CXC

MODEL

EXAMINATIONS -

GENERAL PROFICIENCY

C.X.C. MODEL EXAMINATION 1
MATHEMATICS
Paper 1 - General Proficiency
90 minutes
Answer ALL the questions

1. **How many cm^3 are there in 3 litres?**
   (A) 3 (B) 30 (C) 300 (D) 3 000

2. **The number 5.460 72, correct to 3 decimal places, is**
   (A) 5.460 (B) 5.461 (C) 5.462 (D) 5.467

3. **347 000 expressed in standard form is**
   (A) 3.47×10^5 (B) 3.47×10^6
   (C) 3.47×10^{-5} (D) 3.47×10^{-6}

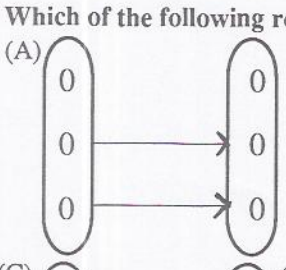
4. **0.325 written as a common fraction is**
   (A) $\frac{5}{32}$ (B) $\frac{3}{25}$ (C) $\frac{13}{40}$ (D) $\frac{15}{40}$

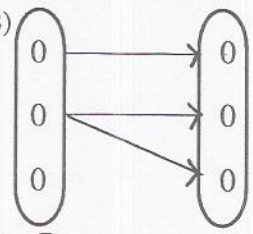
5. $2(xy^2)^3 =$
   (A) $8xy^2$ (B) $2x^3y^6$ (C) $6xy^2$ (D) $8x^3y^6$

6. **If P = {2,3,5,7,11}, Q = {2,5,11} and R = {1,5,7}, then $P \cap Q \cap R$ =**
   (A) { } (B) {5} (C) {2,5,11} (D) {1,5,7}

7. **A quadrilateral whose diagonals are equal and perpendicular to each other is called a**
   (A) trapezium (B) rhombus
   (C) rectangle (D) square

8. $\left(\frac{3}{16} + \frac{2}{15}\right) + \frac{23}{32} = \frac{3}{16} + \left(\frac{2}{15} + \frac{23}{32}\right)$.
   The law applied here is called the
   (A) distributive law (B) commutative law
   (C) identity law (D) associative law

9. **Which of the following relations is a function?**
   (A)


   (B)


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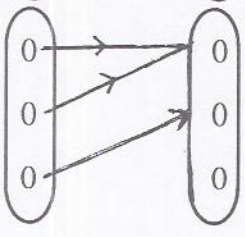
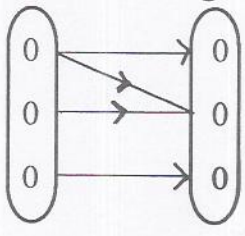
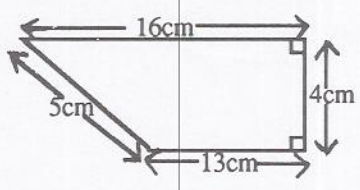


   (D)


10. **The square root of 629 is approximately**
    (A) 2.5×10 (B) 2.5×10^2
    (C) 8.1×10 (D) 8.1×10^2

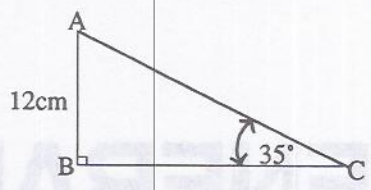


11. **The area of the trapezium above is**
    (A) 72.5cm² (B) 38 cm² (C) 29 cm² (D) 58 cm²

12. **The heights, in centimetres, of ten students are 152,153,170,156,158,150,155,160, 165,155. The range of the heights is**
    (A) 15cm (B) 20cm (C) 25cm (D) 30cm

13. $(-x)^2 + (-x)^3 =$
    (A) $-x^2 + x^3$ (B) $x^2 - x^3$ (C) $-2x + 3x$ (D) $2x - 3x$

14. **A plane was travelling on a bearing of 225°. In what direction was it travelling ?**
    (A) North-east (B) North-west
    (C) South-east (D) South-west



15. **In the figure above, $\widehat{ABC} = 90°$, $\widehat{ACB} = 35°$ and AB = 12 cm. The length of AC, in centimetres, is**
    (A) $\frac{12}{\sin 35°}$ (B) $\frac{12}{\cos 35°}$
    (C) $\frac{12}{\tan 35°}$ (D) $12 \cos 35°$

16. **Which of the following sets represents the function f: $x \rightarrow x^2 + 1$?**
    (A) {(0, 1), (1, 2), (2, 5)} (B) {(0, 1), (1, 1), (2, 3)}
    (C) {(0, 1), (1, 3), (2, 5)} (D) {(0, 1), (1, 4), (2, 7)}

17. If $(x-5)$ is the largest of three consecutive even numbers, then the smallest is
(A) $(x-1)$ (B) $(x-3)$ (C) $(x-7)$ (D) $(x-9)$

18. 18_{ten} may be written in base two as
(A) 100 (B) 1001 (C) 10010 (D) 100101

19. A circular bicycle wheel has a radius of 28 cm. How far will it roll in 100 revolutions?
(A) 28m (B) 56m (C) 176m (D) 280 m

20. Paula left Airport A at 23:15 hrs and arrived at Airport B at 07:30 hrs. How much time did she spend travelling between airports?
(A) 7h 45min (B) 8h 5min
(C) 8h 15min (D) 8h 45min

21. The original price of an article was \$256. The price was increased by $12\frac{1}{2}\%$. The new price of the article is
(A) \$268.50 (B) \$224.00 (C) \$272.50 (D) \$288.00

22. If the number x is such that $25 < x < 49$, then $\sqrt{x}$ lies between
(A) 4 and 6 (B) 6 and 9 (C) 5 and 7 (D) 6 and 8

Items 23-25 refer to the information below.
The marks obtained by 10 students in a test is shown in the table below.

Marks	1	2	3	4	5
Frequency	1	3	0	5	1

23. The modal mark is
(A) 2 (B) 3 (C) 4 (D) 5

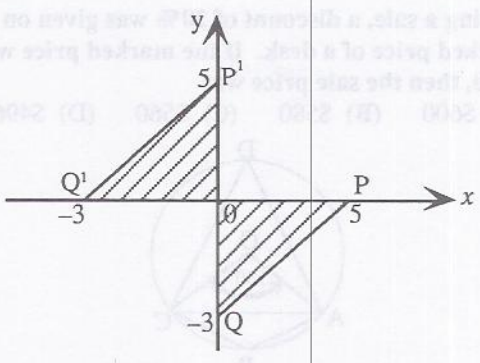
24. The median mark is
(A) 2.5 (B) 3 (C) 4 (D) 4.5

25. The mean mark is
(A) 2.5 (B) 3.2 (C) 4.1 (D) 5

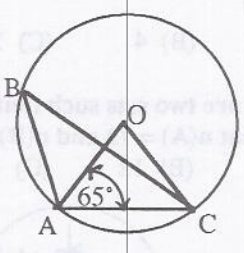
26. The cost price of a shirt is \$60. The marked price of the shirt is obtained by adding 20% of the cost price. During a sale , a 20% discount on marked prices was given. How much did the customer pay for the shirt?
(A) \$55.00 (B) \$57.60 (C) \$58.30 (D) \$60.00

27. A vehicle intially valued at \$96 000 depreciates at the rate of 20% per annum. What is its value one year later?
(A) \$19 200 (B) \$58 600 (C) \$76 000 (D) \$76 800

28. The hire purchase price of a television is \$4 600. It may be purchased by depositing \$900 and making monthly instalments of \$185 each. What is the minimum number of months required to completely pay for the television?
(A) 15 (B) 20 (C) 24 (D) 28



29. The transformation which will map triangle POQ onto triangle P^1OQ^1, as shown in the diagram above is
(A) a reflection in the y – axis
(B) a reflection in the x – axis
(C) a reflection in the line $y = -x$
(D) a reflection in the line $y = x$



30. In the diagram above , O is centre of the circle and angle OAC = 65°. What is size of angle ABC?
(A) 25° (B) 50° (C) 90° (D) 100°

31. If $A = 4\pi r^2$, then
(A) $r = \frac{A}{4\pi}$ (B) $r = \sqrt{\frac{A}{4\pi}}$ (C) $r = \frac{4\pi}{A}$ (D) $r = \sqrt{\frac{4\pi}{A}}$

32. $\frac{3}{4x} - \frac{2}{6y} =$
(A) $\frac{9y-4x}{12xy}$ (B) $\frac{1}{12xy}$ (C) $\frac{18y-8x}{12xy}$ (D) $\frac{3y-2x}{12xy}$

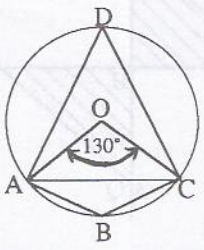
33. If $50 - x < 30$, then a possible value of x is
(A) 10 (B) 15 (C) 20 (D) 25

34. The smallest of three consecutive positive integers is x. The sum of the three integers is 60. The statements given above expressed as an equation is
(A) $3x = 60$ (B) $3x + 3 = 60$
(C) $x + 3 = 60$ (D) $x + 2x + 3x = 60$

35. The vector $\begin{pmatrix} a \\ b \end{pmatrix}$ maps the point P(4, 7) onto P'(3, 4).
Vector $\begin{pmatrix} a \\ b \end{pmatrix}$ =

(A) $\begin{pmatrix} -1 \\ -3 \end{pmatrix}$ (B) $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ (C) $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$ (D) $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$

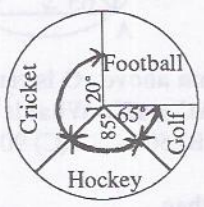
36. During a sale, a discount of 20% was given on the marked price of a desk. If the marked price was \$620, then the sale price was
(A) \$600 (B) \$580 (C) \$560 (D) \$496



37. In the diagram above, O is the centre of the circle and angle AOC = 130°. Angle ABC =
(A) 65° (B) 95° (C) 115° (D) 130°

38. In a class of 40 students, 15 study french, 21 study spanish and 7 study neither french nor spanish. How many students study both french and spanish?
(A) 3 (B) 4 (C) 5 (D) 6

39. A and B are two sets such that A is a subset of B. Given that n(A) = 12 and n(B) = 18, then n(A∩B) =
(A) 6 (B) 12 (C) 18 (D) 30

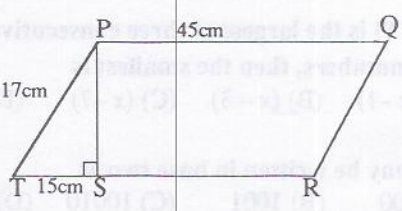


40. The pie chart above, not drawn to scale, represents the expenditure on four sports. The total expenditure was M\$6. What was the expenditure on both cricket and football?
(A) M\$2.5 (B) M\$3.5 (C) M\$4.0 (D) M\$5.2

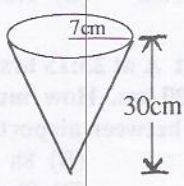
41. The product of five times p and seven times q is
(A) 5p + 7q (B) (35(p + q)(C) 35pq (D) 12pq

42. $7(2x - 3y) + 4(3y - 5x)$ =
(A) $-6x - 9y$ (B) $6x + 9y$ (C) $26x - 41y$ (D) $-15xy$

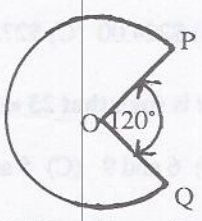
43. What is the simple interest on \$240 for 8 months at $5\frac{1}{2}$% per annum?
(A) \$8.80 (B) \$13.20 (C) \$78.50 (D) \$105.60



44. In the figure above, PQRT is a parallelogram with PQ = 45cm and PT = 17cm. If TS = 15cm, then the area of the trapezium PQRS is
(A) 60cm² (B) 124cm² (C) 300cm² (D) 360cm²

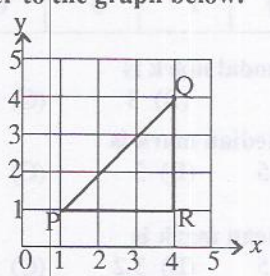


45. The diagram above shows a cone of base radius 7cm and perpendicular height 30cm. The volume of the cone, in cm³, is
(A) 21 (B) 1 320 (C) 1 540 (D) 4 620



46. The diagram above shows the major sector of a circle POQ, centre O. Given that the area of the circle of which the sector is a part is 90cm², then the area of the sector is
(A) 15cm² (B) 30cm² (C) 45cm² (D) 60cm²

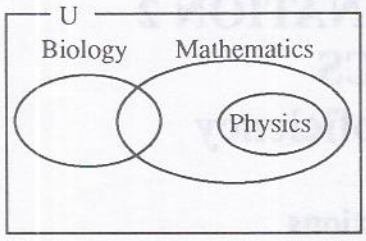
Items 47-49 refer to the graph below.



47. The coordinates of the point Q are
(A) (1, 4) (B) (4, 4) (C) (4, 1) (D) (3, 3)

48. The gradient of PQ is
(A) 1 (B) 1.5 (C) 3 (D) 35

49. The equation of PQ is
(A) $x = 4$ (B) $y = 1$ (C) $y = x$ (D) $y = 3x$



50. The Venn diagram above gives information on students who are studying Advanced level Mathematics, Physics and Biology. Which of the following deductions are valid ?

i. Some Physics students study Biology
ii. All Physics students study Mathematics.
iii. Some Mathematics students study Biology.

(A) i and ii only (B) i and iii only
(C) ii and iii only (D) i, ii and iii

51. A model ship was constructed using the scale 1:500. If a length on the model is 4cm, then the corresponding length on the real ship is

(A) 20mm (B) 20cm (C) 20m (D) 20km

52. What is the amount received on investing $1 000 for 2 years at 5% per annum compound interest?

(A) $52.50 (B) $102.50 (C) $1 052.50 (D) $1 102.50

53. $1 500 invested for 3 years gains $360 in simple interest. The rate per cent per annum achieved is

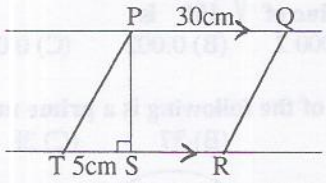
(A) 7 (B) 8 (C) 9 (D) 10

54. Mrs. Farah bought a microwave for $2 875, which includes value added tax at 15 per cent. The price of the microwave exclusive of the value added tax is

(A) $431.25 (B) $2 860 (C) $2 500 (D) $3 306.25

55. Marilyn and Frank each save $25 per month. Their present savings are 3x$ and 2x$ respectively. What will be the sum of their savings 5 months from now?

(A) $(5x \times 250)$ (B) $(5x + 250)$
(C) $75x$ (D) $125x$



56. In the diagram above, PQ is parallel to TR, PQ = 30cm and TS = 5cm. The ratio

$$\frac{\text{area of } \Delta PST}{\text{area of trapezium } PQRS} =$$

(A) 1:11 (B) 11:1 (C) 1:2 (D) 12:1

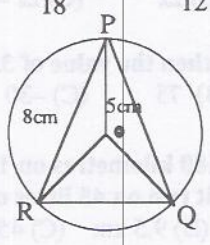
Items 57-58 refer to the pie chart below.
The pie chart shows the favourite games of 900 spectators.

57. How many spectators preferred cricket?

(A) 100 (B) 190 (C) 210 (D) 225

58. If a spectator is chosen at random, the probability that he likes karate is

(A) $\frac{5}{8}$ (B) $\frac{5}{18}$ (C) $\frac{7}{12}$ (D) $\frac{7}{36}$



59. The figure above shows an equilateral triangle PQR of length 8cm, inscribed in a circle with centre O. Given that the radius of the circle is 5cm, then the difference, in cm, between the circumference of the circle and the perimeter of the triangle PQR is

(A) 3cm (B) $6\frac{3}{8}$ (C) $7\frac{3}{7}$ (D) 9

60. A transformation maps the point P(2, 3) onto P^1(–2, –3). The transformation is a

(A) reflection in the x - axis
(B) reflection in the y - axis
(C) glide reflection in the live $y = -x$
(D) rotation of 180° about the origin

C.X.C. MODEL EXAMINATION 2
MATHEMATICS
Paper 1 - General Proficiency
90 minutes
Answer ALL the questions

1. The simple interest on \$900 for 5 years at 7 per cent per annum is

(A) $\$\ \frac{100\times5\times7}{900}$ (B) $\$\ \frac{100\times5}{900\times7}$

(C) $\$\ \frac{900\times5\times7}{100}$ (D) $\$\ \frac{900\times7}{100\times5}$

2. $6x - 3y - 4x + 3y =$

(A) $10x$ (B) $2x$ (C) $2x - 6y$ (D) $10x + 6y$

3. When $x = -5$, then the value of $3x^2$ is

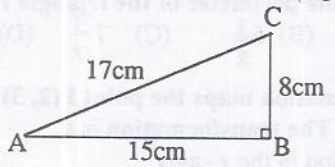
(A) -15 (B) 75 (C) -30 (D) 4

4. A van runs 180 kilometres on 18 litres of petrol. How far will it run on 45 litres of petrol?

(A) 900km (B) 9.5 km (C) 450 km (D) 4.5 km

5. If $\underline{a} = \begin{pmatrix}7\\5\end{pmatrix}$ and $\underline{b} = \begin{pmatrix}3\\2\end{pmatrix}$, then $\underline{a} - \underline{b} =$

(A) $\begin{pmatrix}4\\3\end{pmatrix}$ (B) $\begin{pmatrix}10\\7\end{pmatrix}$ (C) $\begin{pmatrix}-4\\-3\end{pmatrix}$ (D) $\begin{pmatrix}4\\-7\end{pmatrix}$



6. In triangle ABC above, AC= 17 cm, AB = 15 cm and BC = 8 cm. What is sin C ?

(A) $\frac{8}{17}$ (B) $\frac{15}{17}$ (C) $\frac{8}{15}$ (D) $\frac{17}{8}$

7. $(x^3)^2 =$

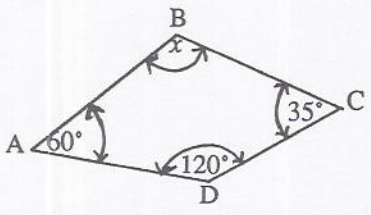
(A) $3x^2$ (B) $2x^3$ (C) x^5 (D) x^6

8. The value of 8 in the number 386.5 is

(A) 8 tenths (B) 8 ones (C) 8 tens (D) 8 hundreds

9. Which of the following sets is equivalent to the set {a, b, c, d, e}?

(A) { 5 } (B) {a, c, e} (C) {1, 2, 3, 4, 5} (D) {b, d)



10. In the quadrilateral ABCD above , x is

(A) 60° (B) 75° (C) 145° (D) 165°

11. The volume of a cube which has sides of length 5 cm is

(A) $15cm^3$ (B) $30cm^3$ (C) $125cm^3$ (D) $250cm^3$

12. The following scores were obtained by seven cricketers in a test match: 13, 125, 40, 59, 60, 6, 9. The median score is

(A) 40 (B) 50 (C) 59 (D) 125

13. If $f(x) = -x^2 + 3$, then $f(5) =$

(A) 28 (B) -7 (C) 4 (D) -22

14. Given that A and B are sets such that $n(A) = 20$ and $n(B) = 15$. If $B \subset A$, then $n(A \cap B) =$

(A) 5 (B) 35 (C) 15 (D) 20

15. If the Universal set U = {2, 4, 6, 8, 10} and G = {4, 8} then $G^1 =$

(A) {1, 3, 5} (B) {12, 14, 16}

(C) {2,6,10} (D) { }

16. A clock valued at \$300 is marked up by 10%. At a sale a discount of 10% is given on the marked price. What was the final selling price of the clock?

