NAME : _____

CLASS : _____

DATE : _____

FINAL EXAM

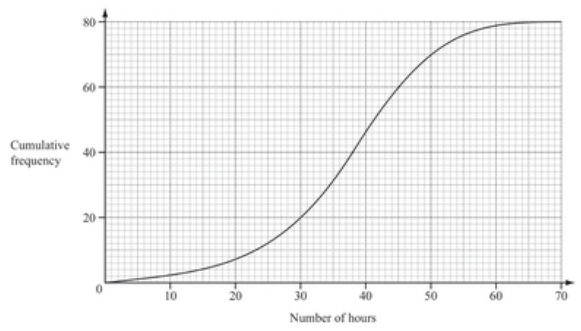
20 Questions

1. (a) From the beginning to the end of the year 2018, the population of Geometry City increased by 5%. The population was 549 780 by the end of the year. Calculate its population at the start of the year.
[3 marks]

(b) Tania sells her land for $12 000.She invests the money for 3 years at 6% per year compound interest. Calculate the total amount of money she will have at the end of the 3 years. Give your answer to the nearest dollar.
[3 marks]

2. (a) The first four terms of a sequence are 12, 7, 2, -3. Write down an expression for the nth term of this sequence.
[2 marks]

(b) The quantity p varies inversely as the square of $(q+2)$. $p=5$ when $q=3$. Find p when $q=8$.
[3 marks]

3. 

The number of hours that a group of 80 students spent using a computer in a week was recorded.The results were shown by the cumulative frequency curve.
Use the graph and write down the:(a) median, Q1 and IQR; [4 marks]
(b) the number of students who spent more than 40 hours but not more than 50 hours using a computer in a week.[1 mark]

4. Find the coordinates of the stationary points on the curve of $y = x^3 - 3x^2 - 9x + 6$ and determine whether it is maximum or a minimum.
[5 marks]

5. (a) Write the four values in order, smallest first.

$$\frac{1}{1000}\ ,\ \cos\left(89.9^\circ\right)\ ,\ 0.11\%\ ,\ 400^{-1}$$

[2 marks]

(b) The length of a road is 380 metres, correct to the nearest 10 metres. Maria runs along this road at an average speed of 3.9 m/s, to the nearest 1 decimal place.Calculate the greatest possible time (in seconds) taken by Maria.
[3 marks]

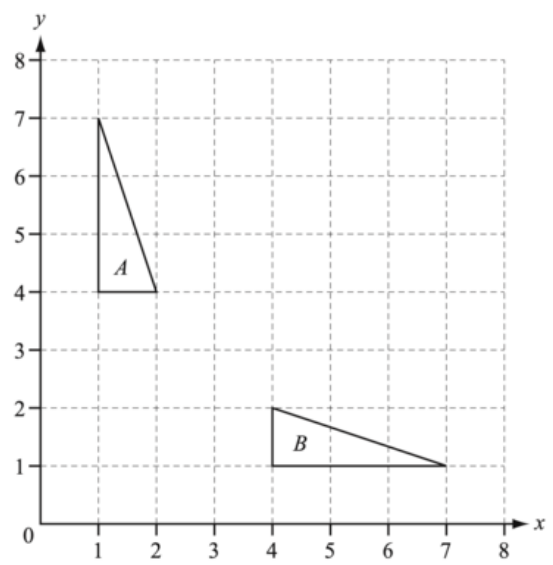
6. Solve the equations:

(a) $x^2 - 5x - 6 = 0$ by factorisation

(b) $x^2 - 102x + 460 = 0,$ correct to 2 decimal places.

[6 marks]

7.



(a) Describe fully the single transformation which maps triangle A onto triangle B.

[2 marks]

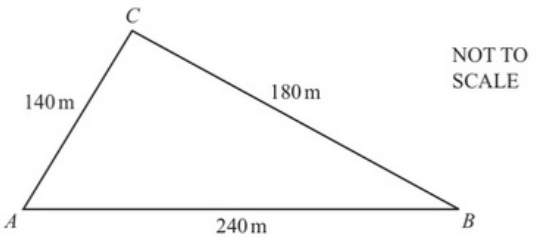
(b) Write down the coordinates of the image of triangle A after rotation by 90° clockwise about the point (4, 4).

[2 marks]

(c) Write down the coordinates of the image of triangle B after enlargement with scale factor of 2 and centre (5,0).

[2 marks]

8.



The boundary of a park is in the shape of a triangle ABC.

$AB = 240$ m, $BC = 180$ m and $CA = 140$ m.

(a) Show completely and clearly that $\angle ACB = 96.4^\circ$.

[3 marks]

(b) Find the measure of $\angle ABC$.

