

Candidate's Name: Mr/Ms \_\_\_\_\_

Identity no: \_\_\_\_\_

Seat no: \_\_\_\_\_

# BCA ACADEMY

## SCHOOL OF BUILDING & DEVELOPMENT SINGAPORE

### MATHEMATICS SCREENING TEST (SET 2)

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 test paper, number of pages and questions.
3. This paper consists of Fifteen (15) questions (70 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 test paper 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 answer in 3 significant figures.
  - Unless the questions require the answer in term of  $\pi = 3.142$  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:	Marker:	Checker:	Marks/70
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Answer **all** questions. (70 marks)

1. The scale on a map is 1:300 000. Calculate
- the actual length, in kilometers, of a railway track represented by 10 cm on the map,
  - the area on the map, in square centimetres which represents an area of 48 km<sup>2</sup>.

Ans: a) \_\_\_\_\_ km [1]

b) \_\_\_\_\_ cm<sup>2</sup> [2]

2. Given that  $\frac{h-2k}{2h+3k} = \frac{4}{5}$ , find the value of  $\frac{2k}{3h}$ .

Ans: \_\_\_\_\_ [2]

3. A number has two digits. The digits satisfy the following conditions:
- the sum of the digits is 9,
  - the product of the digits is  $\frac{4}{9}$  of the original number.

Find the two possible numbers.

Ans: \_\_\_\_\_ or \_\_\_\_\_ [3]

4. (a) Simplify  $16x^2 + 9 - (4x - 3)^2$ .
- (b) Express  $x^2 - 12x + 2$  in the form  $(x + a)^2 + b$ .
- Hence, solve  $x^2 + 2 = 12x$ .**

Ans: a) \_\_\_\_\_ [1]

b) \_\_\_\_\_ [1]

x = \_\_\_\_\_ [2]

5. Given  $8 - 2m < 3(3m + 7)$ ,
- (a) solve the inequality,
- (b) write down the smallest prime number  $m$ .

Ans: (a) \_\_\_\_\_ [1]

(b)  $m =$  \_\_\_\_\_ [1]

6. (a) Given that  $p\sqrt{\frac{p^2 - q}{q}} = \frac{1 - p}{2}$ , express  $q$  in terms of  $p$ .

- (b) (i) Express  $\left(\frac{x^{2n}y^{n-1}}{x^{n-1}y}\right)^{-2}$  in the form  $x^a y^b$ , where  $a$  and  $b$  are in terms of  $n$ ,

- (ii) write down  $\frac{a}{b}$  in terms of  $n$ .

Ans: a) \_\_\_\_\_ [3]

b) i) \_\_\_\_\_ [2]

ii) \_\_\_\_\_ [1]

7. If  $x^2 + y^2 = 65$  and  $4xy = 56$ , calculate the value of
- (a)  $(x + y)^2$ ;
  - (b)  $(3x - 3y)^2$

Ans: (a) \_\_\_\_\_ [1]  
(b) \_\_\_\_\_ [2]

8. (a) Given that 5 men can pave a stretch of road of length 200 m in 4 hours. How long will it take 8 men to pave a 500 m stretch of road?
- (b) Given that  $m$  is proportional to  $(n+1)^2$  and that  $m = 5$  when  $n = 3$ , find the value of  $m$  when  $n = 9$ .

Ans: (a) \_\_\_\_\_ hours [2]  
(b)  $m =$  \_\_\_\_\_ [2]

9. Express the following answers in standard form.
- (a) During a heavy downpour, 3.6 cm of rain fell on the whole of Singapore. If the total area of Singapore is 660 km<sup>2</sup>, calculate the number of litres of water that fell on Singapore during the downpour.
- (b) The storage capacity of an external hard disk is 250 gigabytes. How many documents can be stored if the average file size of a document is 178 megabytes?  
(Correct to nearest whole number)

Ans: (a) \_\_\_\_\_ litres [2]

(b) \_\_\_\_\_ [2]

10. (a) Find the LCM of  $4x^2y^3$ ,  $6x^3y$  and  $18xy^2$ .
- (b) A welfare care centre is given the project to pack 1050 pencils, 630 erasers and 840 pens into as many gift packs as possible without leaving behind any stationery unpacked. Find,
- (i) the greatest number of gift packs that can be made.
- (ii) the number of pencils in each gift pack.

Ans: (a) LCM = \_\_\_\_\_ [2]

(b) (i) \_\_\_\_\_ [2]

(ii) \_\_\_\_\_ [1]

11. Given that  $x$  and  $y$  are integers such that  $-8 \leq x \leq 4$  and  $-2 \leq y \leq 3$ .

Calculate

- a) the greatest value of  $x - y$ ,
- b) the least value of  $2x + y^2$ ,
- c) the greatest value of  $xy$ ,
- d) the least value of  $\frac{x}{y}$ .

Ans: (a) \_\_\_\_\_ [1]  
 (b) \_\_\_\_\_ [1]  
 (c) \_\_\_\_\_ [1]  
 (d) \_\_\_\_\_ [1]

12. (a) Given the sequence 50, 47, 44, 41, ...

