

HARRISON COLLEGE



END OF YEAR EXAMINATION

2022

THIRD FORM MATHEMATICS

DURATION: 1 HOUR and FIFTEEN minutes

INSTRUCTIONS TO CANDIDATES

- 1) ALL QUESTIONS ARE TO BE ANSWERED ON THIS QUESTION PAPER.
THERE IS ONE EXTRA PAGE AT THE END OF THIS PAPER FOR ADDITIONAL WORKING.
- 2) This Examination Paper consists of **EIGHT** printed pages and ONE EXTRA page for **additional working**.
- 3) All **FOURTEEN** questions are to be attempted.
- 4) Number your responses carefully and identically (including any associated parts) as they appear on the question paper.
- 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 **55**.
- 8) Write your **NAME** and **FORM** below.

NAME OF STUDENT: _____

FORM: _____

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

LIST OF FORMULAE

Volume of Prism $V = Ah$ where A is the area of a cross-section and h is the perpendicular length.

Volume of Cylinder $V = \pi r^2 h$ where r is the radius of the base and h is the perpendicular height.

Volume of a right pyramid $V = \frac{1}{3}Ah$ where A is the area of the base and h is the perpendicular height.

Circumference $C = 2\pi r$ where r is the radius of the circle.

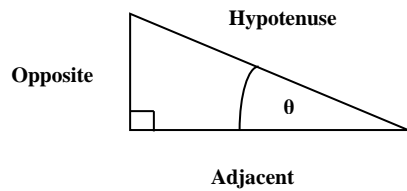
Arc length $S = \frac{\theta}{360} \times 2\pi r$ where θ is the angle subtended by the arc, measured in degrees.

Area of a circle $A = \pi r^2$ where r is the radius of the circle.

Area of a sector $A = \frac{\theta}{360} \times \pi r^2$ where θ is the angle of the sector, measured in degrees.

Area of Trapezium $A = \frac{1}{2}(a + b)h$ where a and b are the lengths of the parallel sides and h is the perpendicular distance between the parallel sides.

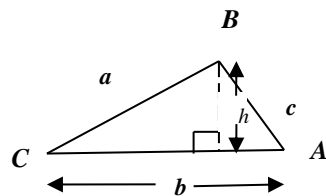
Trigonometric ratios $\sin \theta = \frac{\textit{opposite side}}{\textit{hypotenuse}}$
 $\cos \theta = \frac{\textit{adjacent side}}{\textit{hypotenuse}}$
 $\tan \theta = \frac{\textit{opposite side}}{\textit{adjacent side}}$



Area of a triangle Area of $\Delta = \frac{1}{2}bh$ where b is the length of the base and h is the perpendicular height.

$$\text{Area of } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\text{where } s = \frac{a+b+c}{2}$$

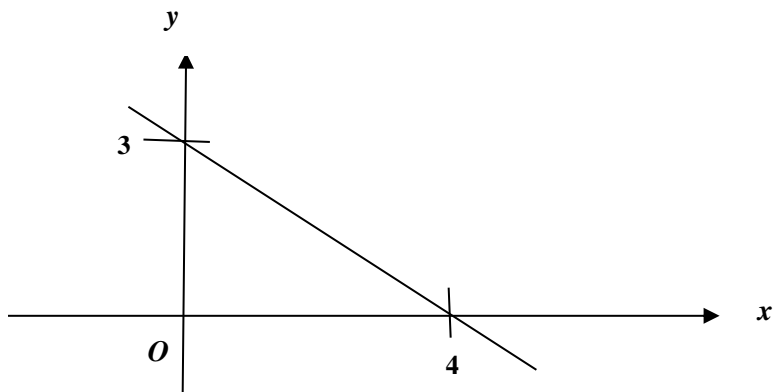


CIRCLE the **LETTER** that matches your response for Questions 1) to 7).