(A) \$300 (B) \$280 (C) \$275 (D) \$297

17. Three towns P, Q and R are situated on level ground. R is 20km east of P. The bearing of Q from P is 065° and the bearing of R from Q is 155°. How far is P from Q?

(A) 20km sin 65° (B) 20km cos 65°

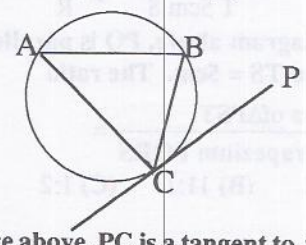
(C) 20km tan 65° (D) $\frac{20\text{km}}{\cos 65°}$

18. The value of $\sqrt{\frac{0.04}{100}}$ is

(A) 0.000 2 (B) 0.002 (C) 0.02 (D) 0.2

19. Which of the following is a prime number?

(A) 36 (B) 37 (C) 38 (D) 39



20. In the figure above, PC is a tangent to the circle and C is the point of tangency. If angle BCP = 39°, then angle BAC =

(A) 39° (B) 141° (C) 30° (D) 45°

21. "A certain number n decreased by two times another number m is equal to p". The statement can be expresed algebraically as
(A) $n - m^2 = p$ (B) $n - 2m = p$
(C) $n + p = 2m$ (D) $n + p = m^2$

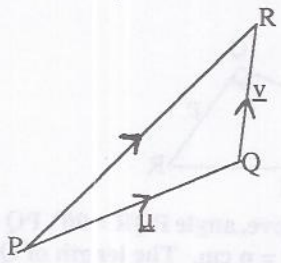
22. A customer bought a radio at a discount of 30%, thus saving $108. What was the original price of the radio?
(A) $71.43 (B) $1 080 (C) $756 (D) $360

23. How many years would it take $500 invested at 7% per annum simple interest to amount to $640?
(A) 4 years (B) 5 years (C) 6 years (D) 7 years

24. A businesswoman bought a lamp for $240 and sold it to gain 20 % on the cost price. How much money did the businesswoman gain?
(A) $260 (B) $288 (C) $60 (D) $48

25. If $\frac{2y-5}{3} = 4$, then y =
(A) $3\frac{1}{2}$ (B) $8\frac{1}{2}$ (C) 11 (D) $12\frac{3}{4}$

26. $6(4x - y) - 3(5x - 2y) =$
(A) $9x$ (B) $9x - 12y$
(C) $-9x + 12y$ (D) $-9x - 12y$



27. In the diagram above, if $\underline{u} = \begin{pmatrix}8\\3\end{pmatrix}$ and $\underline{v} = \begin{pmatrix}1\\2\end{pmatrix}$, then $\overrightarrow{PR}$ =
(A) $\begin{pmatrix}7\\1\end{pmatrix}$ (B) $\begin{pmatrix}-7\\-1\end{pmatrix}$ (C) $\begin{pmatrix}9\\5\end{pmatrix}$ (D) $\begin{pmatrix}-9\\-5\end{pmatrix}$

Score	1	2	3	4	5	6
Frequency	3	6	10	12	7	2

28. The table shows the score and frequency of 40 archers in a competition. What is the median score?
(A) 2 (B) 3 (C) 4 (D) 5

29. A basket contains oranges and tangerines. If there are 25 oranges and the probability of choosing an orange at random is $\frac{5}{12}$, then the number of tangerines in the basket is
(A) 35 (B) 45 (C) 55 (D) 60

30. $x^2 + y^2 - 2xy$ is equivalent to
(A) $(x - y)^2$ (B) $(x + y)^2$
(C) $(x - y)^2 + 2xy$ (D) $(x + y)^2 - 2xy$

31. The number 0.045 9 in standard form is
(A) 4.59×10^{-1} (B) 4.59×10^{-2}
(C) 4.59×10^{1} (D) 4.59×10^{2}

32. The number 43 625 written correct to 4 significant figures is
(A) 4 362 (B) 4 363 (C) 43 620 (D) 43 630

33. Three light bulbs on a Christmas tree flashes at intervals of 2, 5 and 8 seconds respectively If they are started together, how soon after will they next flash together?
(A) 16 (B) 24 (C) 32 (D) 40

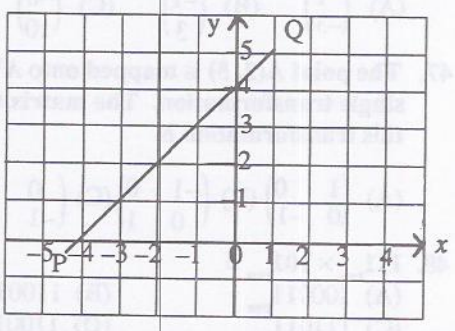
34. A model ship is made on a scale of 1 to 10. Given that the capacity of the actual ship is 1 000m³, then the capacity of the model is
(A) 1m³ (B) 10m³ (C) 100m³ (D) 1 000m³

35. A rectangular football field is $6x$ metres long and $3x$ metres wide. If its perimeter is 360 metres, then the the value of x is
(A) 10 metres (B) 20 metres
(C) 30 metres (D) 40 metres

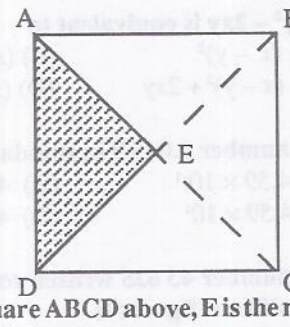
36. The place value of the 3 in the number 4352_{eight} is
(A) three (B) twenty-four
(C) three hundred (D) one hundred and ninety-two

37. The point (x, y) is the image of the point $(2, 5)$ after a reflection in the line $y = -1$. The point (x, y) is
(A) $(5, -4)$ (B) $(-4, 5)$ (C) $(2, -7)$ (D) $(7, -2)$

38. A garden is 800 metres long and 650 metres wide. Its area in hectares is
(A) 52 (B) 520 (C) 5 200 (D) 520 000



39. Using the figure above, state which of the following points lie on the line PQ.
(A) $(-2, 2)$ (B) $(-3, 3)$ (C) $(2, 8)$ (D) $(3, 9)$



40. In the square ABCD above, E is the mid-point of AC and BD. Given that AB = 24cm, then the area of the shaded region of the square is
(A) 96cm² (B) 144cm² (C) 432cm² (D) 576cm²

41. If θ is an obtuse angle and $\sin\theta = \frac{12}{13}$, then $\cos\theta =$
(A) $-\frac{5}{12}$ (B) $\frac{5}{12}$ (C) $\frac{5}{13}$ (D) $-\frac{5}{13}$

42. The exterior angle of a regular polygon is 24°. How many sides has the polygon?
(A) 10 (B) 15 (C) 20 (D) 25

43. If $f(x) = 2x - 1$ and $g(x) = 3x + 2$, the $fg(-2) =$
(A) –13 (B) –9 (C) 11 (D) 15

44. If $f(x) = 3x + 4$, then $f^{-1}(x) =$
(A) $\frac{x-4}{3}$ (B) $\frac{x+4}{3}$ (C) $\frac{x-3}{4}$ (D) $\frac{x+3}{4}$

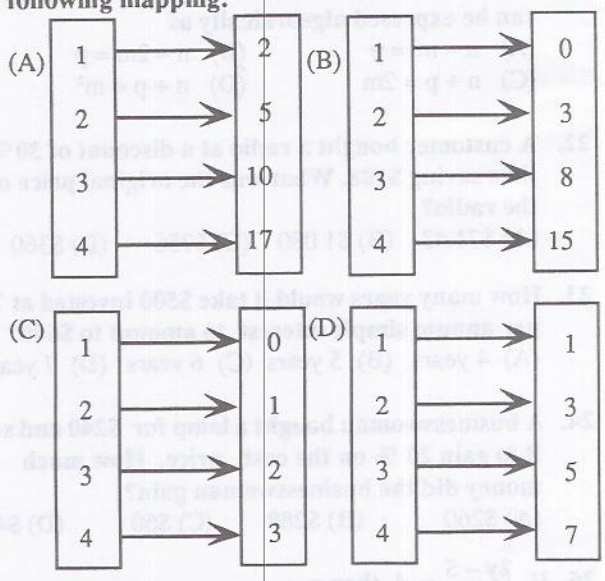
45. A sweet drink factory produces 25 000 bottles of drink each day. The probability that a bottle of drink is defective is $\frac{1}{500}$. How many bottles of drink are likely to be defective on any particular day?
(A) 25 (B) 50 (C) 75 (D) 100

46. The point P(–3, 8) is translated by a vector $\begin{pmatrix}2\\-5\end{pmatrix}$. The coordinates of the image of P are
(A) $\begin{pmatrix}1\\-3\end{pmatrix}$ (B) $\begin{pmatrix}-1\\3\end{pmatrix}$ (C) $\begin{pmatrix}-8\\10\end{pmatrix}$ (D) $\begin{pmatrix}8\\-10\end{pmatrix}$

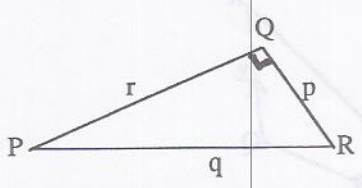
47. The point A(2, 5) is mapped onto $A^1(5, -2)$ under a single transformation. The matrix that represents this transformation is
(A) $\begin{pmatrix}1 & 0\\0 & -1\end{pmatrix}$ (B) $\begin{pmatrix}-1 & 0\\0 & 1\end{pmatrix}$ (C) $\begin{pmatrix}0 & 1\\-1 & 0\end{pmatrix}$ (D) $\begin{pmatrix}0 & -1\\1 & 0\end{pmatrix}$

48. $111_{two} \times 101_{two} =$
(A) 100011_{two} (B) 110011_{two}
(C) 111011_{two} (D) 110011_{two}

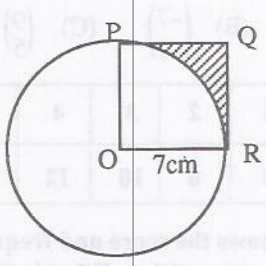
49. The function f: $x \to x^2 - 1$ can be represented by the following mapping:



50. The lengths of the sides of a triangle are 3cm, 5cm and 9cm, each measured to the nearest centimetre. The range of possible values of the perimeter of the triangle is
(A) 15.5cm to 17cm (B) 17cm to 18.5cm
(B) 14.5cm to 17.5cm (D) 15.5cm to 18.5cm



51. In triangle PQR above, angle PQR = 90°, PQ = r cm, PR = q cm and QR = p cm. The length of QR expressed in terms of r and q is
(A) $\sqrt{r^2 + q^2}$ (B) $\sqrt{r^2 - q^2}$ (C) $\sqrt{q^2 - r^2}$ (D) $-\sqrt{q^2 + r^2}$



52. In the figure above, O is the centre of the circle of radius 7cm. Give that OPQR is a square, then the area of the shaded region is
(A) $10\frac{1}{2}$cm² (B) 21cm² (C) $31\frac{1}{2}$cm² (D) 42cm²

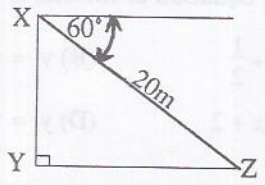
Items 53-55 refer to the table below.
The table below shows the distribution of the marks of 30 students on a test.

Marks	5	6	7	8	9	10
No. of students	2	4	8	9	4	3

53. What is the mode of the distribution?
(A) 6 (B) 7 (C) 8 (D) 9

54. What is the probability that a student chosen at random scored at least 8 marks?
(A) $\frac{7}{30}$ (B) $\frac{9}{30}$ (C) $\frac{8}{15}$ (D) $\frac{3}{10}$

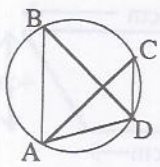
55. The mean mark of the distribution is
(A) 7.6 (B) 7.7 (D) 8.0 (D) 8.1



56. The diagram above shows the angle of depression of a point Z from X. The distance XZ measured along the line of sight is 20m. XY is a vertical tower standing on level ground YZ. The height of the tower, in metres, is
(A) 20 sin 60° (B) 20 cos 60°
(C) 20 tan 60° (D) 20 sin 30°

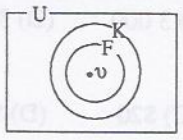
57. The circumference of a circle is 220cm. If we take $\pi = \frac{22}{7}$, then the radius of the circle is
(A) $\sqrt{35}$cm (B) $\sqrt{70}$cm (C) 35cm (D) 70cm

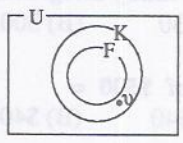
58. If $p = \frac{p-q}{r}$, then q =
(A) p(1 − r) (B) P(1 + r) (C) $\frac{pr}{r-1}$ (D) $\frac{pr}{r+1}$

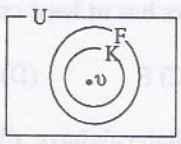


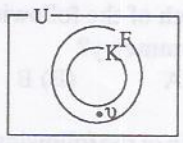
59. In the figure above, angle ACD = 25°. Hence, angle ABD =
(A) 12.5° (B) 25° (C) 37.5° (D) 50°

60. All Karatekas are flexible.
Vidya is flexible.
Therefore Vidya is a Karateka.
Let U = {people},
K = {Karatekas},
F = {flexible people}, and
v = Vidya.
Which pair of Venn diagrams below can be used to prove that the conclusion in the argument above is invalid?

I.


II.


III.


IV.


(A) I and II (B) II and III
(C) III and IV (D) I and IV

C.X.C. MODEL EXAMINATION 3
MATHEMATICS
Paper 1 - General Proficiency
90 minutes
Answer ALL the questions

1. **How many kilograms are there in three tonnes?**
   (A) 30 (B) 300 (C) 3 000 (D) 30 000

2. **8% of \$500 =**
   (A) \$40 (B) \$400 (C) \$20 (D) \$200

3. **Which of the following letters has at least one line of symmetry?**
   (A) A (B) B (C) F (D) G

4. **Which of the following quadrilaterals have diagonals that inter sect at right angles?**
   (A) Trapezium (B) Kite
   (C) Rectangle (D) Parallelogram

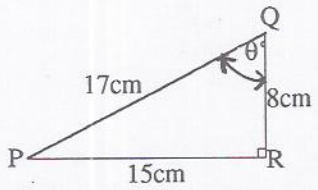
5. **If 1 600 out of 8 000 people do not eat fish, then the percentage that eat fish is**
   (A) 20 (B) 64 (C) 80 (D) 96

6. **The base ten equivalent of 301_{five} is**
   (A) 4 (B) 31 (C) 76 (D) 81

7. **If p * q means $p^2 - pq$, then 5 * 2 is equal to**
   (A) 15 (B) –21 (C) 10 (D) 39

8. $7\frac{2}{3} + 5\frac{4}{7} =$
   (A) $12\frac{8}{21}$ (B) $13\frac{5}{21}$ (C) $12\frac{3}{5}$ (D) $13\frac{8}{21}$

9. **Given that A = {2, 4, 6, 8}, B = {4, 6,8} and C = {6, 8, 10},then A∪ B∪ C=**
   (A) { } (B) {2, 8}
   (C) {6} (D) {2, 4, 6,8, 10}



10. **In triangle PQR above, PQ=17cm,PR=15cm and QR = 8 cm.**
    What is the value of tan θ ?
    (A) $\frac{15}{8}$ (B) $\frac{8}{15}$ (C) $\frac{17}{15}$ (D) $\frac{8}{17}$

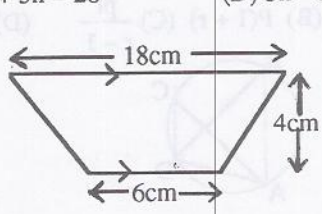
11. **The point P(2, 7) is mapped onto P¹(2, –7) by a transformation represented by the matrix T. The matrix T =**
    (A) $\begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix}$ (B) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ (C) $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$ (D) $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

12. **A line of gradient $\frac{1}{2}$ passes through the point (0, 3). The equation of the line is**
    (A) $y = 3x + \frac{1}{2}$ (B) $y = \frac{1}{2}x + 3$
    (C) $y = -\frac{1}{3}x + 2$ (D) $y = \frac{1}{2}x - 3$

13. **When half of a certain number 'x' is added to five times its square, then the result is**
    (A) $\frac{x}{2} + 5x^2$ (B) $2x + 5x^2$
    (C) $\frac{1}{2}x + (5x)^2$ (D) $2x + 25x^2$

