

Name: \_\_\_\_\_

IC No.: \_\_\_\_\_

Seat No: \_\_\_\_\_

**BCA ACADEMY**  
**SCHOOL OF BUILDING & DEVELOPMENT**  
**SINGAPORE**

**MATHEMATICS SCREENING TEST**

**1.5 HOURS**

**Instructions to candidates**

1. Do **not** turn over this page until you are told to do so.
2. Check that you have the correct exam paper, number of pages and questions.
3. This paper consists of **TEN (10)** questions (100 marks). Answer **ALL** questions
4. Write your **Name, IC NO. and Seat No.** on this cover page.
5. All answers are to be written in **THIS** booklet.
6. Do **NOT** tear out any page. This booklet is the property of BCA Academy and **must not be removed** from the test centre.
7. All mobile phones and electronic equipment are to be switched off.
8. Candidates are to bring their own non-programmable scientific calculator.
  - Unless otherwise stated, leave your answers in 3 significant figures.
  - Unless the questions require the answers in term of  $\pi$ , the calculator value for  $\pi = \mathbf{3.142}$  should be used.
  - If working is needed for any question, it must be shown with the answer. Omission of essential working will result in loss of marks.

For Official Use:	Test Centre:	Test Date:	Marks( /100):
	Marker:	Checker:	

1. Express the following as a single fraction in its simplest form

(a)  $\frac{m-3}{3} + \frac{7m}{12}$ , (3 marks)

(b)  $\frac{3}{p} + \frac{7n}{q}$ , (3 marks)

(c)  $\frac{4x+6}{x^2-25} + \frac{3}{5-x}$ . (4 marks)

2. Solve the following equations

(a)  $3(q-2) = 4$ , (2 marks)

(b)  $(2y-3)(y+1) = -4(2y-3)$ . (3 marks)

(c) It is given that  $y$  is directly proportional to  $\frac{1}{2x-1}$  and when  $x = 3$ ,  $y = 2$ .

Find

(i) the equation relating  $y$  and  $x$ , (3 marks)

(ii) the value of  $x$  when  $y = -4$ . (2 marks)

3. Given that  $6\left(\sqrt{\frac{h+1}{k}}\right) = r$ ,

(a) make  $h$  the subject of the formula. (5 marks)

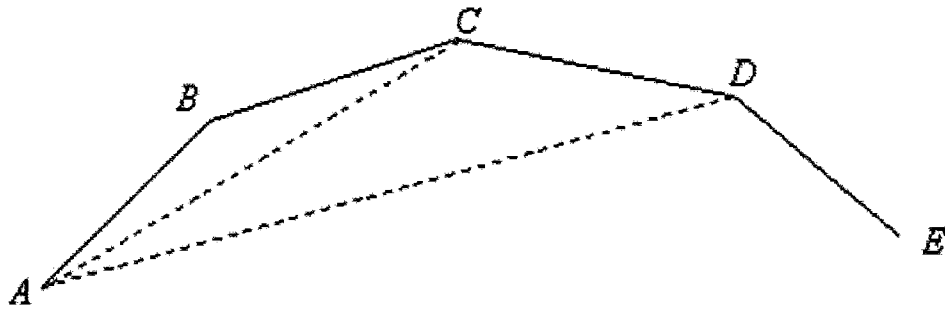
(b) find the value of  $\frac{k}{1+h}$  if  $r = 3$ . (5 marks)

- 4.(a) By completing the square, express  $-x^2 + 8x + 15$  in the form of  $-(x + a)^2 + b$  and hence solve  $-x^2 + 8x + 15 = 0$ . (5 marks)
- (b) A small cylinder is geometrically similar to a large one. The height of the small cylinder is 8 cm. The height of the large cylinder is 20 cm.
- (i) The small cylinder has a circumference of 24 cm. Find the circumference of the large cylinder. (1 mark)
- (ii) Find the ratio of the volume of the small cylinder to that of the large cylinder. (2 marks)
- (ii) Both cylinders are filled completely with sand. The mass of the sand in the small cylinder is 250 g. Find the mass of the sand in the large cylinder. (2 marks)

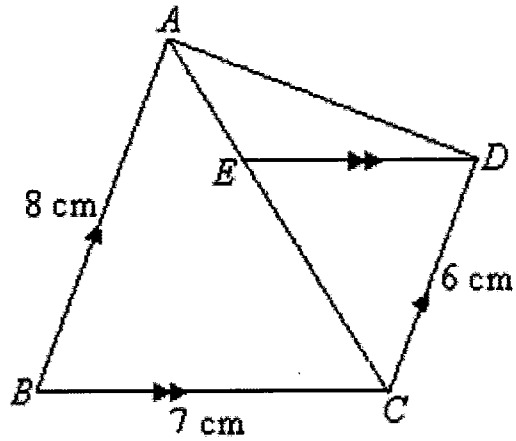
5.  $AB$ ,  $BC$ ,  $CD$  and  $DE$  are adjacent sides of a regular polygon. Given that the exterior angle of the polygon is  $24^\circ$ , calculate

(a) the number of sides of the polygon, (5 marks)

(b)  $\angle BAC$ . (5 marks)



6.



- (a) Explain with reasons, why triangle  $ABC$  is similar to triangle  $CDE$ . (3 marks)
- (b) Find
- (i) the length of  $DE$ , (3 marks)
  - (ii) the ratio of  $\frac{\text{area of } \triangle ABC}{\text{area of } \triangle CDE}$ . (4 marks)

7. Given the points  $A(4, 2)$  and  $B(-4, -6)$ , find
- (a) the equation of the line  $AB$ , (3 marks)
  - (b) the value of  $k$  if the point  $\left(k, -2\frac{1}{2}\right)$  lies on the line  $AB$ , (3 marks)
  - (c) the length of  $AB$ , (2 marks)
  - (d) the value of  $a$  if the line  $3y = 2ax + 6$  is parallel to the  $AB$ . (2 marks)



8. Solve the equations

(a)  $e^{2x} - 3e^{x+1} = 0$ , giving your answer to 2 decimal places. (5 marks)

(b)  $\log_2(5 - y) + \log_2(3 + y) = 3 + \log_2(1 + y)$  (5 marks)

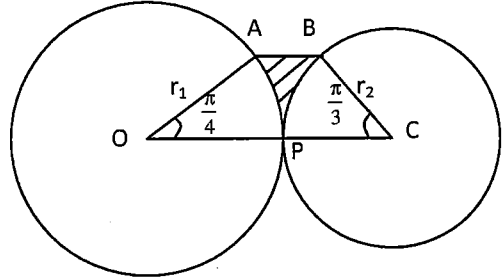
9. (a) Solve the equation  $3\cot x - 2\sin x = 0$  for  $-180^\circ \leq x \leq 180^\circ$  (5 marks)
- (b) Find the range of values of  $m$  for which the line  $y = mx + 4$  does not meet the curve  $y = 3 - 4x - x^2$ . (5 marks)

10. The figure below shows two circles, centres O and C, radii  $r_1$  cm and  $r_2$  cm which touches externally at P. Given that  $\angle AOP = \frac{\pi}{4}$  radians,  $\angle BCP = \frac{\pi}{3}$  radians and AB is parallel to OPC,

(a) show that  $\frac{r_1}{r_2} = \frac{1}{2}\sqrt{6}$ .

Given further that  $r_1 = 6$ ,

- (b) find the area and perimeter of the shaded region.



(10 marks)

**END OF PAPER**

