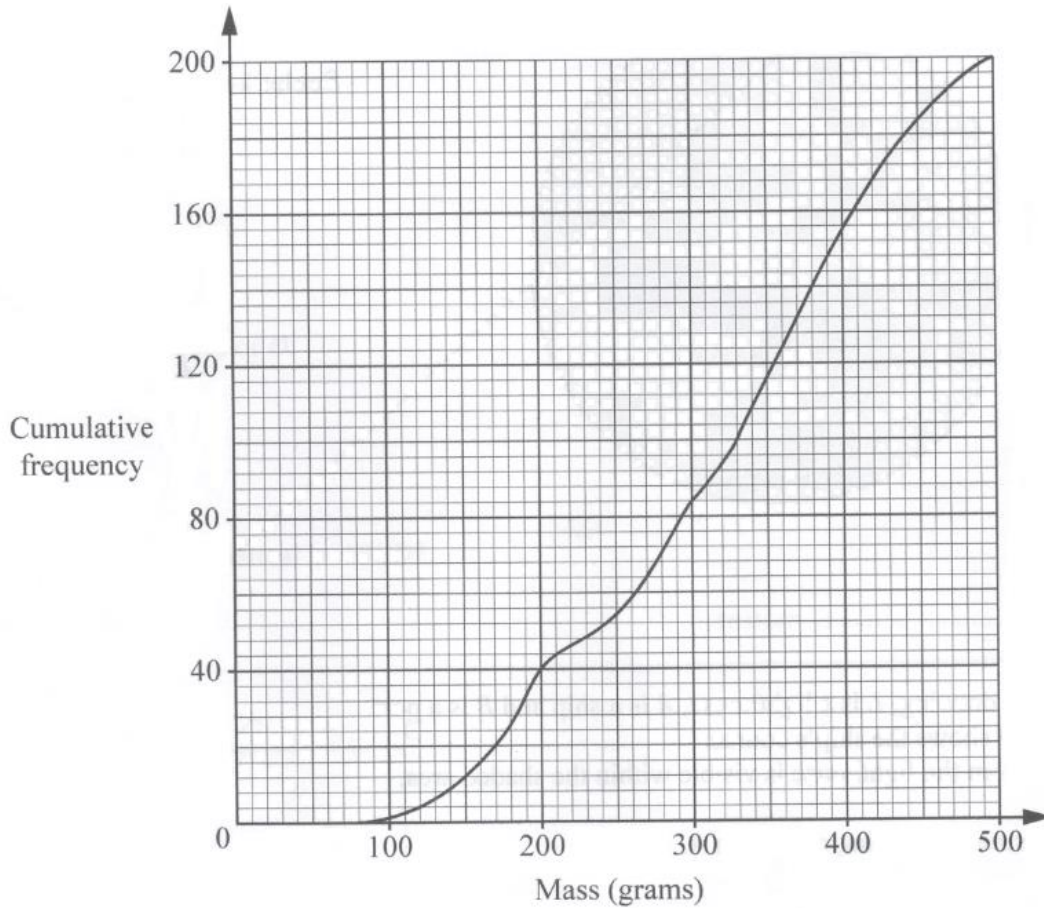
Answer km [2]

(b) The area of Switzerland is 41 285 km².

Calculate the area, in square centimetres, of Switzerland on the map.

Answer cm² [2]

21. Some students were asked to estimate the mass, in grams, of sweets in a jar.



The cumulative frequency diagram shows the results.

The actual mass of the sweets is 300 grams.