14. **If $K = \frac{m^2}{m-2}$ and m = –3, then K =**
    (A) $\frac{-9}{5}$ (B) $\frac{9}{5}$ (C) $\frac{6}{-5}$ (D) $\frac{9}{-5}$

15. **"When 4 is added to 5 times a certain number n, the result is 28". This statement can be represented by the equation**
    (A) 5n + 28 = 4 (B) 5n – 4 = 28
    (C) 4 + 5n = 28 (D) 5n – 28 = 4



16. **The area of the trapezium above is**
    (A) 24cm² (B) 48cm² (C) 72 cm² (D) 144cm²

17. **If 3 + (4 × p) = 19, then p =**
    (A) 4 (B) $5\frac{1}{2}$ (C) $25\frac{1}{3}$ (D) $8\frac{3}{4}$

18. **A computer costs \$12 500 cash. When bought on hire purchase, a deposit of \$1 500 is required, followed by 20 monthly instalments of \$643.75. How much is saved by paying cash?**
    (A) \$375 (B) \$845 (C) \$1 650 (D)\$1 875

19. 0.125 written as a vulgar fraction is

(A) $\frac{5}{12}$ (B) $\frac{1}{25}$ (C) $\frac{1}{8}$ (D) $\frac{12}{25}$

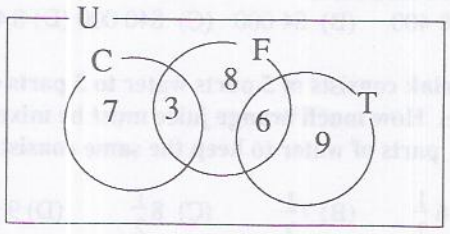
20. Which of the following is a prime number?
(A) 46 (B) 47 (C) 48 (D) 49

21. The value of 4 in the number 32 451 is
(A) 4 ones (B) 4 tens
(C) 4 hundreds (D) 4 thousands

22. The middle value in a set of ascending or decending values is called the
(A) mean (B) median (C) mode (D) range

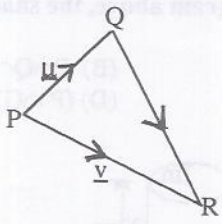
23. Using the distributive law, $36 \times 18 + 36 \times 9 =$
(A) $36 + 27$ (B) 72×27 (C) 36×27 (D) $72 + 27$

24. Given that $40 - 5x = x - 2$, then $x =$
(A) 6 (B) 7 (C) –10 (D) –8

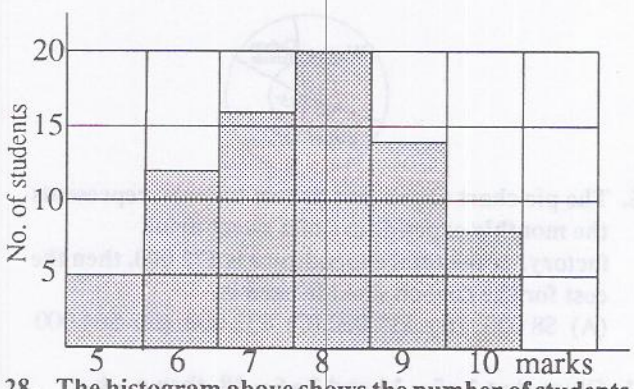


25. In the Venn diagram above,
U = {students who play games},
C = {students who play cricket},
F = {students who play football} , and
T = {students who play tennis}.
The number of students in each set is indicated.
How many students play cricket and football only?
(A) 3 (B) 6 (C) 7 (D) 8

26. $6a^2 - 14a + 4$ is equivalent to
(A) $2(3a - 1)(a - 2)$ (B) $2(3a - 1)(a + 2)$
(C) $2(3a + 1)(a - 2)$ (D) $-2(3a + 1)(a - 2)$



27. In the diagram above, not drawn to scale, $\underline{\mu}$ is the vector $\begin{pmatrix}5\\3\end{pmatrix}$ and $\underline{\nu}$ is the vector $\begin{pmatrix}7\\-9\end{pmatrix}$.
$\overrightarrow{QR}$ is the vector
(A) $\begin{pmatrix}-2\\12\end{pmatrix}$ (B) $\begin{pmatrix}2\\12\end{pmatrix}$ (C) $\begin{pmatrix}-2\\-12\end{pmatrix}$ (D) $\begin{pmatrix}2\\-12\end{pmatrix}$



28. The histogram above shows the number of students and the marks they obtained out of a maximun of 10 marks in a test. How many students wrote the test?
(A) 60 (B) 75 (C) 90 (D) 105

29. Luke bought a lighter for $90. He sold it to make a profit of 20% on the cost to him. How much money did he gain?
(A) $18 (B) $36 (C) $72 (D) $108

30. The image of a point (1, 3) under a translation is (–4, –5). What is the translation vector?
(A) $\begin{pmatrix}-5\\8\end{pmatrix}$ (B) $\begin{pmatrix}5\\-8\end{pmatrix}$ (C) $\begin{pmatrix}-5\\-8\end{pmatrix}$ (D) $\begin{pmatrix}5\\8\end{pmatrix}$

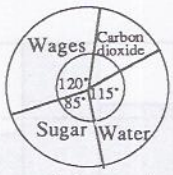
31. The diagram above shows two concentric circles. The radius of the large circle R is 5 cm and the radius of the small circle r is 3cm. The area, in cm^2, of the shaded ring is
(A) 2π (B) 4π (C) 8π (D) 16π

32. A circular bicycle wheel has a diameter of 14cm. How far will it move in 10 revolutions?
(A) 44 (B) 88 (C) 440 (D) 880

33. Karen's present age is $4x$ years and Teddy is thrice her age. The sum of their ages in 4 years time is
(A) $7x + 4$ (B) $7x + 8$ (C) $16x + 4$ (D) $16x + 8$

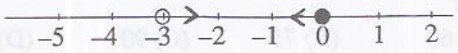
34. Given that $5.1 \times 3.8 = 19.38$, then $510 \times 0.38 =$
(A) 0.193 8 (B) 19.38 (C) 193.8 (D) 1 938

35. The volume of a cube which has sides of length 5 m is
(A) 20 m^3 (B) 125 m^3 (C) 375 m^3 (D) 500 m^3

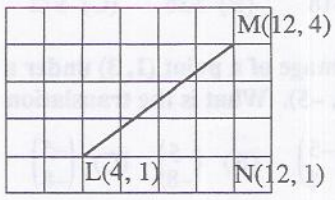


36. The pie chart above, not drawn to scale, represents the monthly expenditure of a sweet drink factory. If the total expenditure is $72 000, then the cost for the carbon dioxide used is
(A) $8 000 (B) $12 000 (C) $32 000 (D) $64 000

37. Given that $2 * 5 = 14$ and $3 * 6 = 18$, then $a * b =$
(A) $3(2a - b)$ (B) $2(b + 3a)$ (C) $2(a + b)$ (D) $2(a - b)$



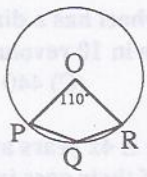
38. The graph of the common region in the diagram above is defined by
(A) $\{x: -3 \leq x \leq 0\}$ (B) $\{x: -3 < x \leq 0\}$
(C) $\{x: -3 < x < 0\}$ (D) $\{x: -3 \leq x < 0\}$



39. In the diagram above, the gradient of the line LM is
(A) $\frac{3}{4}$ (B) $\frac{4}{3}$ (C) $\frac{3}{8}$ (D) $\frac{8}{3}$

40. The area of a triangle is 36.5cm². If the base is doubled and the altitude is halved, then the area is equal to
(A) 36.5cm² (B) 73cm² (C) 109.5cm² (D) 146cm²

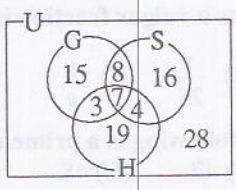
41. If $ax^2 + 12x + 4$ is a perfect square, then a is
(A) 2 (B) 3 (C) 6 (D)9



42. In the diagram above, O is the centre of the circle and angle POR = 110°. Angle PQR =
(A) 55° (B) 70° (C) 120° (D) 125°

43. The exterior angle of a regular polgon is 40°. How many sides has the polygon.
(A) 7 (B) 8 (C) 9 (D) 10

44. A basket contains plums and peaches. If there are 9 peaches in the basket and the probability of drawing a peach is 3/8, then the number of plums in the basket is
(A) 5 (B) 8 (C) 15 (D) 24



45. In the Venn diagram above:
U = { students in Form vi},
G = {students who study Geography},
S = {students who study Sociology}, and
H = {students who study History}.
The number of students who study neither Geography nor Sociology nor History is
(A) 15 (B) 16 (C) 19 (D) 28

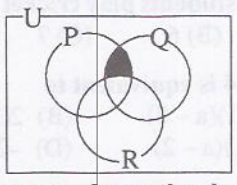
46. How many years will it take $1 200 invested at 6% per annum simple interest to amount to $1 416?
(A) 2 (B) 2.5 (C) 3 (D) 3.5

47. The area of a plot of land is 840 hectares. Its area, in square metres, is
(A) 8 400 (B) 84 000 (C) 840 000 (D) 8 400 000

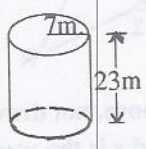
48. A drink consists of 5 parts water to 3 parts orange juice. How much orange juice must be mixed with $12\frac{1}{2}$ parts of water to keep the same consistency?
(A) $6\frac{1}{2}$ (B) $7\frac{1}{2}$ (C) $8\frac{1}{2}$ (D) $9\frac{1}{2}$

49. $x^2 - 2x$ is equivalent to
(A) $x^2(1 - 2)$ (B) $x(x - 2)$ (C) $(x - 1)^2$ (D) $(x - 2)^2$

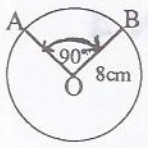
50. $\frac{6x - 9}{3}$
(A) $2x - 9$ (B) $6x - 3$ (C) $2x - 3$ (D) -1



51. In the Venn diagram above, the shaded region represents
(A) $P \cap Q$ (B) $P \cap Q \cap R^1$
(C) $(P \cup Q)^1 \cap R^1$ (D) $(P \cap G)^1 \cap R^1$

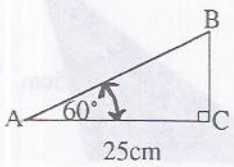


52. The diagram above shows a closed cylindrical water container of radius 7m and height 23m. The total surface area of the container is
(A) 161π (B) 420π (C) $1\,127\pi$ (D) $2\,940\pi$



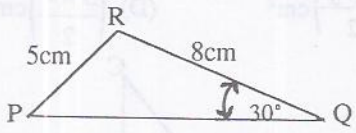
53. In the figure above, O is the centre of the the circle of radius 8cm. Angle AOB = 90°. The length of the major arc AB, in cm is

(A) 4π (B) 8π (C) 12π (D) 16π



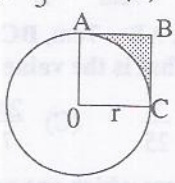
54. Triangle ABC shown above is right - angled at C. If AC = 25cm and angle BAC = 60°, then the length of AB is

(A) 35cm (B) 50cm (C) 65cm (D) 75cm



55. In triangle PQR above, PR = 5cm, QR = 8cm and angle PQR = 30°. So sin $\widehat{P}$ =

(A) $\frac{5}{8}$ (B) $\frac{8}{5}$ (C) $\frac{4}{5}$ (D) $\frac{5}{4}$

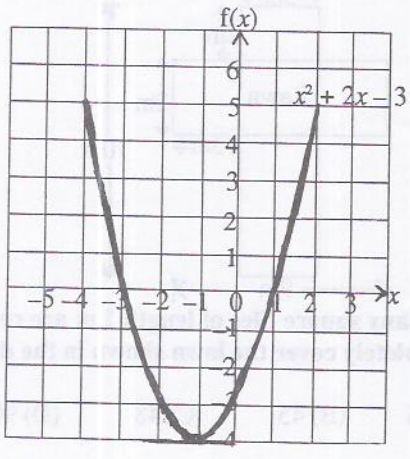


56. In the figure above, O is the centre of the circle, radius r cm. Given that OABC is a square, then an expression for the shaded region is

(A) $r^2\left(1-\frac{1}{4}\pi\right)$ (B) $r\left(\frac{1}{4}\pi r-2\right)$

(C) $\frac{1}{4}\pi r\,(r-1)$ (D) $\frac{1}{4}\pi r\,(r-2)$

Items 57-58 refer to the graph shown below.
The graph represents the function $f(x) = x^2 + 2x - 3$.



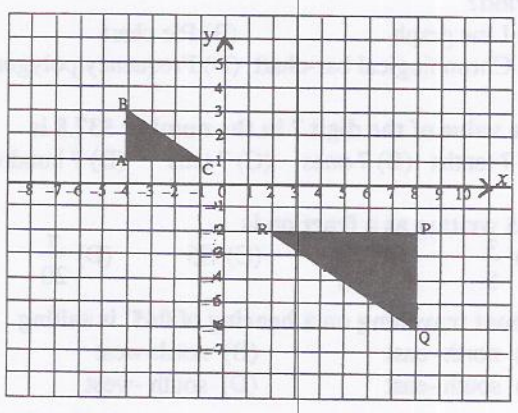
57. For what values of the domain is the function f(x) positive?

(A) $\{x: -3 < x \leq 1\}$ (B) $\{: -3 \leq x < 1\}$
(C) $\{x: -3 < x < 1\}^1$ (D) $\{: -3 \leq x \leq 1\}^1$

58. $f(x) = 5$ when $x =$

(A) {0,5} (B) {–4,2} (C) {–2,3} (D) {0,–5}

Items 59-60 refer to the graph below.



59. The transformation that maps ΔPQR onto ΔABC is an

(A) enlargement about the origin with scale factor $-\frac{1}{2}$

(B) enlargement about the origin with scale factor –2

(C) enlargement about the origin with scale factor $\frac{1}{2}$

(D) enlargement about the origin with scale factor 2

60. The translation T that maps A(–4,1) onto P(8,–2) is represented by the matrix

(A) $\begin{pmatrix}-3\\12\end{pmatrix}$ (B) $\begin{pmatrix}3\\-12\end{pmatrix}$ (C) $\begin{pmatrix}12\\-3\end{pmatrix}$ (D) $\begin{pmatrix}-12\\3\end{pmatrix}$

C.X.C. MODEL EXAMINATION 4
MATHEMATICS
Paper 1 - General Proficiency
90 minutes
Answer ALL the questions

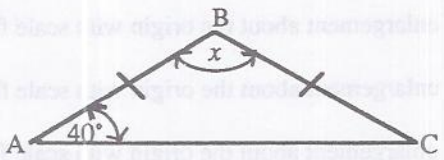
1. **Which of the following would be most suitable for comparing a country's budget over a five-year period?**
   (A) Line graph (B) Pie chart
   (C) Chronological bar-chart (D) Frequency polygon

2. **The value of the digit 7 in the number 537.8 is**
   (A) 7 tenths (B) 7 ones (C) 7 tens (D) 7 hundreds

3. **0.35 written as a fraction is**
   (A) $\frac{3}{5}$ (B) $\frac{5}{3}$ (C) 35 (D) $\frac{7}{20}$

4. **A boat travelling on a bearing of 045° is sailing**
   (A) north- east (B) north-west
   (C) south -east (D) south -west

5. **The number 0.004 35 written in standard form is**
   (A) 4.35×10^{-2} (B) 4.35×10^{-3}
   (C) 4.35×10^{2} (D) 4.35×10^{3}



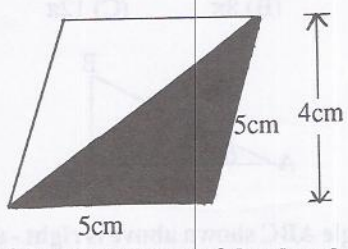
6. **In Δ ABC above, the magnitude of angle x is**
   (A) 40° (B) 80° (C) 90° (D) 100°

7. **Which of the following words best decribes a polygon with all its sides equal ?**
   (A) Scalene triangle (B) Isosceles triangle
   (C) Equilateral triangle (D) Convex polygon

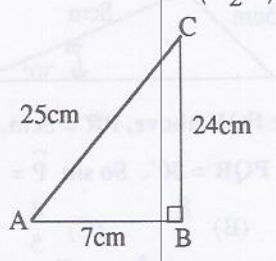
8. **If $m * n = \sqrt{2m - 3n}$, then $4 * 1 =$**
   (A) $\sqrt{-1}$ (B) $\sqrt{-11}$ (C) $\sqrt{5}$ (D) $\sqrt{24}$

9. **Which of the following numbers is prime?**
   (A) $\sqrt{1}$ (B) $\sqrt{4}$ (C) $\sqrt{5}$ (D) $\sqrt{37}$

10. **The following scores were obtained by seven marksmen in a shooting competition:**
    9,3,7,15,10,19,17.
    The median score is
    (A) 3 (B) 9 (C) 10 (D) 17



11. **The area of the shaded part of the rhombus above is**
    (A) $(5 + 5)\text{cm}^2$ (B) $(5 \times 4)\text{cm}^2$
    (C) $\left(\frac{5+5}{2}\right)\text{cm}^2$ (D) $\left(\frac{5\times4}{2}\right)\text{cm}^2$

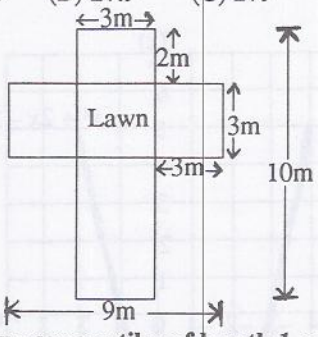


12. **In Δ ABC above, AB = 7cm, BC=24 cm and AC = 25 cm. What is the value of tan A?**
    (A) $\frac{24}{25}$ (B) $\frac{7}{25}$ (C) $\frac{24}{7}$ (D) $\frac{7}{24}$

