St. Stephen's Girls' College
Final Examination 2021-2022

Form 2   **LL, SCHL, TYL, CYN**
145 students   **MATHEMATICS**
Paper I
Time Allowed: 1 hour 30 minutes

Class: _____   Class No.: _____   Division: _____   Name: _____

Instructions:

- *Attempt **ALL** questions.*

- *Write your answers in the spaces provided in this **Question-Answer Paper**.*

- ***ALL** working must be clearly shown.*

- *The diagrams in this paper are not necessarily drawn to scale.*

- *This paper carries 100 marks.*

- *Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.*

1. It is given that $Px(x-2)+x^2 \equiv x(3x+Q)-10x$, where P and Q are constants. Find the values of P and Q.   (4 marks)

2. (a) Factorize $48x^2 -147y^2$.   (2 marks)
    (b) Factorize $8xz-14yz$.   (1 mark)
    (c) Using the results of (a) and (b), factorize $48x^2 -147y^2 -8xz+14yz$.   (2 marks)

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3. If $a:c=2:3$ and $b:c=5:4$, find
   (a) $a:b$, (2 marks)
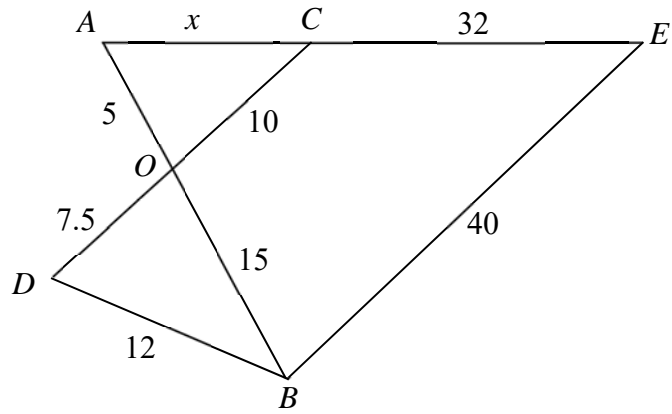   (b) $(2a+b):(4a-b)$. (3 marks)

4. Consider the formula $\dfrac{2x-1}{x}=\dfrac{3-y}{2y}$.
   (a) Make y the subject of the formula. (4 marks)
   (b) It is given that $x=2P$. Using the result of (a), express y in terms of P. (2 marks)

5.   Simplify the following.

   (a) $\dfrac{ab^2}{6a^2 - 12ab + 6b^2} \div \dfrac{b}{3b - 3a}$ (4 marks)

   (b) $\dfrac{x+3}{x-3} - \dfrac{x+1}{x-1}$ (4 marks)

6.   The length of a square mat is measured to be 850 mm, correct to the nearest 2 mm.
      (a) Write down the maximum absolute error of the measurement.   (1 mark)
      (b) (i)   Find the lower limit of the actual area of the mat in cm^2.   (3 marks)
           (ii) Find the upper limit of the actual area of the mat in cm^2.   (3 marks)
   (iii) Find the range of the actual area of the mat.   (1 mark)

7.   (a)   Clara weighs a parcel on an electronic balance and the result is 6.0 kg, correct to the nearest 0.5 kg.
          (i)   Write down the maximum absolute error of the measurement. (1 mark)
          (ii)   Find the percentage error of the measurement. (*Give the answer correct to 3 significant figures.*) (2 marks)
     (b)   Tom weighs another parcel on another electronic balance and the result is 17 kg, correct to the nearest 1 kg. Find the percentage error of the measurement. (*Give the answer correct to 3 significant figures.*) (2 marks)
     (c)   Clara thinks the degree of accuracy of her measurement is higher than that of Tom's measurement. Do you agree? Explain your answer. (1 mark)

8. In the figure, *ABD* and *ACE* are straight lines. It is given that *BC* // *DE*.
   (a) Prove that $\triangle ABC \sim \triangle ADE$. (3 marks)
   (b) Find *y*. (3 marks)