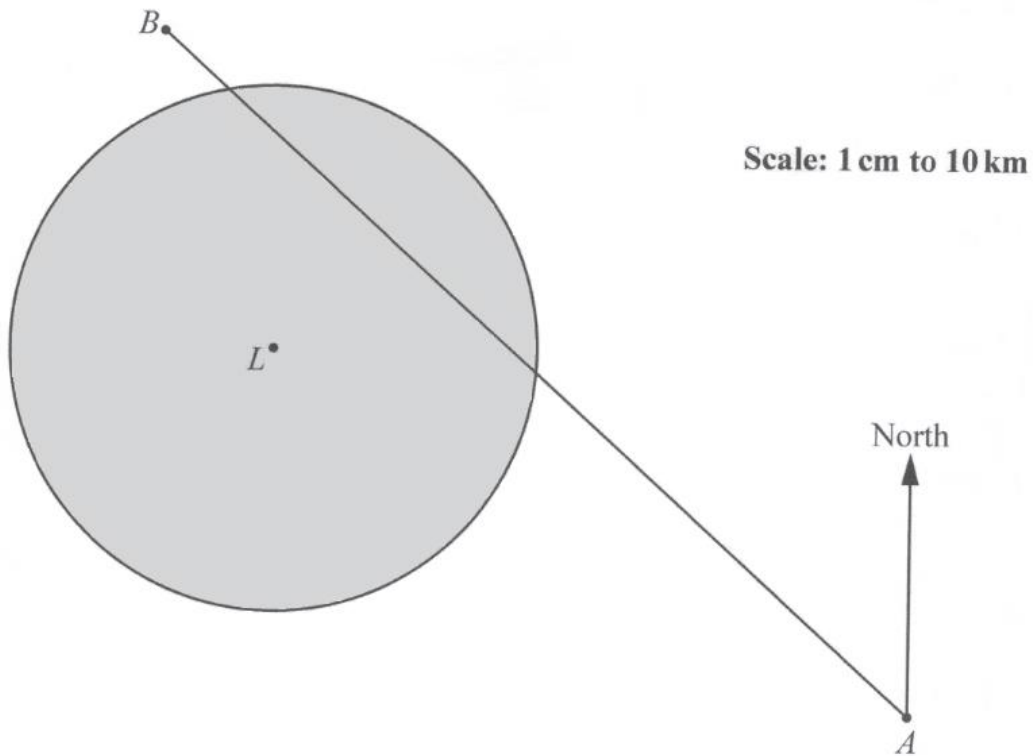
(a) Find the probability that a student, chosen at random, overestimated the mass.

Answer [2]

(b) Find the number of students who gave estimates within 10% of the actual mass.

Answer [2]

22.



In the scale drawing, L is a lighthouse, A is a ship and B is a port.
 The line AB shows the ship's course.
 The light from the lighthouse is visible within the shaded area.

(a) Measure the bearing of B from A .

Answer [1]

(b) The ship sails at an average speed of 35 km/h.

Find the length of time for which the light is visible from the ship.
 Give your answer in hours and minutes, correct to the nearest minute.

Answer hours minutes [3]

23. $\vec{AB} = \begin{pmatrix} -8 \\ 15 \end{pmatrix}$.

(a) Find $|\vec{AB}|$.

Answer [1]

(b) C is the point $(4, 20)$.
 $\vec{DC} = 2\vec{AB}$.

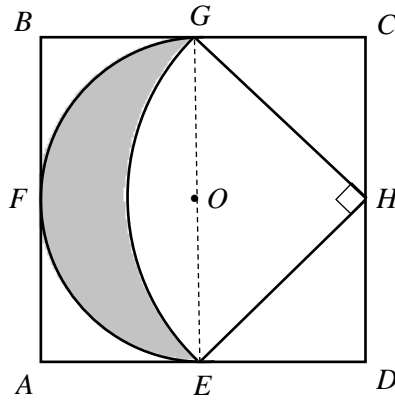
Find the coordinates of D .

Answer (.....,) [2]

(c) What type of quadrilateral is $ABCD$?

Answer [1]

24.



$ABCD$ is a square, centre O .

$BC = 2r$.

E, F, G and H are the midpoints of the sides of the square.

EFG is a semi-circular arc, centre O .

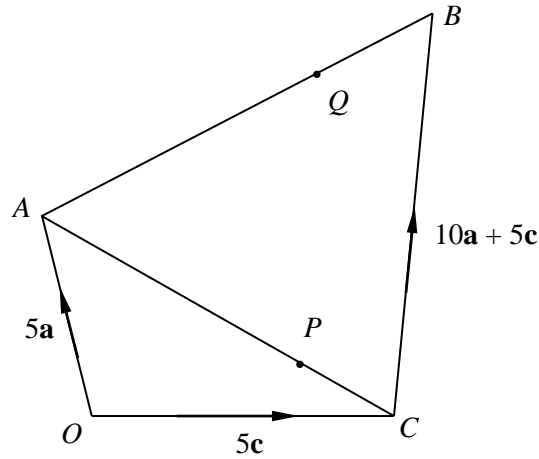
The other arc EG has centre H .

$HG = \sqrt{2}r$.

What fraction of the square $ABCD$ is **not** shaded?

Answer [5]

25.



$OABC$ is a quadrilateral.

$\vec{OA} = 5\mathbf{a}$, $\vec{OC} = 5\mathbf{c}$, $\vec{CB} = 10\mathbf{a} + 5\mathbf{c}$ and $\vec{AQ} = 4\mathbf{a} + 8\mathbf{c}$.

$AP : PC = 4 : 1$.

- (a) Write each of the following in terms of \mathbf{a} and \mathbf{c} .
Give your answers in their simplest form.

(i) \vec{OP} .

Answer [2]

(ii) \vec{PQ} .

Answer [2]

- (b) (i) Explain why PQ is parallel to CB .

Answer

..... [1]

(ii) Find the ratio $CB : PQ$.

Answer : [1]