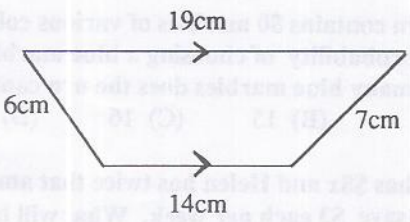
13. **The set of numbers which are greater then –3 but less than 9 may be written as**
    (A) $\{x: -3 > x > 9\}$ (B) $\{x: -3 \geq x \geq 9\}$
    (C) $\{x: -3 < x < 9\}$ (D) $\{x: -3 \leq x < 9\}$

14. **$6x - 3y - 4x + 7y =$**
    (A) $2(x - 3y)$ (B) $2(x + 2y)$ (C) $-2(x + 2y)$ (D) $2(x + 3y)$

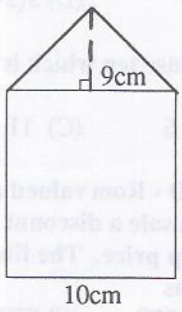
15. **If $6.2 \times 0.45 = 2.79$, then $0.62 \times 450 =$**
    (A) 0.279 (B) 27.9 (C) 279 (D) 2 790



16. **How many square tiles of length 1 m are required to completely cover the lawn shown in the diagram above?**
    (A) 136 (B) 45 (C) 48 (D) 90



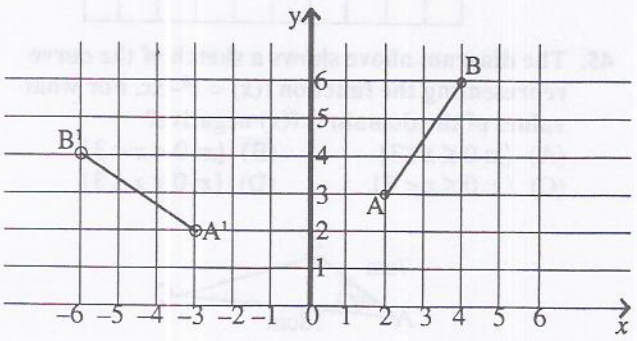
17. What is the perimeter of the trapezium above?
(A) 46cm (B) 99cm (C) 115.5cm (D) 66cm



18. The figure above, not drawn to scale, consists of a triangle of height 9cm, resting on a rectangle of dimensions 18cm by 10cm. What is the total area of the compound figure?
(A) 37cm² (B) 74cm² (C) 76.9cm² (D) 225cm²

19. If $g(x) = \frac{2x-3}{4}$, then $g(-5) =$

(A) $\frac{7}{4}$ (B) $-\frac{13}{4}$ (C) $-\frac{7}{4}$ (D) -4



20. In the figure above, the line A'B' is the image of the line AB after
(A) an enlargement with scale factor –1
(B) an anti-clockwise rotation through 90°, about 0
(C) reflection in the y - axis
(D) translation $\begin{pmatrix}-5\\-1\end{pmatrix}$

21. The number of subsets possible with three different elements is
(A) n^3 (B) 2^3 (C) 3n (D) 3^2

22. The area of a rectangle is 45.6 cm². If the length is doubled and the width is halved, then the area would be
(A) 45.6 cm² (B) 91.2cm² (C) 136.8cm² (D) 182.4 cm²

23. $\frac{6x+9}{3} =$
(A) $2x+3$ (B) $5x$ (C) $2x+9$ (D) $6x+3$

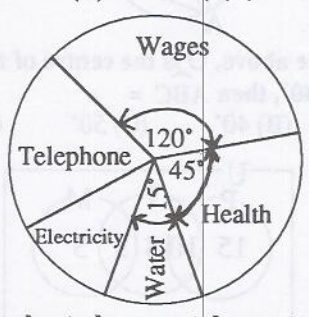
24. Robert bought a book for $120. He sold it to gain 30% on his cost. How much money did he collect?
(A) $150 (B) $156 (C) $164 (D) $210

25. y varies inversely as the square root of x. Given that k is the constant of proportionality, then y =
(A) $k\sqrt{x}$ (B) kx^2 (C) $\frac{k}{\sqrt{x}}$ (D) $\frac{k}{x^2}$

26. The transformation matrix $\begin{pmatrix}\frac{3}{2} & 0\\ 0 & \frac{3}{2}\end{pmatrix}$ represents
(A) an enlargement of scale factor $\frac{3}{2}$, centre 0
(B) a rotation about the point (3, 2)
(C) a translation $\begin{pmatrix}3\\2\end{pmatrix}$
(D) a reflection about the line $x = \frac{3}{2}$

27. If $e = Mv^2$, then v =
(A) $\frac{1}{2}\frac{e}{M}$ (B) $\frac{1}{2}$ eM (C) $\sqrt{\frac{e}{M}}$ (D) $\frac{e^2}{M^2}$

28. $5^{2x} \times 5^{3y} =$
(A) 5^{6xy} (B) 5^{2x+3y} (C) $(2x+3y)5$ (D) 25^{6xy}



29. The pie chart above, not drawn to scale, represents the amount of money a company spends monthly. The total monthly expenditure is $60 900. What is the expenditure on telephone and electricity for any particular month?
(A) $15 225 (B) $45 675 (C) $30 450 (D) $40 650

30. A field is in the shape of a parallelogram of length $6x$ metres. The perpendicular distance between the lengths is $4x$ metres. Given that its area is 600 square metres, then the value of x is
(A) 5m (B) 10m (C) 15m (D) 20 m

31. An alloy consists of a mixture of 3 parts copper to 5 parts brass. How much copper should be mixed with 60kg of brass to obtain an alloy in the same proportion?
(A) 12kg (B) 36kg (C) 48kg (D) 96k g

32. Given that $f(x) = 5x - 2$, then $f^{-1}(x) =$
(A) $\frac{x-2}{5}$ (B) $\frac{x+2}{5}$ (C) $5(x-2)$ (D) $5(x+2)$

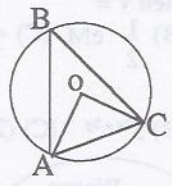
33. $4(3x - y) - 2(4y - 5x) =$
(A) $2x - 4y$ (B) $-2x + 4y$
(C) $-22x + 12y$ (D) $22x - 12y$

34. If $9x^2 + bx + 100$ is a perfect square, then b is
(A) -30 (B) 30 (C) -60 (D) 60

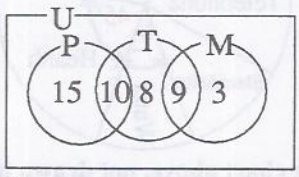
35. A plot of land is 65 hectares in area. Its area in square metres is
(A) 650 (B) 6 500 (C) 65 000 (D) 650 000

36. How many years would it take \$400 invested at 6% per annum simple interest to amount to \$472?
(A) 3 years (B) 4 years (C) 5 years (D) 6 years

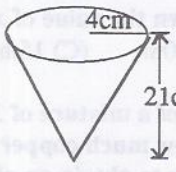
37. A company gives a 10% discount on all items on which a sales tax of 15% of the marked price is charged. What would a customer pay for an article marked \$9 000, if the sales tax is added before the discount is given?
(A) \$7 965 (B) \$8 550 (C) \$9 315 (D) \$10 350



38. In the figure above, O is the centre of the circle. If $\widehat{OAC} = 40°$, then $\widehat{ABC} =$
(A) 30° (B) 40° (C) 50° (D) 60°



39. In the Venn diagram above:
U = {students who play musical instruments},
P = {students who play pan},
T = {students who play tassa}, and
M= {students who play mandolin}.
The number of students in each set is indicated.
How many students play pan or tassa or both musical instruments?
(A) 10 (B) 24 (C) 34 (D) 42



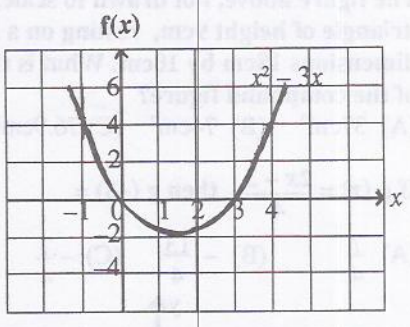
40. The diagram above shows a cone of base radius 4cm and altitude 21 cm. The volume of the cone, in cm^3, is
(A) 84π (B) 112π (C) 168π (D) 336π

41. An urn contains 80 marbles of various colours. The probability of choosing a blue marble is $\frac{3}{16}$. How many blue marbles does the urn contain?
(A) 3 (B) 15 (C) 16 (D) 25

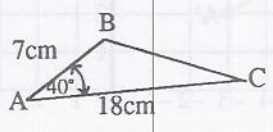
42. Rick has \$8x and Helen has twice that amount. They save \$3 each per week. What will be the sum of their money 4 weeks from now?
(A) $\$(12x + 24)$ (B) $\$(12x - 24)$
(C) $\$(24x + 24)$ (D) $\$(24x - 24)$

43. The number in base ten which is equivalent to 110_{two} is
(A) 5 (B) 6 (C) 11 (D) 12

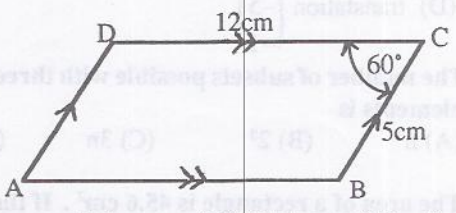
44. The price of a CD - Rom valued at \$80 is marked up by 10 %. At a sale a discount of 10% is given on the marked-up price. The final selling price of the CD - Rom was
(A) \$60 (B) \$72 (C) \$79.20 (D) \$80



45. The diagram above shows a sketch of the curve representing the function $f(x) = x^2 - 3x$. For what values of the domain is $f(x)$ negative?
(A) $\{x: 0 \le x \le 3\}$ (B) $\{x: 0 < x < 3\}$
(C) $\{x: 0 \le x < 3\}$ (D) $\{x: 0 < x \le 3\}$



46. In the triangle above, not drawn to scale, AB = 7cm, AC = 18cm and angle BAC = 40°. The area of ΔABC (in cm^2) =
(A) 63 sin 40° (B) 126 sin 40°
(C) 63 cos 40° (D) 126 cos 40°



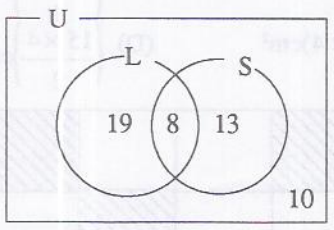
47. In the parallelogram ABCD above, BC = 5cm, CD = 12cm and angle BCD = 60°. The area of parallelogram ABCD (in cm^2) =
(A) 60 cos 60° (B) 30 cos 60°
(C) 60 sin 60° (D) 30 sin 60°

48. Jerry usually saves $\$x$ each month. However, in August he saved \$5 more than thrice his normal amount. Hence, in August Jerry saved
(A) $\$5x$ (B) $\$(5 + 3x)$ (C) $\$15x$ (D) $\$(5x + 3)$

49. A company employs 14 unskilled labourers at \$40 per day and 11 skilled labourers at \$45 per day. What is the mean daily wage of the 25 employees?
(A) \$42.00 (B) \$42.10 (C) \$42.20 (D) \$42.50

50. The simple interest on \$18 000 for four months at 10% per annum is
(A) \$600 (B) \$850 (C) \$4 500 (D) \$7 200

51. A computer presently valued at \$16 000 depreciates at the rate of 10% per annum. What is its book value one year later?
(A) \$12 960 (B) \$14 400 (C) \$15 600 (D) \$15 990

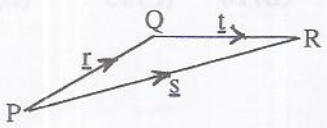


52. In the Venn diagram above:
U = {students in Form six},
L = {students studying law}, and
S = {students studying sociology}.
The number of students in each set is shown. How many students study sociology but not law?
(A) 8 (B) 13 (C) 221 (D) 23

53. P and Q are two finite sets such that $n(P) = 27$, $n(Q) = 30$, $n(P \cap Q) = 12$ and $n(P \cup Q)^1 = 5$. What is $n(P \cup Q)$?
(A) 5 (B) 12 (C) 15 (D) 45

54. Each exterior angle of a regular polygon is 45°. If one side of the polygon is 5cm, then the perimeter of the polygon is
(A) 30cm (B) 35cm (C) 40cm (D) 45cm

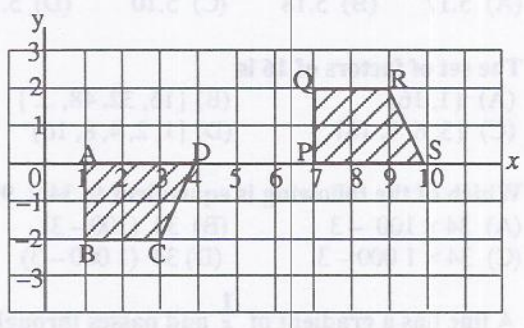
55. Sin 135° has the same value as
(A) sin 45° (B) –sin 45° (C) –cos 45° (D) tan 45°



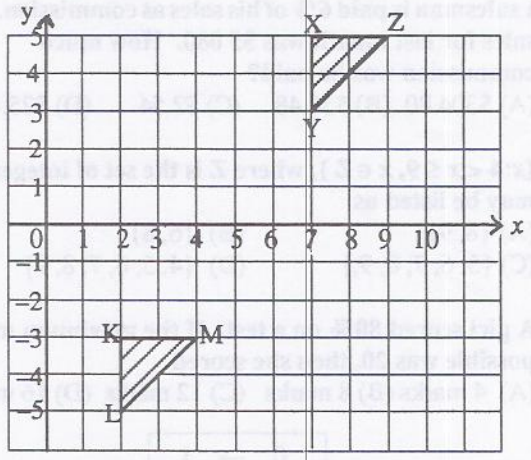
56. In the triangle PQR above, $\overrightarrow{PQ} = \underline{r}$, $\overrightarrow{PR} = \underline{s}$ and $\overrightarrow{QR} = \underline{t}$. Which of the following equations expresses the triangular law of vectors?
(A) $\underline{r} = \underline{s} + \underline{t}$ (B) $\underline{s} = \underline{r} + \underline{t}$ (C) $\underline{t} = \underline{s} + \underline{r}$ (D) $\underline{r} = \underline{t} - \underline{s}$

57. p is inversely proportional to the square root of r. When p = 4, then r = 25. So the constant of proportionality is
(A) 5 (B) 10 (C) 15 (D) 20

58. The point P(3 –5) is rotated through an anti-clockwise angle of 90° about the origin. The coordinates of the image of P is
(A) (–5, 3) (B) (5, 3) (C) (–3, –5) (D) (–3, 5)



59. In the diagram above, quadrilateal PQRS is the image of quadrilateral ABCD after a transformation. The transformation can best be described as a (an)
(A) reflection in the x-axis
(B) rotation through 180° above the point (5.5,0)
(C) glide reflection
(D) enlargement with centre (5.5,0) and scale factor –1



60. In the diagram above, triangle XYZ is the image of triangle KLM after a translation. Which of the following matrices represents the translation vector?
(A) $\begin{pmatrix} 5 \\ 8 \end{pmatrix}$ (B) $\begin{pmatrix} -5 \\ -8 \end{pmatrix}$ (C) $\begin{pmatrix} -5 \\ 8 \end{pmatrix}$ (D) $\begin{pmatrix} 5 \\ -8 \end{pmatrix}$

C.X.C. MODEL EXAMINATION 5
MATHEMATICS
Paper 1 - General Proficiency
90 minutes
Answer ALL the questions

1. **The number 5.176 04, correct to 3 significant figures, is**
   (A) 5.17 (B) 5.18 (C) 5.10 (D) 5.16

2. **The set of factors of 16 is**
   (A) {1, 16} (B) {16, 32, 48, ... }
   (C) {3, 6, 9, 18} (D) {1, 2, 4, 8, 16}

3. **Which of the following is equivalent to 34×997 ?**
   (A) $34 \times 100 - 3$ (B) $34\ (100 - 3)$
   (C) $34 \times 1\,000 - 3$ (D) $34\ (1\,000 - 3)$

4. **A line has a gradient of $\frac{1}{5}$ and passes through the point (0, 3). The equation of the line is**
   (A) $y = \frac{1}{5}x$ (B) $y = \frac{1}{5}x + 3$
   (C) $y = 5x$ (D) $y = 3x + \frac{1}{5}$

5. **A ship sailing on a bearing of 135° is travelling**
   (A) north-east (B) north - west
   (C) south -east (D) south - west

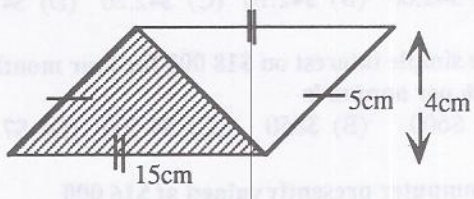
6. **A salesman is paid 6% of his sales as commission. His sales for last month was $5 080. How much commission was he paid?**
   (A) $304.80 (B) $30.48 (C) $2.54 (D) $25.40

7. **$\{x: 4 < x \leq 9, x \in Z\}$, where Z is the set of integers, may be listed as**
   (A) {8, 9} (B) {6, 8}
   (C) {5, 6, 7, 8, 9,} (D) {4, 5, 6, 7, 8, 9}

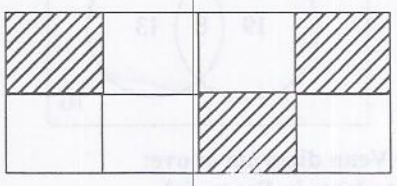
8. **A girl scored 80% on a test. If the maximum mark possible was 20, then she scored**
   (A) 4 marks (B) 8 marks (C) 12 marks (D) 16 marks

0	→	1
1	→	2
2	→	4
3	→	8

9. **Which of the following functions could describe the mapping shown above?**
   (A) $f: x \rightarrow x + 1$ (B) $f: x \rightarrow x + 2$
   (C) $f: x \rightarrow 3^x$ (D) $f: x \rightarrow 2^x$