1) If $x * y$ is defined to be $x \div 2y$, then $-3 * a$

- (A) $-3 \div 2a$ (B) $2a \div (-3)$ (C) $3 \div 2a$ (D) $-3 \div a$

2) The diagram below illustrates the graph of



- (A) $y = 3x + 4$ (B) $y = 4x + 3$ (C) $y = -\frac{3}{4}x + 3$ (D) $y = \frac{4}{3}x + 3$

3) The gradient of the line parallel to $2y = 3x - 1$ is

- (A) $\frac{2}{3}$ (B) $\frac{3}{2}$ (C) 3 (D) 2

4) If $\frac{4}{a+b} = \frac{1}{p}$, then $\frac{a+b}{2}$ equals

- (A) $\frac{1}{2p}$ (B) $\frac{4}{p}$ (C) $4p$ (D) $2p$

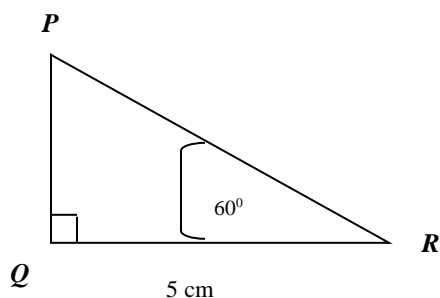
5) A number, $3c$, is cubed, then it is divided by one-half. Algebraically, this may be represented as

- (A) $\frac{9c^3}{2}$ (B) $27c^3 - \frac{1}{2}$ (C) $54c^3$ (D) $\frac{27c^3}{2}$

6) If $y - r = \frac{r}{4}$, then r equals

- (A) $\frac{4y}{5}$ (B) $\frac{4}{5y}$ (C) $y - \frac{r}{4}$ (D) $4y - 4r$

7)



The triangle PQR above is right-angled at Q . Angle $PRQ = 60^\circ$ and $QR = 5$ cm.

The length of PQ , in cm, is

- (A) $\frac{5}{\tan 60^\circ}$ (B) $\frac{5}{\cos 60^\circ}$ (C) $5\cos 60^\circ$ (D) $5\tan 60^\circ$

[Total: 7]

All working MUST be clearly shown for Questions 8 to 14 in the space provided after each Question

8) \$ 12 000 in savings bonds are invested for 3 years at the rate of 2 % per annum compounded interest. Calculate

(i) the value of the investment after one year. [2]

(ii) the amount of interest received at the end of the investment period. [4]

9) Simplify fully $\left(k^{\frac{1}{3}}\right)^2 \times k^3$. [3]

10) y is inversely proportional to the square of x , and $y = 5$ when $x = 3$. Using this information

(i) Write an **equation** involving y and x . [2]

(ii) Calculate, **as a fraction**, the value of y when $x = 7$. [4]

11) Solve for x and y , the simultaneous equations:
$$\begin{aligned} 7x - 4y &= 37 \\ 6x + 3y &= 51 \end{aligned}$$
 [5]

12) A group of students each recorded the time it took to wait in line in order to collect their lunch from a school cafeteria. The time, to the nearest minute, is recorded below:

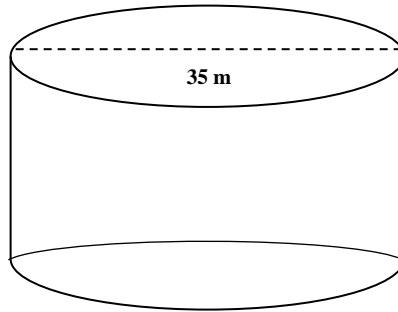
Time in minutes	Number of Students
1 – 5	5
6 – 10	2
11 – 15	4
16 – 20	8
21 – 25	3
26 – 30	3

- (i) State the modal class. [1]
- (ii) Calculate the mean wait time. [9]
- (iii) Determine the probability that a randomly chosen student waited at least 11 minutes. [2]

13) An iron stake is driven into the ground at a point A on the horizontal ground and is 15metres away from the base, B , of a vertical cell phone tower, BT , which is 20 metres high.

- (i) Sketch a fully labelled diagram to show ALL of the above information. [5]
- (ii) Calculate the angle of elevation of the top, T , of the tower from the point A . [3]

- 14) The figure below, not drawn to scale, represents a storage tank in the form of a cylinder. The diameter of the tank is 35 metres and its volume is 11 550 cubic metres.



Using $\pi = \frac{22}{7}$, calculate the **EXACT** value of

- (i) the height of the storage tank. [4]
- (ii) the total surface area of the storage tank. [4]

End of Examination

EXTRA PAGE

If you use this extra page, you **MUST** write the question number clearly in the box provided.

Question No.