

Name: _____

IC No.: _____

Seat No: _____

BCA ACADEMY
SCHOOL OF BUILDING & DEVELOPMENT
SINGAPORE

MATHEMATICS SCREENING TEST (SET M)

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 π , the calculator value for $\pi = 3.142$ 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:	Test Centre:	Test Date:	Marks(/100):
	Marker:	Checker:	

This question paper consists of 10 printed pages (excluding this page)

1. Simplify the following expressions:

(a) $[5(6x - 2)] / [4(x + 1) - 3(2x - 1)]$ (5 marks)

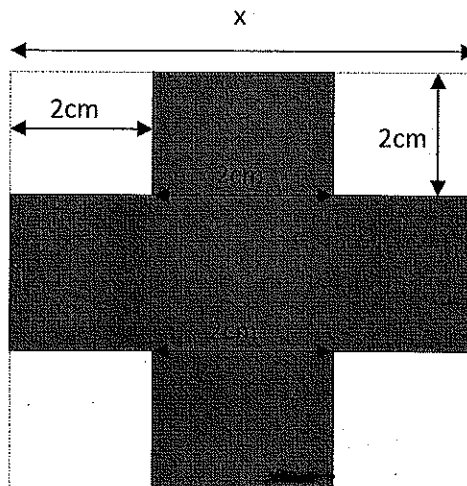
(b) $[5(12 - 2)] / [4(2 + 1) - 3(4 - 1)]$ (5 marks)

2. Simplify the following equations:

(a) $\frac{3x+1}{3x-1} = \frac{2x+1}{2x-3}$ (5 marks)

(b) $ay + b = cy + d$ (5 marks)

3. As shown in the diagram, an open box containing 24cm^3 is to be made from a square piece of tin by cutting 2cm squares from each corner and turning up the sides. Find the dimension of the piece of tin required. (10 marks)

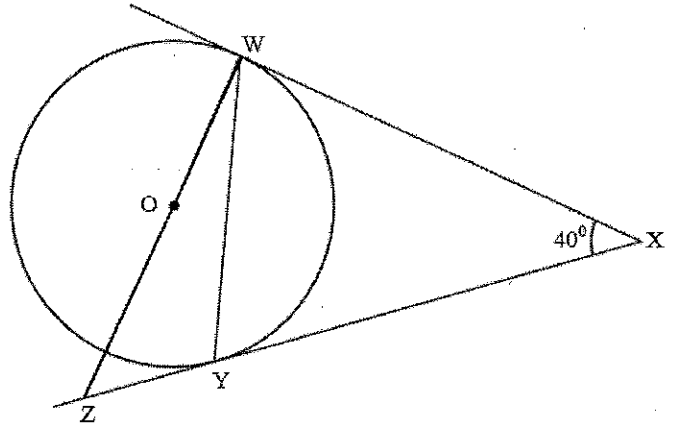


4. A rectangle has sides of length 12cm and 0.18m.

- (a) Calculate the length (in millimeter) of the diagonal of the rectangle, giving your answer with 2 decimal place (5 mark)
- (b) Calculate the angle between the diagonal and the shorter side of the triangle, giving your to the nearest degree (5 marks)

5. In the diagram, WX and XY are two equal tangents from the external point X. Angle WXY is equal to 40° . Find:

- (a) $\angle OWX$ (1 mark)
- (b) $\angle XWY$ (2 marks)
- (c) $\angle OWY$ (2 marks)
- (d) $\angle WYZ$ (3 marks)
- (e) $\angle WZY$ (2 marks)

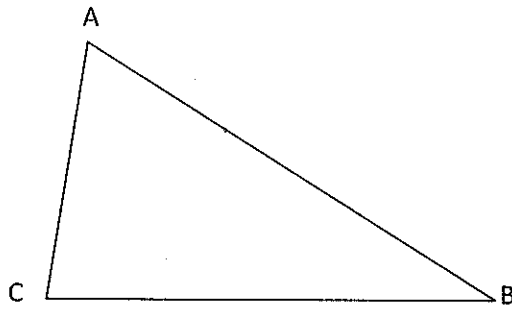


6. Adam has 2 more apples than Bart, who has double of Charlie. The total number of all their apples is 127. Find the number of apples for the following:
- a) Adam (3 marks)
 - b) Bart (3 marks)
 - c) Charlie (4 marks)

