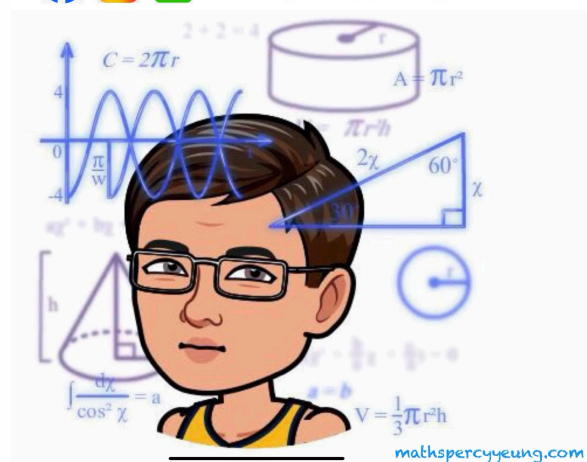# MSC F2 2024-25 Final P1

1.   (a) Factorize $4a^2 - 25b^2$.

   (b) Hence, factorize $16a^4 - 625b^4$.

   (4 marks)

2.   If a and b are non-zero constants such that $2 - x(ax + 4) \equiv -3x^2 - 4x + 5b$, find $a:b$.   (3 marks)

3.   Make k the subject of the formula $h = \dfrac{2}{k} + \dfrac{3}{j}$.   **(3 marks)**

4. The cumulative frequency polygon below shows the scores of S2A students in a Chinese Language test.

**Scores of S2A students
in a Chinese Language test**
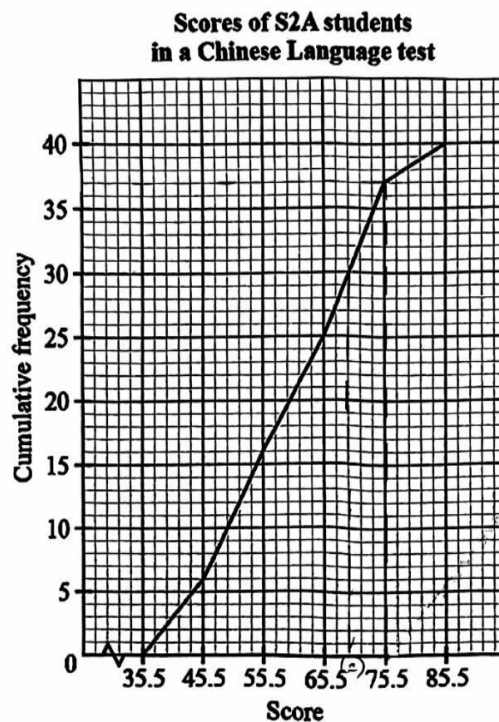
(a) How many students are there in S2A?

(b) Find the number of students who score 75.5 or above.

(c) If the scores of the top 10 students are x or above, find the value of x.
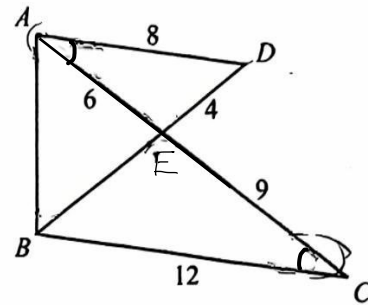
(3 marks)

5.   In the figure, AC and BD intersect at E. It is given that $\angle DAE = \angle BCE$.

   (a) Write down a pair of similar triangles and provide a proof.

   (b) Prove that $\angle EBA = \angle EAB$.

(5 marks)

6. The graph of the equation $3x - 2y - 12 = 0$ intersects the x-axis and the y-axis at points $A(a, 0)$ and $B(0, b)$ respectively.

   (a) Find the values of a and b.

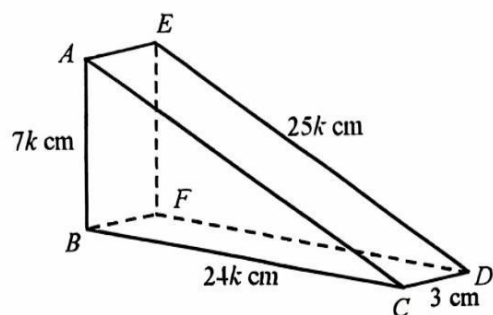   (b) Hence, find the area of the triangle bounded by the graph, x-axis and y-axis.