9.   In the figure, *AB* and *CD* intersect at *O*. *ACE* is a straight line.

(a)   Prove that $\triangle AOC \sim \triangle DOB$.   (3 marks)

(b)   Find *x*.   (2 marks)

(c)   Is $\triangle AOC$ similar to $\triangle ABE$? Explain your answer.   (3 marks)

10. (a) (i) Simplify $\sqrt{8}$.   (1 mark)

     (ii) Rationalize the denominator of $\dfrac{1}{\sqrt{8}}$.   (2 marks)

  (b) Hence, simplify $(\dfrac{1}{\sqrt{8}} + \dfrac{1}{\sqrt{27}}) \times \sqrt{6}$.   (3 marks)

11. In the figure, a right circular cylindrical glass container has a uniform thickness of 5 mm (including the base). Its outer radius is 4 cm and its height is 12 cm.
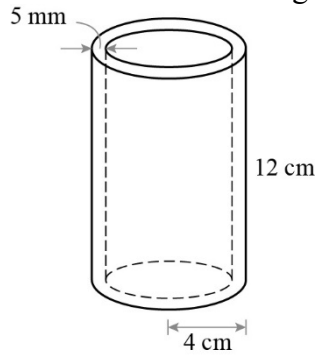
(a) Find the capacity of the container.   (2 marks)
(b) Find the volume of glass required for making the container.   (2 marks)
(c) The cost of glass is \$0.1/cm^3. How much is the glass required to make 400 such containers?   (2 marks)
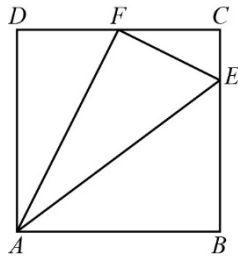
 (*Give the answers correct to 3 significant figures.*)

12. In the figure, *BCD* is a straight line. It is given that $AB \perp BD$, $AC = 10$ cm, $CD = 12$ cm and $\angle ACB = 42°$.
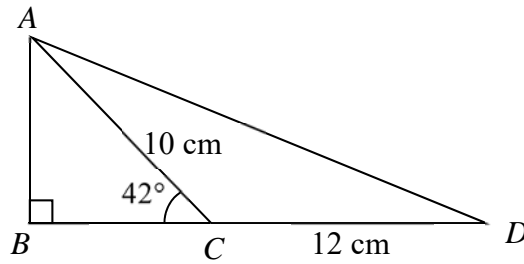

(a) Find *BC*. (2 marks)

(b) Find $\angle CAD$. (4 marks)

(*Give your answers correct to 3 significant figures.*)

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13. In the figure, *ABCD* is a square. *F* is the mid-point of *CD*. *E* is a point on *BC* such that $CE = \dfrac{1}{4}BC$.

(a)   (i)   If *BC* = *a*, express AF^2 in terms of *a*.   (2 marks)
      (ii) Hence, prove that $\triangle AEF$ is a right-angled triangle.   (5 marks)
(b)   If the length of each side of square *ABCD* is 4 cm, find the area of $\triangle AEF$.   (2 marks)

14. In the figure, O is the centre of sector AOB and C is the mid-point of AB. It is given that the perimeter of the figure is $(18+30\pi)$ cm. $\triangle ABO$ is an equilateral triangle and $OC \perp AB$.
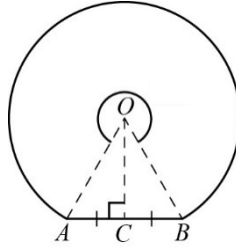
(a) Find reflex $\angle AOB$. Hence, find the length of OA. (3 marks)
(b) Find the area of the figure. (*Give your answer correct to 3 significant figures.*)
(5 marks)

15. In the figure, a wire is bent into a right-angled triangle *ABC*, where $AC \perp CB$, $BC = 20$ cm and $\angle BAC = 40°$.

(a) Find the length of the wire. (4 marks)

(b) John bends the same wire into an equilateral triangle. He claims that the area of the new triangle formed is less than that of $\triangle ABC$. Do you agree? Explain your answer. (5 marks)

(*Give your answers correct to 3 significant figures.*)

End of paper

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