7. Below diagram shows a triangle ABC, given $AB=628\text{m}$, $AC=480\text{m}$, and $C=55^\circ 10'$.

Find the following:

- a) Angle A
- b) Angle B
- c) Length BC



8. A concealed box contains eighteen colourful marbles; five red, four blue, and three green and the rest is yellow. Expressing all your answers in fractions,
- (a) What is the probability of drawing one yellow marble if only one marble can be drawn? (2 marks)
- (b) What is the probability of drawing two red marble if exactly three marbles can be drawn one after the other? (3 marks)
- (c) What is the probability of drawing (in order) one red marble, one blue marble, one yellow marble and one green marble? (5 marks)

9. A bus leaves Singapore and travels towards Malaysia at a constant speed. Four hours later, a car leaves Singapore at a constant speed of 90 km/h. The car catches up with the bus two (2) hours later. The car reaches Malaysia one (1) hours after it caught up with the bus.
- (a) Find the speed of the bus. (3 marks)
- (b) Calculate the distance between Singapore and Malaysia. (5 marks)
- (c) Calculate the total travel time (to the nearest hour) for the bus to travel from Singapore to Malaysia. (2 marks)

10. (a) Find the value of y if:

$$4^y = 3(2^1) + 2^y \quad (5 \text{ marks})$$

- (b) It is given that:

$$\log_a(2) = 0.3456$$

$$\log_a(3) = 0.4398$$

$$\log_a(5) = 0.5567$$

$$\log_a(7) = 0.7865$$

Using this information, find the value of a if

$$3^a + \log_a(10) = \log_a(21) \quad (5 \text{ marks})$$

END OF PAPER

ANSWER KEY

$$\begin{aligned} 1a) \quad & \frac{5(6x-2)}{4(x+1)-3(2x-1)} \\ & = \frac{30x-10}{4x+4-6x+3} \\ & = \frac{30x-10}{7-2x} \end{aligned}$$

#

$$\begin{aligned} 1b) \quad & \frac{5(12-2)}{4(2+1)-3(4-1)} \\ & = \frac{50}{12-9} \\ & = \frac{50}{3} \\ & = 16\frac{2}{3} \end{aligned}$$

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2a)

$$\frac{3x+1}{3x-1} = \frac{2x+1}{2x-3}$$

$$(3x+1)(2x-3) = (2x+1)(3x-1)$$

$$6x^2 - 7x - 3 = 6x^2 + x - 1$$

$$-8x = 2$$

$$x = -\frac{1}{4} \quad \#$$

$$2b) \quad ay + b = cy + d$$

$$ay - cy = d - b$$

$$(a-c)y = d - b$$

$$y = \frac{d-b}{a-c}$$

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3.

Let x = the required dimension
Height = 2cm (given)

$$\text{Volume} = 2 \times (x-4) \times (x-4)$$

$$24 = 2 \times (x-4) \times (x-4)$$

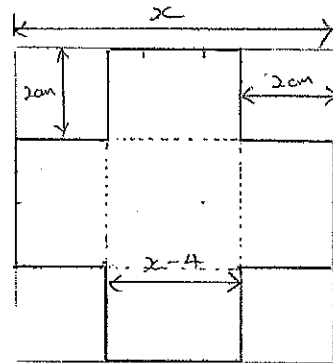
$$2(x-4)^2 = 24$$

$$x-4 = \pm 2\sqrt{3}$$

$$x = 7.46 \text{ or } x = 0.54$$

$$\therefore x = 7.46 \text{ cm}$$

*.