[3 marks]

(c) Ivy computed for the area of the park with the following work and said that the area is 16 695 sq. m. (to the nearest sq. m.).

$$Area = \frac{1}{2} \times 140 \times 240\ x\ \sin(96.4^\circ)$$

$$Area = 16,\ 695$$

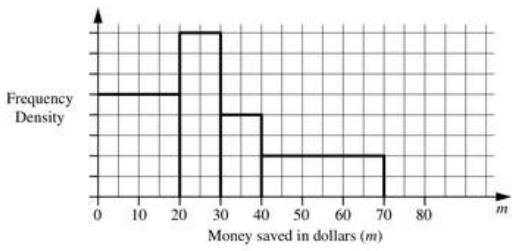
Do you agree or not? Support/Explain your answer clearly.

[2 marks]

(d) If B is east of A, write down the bearing of C from A.

[2 marks]

9.



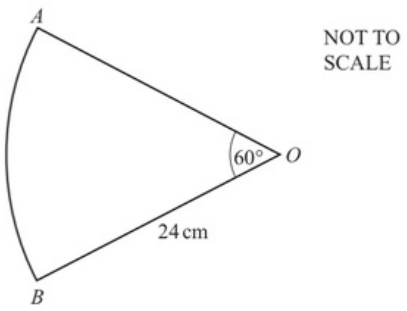
Money saved ($m)	$0 < m \leq 20$	$20 < m \leq 30$	$30 < m \leq 40$	$40 < m \leq 70$
Frequency	25	p	q	r

A group of children were asked how much money they had saved. The histogram and table show the results.

(a) Find the values of p, q and r.
[3 marks]

(b) Calculate the estimated mean amount of money the children had.
[3 marks]

10.

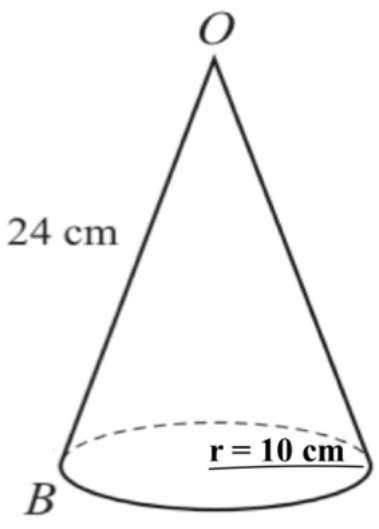


The sector of a circle, centre O, radius 24 cm, has $\angle AOB = 60^\circ$. Calculate the

(a) length of arc AB [2 marks]

(b) area of the sector AOB. [2 marks]

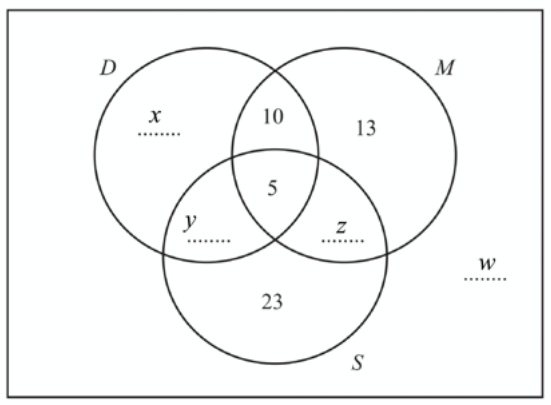
11.



Calculate the volume of the cone with radius of 10 cm and a slant height of 24 cm.
[4 marks]

(Volume of cone = $\frac{1}{3}\pi r^2 h$).

12.



90 students are asked which school clubs they attend.

D = {students who attend drama club}

M = {students who attend music club}

S = {students who attend sports club}

39 students attend music club.

26 students attend exactly two clubs

35 students attend drama club.

(a) Find the values of w, x, y, and z. [3 marks]

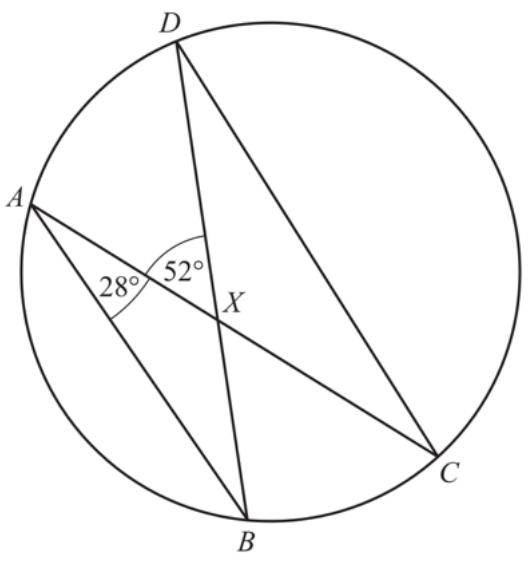
(b) How many students attend all clubs? [1 mark]

(c) How many students attend one club only? [1 mark]

(d) Find n($A \cap B$). [1 mark]

(e) Shade the region of the set $D \cap M \cap S'$. [1 mark]

13.