10. **The area of the shaded part of the parallelogram shown above is**
    (A) $(15 \times 5)\ cm^2$ (B) $\left(\frac{15 \times 5}{2}\right) cm^2$
    (C) $(15 \times 4) cm^2$ (D) $\left(\frac{15 \times 4}{2}\right) cm^2$



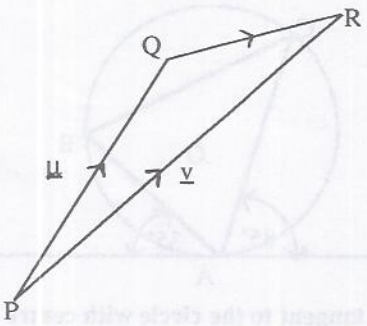
11. **In the rectangle above, the ratio of the shaded area to the unshaded area is**
    (A) 3:8 (B) 8:3 (C) 3:5 (D) 5:3

12. $\frac{7r}{3s} + \frac{3r}{4s} =$
    (A) $\frac{27r}{12s}$ (B) $\frac{37r}{12s}$ (C) $\frac{21r}{7s}$ (D) $\frac{10r}{7s}$

13. **Expressed in standard form, 0.000 768 =**
    (A) 7.68×10^{-4} (B) 7.68×10^{-3}
    (C) 7.68×10^{4} (D) 7.68×10^{3}

14. $4(3x - y) - 2(5x - y) =$
    (A) $-2(x + y)$ (B) $-2(x - y)$
    (C) $2(x + y)$ (D) $2(x - y)$

15. **If $35 - y > 15$, then a possible value of y is**
    (A) 50 (B) 20 (C) 15 (D) 35



16. In the diagram shown above, if $\underrightarrow{\mu}$ is the vector $\begin{pmatrix}2\\7\end{pmatrix}$ and $\underrightarrow{v}$ is the vector $\begin{pmatrix}6\\9\end{pmatrix}$, then $\overrightarrow{QR}$ is

(A) $\begin{pmatrix}4\\2\end{pmatrix}$ (B) $\begin{pmatrix}-4\\-2\end{pmatrix}$ (C) $\begin{pmatrix}-4\\2\end{pmatrix}$ (D) $\begin{pmatrix}4\\-2\end{pmatrix}$

17. Expressed in standard form, 365 000 =

(A) 3.65×10^{-4} (B) 3.65×10^{-5}
(C) 3.65×10^{4} (D) 3.65×10^{5}

18. If $A = \begin{pmatrix}1 & 0\\-2 & 3\end{pmatrix}$ and $B = \begin{pmatrix}0 & -2\\3 & 1\end{pmatrix}$, then AB=

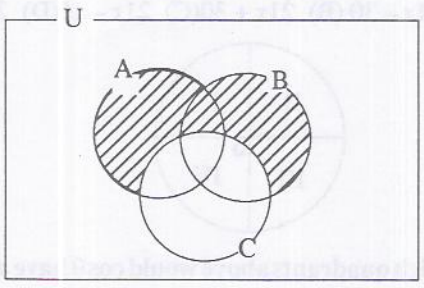
(A) $\begin{pmatrix}0 & -3\\9 & -1\end{pmatrix}$ (B) $\begin{pmatrix}0 & -2\\9 & 7\end{pmatrix}$ (C) $\begin{pmatrix}3 & -2\\-6 & 3\end{pmatrix}$ (D) $\begin{pmatrix}1 & -2\\-6 & 4\end{pmatrix}$

19. $6x^2 + 11x - 10$ is equivalent to

(A) $(3x + 2)(2x - 5)$ (B) $(3x - 2)(2x - 5)$
(C) $(6x + 5)(x - 2)$ (D) $(3x - 2)(2x + 5)$

20. A company gives a 10% discount on the marked price of articles. Value added tax of 15% is charged on the sale price. What would a customer pay for an article marked \$3 000?

(A) \$2 250 (B) \$2 700 (C) \$3 105 (D) \$ 3 450



21. In the Venn diagram above, the shaded region represents the set

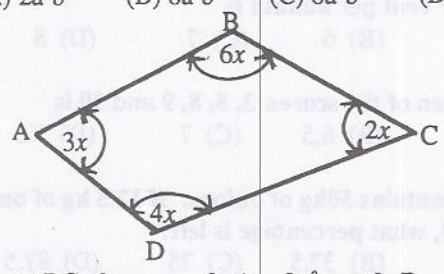
(A) $A \cup B$ (B) $A \cup B \cap C'$
(C) $A \cap B \cap C'$ (D) $(A \cup B)' \cap C'$

22. There are 50 000 people in a town of which $\frac{2}{5}$ are children. The probability that a child can be affected by an epidemic is $\frac{1}{2}$. How many children are likely to be affected?

(A) 2 500 (B) 5 000 (C) 10 000 (D) 20 000

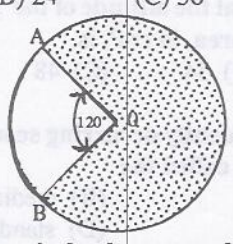
23. $(2a^2b)^3 =$

(A) $2a^6b^3$ (B) $8a^6b^3$ (C) $8a^2b$ (D) $6a^2b$



24. In ΔABC above, angle A = $3x°$, angle B = $6x°$, angle C = $2x°$ and angle D = $4x°$. So x =

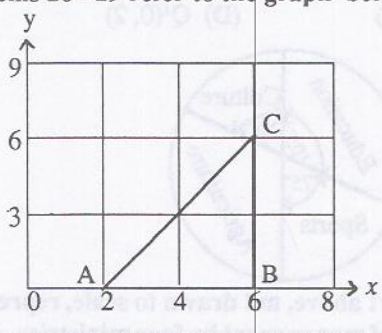
(A) 12° (B) 24° (C) 36° (D) 48°



25. The area of the circle above, not drawn to scale, is 60cm². What is the area of the shaded sector ?

(A) 20cm² (B) 30cm² (C) 40 cm² (D) 45cm²

Items 26 - 29 refer to the graph below.



26. The coordinates of the point C are

(A) (6, 6) (B) (6, 0) (C) (0, 6) (D) (2, 0)

27. The gradient of AC is

(A) –1 (B) 1 (C) $-\frac{2}{3}$ (D) $\frac{3}{2}$

28. The equation of the line AB is

(A) $x = 0$ (B) $y = 0$ (C) $x = 2$ (D) $y = 6$

29. The equation of the line AC is

(A) $y = -x - 1$ (B) $y = -\frac{2}{3}x - 3$
(C) $y = \frac{3}{2}x - 3$ (D) $y = x - 1$

30. Given that $x = -4$, what is the value of $3x^2 + x - 5$

(A) –57 (B) –33 (C) 43 (D) 39

31. A car initially valued at \$120 000 depreciates at the rate of 20% per annum. What is its book value two years later?

(A) \$97 200 (B) \$108 000 (C) \$76 800 (D) \$96 000

32. The simple interest on $400 for 3 years is $84. The rate per cent per annum is
(A) 5 (B) 6 (C) 7 (D) 8

33. The mean of the scores 3, 5, 8, 9 and 10 is
(A) 6 (B) 6.5 (C) 7 (D) 7.5

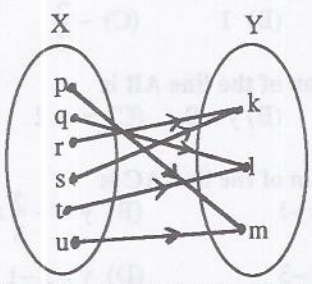
34. A bag contains 50kg of onions. If 12.5 kg of onions are sold, what percentage is left?
(A) 25 (B) 37.5 (C) 75 (D) 87.5

35. The adjacent sides of a parallelogram are 12cm and 5cm. Given that the altitude of the parallelogram is 4cm, then its area, in cm^2, is
(A) 20 (B) 34 (C) 48 (D) 60

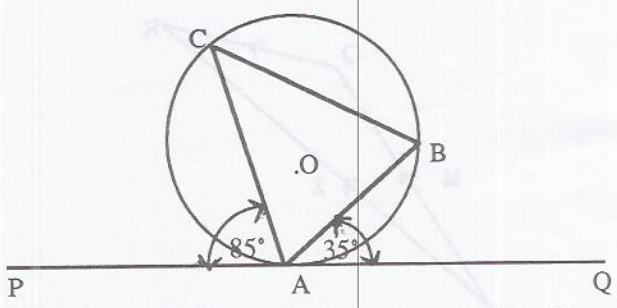
36. The most frequently occurring score in a distribution is called the
(A) mean (B) median
(C) mode (D) standard deviation

37. The translation T maps P(4, 5) onto P^1 (2, 2). What is the image of Q(0, 3) under the translation T?
(A) $Q^1(-2, 0)$ (B) $Q^1(2, 0)$
(C) $Q^1(0, -2)$ (D) $Q^1(0, 2)$

38. The pie chart above, not drawn to scale, represents the amount of money spent by four ministries. If the total amount spent is M$90, then the amount spent on Agriculture and Culture is
(A) M$15 (B) M$30 (C) M$45 (D) M$48



39. The relationship that best describes the mapping in the diagram above is
(A) one-to-one (B) one-to-many
(C) many-to-one (C) many-to-many



40. PAQ is a tangent to the circle with centre O. Given that angle PAC = 85° and angle QAB = 35°, then angle ABC =
(A) 120° (B) 85° (C) 60° (D) 35°

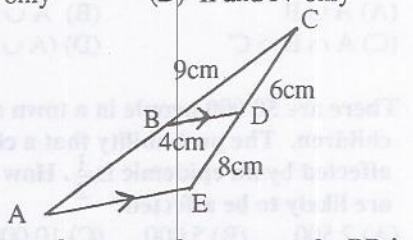
41. A triangular field has sides $4x$, $3x$ and $2x$ metres long. Its perimeter is 360 metres. The longest side is
(A) 80 metres long (B) 120 metres long
(C) 160 metres long (D) 200 metres long

42. If $9x^2 + 24x + c$ is a perfect square, then c is
(A) 3 (B) 4 (C) 9 (D) 16

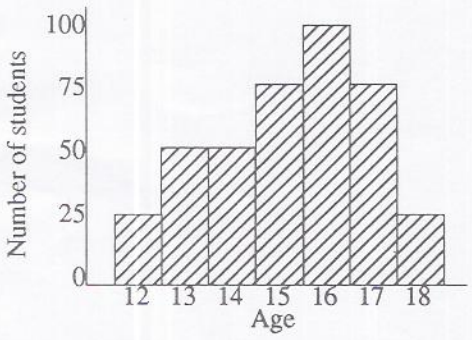
43. If $E = \frac{q}{4\pi \varepsilon_0 r^2}$, then r =
(A) $r = \frac{q}{2\pi\varepsilon_0 E}$ (B) $r = \frac{2q}{\pi\varepsilon_0 E}$
(C) $r = \frac{q}{4\pi\varepsilon_0 E}$ (D) $r = \sqrt{\frac{q}{4\pi\varepsilon_0 E}}$

44. Karen has $7x$ rings and Jane has twice as many. They each sell 3 rings per day. How many rings will they have altogether after a 5-day work week?
(A) $21x - 30$ (B) $21x + 30$ (C) $21x - 15$ (D) $21x + 15$

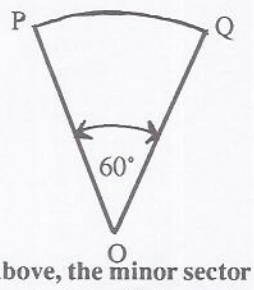
45. In which quadrants above would $\cos\theta$ have a positive value?
(A) I and II only (B) I and III only
(C) I and IV only (D) II and IV only



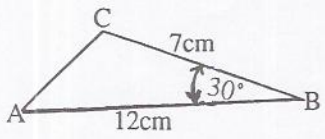
46. In the diagram above, not drawn to scale, BD is parallel to AE, BC = 9cm, CD = 6cm, BD = 4 cm and DE = 8cm. What is the length of AC?
(A) 11cm (B) 12cm (C) $14\frac{2}{3}$cm (D) 21cm



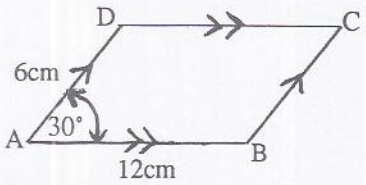
47. The histogram above shows the ages of students in a school. How many students attend the school?
(A) 105 (B) 375 (C) 400 (D) 425



48. In the figure above, the minor sector POQ is part of a circle with centre O and circumference 84cm. The length of the minor arc PQ, in cm, is
(A) 14 (B) 28 (C) 35 (D) 56



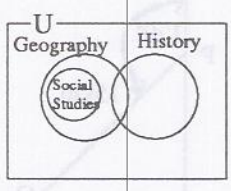
49. In the triangle above not drawn to scale, AB = 12cm, BC = 7cm and $\widehat{ABC} = 30°$. The area of triangle ABC is
(A) 14cm² (B) 21cm² (C) 28cm² (D) 42cm²



50. In the parallelogram above, not drawn to scale, AB = 12cm, AD = 6cm and $\widehat{BAD} = 30°$. The area of parallelogram ABCD is
(A) 24cm² (B) 36cm² (C) 48cm² (D) 72cm²

51. P and Q are two finite sets such that n(U) = 50, n(P) = 25, n(Q) = 23 and $n(P \cap Q) = 7$. What is $n(P \cup Q)^1$?
(A) 7 (B) 9 (C) 16 (D) 18

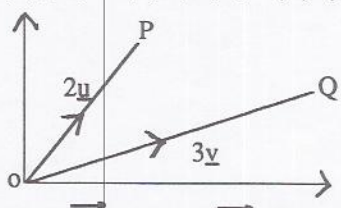
52. A square has sides of length 12 cm. A rectangle is 16cm long and has the same are as the square. What is the width of the rectangle?
(A) 9cm (B) 10cm (C) 11cm (D) 12cm



53. The Venn diagram above gives information on students who are studying Geography, History and Social Studies. Which of the following deductions are valid?
i. Some students who study Geography study History.
ii. All Geography students study Social Studies.
iii. Some Social Studies students study History
(A) i and ii only (B) i and iii only
(C) ii and iii only (D) i only

54. A rectangle is 5 times as long as its width. If its width is ω centimetres, than its perimeter, in cm, is
(A) 6ω (B) 12ω (C) 5ω² (D) 2ω + 10

55. The coordinates of the image of the point (0,5) under reflection in the line y = 8 is
(A) (0, 11) (B) (0, 2) (C) (11, 0) (D) (2. 0)

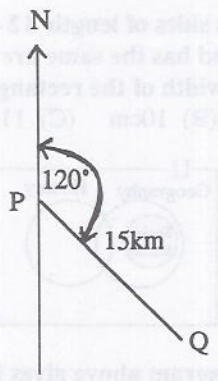


56. In the figure above, $\overrightarrow{OP} = 2\underline{u}$ and $\overrightarrow{OQ} = 3\underline{v}$, so $\overrightarrow{PQ}$ =
(A) $2\underline{u} - 3\underline{v}$ (B) $3\underline{v} - 2\underline{u}$ (C) $2\underline{u} + 3\underline{v}$ (D) $6\underline{u}\,\underline{v}$

57. The sum of the interior angles of a regular polygon is 1 440°. If one side of the polygon is 12cm, then the perimeter of the polygon is
(A) 100cm (B) 110cm (C) 120cm (D) 130cm

58. An insurance salesman receives a commission of 20% on sales exceeding a value of $25 000. If he received $12 100 commission, how much did he actually sell?
(A) $12 900 (B) $37 900 (D) $60 500 (D) $85 500

59. A man's wage was increased from $375 to $450 per week. His friend's wage was increased proportionately. If his friend's wage was $345 before the increase, then his present wage is
(A) $410 (B) $414 (C) $420 (D) $489



60. A plane travels from Airport P to Airport Q 15km away on a bearing of 120°. How far south of Airport P is Airport Q?

(A) 15km × sin 30° (B) 15km × cos 30°
(C) 15km × sin 60 ° (D) 15km × tan 60°

C.X.C. MODEL EXAMINATION 6
MATHEMATICS
Paper 1 - General Proficiency
90 minutes
Answer ALL the questions

1. The simple interest on $500 at 6% per annum for $2\frac{1}{2}$ years is equal to

(A) $\$\frac{500 \times 6 \times 5}{100 \times 2}$ (B) $\$\frac{500 \times 6 \times 2}{100 \times 5}$

(C) $\$\frac{100 \times 6 \times 5}{500 \times 2}$ (D) $\$\frac{100 \times 6 \times 2}{500 \times 2}$

2. $\sqrt{13^2 - 12^2}$

(A) 1 (B) 2 (C) 5 (D) 25

3. The best approximation of $\frac{50.1 \times 199.4}{0.50}$ **is**

(A) 20 (B) 200 (C) 2 000 (D) 20 000

4. The number 134_8 **converted to base 10 is**

(A) 8 (B) 12 (C) 92 (D) 120

5. $\{x: 3 \leq x < 9, x \in Z\}$**, where Z is the set of integers, may be listed as**

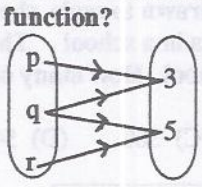
(A) {3, 9} (B) {4, 5, 6, 7, 8}

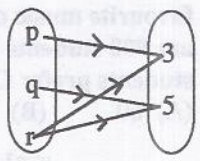
(C) {3, 4, 5, 6, 7,8} (D) {3,4,5,6,7,8,9}

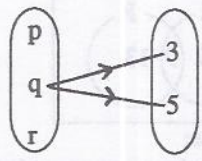
6. The exchange rate for one United States dollar (US $1.00)is five dollars and ninety cents in Trinidad and Tobago currency (TT $5.90). The value of US $10.00 in TT currency is

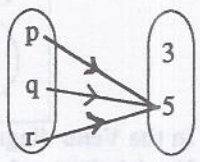
(A) $0.59 (B) $59.00 (C) $1.18 (D) $ 118.00

7. Which of the following mappings from set X to set Y is a function?

(A) 

(B) 

(C) 

(D) 

8. The length of time between 21:35 hours and 02:45 hours the following day is

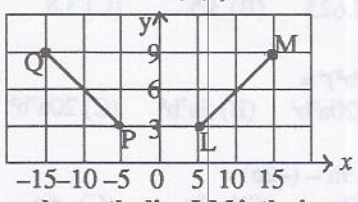
(A) 5h 10 min (B) 5h 20min

(C) 18h 30min (D) 18h 50 min

9. Which of the following represents the equation of a straight line?

(A) $y = 3x^2 + 4$ (B) $y = x + 5$

(C) $xy = 3$ (D) $y = 3x^2 + 2x - 5$



10. In the figure above, the line LM is the image of the line PQ after

(A) a reflection in the y – axis

(B) a rotation through 90°

(C) an enlargement with scale factor –1

(D) a translation by $T = \begin{pmatrix} 10 \\ 0 \end{pmatrix}$

11. The number property shown in $\frac{3}{5}\left(\frac{2}{7} - \frac{4}{9}\right) = \frac{3}{5} \times \frac{2}{7} - \frac{3}{5} \times \frac{4}{9}$ **is the**

(A) commutative property (B) associative property

(C) distributive property (D) identity property

12. The volume of a cuboid of length 30cm, width 20cm and height 10cm is

(A) 6 000cm³ (B) 5 000cm³ (C) 160cm³ (D) 60cm³

13. How many squares of side 1cm is needed to cover a cube of edge 5cm?

(A) 25 (B) 75 (C) 150 (D) 300

14. A factory starts work at 08:30hrs and ends at 17:00 hrs. There is a lunch-hour and a 15 - minute afternoon break. How much time is spent working?

