

**HARRISON COLLEGE**  
**THIRD FORM MATHEMATICS**  
**INTERNAL PROMOTION EXAMINATION 2015 – 2016**



DURATION: 1 hour and 45 minutes

**GENERAL INSTRUCTIONS TO CANDIDATES**

- 1) This Examination Paper consists of FIVE printed pages.
- 2) Write your name clearly on **EACH** sheet of foolscap used.
- 3) All **TWENTY** questions are to be attempted.
- 4) Number your responses carefully and identically (including any associated parts) as they appear on the question paper.  
Do **NOT** write ANY of your responses beside each other.
- 5) Calculators are allowed.
- 6) If a numerical answer cannot be given **exactly**, and the accuracy required is not specified in the question, then in the case of an angle it must be given correct to **one (1)** decimal place, in other cases it must be given correct to **three (3)** significant figures.
- 7) The maximum mark for this Examination is **82**.

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO**

**Write on the foolscap provided** the **LETTER** that matches your response for Questions 1 – 10.

1) If  $a * b = \frac{a^2 - 3}{ab}$ , then  $p * 2 =$

(A)  $\frac{p^2 - 3}{ab}$

(B)  $\frac{p^2 - 3}{2p}$

(C)  $\frac{a^2 - p}{2b}$

(D)  $\frac{a^2 - p}{ab}$

2) A container contains 3 red pens, 6 blue pens, 4 green pens and 7 yellow pens. A pen is drawn at random from the container. The probability that this pen is not green is

(A)  $\frac{4}{5}$

(B)  $\frac{1}{5}$

(C)  $\frac{3}{10}$

(D)  $\frac{7}{20}$

3) If  $p$  shirts cost  $\$x$  each and  $q$  socks cost  $\$y$  each, then the total cost of  $p$  shirts and  $q$  socks, in dollars is

(A)  $p + x + q + y$

(B)  $\frac{px}{qy}$

(C)  $\frac{p}{x} + \frac{q}{y}$

(D)  $px + qy$

4)  $\frac{a^2b}{c^3} \div \frac{c^4}{ab^2}$  simplifies to

(A)  $\frac{ac}{b}$

(B)  $\frac{a^2bc^4}{ab^2c^3}$

(C)  $\frac{a^3b^3}{c^7}$

(D)  $\frac{abc^6}{ab^2c^3}$

5) The cube of a number  $n$  is squared. This statement can be expressed as

(A)  $\sqrt[3]{n^2}$

(B)  $(n^3)^2$

(C)  $\sqrt{n^2}$

(D)  $(n^3)^{\frac{1}{2}}$

6) The gradient of the line parallel to  $2x = 3y + 5$  is

(A)  $\frac{3}{2}$

(B)  $-\frac{2}{3}$

(C) 6

(D)  $\frac{2}{3}$

7) Given that  $C = \frac{5}{9}P - R$ , then  $R =$

(A)  $C - \frac{5}{9}P$

(B)  $\frac{5P - 9C}{9}$

(C)  $\frac{9C}{5P}$

(D)  $\frac{5}{9}P + C$

8) Given that  $y$  is directly proportional to the cube root of the difference of  $u$  and  $v$ , this statement can be written as

(A)  $y = k \times \sqrt[3]{(u - v)}$

(B)  $y = k \times (u^3 - v^3)$

(C)  $y = k \times \frac{u}{v}$

(D)  $y = k \times \frac{u^3}{v^3}$

9) Given that  $f: x \rightarrow -5x + 3$ , then for  $f(x) = -3$ ,  $x =$

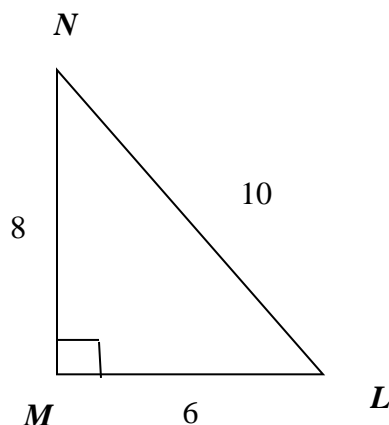
(A)  $-12$

(B) 18

(C)  $\frac{6}{5}$

(D)  $-5$

10) The value of  $\cos N$  in the triangle  $LMN$  is



(A)  $\frac{6}{10}$

(B)  $\frac{8}{10}$

(C)  $\frac{6}{8}$

(D)  $\frac{8}{6}$

[Total: 10]

**All working MUST be shown for Questions 11 – 20**

11) A truck is bought for \$ 60 000. It depreciates in value at the rate of 7.5 % per annum. Calculate

- (i) the amount of depreciation after one year. [1]  
 (ii) the value of the truck after three years. [3]

12)  $s$  is inversely proportional to the square of  $t$  and  $s = 10$  when  $t = 2$ . Calculate