4)

$$\begin{aligned} a) L^2 &= 12^2 + 18^2 \\ &= 144 + 324 \\ &= 468 \text{ cm} \end{aligned}$$

$$\begin{aligned} L &= \sqrt{468} \\ &= 21.6333 \text{ cm} \\ &= 2166.33 \text{ mm} \end{aligned}$$

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$$\begin{aligned} b) \angle A &= \tan^{-1}(1.5) \\ &= 56^\circ \end{aligned}$$

#

5)

$$a) \angle OWX = 90^\circ$$

$$b) \angle XWY = \frac{180^\circ - 40^\circ}{2}$$
$$= 70^\circ$$

$$c) \angle OWY = \angle OWX - \angle XWY$$
$$= 90^\circ - 70^\circ$$
$$= 20^\circ$$

$$d) \angle WYZ = 180^\circ - \angle WYX$$
$$= 180^\circ - \angle XWY$$
$$= 180^\circ - 70^\circ$$
$$= 110^\circ$$

$$e) \angle WZY = 180^\circ - \angle OWY - \angle WYZ$$
$$= 180^\circ - 20^\circ - 110^\circ$$
$$= 50^\circ$$

6)

Let Charlie's no. of apple = x .

Let Bart's no. of apple = $2x$

Let Adam's no. of apple = $2x + 2$.

Total no. of apple = $x + 2x + 2x + 2$.

$$127 = x + 2x + 2x + 2$$

$$5x = 127 - 2$$

$$5x = 125$$

$$x = 25$$

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a) Adam = $2(25) + 2 = 52$

b) Bart = $2(25) = 50$

c) Charlie = $x = 25$

7).

Since $\angle C$ is acute and $AB > AC$
there is only one solution.

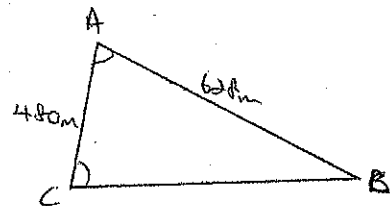
$$\begin{aligned}\text{For } B, \quad \sin B &= \frac{AC \sin C}{AB} \\ &= \frac{480 \sin 55^\circ 10'}{628}\end{aligned}$$

$$\therefore \angle B = 38^\circ 50' \quad \#$$

$$\text{For } A, \quad A = 180^\circ - (\angle B + \angle C) = 86^\circ 0' \quad \#$$

$$\text{For } BC, \quad \frac{\sin 86^\circ 0'}{CB} = \frac{\sin 55^\circ 10'}{628}$$

$$\therefore CB = 763.2 \text{ m} \quad \#$$



e)

$$a) P(\text{one yellow cookie}) = \frac{6}{18} = \frac{1}{3} \#$$

$$b) P(\text{two real}) = \left(\frac{5}{18}\right) \times \left(\frac{4}{18-1}\right) = \frac{10}{153} \#$$

$$c) P(\text{one real, one blue, one yellow, one green}) \\ = \left(\frac{5}{18}\right) \times \left(\frac{4}{17}\right) \times \left(\frac{6}{16}\right) \times \left(\frac{3}{15}\right) \\ = \frac{1}{204} \#$$

9)

a) Travel time of bus at catch-up point = $4+2 = 6$ hrDistance travelled by bus/car at catch-up point = $90 \text{ km/hr} \times 2 \text{ hr}$
= 180 km .Speed of bus = $180 \text{ km} / 6 \text{ hr}$ = 30 km/hr . #

b) Distance between S & M

= Distance travelled by car

= Speed \times total time= $90 \text{ km/hr} \times (4+2+1) \text{ hr}$.= 630 km #

10)

a)

$$4^y = 3(2^y) + 2^y$$

$$(2^y)^2 = 6 + 2^y$$

$$\text{Let } x = 2^y \Rightarrow x^2 = 6 + x$$

$$x^2 - x - 6 = 0$$

$$(x+2)(x-3) = 0$$

$$x = -2 \text{ or } x = 3$$

$$\Rightarrow 2^y = -2 \text{ (rejected) or } 2^y = 3$$

$$y \ln 2 = \ln 3$$

$$y = \frac{\ln 3}{\ln 2}$$

$$= 1.58$$

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b)

$$3^a + \log_a(10) = \log_a(21)$$

$$\Rightarrow 3^a + \log_a(5 \times 2) = \log_a(3 \times 7)$$

$$3^a + \log_a(5) + \log_a(2) = \log_a(3) + \log_a(7)$$

$$3^a + 0.5567 + 0.3456 = 0.4398 + 0.7865$$

$$3^a = 0.324$$

$$a \ln 3 = \ln(0.324)$$

$$a = \frac{\ln(0.324)}{\ln 3}$$

$$= -1.026$$

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