(A) 6h 25min (B) 6h 30min

(C) 7h 5min (D) 7h 15 min

15. During a sale, a shopkeeper allows a 15% discount on the marked price of all items. What will a customer pay for a pants with a marked price of $80?

(A) $65 (B) $68 (C) $12 (D) $92

16. Mrs. Trudy's weekly wage was increased from $250 to $300. Mr. Jack's wage was increased proportionately.If Mr. Jack's wage was $325, then his new wage is

(A) $270.83 (B) $360 (C) $375 (D) $390

17. Ram mowed $\frac{4}{15}$ of a lawn and Jerome mowed $\frac{2}{3}$ of the lawn. What fraction of the lawn remained to be done?
(A) $\frac{1}{15}$ (B) $\frac{2}{13}$ (C) $\frac{7}{15}$ (D) $\frac{1}{4}$

18. The following scores were obtained in a shooting competition: 2, 5, 9, 8, 7, 6, 5, 4, 1, 5.
The modal score is
(A) 0 (B) 2 (C) 5 (D) 8

19. $3\frac{5}{8}$ expressed as a decimal is
(A) 3.625 (B) 3.5 (C) 3.8 (D) 3.125

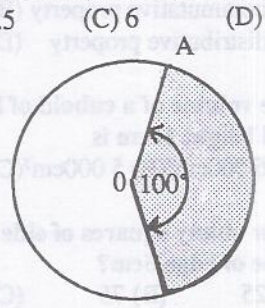
20. $5(a^3b^2)^4 =$
(A) $20a^3b^2$ (B) $5a^7b^6$ (C) $20a^7b^6$ (D) $5a^{12}b^8$

21. $5a - 9a - (-2a) =$
(A) 2a (B) –2a (C) –6a (D) –11a

22. In a school there are 585 boys which represents 65% of the student population. The number of girls in the school is
(A) 315 (B) 650 (C) 620 (D) 900

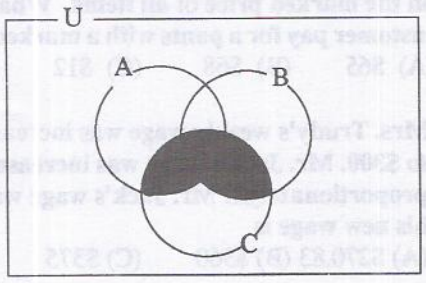
23. $2^{-5} =$
(A) 32 (B) 64 (C) $\frac{1}{32}$ (D) $\frac{1}{64}$

24. The median of the scores 5,7,4,6,9,3,10,5,8,4, is
(A) 5 (B) 5.5 (C) 6 (D) 6.5



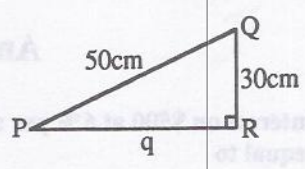
25. The area of the circle shown above, not drawn to scale, is 72cm². What is the area of the shaded sector?
(A) 64cm² (B) 60cm² (C) 52cm² (D) 20cm²

26. The simple interest on \$700 for $3\frac{1}{2}$ years is \$196. The rate per cent per annum is
(A) 6% (B) 7% (C) 8% (D) 9%



27. In the venn diagram above, the shaded area is
(A) (A∩B) ∪ C (B) (A∩ B)∩ (B∩C)
(C) A∩ C∪ B (D) A∪B∩C

Items 28 -29 refer to the triangle below.

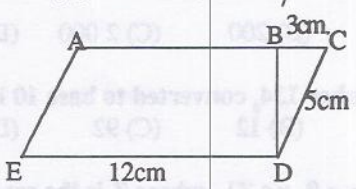


In ΔPQR, $\widehat{R} = 90°$, PQ = 50cm and QR = 30cm.

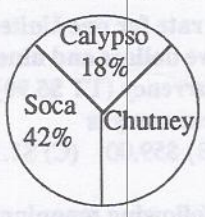
28. Tan $\widehat{PQR}$ =
(A) $\frac{30}{q}$ (B) $\frac{q}{30}$ (C) $\frac{3}{5}$ (D) $\frac{5}{3}$

29. The length of PR =
(A) 20cm (B) 25cm (C) 40cm (D) 45cm

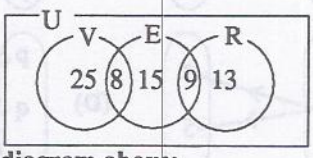
30. If $f(x) = 7x - 4$, then $f^{-1}(x) =$
(A) $7x + 4$ (B) $4 - 7x$ (C) $\frac{x-4}{7}$ (D) $\frac{x+4}{7}$



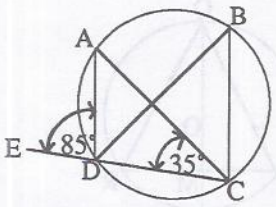
31. In the figure above, ACDE is a parallelogram with ED = 12cm and CD = 5cm. Given that BC = 3cm, then the area of the trapezium ABDE is
(A) 7.5cm² (B) 24cm² (C) 30cm² (D) 42cm²



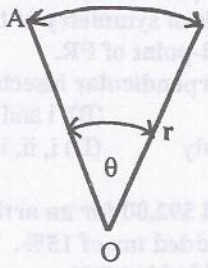
32. The pie chart above, not drawn to scale, shows the favourite music of students in a school. There are 900 students in the school. How many of the students prefer Chutney?
(A) 60 (B) 300 (C) 360 (D) 540



33. In the Venn diagram above:
U = {students who have modern games at home},
V = {students who have video games},
E = {students who have educational games}, and
R = {students who have CD - roms}.
The number of students in each set is indicated.
How many students have educational games only?
(A) 8 (B) 9 (C) 15 (D) 32



34. In the circle above, angle ADE = 85° and angle ACD = 35°. So angle DAC =
(A) 35° (B) 50° (C) 85° (D) 95°



35. The figure above shows the sector of a circle AOB with radius rcm and sector angle θ degrees. The length of the arc AB, in cm, is
(A) $\pi r^2 \times \frac{\theta}{360}$ (B) $2r \times \frac{\theta}{360}$
(C) $\pi r \times \frac{\theta}{360}$ (D) $2\pi r \times \frac{\theta}{360}$

36. Three sportsmen taking part in a rifle competition shoot at intervals of 5, 8 and 10 seconds respectively. At the start they shoot together. What is the least number of seconds it will take for them to next shoot together?
(A) 40 (B) 80 (C) 160 (D) 400

37. The semi-interquartile range of the set of scores 5, 9, 11, 18, 7, 12, 14, 16 is
(A) 3.5 (B) 7 (C) 8.5 (D) 15

38. The marked price of a shirt was $150. The marked price was increased by 10% and then decreased by 10 % during a sale. The sale price of the shirt was
(A) 123.50 (B) $130 (C) $148.50 (D) $150

39. If $35.2 \times 0.40 = 14.08$, then $3.52 \times 4.0 =$
(A) 140.8 (B) 14.08 (C) 1.408 (D) 0.140 8

40. A computer presently valued at $18 000 depreciates at the rate of 10% per annum. What will be its book value after one year?
(A) $1 800 (B) $14 650 (C) $15 900 (D) $16 200

41. $(-2x)^3 - (2x)^3 =$
(A) $12x^3$ (B) $-16x^3$ (C) $4x^3$ (D) $-4x^3$

42. $x^2 - 2x - 15 =$
(A) $(x-5)(x-3)$ (B) $(x-5)(x+3)$
(C) $(x+5)(x-3)$ (D) $(x+5)(x+3)$

43. A rectangular field is $5x$ metres long and $2x$ metres wide. If its perimeter is 140cm, then its area is
(A) 240cm² (B) 480cm²
(C) 1 000cm² (D) 4 000cm²

44. If $K = \frac{1}{2}mv^2$, then v =
(A) $\sqrt{\frac{2K}{m}}$ (B) $\frac{2K}{m}$
(C) $\sqrt{\frac{K}{2m}}$ (D) $\frac{K}{2m}$

45. If $xy = 6$ and $x = 2$, then $x + y =$
(A) 1 (B) 3 (C) 4 (D) 5

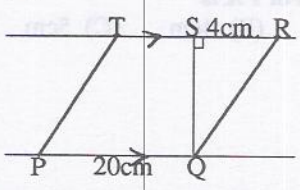
46. If $f(x) = x + 1$ and $g(x) = 2x - 3$, then the value of $fg(5) =$
(A) 8 (B) 9 (C) 14 (D) 15

47. Robert has $3x$ marbles and Rita has $2x$ marbles. They each lose 4 marbles per week. What is the sum of their marbles 5 weeks from now?
(A) $5x + 40$ (B) $5x - 40$ (C) $6x + 20$ (D) $6x - 20$

48. The probability of candidates failing an examination is $\frac{1}{3}$. If 1 200 candidates wrote the examination, how many are expected to pass?
(A) 200 (B) 400 (C) 600 (D) 800

Age of students	5	6	7	8	9	10	11
No. of students	60	55	48	39	63	47	33

49. What is the mode of the given distribution above?
(A) 9 (B) 11 (C) 33 (D) 63



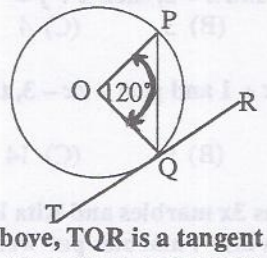
50. In the diagram above, PQ is parallel to TR, PQ = 20cm and SR = 4cm. The ratio
$\frac{\text{area of}\Delta\ PQR}{\text{area of trapezium PQSR}} =$
(A) 9:1 (B) 1:9 (C) 10:1 (D) 1:10

51. A company gives a 10% discount on the marked price of all items. A sales tax of 15% of the sale price is charged. What is the cost to the customer of an article marked $3 000?
(A) $2 250 (B) $2 850 (C) $2 950 (D) $3 105

52. A quadrilateral whose opposite sides are parallel can best be described as a
(A) trapezium (B) kite (C) rhombus (D) pentagon

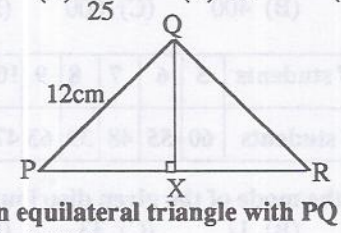
53. P and Q are finite sets such that n(U) = 25, n(P) = 12, n(Q) = 14 and n(P∩Q) = 5. What is $n(P \cup Q)^1$?
(A) 4 (B) 5 (C) 7 (D) 9

54. An cyclist rides twice around a circular track of radius 70 metres. What distance did he cover?
(A) 140m (B) 280m (C) 440m (D) 880m



55. In the figure above, TQR is a tangent to the circle with centre O. Given that angle POQ = 120°, then angle PQR =
(A) 30° (B) 45° (C) 60° (D) 90°

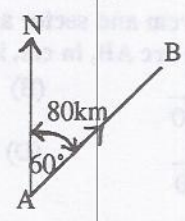
56. r is inversely proportional to s squared. When r = 4, then s = 5. The constant of proportionality is
(A) $\frac{4}{5}$ (B) $\frac{4}{25}$ (C) 10 (D) 100



57. PQR is an equilateral triangle with PQ = 12cm. The length of PX is
(A) 3cm (B) 4cm (C) 5cm (D) 6cm

58. In the figure above, ΔPQR is inscribed in the circle with centre O. Which of the following are correct geometric statements?
i. QX is the perperdicular bisector of PR.
ii. QX is an axis of symmetry of the figure.
iii. M is the mid-point of PR.
iv. PR is the perpendicular bisector of QX.
(A) i and ii only (B) i and iii only
(C) i, ii and iii only (D) i, ii, iii and iv

59. A customer paid $92.00 for an article. This price includes value added tax of 15%. The price exclusive of value added tax was
(A) $77.00 (B) $78.20 (C) $80 (D) $105.80



60. In the diagram above, Port B is 80km from Port A on a bearing of 060°. How far east of Port A is Port B?
(A) 80km × tan 60° (B) 80km × cos 60°
(C) 80km × sin 30° (D) 80km × cos 30°

C.X.C. MODEL EXAMINATION 1

MATHEMATICS

Paper 2 – General Proficiency

2 hours 40 minutes

SECTION 1

Answer ALL the questions in this section.

1. All working must be clearly shown.

(a) Calculate the exact value of

$$\frac{4\frac{5}{7}+3\frac{2}{7}}{5-3\frac{4}{5}}$$ **(4 marks)**

(b) A piece of ribbon 81 cm long is divided into three pieces in the ratio 1:3:5. Calculate the length of the longest piece of ribbon. **(3 marks)**

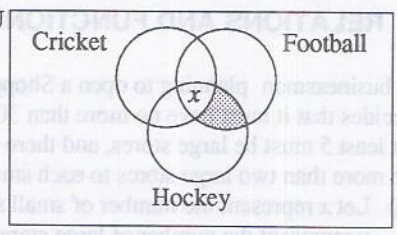
(c) A businesswoman sold a bag for $52.32, thereby making a profit of 9% on the cost to him. Calculate:

(i) the cost price of the bag to the businesswoman

(ii) the selling price the businesswoman should ask in order to make a 20% profit instead. **(5 marks)**

2. (a) Solve $\frac{x}{5}-3=\frac{x}{7}-1$ **(4 marks)**

(b)



The Venn diagram above illustrates some of the information given below.

There are 100 members in a sports club.
57 members play cricket.
50 members play football.
48 members play hockey.
19 members play cricket and football.
23 members play football and hockey.
21 members play cricket and hockey.
Each member plays AT LEAST ONE of the three games.

Let the number of members who play all three games be x.

(i) Write an algebraic expression to represent the number of members in the shaded region.

(ii) Describe the shaded region.

(iii) Write an equation to show the total number of members in the club.

(iv) Hence, determine the number of members who play all three games. **(7 marks)**

3. (a) Solve the simultaneous equations:

$$3x + 4y = 7$$
$$5x + 23 = 2y$$ **(4 marks)**

(b) Factorize completely:

(i) $1 - 4x^2$

(ii) $3x^2 - 5x - 2$ **(3 marks)**

(c) The vector $\underline{a}$ translates the point (2,3) to the point (5,6).

The vector $\underline{b}$ translates the point (3,5) to the point (–4,–1).

(i) State $\underline{a}$ and $\underline{b}$ as column vectors.

(ii) Hence, determine the vector $\frac{1}{2}(\underline{a} + \underline{b})$. **(5 marks)**

4. (a) Using ruler and compasses only, construct a quadrilateral ABCD such that AB = AD = 8 cm, BC = 5 cm, angle BAD = 60° and angle ABC = 90°.

Measure and state

(i) the length of DC

(ii) the magnitude of angle ADC **(6 marks)**

(b) The images of K(1,2) and L(3,5) under a single transformation P are K′(2,–1) and L′(5,–3).

(i) Describe geometrically the transformation P.

(ii) Determine the equation of the line K′L′. **(6 marks)**

5. (a) Copy the table below for $f(x) = 2x^2 - x - 6$ for the domain $-2 \leqslant x \leqslant 3$, and calculate the missing values.

x	–2	–1	0	$\frac{1}{2}$	1	2	3
$f(x)$	4				–5		9

(b) Using a scale of 2 cm to represent 1 unit on the x-axis and 1 cm to represent 1 unit on the $f(x)$-axis, draw the graph of $f(x)$ for $-2 \leqslant x \leqslant 3$.

(c) From your graph, determine:
(i) the values of x for which $f(x) = 0$
(ii) the minimum value of $f(x)$.

(11 marks)

6. The frequency distribution of the Mathematics marks obtained by 120 candidates is given below.

Marks	Number of candidates	Cumulative frequency
0– 10	2	2
11– 20	7	9
21– 30	10	
31– 40	22	
41– 50	25	
51– 60	29	
61– 70	12	
71– 80	8	
81– 90	3	
91–100	2	

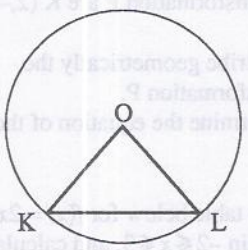
(a) Copy the table and complete the cumulative frequency column.

(b) Using a scale of 1 cm to represent 10 marks on the x-axis and 1 cm to represent 10 candidates on the y-axis, draw the cumulative frequency curve for the data.

(c) From your cumulative frequency curve, estimate
(i) the number of candidates who scored at LEAST 50 marks
(ii) the probability that a candidate chosen at random scored less than 50 marks.