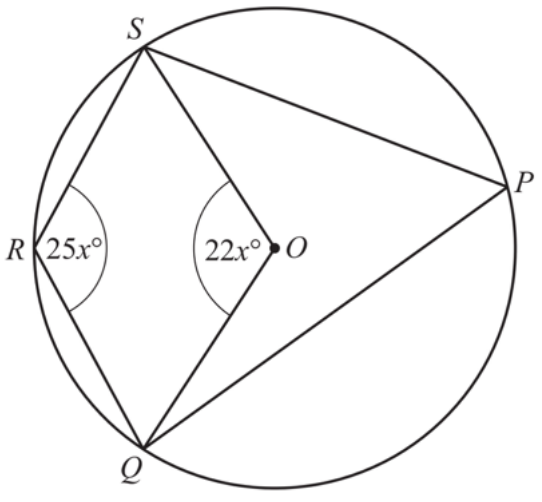
A, B, C and D lie on a circle.

The chords AC and BD intersect at X.

Given that $\angle BAC = 28^\circ$ and $\angle AXD = 52^\circ$, calculate $\angle XCD$.

[3 marks]

14.



$PQRS$ is a cyclic quadrilateral in the circle, centre O.

It is given that $\angle QOS = 22x^\circ$ and $\angle QRS = 25x^\circ$.

Find the value of x and the measure of the reflex angle $\angle SOQ$.

[3 marks]

15. Given the functions:

$$f(x) = 2x - 5 \text{ and } g(x) = \frac{4}{x-2}$$

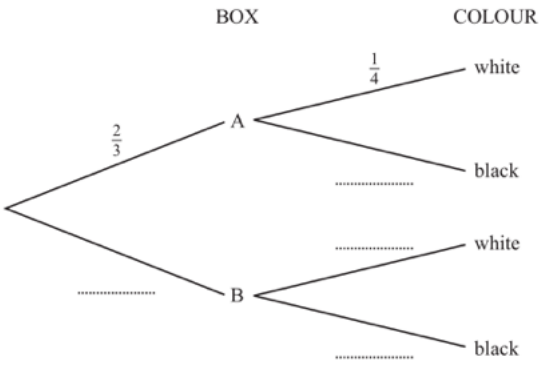
Find, in simplest form and/or in single fraction,

(a) $f(x+1)$ [2 marks]

(b) $gf(x)$ [2 marks]

(e) $g^{-1}(x)$ [3 marks]

16.



Box A contains 3 black balls and 1 white ball.

Box B contains 3 black balls and 2 white balls.

(a) Adel chooses a box and then chooses a ball from this box at random.

The probability that he chooses box A is $\frac{2}{3}$.

Calculate the probability that Adel chooses a black ball.

[3 marks]

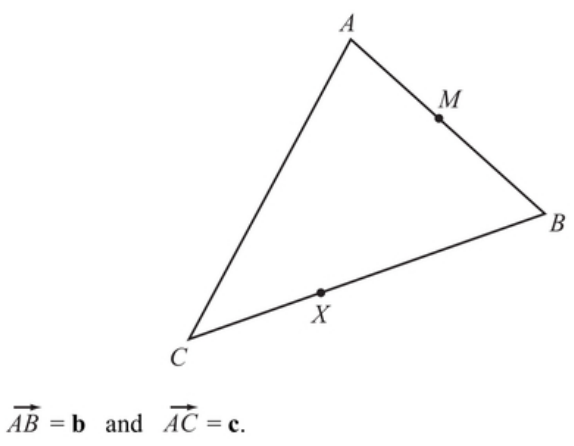
(b) Tatiana chooses a box and then chooses 2 balls from this box at random, without replacement.

The probability that she chooses box A is $\frac{2}{3}$.

Find the probability that Tatiana chooses two white balls.

[3 marks]

17.



Given that $\overrightarrow{AB}$ = b and $\overrightarrow{AC}$ = c.

(i) Find $\overrightarrow{CB}$ in terms of b and c. [1 mark]

(ii) X divides CB in the ratio 1:3.

M is the midpoint of AB.

Find $\overrightarrow{MX}$ in terms of vectors b and c, in simplest form.

[3 marks]

18. Find the values of x and y in the simultaneous equations below:

$x + 2y - 18 = 0$

$3x - 4y - 4 = 0.$

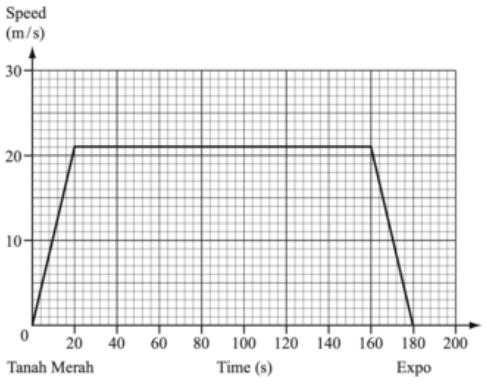
[3 marks]

19. The line $y + 2x = k$ is tangent to the curve

$y = x^2 - 6x + 14.$

Find the value of k.

[4 marks]

20. 

The graph shows the train journey between Tanah Merah and Expo in Singapore. Work out the average speed of the train for this journey.

[3 marks]