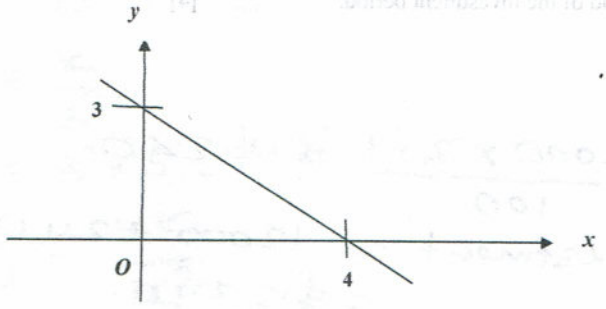
CIRCLE the **LETTER** that matches your response for Questions **1)** to **7)**.

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)** $2p$

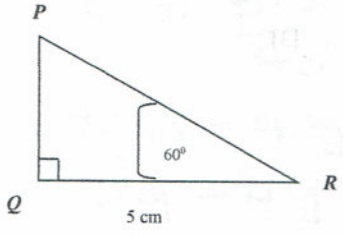
5) A number, $3c$, is cubed, then it is divided by one-half. Algebraically, this may be represented as

(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*** = 60^0 and ***QR*** = 5 cm.

The length of ***PQ***, in cm, is

(A) $\frac{5}{\tan 60^0}$ **(B)** $\frac{5}{\cos 60^0}$ **(C)** $5\cos 60^0$ **(D)** $5\tan 60^0$

[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]

(i) $I = \frac{PRT}{100}$

after 1 year $I = \frac{12000 \times 2 \times 1}{100} = \$240$

So value of investment $= 12000 + 240$

$= \$12,240$

(ii) A = amount accruing $= P + I$

$A = P\left(1 + \frac{r}{100}\right)^n$

$A = 12000\left(1 + \frac{2}{100}\right)^3 = 12734.50$

$I = A - P = 12734.50 - 12000$

$= \$734.50$

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

$(K^{1/3})^2 \times K^3$

$= K^{2/3} \times K^3$

$= K^{2/3+3} = K^{3\,2/3} = K^{11/3}$

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]

(i) $y = \frac{k}{x^2}$

(ii) when $x=3$ $y=5$

$\therefore 5 = \frac{k}{3^2}$

$k = 3^2 \times 5 = 45$

$\Rightarrow y = \frac{45}{x^2}$

when $x=7$

$y = \frac{45}{7^2} = \frac{45}{49}$

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

$7x - 4y = 37 \quad (\times 3)$

$6x + 3y = 51 \quad (\times 4)$

$21x - 12y = 111$

$24x + 12y = 204$

ADD $45x = 315$

$x = \frac{315}{45} = 7$

$\therefore 7(7) - 4y = 37$

$49 - 4y = 37$

$-4y = 37 - 49$

$-4y = -12$

$y = \frac{-12}{-4} = 3$

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	mid Pt	$f \times mid$
1 – 5	5	3	15
6 – 10	2	8	16
11 – 15	4	13	52
16 – 20	8	18	144
21 – 25	3	23	69
26 – 30	3	28	84
SUM	25		380

(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]

(i) The modal class is 16–20

(ii) mean wait time $= \frac{380}{25} = 15.2$ minutes

(iii) Prob(student waited at least 11 minutes)

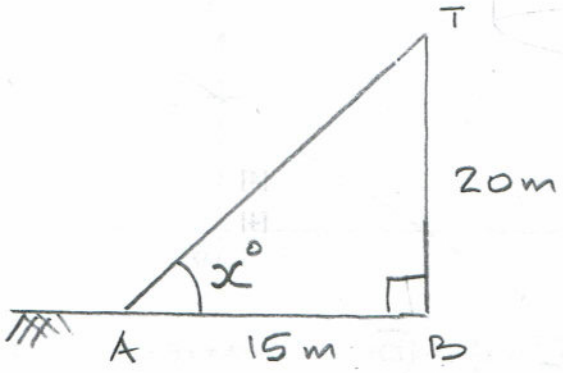
$= \frac{4+8+3+3}{25} = \frac{18}{25}$

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]

(i)



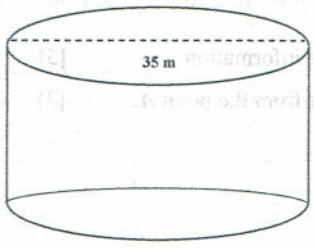
(ii) x° = angle of elevation

$$\tan x = \frac{20}{15}$$

$$x = \tan^{-1}\left(\frac{20}{15}\right)$$

$$x = 53.1^\circ$$

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]

(i) $V = \pi r^2 h \qquad r = \frac{d}{2}$

$V = \pi \frac{d^2}{4} h$

$h = \frac{4V}{\pi d^2}$

$h = \frac{4 \times 11550}{\frac{22}{7} \times 35^2} = 12 \text{ m}$

(ii) Total surface area

$= 2\pi r h + \pi r^2 + \pi r^2$

$= \pi d h + 2\pi r^2$

$= \pi d h + \frac{\pi d^2}{2}$

$= \frac{22}{7} \times 35 \times 12 + \frac{22}{7} \times \frac{35^2}{2}$

$= 1320 + 1925 = 3245 \text{ m}^2$

End of Examination