(11 marks)

7. In this question, take $\pi = 3.14$



In the figure above, the chord KL subtends angle KOL at O, the centre of the circle. Given that angle KOL = 120° and OK = 15cm, calculate to three significant figures:

(a) the area of the circle

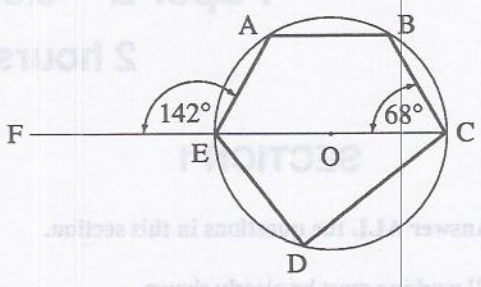
(b) the area of the minor sector OKL

(c) the area of the triangle KOL

(d) the length of the minor arc KL.

(11 marks)

8.



In the figure above, ABCDE is a pentagon inscribed in a circle with centre O. The diameter CE is produced to F. Angle BCE = 68° and angle AEF = 142°.

(a) Calculate, giving reasons for your answer, the magnitude of angles
(i) EDC
(ii) AEC
(iii) EAB **(6 marks)**

(b) Given that OC = 12 cm and angle ECD = 48°, calculate the length of ED. **(4 marks)**

SECTION II

Answer TWO questions in this section.

RELATIONS AND FUNCTIONS

9. A businessman planning to open a Shopping Mall decides that it must have no more than 30 stores. At least 5 must be large stores, and there must be no more than two large stores to each small store.

(a) Let x represent the number of small stores and y represent the number of large stores. Hence, write down THREE inequalities, not including $x \geqslant 0$ and $y \geqslant 0$, which represent the above conditions.

(b) Using a scale of 2 cm to represent 5 stores on EACH axis, shade on graph paper, the region which satisfies the inequalities.

(c) Given that \$1 500 per month is charged for each small store and \$2 400 per month is charged for each large store, use your graph to determine the values of x and y which gives the owner maximum income. Calculate the maximum income.

(15 marks)

10. (a) Copy and complete the following table for the function $f: x \to \frac{1}{x^3}$ for real values of x in the domain $0.5 \leqslant x \leqslant 3.5$

x	0.5	1.0	1.25	1.5	1.75	2.0	2.5	3.0	3.5
$f(x)$		1.0			0.19	0.13			4.0

(b) Using a scale of 4 cm to represent 1 unit on the x-axis and 2 cm to represent 1 unit on the $f(x)$-axis, draw the graph of the function $f: x \to \frac{1}{x^3}$ for real values of x in the domain $1 \leqslant x < 4$.

(c) (i) Using the same scales and axes, draw the graph of the function $g: x \to \frac{x}{5}$ for the domain $1 \leqslant x < 4$.

(ii) Use your graph to solve the equation $\frac{1}{x^3} = \frac{x}{5}$ for real values of x such that $1 \leqslant x < 4$.

(iii) Hence, deduce one solution of the equation

$$16x^4 = 5$$

for real values of x. **(15 marks)**

TRIGONOMETRY

11. The foot, F, of a hill and the base B, of a vertical tower TB, 27 metres tall, are on the same horizontal plane. From the top, T, of the tower, the angle of depression of F is 32.7°. P is a point on the hill 27.5 m away from F along the line of greatest slope. T, B, F and P all lie in the same vertical plane. The angle of depression of P from T is 22.6°.

(a) Draw a sketch to represent the information given above.

(b) Show that:

(i) TF is 50 m approximately

(ii) $\sin \hat{TPF} = \frac{7}{22}$ approximately.

(c) Calculate:

(i) the gradient of the hill

(ii) the height, in metres, of P above F, giving your answer correct to the nearest metre. **(15 marks)**

12. Assume the earth to be a sphere of radius 6 377 km. And take π as $\frac{22}{7}$.

The positions of two places on the earth's surface are A(70°N, 45°E) and B(70°N, 135°W).

(a) Calculate the distance AB, measured along the parallel of latitude, 70°N. State your answer correct to two significant figures.

(b) Calculate the distance AB measured along the meridian via the South Pole.

(c) Which is the shortest distance from A to B? Justify your answer. **(15 marks)**

VECTORS AND MATRICES

13. ABCDEF is a regular hexagon with centre O, so that $\overrightarrow{AB} = \overline{p} - 3$ and $\overrightarrow{AC} = \overline{q} + 2$.

(a) Prove that $\overrightarrow{AO} = \overline{q} - \overline{p} + 5$.

(b) Derive an expression for $\overrightarrow{AD}$ in terms of $\overline{p}$ and $\overline{q}$.

(c) Show that $\overrightarrow{AE} = 2\overline{q} - 3\overline{p} + 13$.

(d) Write down an expression for $\overrightarrow{CD}$ in terms of $\overline{p}$ and $\overline{q}$. **(15 marks)**

14. A transformation T is represented by the matrix

$$\begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix}.$$

(i) Determine the images of (0,1) and (1,0) under T.

(ii) Describe the geometrical transformation T.

(iii) Given the points A(5,2) and B(–3.5, 23.25), find the images of A and B under the transformation T.

(iv) Calculate the gradients of OA and AB.

(v) State the size of angle OAB, if possible.

(vi) Calculate the length of AB. Hence state the length of A'B'.

(vii) Calculate the area of triangle OAB. Hence state the area of triangle OA'B'.

(15 marks)

C.X.C. MODEL EXAMINATION 2

MATHEMATICS

Paper 2 – General Proficiency

2 hours 40 minutes

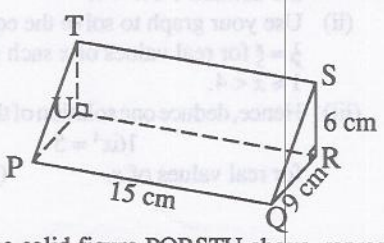
SECTION 1

Answer ALL the questions in this section.

1. **All steps in your calculation must be clearly shown.**
   (a) Calculate the exact value of:
   $(3\frac{2}{5} - 2\frac{7}{8}) \div 1\frac{2}{5}$ **(4 marks)**
   (b) The simple interest on \$12 000 invested at 4.5 per cent per annum is \$1 620. Calculate the period of investment. **(3 marks)**
   (c) The sum of \$3 500 is divided among Albert, Christine and Raymond. Raymond received half, Albert received \$437.50 and Christine received the remainder.
   Calculate:
   (i) Raymond's share
   (ii) Christine's share
   (iii) the ratio in which the \$3 500 was divided among the three persons
   (iv) the percentage of the total that Albert received. **(5 marks)**

2. (a) Factorize completely:
   (i) $1 - (2a + 3b)^2$
   (ii) $(3x^2 - 2xy - y^2) \div 3x - y$. **(3 marks)**
   (b) Solve:
   $$\frac{x}{8} - 3 = \frac{x}{12} + 5$$ **(4 marks)**
   (c) Solve the simultaneous equations:
   $$x - y = 5$$
   $$xy = 36$$ **(5 marks)**

3. (a) The scores obtained by ten competitors in a shooting contest were:
   1, 2, 2, 3, 5, 6, 6, 7, 8, 9.
   Calculate:
   (i) the median score
   (ii) the mean score
   (iii) the standard deviation of the scores **(8 marks)**
   (b) Determine the probability that a competitor chosen at random scored
   (i) exactly 6
   (ii) at LEAST 6. **(4 marks)**



4. (a) The solid figure PQRSTU above, represents a wooden wedge with measurements as shown. SR and TU are perpendicular to the plane PQRU.
   Calculate:
   (i) the length of PT in cm
   (ii) the surface area of the wedge in cm^2
   (iii) the volume of the wedge in cm^3
   (iv) the size of angle TPU. **(7 marks)**
   (b) Using ruler and compasses only, construct a parallelogram PQRS, such that PQ = 9.5 cm, PS = 7.3 cm and angle SPQ = 60°. Measure and state the length of PR in centimetres. All construction lines must be clearly shown. **(4 marks)**

5. There are 50 students in a group.
   All students study English.
   14 study History.
   21 study Geography.
   24 study Sociology.
   7 study History, Geography and English.
   10 study Geography, Sociology and English.
   6 study Sociology, History and English.
   4 study all four subjects.
   (a) Draw a carefully labelled Venn diagram to represent the data, using the universal set as the set of students who study English. **(3 marks)**
   (b) Determine the number of students who study at LEAST TWO subjects. **(2 marks)**
   (c) Calculate the number of students who study English only. **(1 mark)**

6. (a) The function f and g are defined by:

$f: x \to 3 + x$

$g: x \to x^4$.

Determine expressions for the functions:

(i) fg (ii) g^{-1} **(4 marks)**

(b) The distances, in metres, moved by a particle from its starting point, at time t seconds, is given by

$s = 5t + t^2$.

(i) Copy and complete the table below for $s = 5t + t^2$.

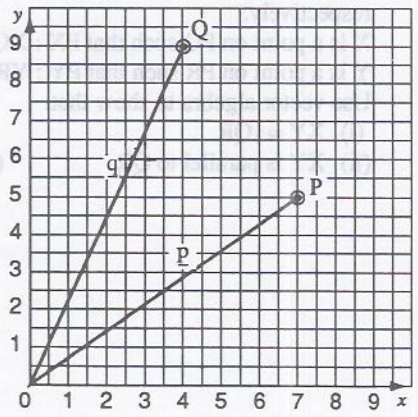
t	0	1	2	3	4	5	6	7
s			14	24		50		

(ii) Using a scale of 1 cm to represent 1 second and 1 cm to represent 10 m, draw the graph of the function $s = 5t + t^2$ for the domain $0 \leqslant t \leqslant 7$.

(iii) Using the graph, estimate the distance moved in 3.5 seconds.

(iv) Draw a tangent to the curve at $t = 5$ seconds. Estimate the value of the tangent at this point. Hence, give an interpretation of this value. **(8 marks)**

7.



(a) In the graph above, P and Q are points such that $\overrightarrow{OP} = \underline{p}$ and $\overrightarrow{OQ} = \underline{q}$. The point R (not shown) is such that $\overrightarrow{OR} = \underline{p} + \frac{1}{2}\underline{q}$.

(i) Write $\overrightarrow{OR}$ in the form $\begin{pmatrix} x \\ y \end{pmatrix}$.

(ii) Determine the length of OR. **(5 marks)**

(b) A transformation T maps (1,2) onto (–1,2). If this transformation is a rotation through two right angles about the origin, followed by a reflection in a line l, determine

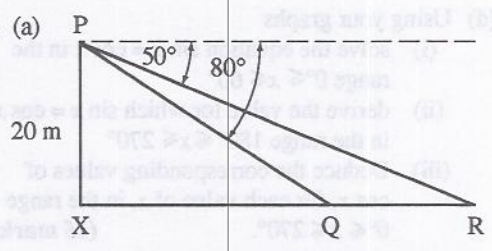
(i) the equation of the line l

(ii) the image of (2,3)

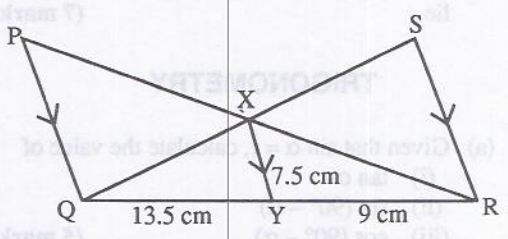
(iii) the matrix which describes T.

(7 marks)

8. (a)



In the diagram, the points X, Q and R all lie on a straight line in the same horizontal plane. The angle of depression of a point Q from the top of a tower PX, 20 m high, is 80°. The angle of depression of R from the top of the tower is 50°. Calculate the length QR to one decimal place. **(5 marks)**



(b) In the diagram above, PQ, XY and SR are mutually parallel line. QY = 13.5 cm, YR = 9 cm and XY = 7.5 cm.

(i) Prove that triangle PQX and RSX are similar.

(ii) Calculate the lengths of PQ and RS.

(iii) Evaluate the ratio of the areas of triangles PQX and RSX. **(8 marks)**

SECTION II

Answer TWO questions in this section

RELATIONS AND FUNCTIONS

9. (a) Copy and complete the table below for the functions $x \to \sin x$ and $x \to \cos x$, where x is measured in degrees.

x	0	10	20	30	40	50	60
$\sin x$	0	0.174		0.500			0.866
$\cos x$	1.000	0.985				0.643	

(b) Using 2 cm to represent 10° on the horizontal axis and 10 cm to represent 1 unit on the vertical axis, draw the graph of $x \to \sin x$, for $0° \leqslant x \leqslant 60°$.

(c) Using the same scales and axes, draw the graph of $x \to \cos x$, for $0° \leqslant x \leqslant 60°$.

(d) Using your graphs
(i) solve the equation $\sin x = \cos x$ in the range $0° \leqslant x \leqslant 60°$
(ii) derive the value for which $\sin x = \cos x$ in the range $180° \leqslant x \leqslant 270°$
(iii) Deduce the corresponding values of $\cos x$, for each value of x, in the range $0° \leqslant x \leqslant 270°$. **(15 marks)**

10. (a) Find the range of values of x for which
(i) $x(x+2) > 0$
(ii) $x(x+4) \leqslant 5$. **(8 marks)**
(b) The altitude of a triangle is 6 cm more than its base. If the area of the triangle is between 8 cm² and 20 cm², determine between what two integers must the altitude of the triangle lie. **(7 marks)**

TRIGONOMETRY

11. (a) Given that $\sin \alpha = \frac{3}{k}$, calculate the value of
(i) $\tan \alpha$
(ii) $\sin(90° - \alpha)$
(iii) $\cos(90° - \alpha)$ **(5 marks)**
(b) Taking the circumference of the earth as 40 000 km, calculate:
(i) the latitude of A, if the length of the parallel of latitude through A is 28 000 km,
(ii) the latitude of B, a place 430 km due South of Port Kaituma (8°N, 60°W),
(iii) the longitude of C, a place 430 km due East of Port Kaituma. **(10 marks)**

12. A vertical extension is to be constructed on top of a building situated on level ground. The angle of elevation of the top of the extension from a point P on ground level is 39°, and the angle of elevation of the bottom of the extension is 32°. The angle of elevation of the top of the extension from a point Q which is 100 m closer to the building is 48°. Calculate to three significant figures:
(i) the distance of P from the base of the building
(ii) the height of the building
(iii) the height of the extension. **(15 marks)**

VECTORS AND MATRICES

13. The image of any point P(x,y) under the transformation $T = \begin{pmatrix} 1 & 0 \\ 3 & 1 \end{pmatrix}$ is P′(x',y').
(i) Find an expression for x' and y' in terms of x and y.
(ii) Calculate the coordinates of the images of the points A(0,3), B(7,3), C(7,6) and D(0,6) under the transformation, T.
(iii) Hence, plot on graph paper the figures of ABCD and A′B′C′D′.
(iv) Describe the transformation geometrically, if possible. **(15 marks)**

14. (a) Given that $A = \begin{pmatrix} 2 & 3 \\ -4 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} -5 & -7 \\ 2 & 1 \end{pmatrix}$.
(i) Determine the inverse of B.
(ii) Prove that BB^{-1} is the identity matrix, I.
(iii) Hence or otherwise, solve the following matrix equation for the unknown values x and y:
$$[(AB)B^{-1}]\begin{pmatrix} x \\ 8 \end{pmatrix} = \begin{pmatrix} 20 \\ 6y \end{pmatrix}$$ **(8 marks)**
(b) In a triangle PQR the position vectors of the vertices P, Q and R relative to O are $\underline{p}$, $\underline{q}$ and $\underline{r}$ respectively.
X is a point on PQ such that PX : XQ = 1 : 3
Y is a point on PR such that PY : YR = 1 : 3
Use vector algebra to show that:
(i) $XY = \frac{1}{4}QR$
(ii) XY is parallel to QR. **(7 marks)**

C.X.C. MODEL EXAMINATION 3
MATHEMATICS
Paper 2 – General Proficiency
2 hours 40 minutes

SECTION I

Answer ALL the questions in this section

1. All working must be clearly shown

(a) Calculate the exact value of
$(3\frac{2}{5} + 1\frac{2}{7}) \div 8\frac{1}{5}$ **(4 marks)**

(b) Evaluate $\sqrt{0.0025 \times 10^{-8}}$, stating your answer in standard form. **(3 marks)**

(c) A tourist exchanged US $300.00 for Guyanese currency at the rate of US $1.00 = GUY $125.50. Government tax of 5% of the amount exchanged is payable. Calculate in Guyanese currency
(i) the tax paid
(ii) the amount the tourist received. **(4 marks)**

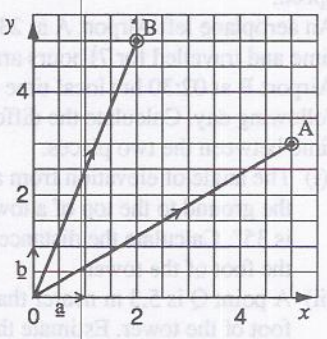
2. (a) There are 100 students in a group.
10 students study Accounts only.
11 students study Business only.
15 students study Business and Economics only.
7 students study Accounts and Business only.
13 students study Accounts, Business and Economics.
8 students do not study any of these subjects.

(i) Draw a carefully labelled Venn diagram to represent the information given above. **(2 marks)**

(ii) Determine the number of students who study Business. **(1 mark)**

(iii) Given that x students study Accounts and Economics only, and thrice as many study Economics only, write an algebraic equation to represent the information given and hence, calculate the value of x. **(3 marks)**

(b)



Given that $\underline{a}$ and $\underline{b}$ are unit vectors as shown in the diagram above:

(i) write the position vectors $\overrightarrow{OA}$ and $\overrightarrow{OB}$ in terms of $\underline{a}$ and $\underline{b}$

(ii) determine the length of $\overrightarrow{OA}$. **(5 marks)**

3. (a) Solve $\frac{x-7}{2} + \frac{6}{x} = \frac{1}{2}$ **(4 marks)**

(b) Given that F varies inversely as d^2 and that $F = 5$ when $d = 2$, calculate the value of F when $d = 4$. **(3 marks)**

(c) The cost of five text books and a dictionary is $473. The cost of seven text books and an encyclopedia is $691. The cost of an encyclopedia is TWICE the cost of a dictionary. Given that x is the cost, in dollars, of a text book and d is the cost, in dollars, of a dictionary,
(i) write a pair of simultaneous equations to represent the information given
(ii) calculate the cost of an encyclopedia. **(5 marks)**

4. (a) (i) Using a ruler and compasses only, construct a triangle ABC such that AB = 8.5 cm, BC = 6.5 cm and angle ABC = 60°.