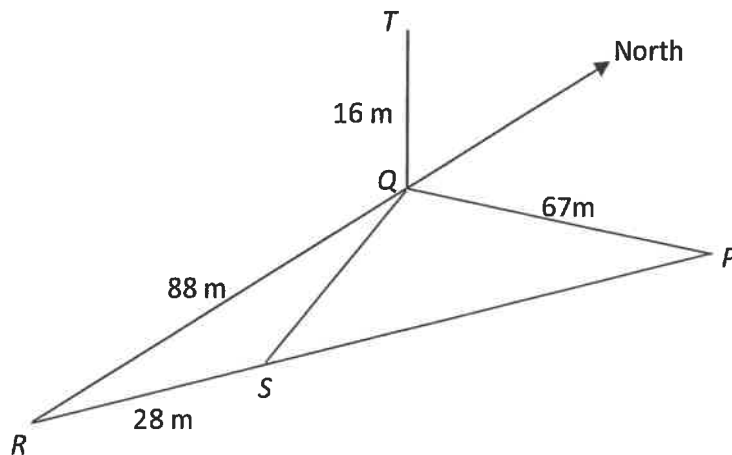
- (i) Write down the next two terms.
- (ii) Write down an expression, in terms of  $n$ , for the  $n$ th term in the above sequence.

(b) Given another sequence 3, 8, 15, 24, 35, ...

Write down an expression, in terms of  $n$ , for the  $n$ th term of this sequence in the form of  $an^2+bn$ .

Ans: (a) (i) \_\_\_\_\_, \_\_\_\_\_ [1]  
 (ii) \_\_\_\_\_ [1]  
 (b) \_\_\_\_\_ [2]

13.  $P$ ,  $Q$ ,  $R$  and  $S$  are points on level ground.  $R$  is due south of  $Q$  and  $P$  is due east of  $Q$ . It is given that  $PSR$  is a straight line,  $RS = 28$  m,  $QR = 88$  m and  $PQ = 67$  m.

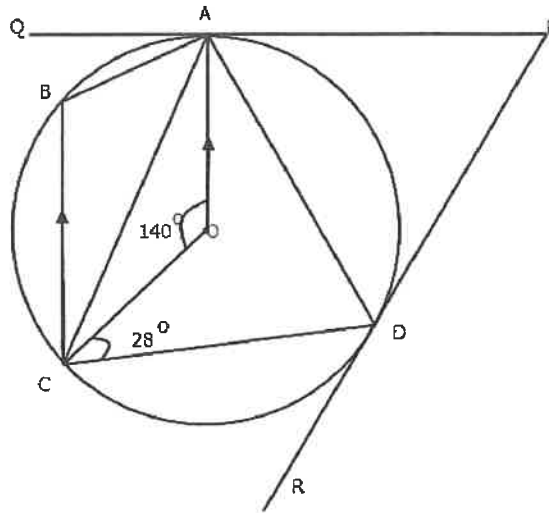


- (a) Calculate
- (i) the bearing of  $P$  from  $R$ ,
  - (ii) the distance  $QS$ ,
  - (iii) the area of triangle  $PQS$ , to the nearest 2 decimal places,
- (b) A vertical mast,  $QT$ , of height 16 metres stands at  $Q$ . Calculate the angle of elevation of  $T$  from  $S$ .

Ans: (a) (i) \_\_\_\_\_ [2]  
 (ii) \_\_\_\_\_ [2]  
 (iii) \_\_\_\_\_ [3]  
 (b) \_\_\_\_\_ [2]



14. In the diagram, O is the centre of the circle, PQ and PR are tangents to the circle at A and D respectively. Given that  $\angle AOC = 140^\circ$ ,  $\angle DCO = 28^\circ$  and OA is parallel to CB,



(a) show that CA bisects  $\angle BCO$ .

(b) Calculate

- (i)  $\angle BAC$
- (ii)  $\angle OAD$
- (iii)  $\angle PDA$
- (iv)  $\angle APD$ .

Ans: (a) \_\_\_\_\_ [2]

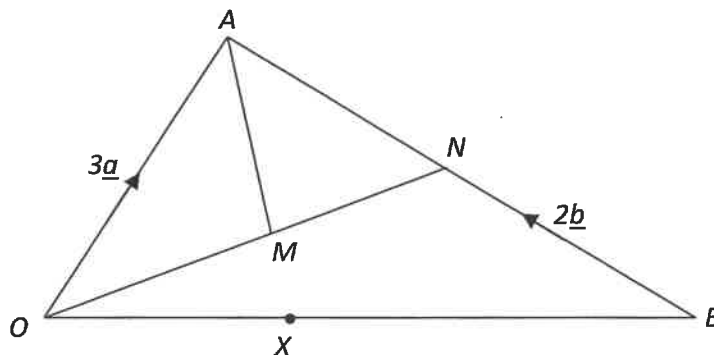
(b) (i) \_\_\_\_\_ [2]

(ii) \_\_\_\_\_ [2]

(iii) \_\_\_\_\_ [2]

(iv) \_\_\_\_\_ [1]

15. In the diagram,  $N$  is the midpoint of  $AB$ .  $M$  is a point on  $ON$  such that  $OM = \frac{1}{2} ON$ .  $X$  is a point on  $OB$  such that  $XB = \frac{2}{3} OB$ .  $\vec{OA} = 3\vec{a}$  and  $\vec{BN} = 2\vec{b}$ .



- (a) Express, as simply as possible, in terms of  $\vec{a}$  and/or  $\vec{b}$ ,

(i)  $\vec{OB}$

(ii)  $\vec{ON}$

(iii)  $\vec{AM}$

- (b) Show that  $A$ ,  $M$  and  $X$  are collinear.

- (c) Calculate

(i)  $\frac{\text{Area of } \triangle OMX}{\text{Area of } \triangle OAM}$

(ii)  $\frac{\text{Area of } \triangle OMX}{\text{Area of } \triangle OAB}$

- Ans: (a) (i) \_\_\_\_\_ [1]  
 (ii) \_\_\_\_\_ [1]  
 (iii) \_\_\_\_\_ [1]  
 (b) \_\_\_\_\_ [2]  
 (c) (i) \_\_\_\_\_ [1]  
 (ii) \_\_\_\_\_ [2]