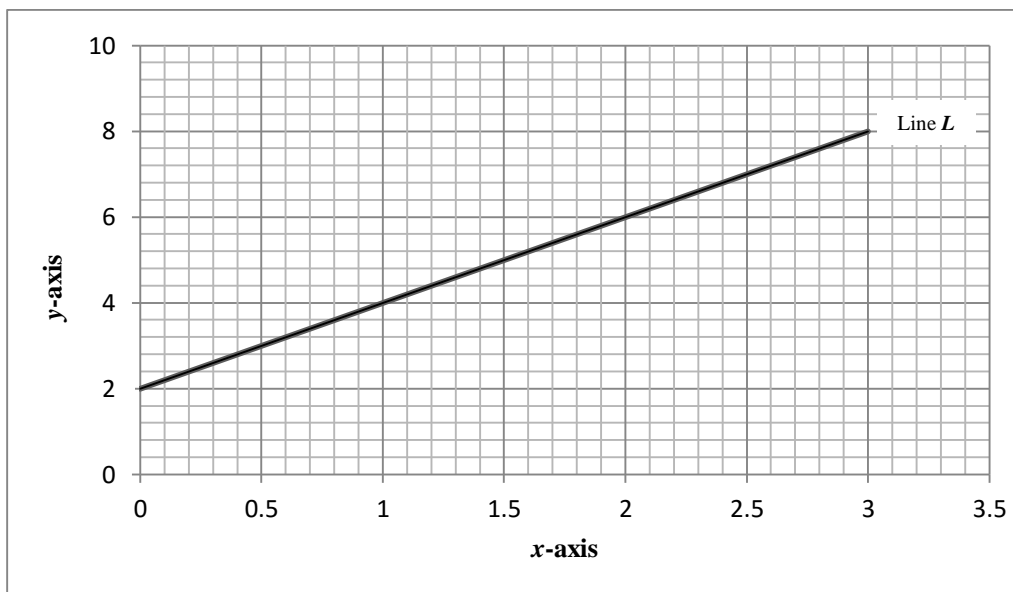
- (i) the value of the constant of proportionality [2]  
 (ii) the value of  $s$  when  $t = 8$ . [2]

13) (i) Solve for  $r$ ,  $(r - \frac{1}{4}) \geq \frac{1}{3}(r + 1)$ . [5]

- (ii) Given that  $r \in \mathbf{Z}$ , state the largest value of  $r$  which satisfies the inequality in part (i). [1]

14) Solve for  $x$  and  $y$ , the simultaneous equations:  $3x = 10 + 5y$  [6]  
 $5x - 3y = 6$

15) The Cartesian plane below shows the line  $L$ .



Determine

- (i) the midpoint of line  $L$  [2]  
 (ii) the gradient of line  $L$  [2]  
 (iii) the equation of line  $L$ . [2]  
 (iv) the equation of the perpendicular bisector of  $L$ . [4]

16) Jeff is married with two children. In the year 2015, he earned \$ 28 500.

<b>Tax-Free Allowances per year</b>
Personal Allowance: \$ 12 000
Spouse: \$ 8 000
Child: \$500
<b>Tax Rates</b>
First \$2 000: 4 %
Next \$3 000: 6 %
Remainder: 8 %

Using the information in the above table, for income year 2015, calculate

- (i) his total tax-free allowances [4]  
 (ii) his taxable income [2]  
 (iii) the amount of income tax paid [4]  
 (iv) his net income. [2]

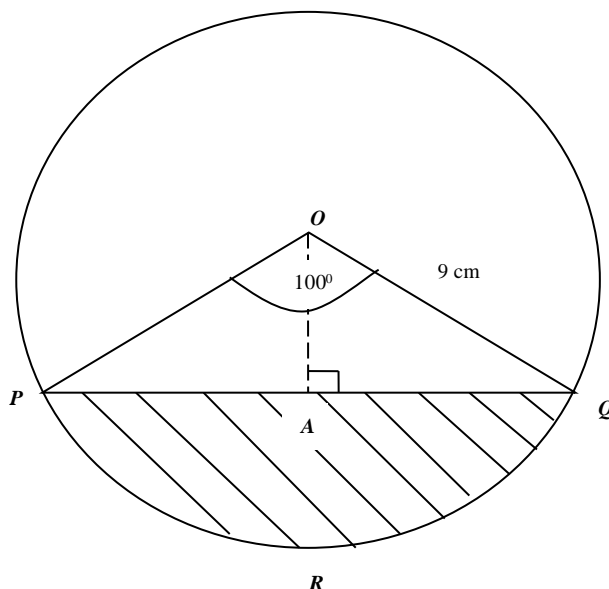
17) The masses of a sample of coconuts were recorded as shown in the table below.

Mass (g)	Number of coconuts
335 – 339	20
340 – 344	17
345 – 349	31
350 – 354	24
355 – 359	18

- (i) State the class limits of the least common class. [2]  
 (ii) State the class boundaries of the most common class. [2]  
 (iii) Determine the probability that a coconut chosen at random is at least 454.5 g. [2]

18) In the diagram below, (not drawn to scale),  $O$  is the centre of the circle of radius 9 cm.

Chord  $PQ$  subtends an angle  $POQ$  of  $100^\circ$  at the centre of the circle. Using  $\pi = \frac{22}{7}$



- (a) Calculate the length of the arc  $PRQ$ . [2]  
 (a) Calculate the length of  $OA$ . [3]  
 (b) Calculate  
 (i) the area of the sector  $POQR$ . [2]  
 (ii) the area of triangle  $POQ$  [3]  
 (iii) the area of the shaded segment  $PQR$  of the circle. [2]

19) From a point  $N$  on level ground the angle of elevation of the top  $T$  of a building is  $32^\circ$ .

The  $B$  base of the building is 60 metres from  $N$ .

(i) Draw a diagram to show ALL of the above information. [5]

(ii) Calculate the distance  $TB$ . [3]

20) COPY and COMPLETE the table below by inserting the missing expression and or value at the rows marked (iv) b) and (iv) c), and (v) b) and (v) c). [4]

(i)	3	$\frac{3}{2} + \left(\frac{2}{3} \times 3\right)$	$\frac{7}{2}$
(ii)	6	$3 + \left(\frac{2}{3} \times 6\right)$	7
(iii)	9	$\frac{9}{2} + \left(\frac{2}{3} \times 9\right)$	$\frac{21}{2}$
(iv)	39	b) _____	c) _____
(v)	$x$	b) _____	c) _____

**End of Examination**