   (5 marks)

7. Simplify and rationalize $\dfrac{\sqrt{48} - 3\sqrt{8}}{\sqrt{18}}$.

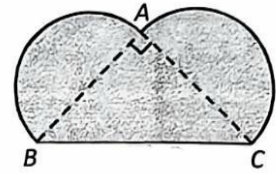   (3 marks)

8. In the figure, *ABCDEF* is a triangular prism.

(a) Show that $\triangle ABC$ is a right-angled triangle.

(b) If the volume of the prism is 4032 cm^3, find the value of k.

(4 marks)

9. The figure below is formed by two semi-circles and a right-angled triangle ABC. It is given that $\overset{\frown}{AB} = 2\pi$ cm and $BC = 5.8$ cm. Find the area of the figure. (5 marks)
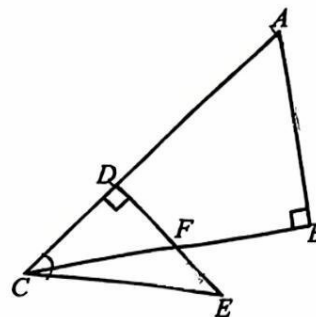
10. In the figure, *ADC*, *BFC* and *DFE* are straight lines. It is given that $AD = 9$ cm, $AB = CE = 8$ cm and $\angle E = 40°$.

(a) Find $\angle ACB$.

(b) Find *CF*.

(Give your answers correct to 1 decimal place.)

(5 marks)

Section B (40 marks)

11. Jane and Kay cycle from town A to town B along a road. They start to cycle at 8:45 am. Jane cycles at a speed of 6 m/s and Kay cycles at a speed of 5 m/s. Jane arrives at town B earlier than Kay by 4 minutes.

(a) Find the distance between town A and town B

(b) At what time does Kay arrive at town B?

(c) Suppose David starts to cycle from town B to town A along the same road at 8:45 am and he cycles at a speed of 4 m s. At what time will Jane and David meet? Explain your answer.

(12 marks)

12. (a) Solve $\begin{cases} \dfrac{x}{2} - 2y - 4 = 0 \\ \dfrac{x}{4} - 5y - 14 = 0 \end{cases}$ by an algebraic method.

(b) Using the result of (a), solve $\begin{cases} (a+3) - 4(b-2) - 8 = 0 \\ (a+3) - 20(b-2) - 56 = 0 \end{cases}$.

(8 marks)

13. The figure shows two right circular cylindrical containers A and B. The base radii of containers A and B are 4 cm and 2 cm respectively. Originally, container A contains water to a depth of 2 cm while container B is empty.

4 cm   2 cm

container A container B
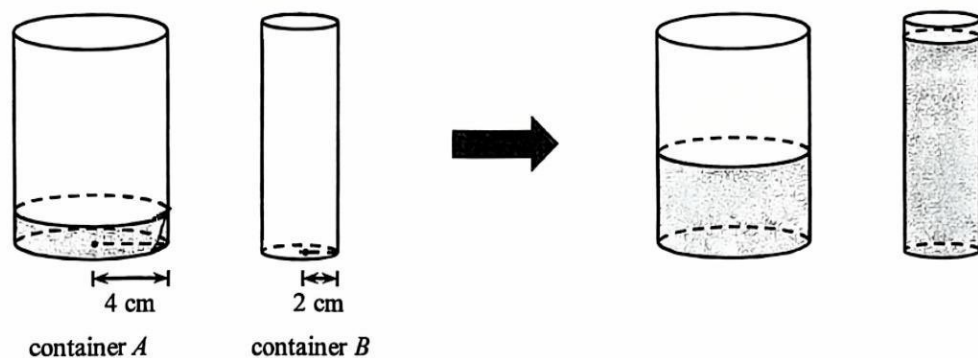
Afterwards, equal volume of 48π cm^3 of water is poured into each of the containers A and B and no water overflows.

(a) Find the depths of water in containers A and B respectively.

(b) Someone claims that the area of the wet surface of container A is larger than that of container B. Do you agree? Explain your answer.

(8 marks)

(Answers of Question 13)

14. The figure shows the uniform cross section of the inner structure of a tunnel of length 1400 m in the shape of part of a right circular cylinder. O is the centre of sector OPQ of radius 9 m. $OM \perp PQ$ and $PQ = 12$ m.

(a) Find reflex $\angle POQ$.

(b) Find the inner curved surface area of the tunnel.

(c) If the cost of digging the tunnel is $180/\,m^3$, find the total cost of digging the tunnel.

(12 marks)