(ii) Locate the point D such that DC is parallel to AB and DA is perpendicular to AB. Measure and state the length of AD.

(b) Triangle PQR with vertices P(1,8), Q(1,1) and R(10,3) is mapped onto triangle P′Q′R′ with vertices P′(2, 5.5), Q′(2, 2) and R′(6.5, 3).

(i) Using a scale of 2 cm to represent 1 unit on both axes, draw on graph paper triangles PQR and P' Q' R'.

(ii) Hence, describe fully the simple transformation which maps triangle PQR onto triangle P' Q' R'. **(6 marks)**

5. (a) Given that an aeroplane travels a distance of 1 650 km in $3\frac{1}{2}$ hrs, calculate its exact average speed. **(2 marks)**

(b) An aeroplane left Airport A at 23:00 hrs local time and travelled for $7\frac{1}{2}$ hours arriving at Airport B at 02:30 hrs local time on the following day. Calculate the difference in time between the two places. **(4 marks)**

(c) (i) The angle of elevation from a point P on the ground to the top of a tower 10 m tall is 35°. Calculate the distance of P from the foot of the tower.

(ii) A point Q is 5.3 m nearer than P to the foot of the tower. Estimate the angle of depression of Q from the top of the tower. **(6 marks)**

6. A survey was conducted in a High School. The weights of the students are shown in the table below.

Weight (kilograms)	Number of students
21–29	10
30–38	20
39–47	140
48–56	220
57–65	120
66–74	60
75–83	30

(a) Construct a cumulative frequency table to represent the data above. **(2 marks)**

(b) Using a scale of 2 cm to represent 10 kg on the horizontal axis and 2 cm to 50 students on the vertical axis, draw a cumulative frequency curve to illustrate the information. **(4 marks)**

(c) Estimate the proportion of students who weighed more than 47 kilograms. **(2 marks)**

(d) Calculate the probability that a student chosen at random weighed more than 50 kilograms. **(3 marks)**

7. (a) Copy and complete the table below for the function $y = 3 + x - 2x^2$.

x	–3	–2	–1	0	1	2	3
y	–18		0			–3	–12

(2 marks)

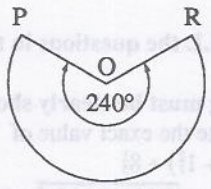
(b) Using a scale of 2 cm to 1 unit on the x-axis and 1 cm to 1 unit on the y-axis, draw the graph of $y = 3 + x - 2x^2$ for $-3 \leqslant x \leqslant 3$. **(4 marks)**

(c) Using your graph or otherwise, determine the range of values of x for which $x - 2x^2 > -6$. **(5 marks)**

8. In this question:

Take $\pi = \frac{22}{7}$

Volume of cone $= \frac{1}{3}\pi r^2 h$



The diagram above shows the MAJOR sector, POR, of a circle with centre O and radius 10.5 cm. The sector represents the net of a cone.

(a) Show by calculation that the circumference of the base of the cone is 44 cm. **(2 marks)**

(b) Calculate:

(i) the radius of the base of the cone

(ii) the height of the cone to 1 decimal place.

(c) Calculate the volume of liquid, in litres, that the cone holds when completely filled.

SECTION II

Answer TWO questions in this section

RELATIONS AND FUNCTIONS

9. (a) Copy and complete the table below for $y = 3\cos 2x$.

x	0	$\frac{\pi}{10}$	$\frac{\pi}{5}$	$\frac{3\pi}{10}$	$\frac{2\pi}{5}$	$\frac{\pi}{2}$	$\frac{3\pi}{5}$	$\frac{7\pi}{10}$	$\frac{4\pi}{5}$	$\frac{9\pi}{10}$	π
y			0.93				–2.43				3.00

(b) Using a scale of 2 cm to represent $\frac{\pi}{10}$ radians on the x-axis and 2 cm to represent 1 unit on the y-axis, draw the graph of the function $y = 3\cos 2x$, for $0 \leqslant x \leqslant \pi$.

(c) Using your graph

(i) state the minimum value of the function

(ii) state the values of x within the domain $0 \leqslant x \leqslant \pi$, for which the function is negative

(iii) determine the solutions of

$3\cos 2x = 2.0$ **(15 marks)**

10.

Type	Cost per pupil
Full–session	\$50
Half–session	\$30

The table above shows the cost of lessons per month to students attending a private class.
The class operates under the following limitations:

1. The maximum number of students in the class is 40.
2. There must be a minimum of 5 full-session students.
3. The number of half-session students must be at least half the number of full-session students.
4. The minimum monthly income must be \$1 200.

(a) Let x represent the number of full-session students and y represent the number of half-session students.
Hence state FOUR inequalities, not including $x \geqslant 0$ and $y \geqslant 0$, to represent the conditions given above.

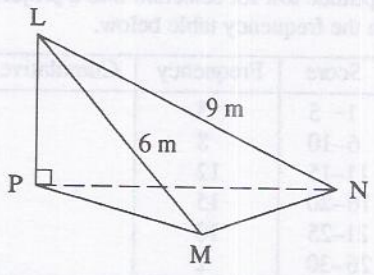
(b) Using a scale of 1 cm to 5 students on both axes, draw the graphs of the inequalities.

(c) If the teacher receives \$12.50 for each full-session student and \$6.00 for each half-session student, determine from your graph
(i) the number of full-session and half-session students required for maximum income to be obtained
(ii) the sum representing the maximum possible income. **(15 marks)**

TRIGONOMETRY AND GEOMETRY

11. (a) A quadrilateral ABCD is formed by joining the points whose coordinates are A(–1,–4), B(0,3), C(3,4) and D(8,–1).
(i) Calculate the length of AC.
(ii) Show that BD is perpendicular to AC.
(iii) Prove that ABCD is a trapezium. **(5 marks)**

(b)



LP is a vertical lamp-post. P, M and N are points on the same horizontal plane. Two ropes LM and LN are attached to the top of the post. The angles of depression of M and of N from L are 39.5° and 28.7° respectively. LM = 6 m, LN = 9 m and $M\hat{P}N = 45°$.
Calculate the length of:
(i) NP (ii) MN **(10 marks)**

12. (a) Prove that

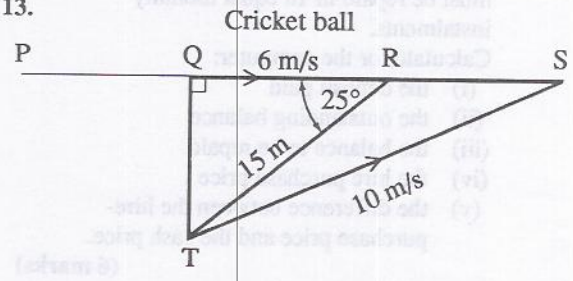
$$\frac{1}{\tan A} - \tan A = \frac{1 - 2\sin^2 A}{\sin A \cos A}$$

(4 marks)

(b) Three stations, P, Q and R, are on level ground such that P is due south of Q and R is on a bearing of 085° from Q. The bearing of R from P is 039°. A vertical tower TQ is situated at Q. Given that TQ = 20 m and QR = 75 m, calculate:
(i) the distance PR
(ii) the angle of elevation of T from P. **(11 marks)**

VECTORS AND MATRICES

13.



A cricket ball played by a batsman moves with a speed of 6m/s along a straight line path PQRS, as shown in the diagram above. When the ball is at R, a fieldsman starts to run in a straight line from T with a speed of 10 m/s. Given that QRT = 25° and RT = 15 m, find by calculation or drawing:
(a) the direction in which the fieldsman must run in order to retain the ball
(b) the time he would take to eventually reach the ball at S. **(15 marks)**

14. An aircraft has an airspeed of 400 km/h and a track of 065°. The wind speed is 60 km/h from 320°.
Find:
(a) the aircraft's course
(b) the ground speed
(c) the time taken by the aircraft to travel a distance of 1 250 km. **(15 marks)**

C.X.C. MODEL EXAMINATION 4

MATHEMATICS

Paper 2 – General Proficiency

2 hours 40 minutes

SECTION I

Answer ALL the questions in this section

1. **All steps in your calculation must be clearly shown.**
   (a) Calculate, correct to 2 decimal places
   (i) 0.05×1.3
   (ii) $7(3 - 1.45)$ **(3 marks)**
   (b) Calculate the exact value of
   $5.3 \times 2.5 \div 0.04$ **(3 marks)**
   (c) The cash price of a computer is $12 480. The computer can also be bought on hire-purchase by making a 25% deposit and paying interest of 20% on the outstanding balance which must be repaid in 18 equal monthly instalments.
   Calculate for the computer:
   (i) the deposit paid
   (ii) the outstanding balance
   (iii) the balance to be repaid
   (iv) the hire purchase price
   (v) the difference between the hire-purchase price and the cash price.
   (6 marks)

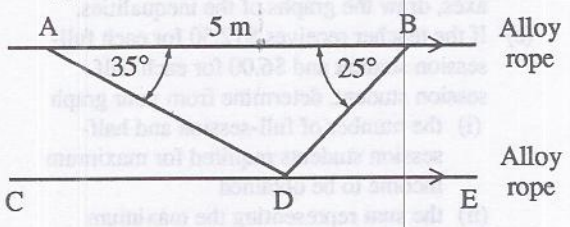
2. Given that:
   U = { natural numbers }
   P = { factors of 18 }
   Q = { factors of 6 }
   R = { multiples of 18 }.
   Draw a Venn diagram to represent the data given above. State the members of $P \cap Q'$. **(6 marks)**

3. The coordinates of the points P and Q are (3,7) and (9,1) respectively. X is the mid-point of PQ.
   (a) Calculate:
   (i) the length of PQ
   (ii) the gradient of PQ
   (iii) the coordinates of X. **(4 marks)**
   (b) Determine the equation of the perpendicular bisector of PQ and state the coordinates of the point at which the perpendicular bisector intersects the x-axis. **(6 marks)**

4. (a) Simplify:
   (i) $2(7x - y) - 3(5x - y)$
   (ii) $8^{-\frac{1}{3}} \times 16^{\frac{1}{2}}$ **(6 marks)**
   (b) Calculate correct to one decimal place the values of x for which
   $2x^2 - 3x + 6 = 3x + 5$. **(6 marks)**

5. (a) Given that
   $A = \begin{pmatrix} 3 & -4 \\ 2 & 1 \end{pmatrix}$, $B = \begin{pmatrix} \alpha \\ \beta \end{pmatrix}$, $C = \begin{pmatrix} \alpha \\ 5 \end{pmatrix}$
   and that AB = C, calculate the values of α and β.
   (7 marks)

   (b)



   The diagram above shows the design on the sides of a suspension bridge. Assume that AB is parallel to CE and that the altitude DF is v. Given that $D\hat{A}B = 35°$, $D\hat{B}A = 25°$ and AB = 5 metres,
   (i) Derive an expression for AF and BF in terms of v.
   (ii) Hence, determine the altitude between the two parallel alloy ropes.
   (7 marks)

6. The scores obtained by 50 applicants on an aptitude test for selection into a project are shown in the frequency table below.

Score	Frequency	Cumulative frequency
1– 5	3	
6–10	8	
11–15	12	
16–20	15	
21–25	10	
26–30	2	

(a) Copy and complete the cumulative frequency column.

(b) Draw the cumulative frequency curve using 2 cm to represent each class interval and 2 cm to represent 5 applicants.

(c) Using your curve, answer the following:

(i) A score of 18 was considered as a pass. Estimate the number of applicants who passed the Mathematics Test.

(ii) Assuming that there were places for only 10 applicants, estimate the lowest score that would be used to select them.

(iii) What is the probability of selecting at random, from the set of applicants, an applicant whose score x is such that $21 \leqslant x \leqslant 20$? **(12 marks)**

7. Given that

$$f: x \to \frac{3x-2}{x+1}$$

$$g: x \to x+5.$$

(a) Evaluate $f(-4)$ and $gf(-4)$.

(b) Determine $f^{-1}(x)$.

(c) Calculate the value of x, if $f(x) = 15$.

(d) Calculate the value of x, for which

(i) $f(x) = 0$

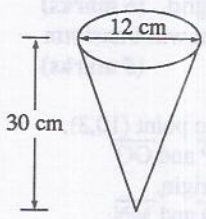
(ii) $f(x)$ is undefined. **(12 marks)**

8. (a) (i) Using ruler and compasses only, construct a triangle ABC in which AB = 9 cm, angle A = 45° and angle B = 60°.

(ii) Construct the perpendicular bisector of BC to meet AB at X.

(iii) Measure and state the length of BC and AX. (5 marks)

(b)



Use $\pi = 3.142$ and volume of a cone, $V = \frac{1}{3}\pi r^2 h$.

Calculate for the cone shown above:

(i) the volume

(ii) the mass in kilograms, if the material from which it was made has a density of 7 g/cm³. **(7 marks)**

SECTION II

Answer TWO questions in this section

RELATIONS AND FUNCTIONS

9. (a) Given that $f(x) = 20x - 9 - 4x^2$

(i) derive $f(x)$ in the form $f(x) = c + (ax + b)^2$, where a, b and c are constants

(ii) determine the value of x at which the maximum value of $f(x)$ occurs

(iii) state the maximum value of $f(x)$. **(6 marks)**

(b) A composite function k is defined as $k(x) = (3x - 2)^2$.

(i) Express $k(x)$ as $gf(x)$, where $f(x)$ and $g(x)$ are two simpler functions.

(ii) Show that $k^{-1}(x) = f^{-1}g^{-1}(x)$. **(9 marks)**

10. A boy has $1300. He wants to buy x Atari Video Game cartridges at $95 each and y Sega Genesis Video Game cartridges at $275 each. He must buy more than two but not more than five Atari Video Game cartridges. He must also buy at least one Sega Genesis Video Game cartridge.

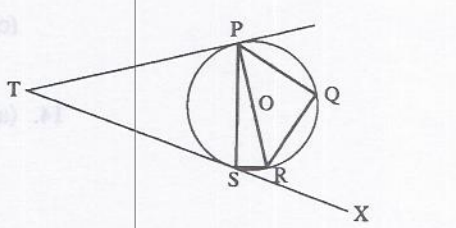
(a) Write THREE inequalities in x and y to represent the above information. **(4 marks)**

(b) Using a scale of 2 cm to represent 1 cartridge on EACH axis, draw the graphs of the inequalities. **(7 marks)**

(c) Determine the maximum amount spent and state the (x, y) value that gives this amount. **(4 marks)**

TRIGONOMETRY AND GEOMETRY

11. (a)

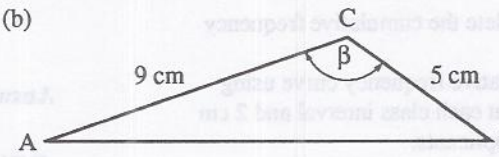


In the figure above, the quadrilateral PQRS is inscribed in the circle, centre O. PR is the diameter. The tangents TP and TS are drawn to the circle from T. Given that angle RSX = 15°, calculate, giving reasons:

(i) angle PQR (ii) angle RPS

(iii) angle SPT (iv) angle PTS. **(7 marks)**

(b)



In triangle ABC, AC = 9 cm, BC = 5 cm and angle ACB = β degrees.

Given that $\cos^2\beta = 0.84$, determine

(i) the exact value of $\sin^2\beta$

(ii) the value of β, if $90° < \beta < 180°$

(iii) the length of AB. **(8 marks)**

12. A place L is on a bearing of 035° from another place K. A boat leaves L to go to K. The engine speed of the boat is 45 kmh^{-1}. A wind is blowing from the East with a speed of 15 kmh^{-1}.

(a) Using a scale of 1 cm to represent 5 kmh^{-1}, find by accurate drawing

(i) the course of the boat

(ii) the resultant speed of the boat. **(12 marks)**

(b) Given that L is 17.3 km away K, and the boat leaves L at 09:15 hrs, calculate the time at which the boat reaches K.

VECTORS AND MATRICES

13. (a) Using a scale of 2 cm to represent 1 unit on EACH axis, draw ΔPQR with vertices P(1,3), Q(4,1) and R(5,2). **(4 marks)**

(b) ΔPQR is transformed by the matrix $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$.

(i) Determine the coordinates of the image ΔP′Q′R′.

(ii) Draw P′Q′R′ on the same grid. **(6 marks)**

(c) Determine the 2 x 2 matrix that will transform ΔP′Q′R′ onto ΔPQR. **(5 marks)**

14. (a) P is the point (8,6) and Q is the point (10,3). M and N are mid-points of $\overrightarrow{OP}$ and $\overrightarrow{OQ}$ respectively, where O is the origin.

(i) Determine the vectors $\overrightarrow{PQ}$ and $\overrightarrow{MN}$.

(ii) State the relationship between PQ and MN. **(8 marks)**

(b) Given the equations:

$$x - y = -7$$
$$5x + 2y = -14$$

(i) write the equations in matrix form

(ii) determine the inverse of the 2 x 2 matrix

(iii) hence, solve the equations. **(7 marks)**

C.X.C. MODEL EXAMINATION 5

MATHEMATICS

Paper 2 – General Proficiency

2 hours 40 minutes

SECTION I

Answer ALL the questions in this section.

1. All working must be clearly shown.

(a) Find the exact value of

$$\frac{3.65(7.73-3.41)}{4.32 \times 5.0}$$

(5 marks)

(b) Write your answer to part (a) as a decimal correct to 1 significant figure. **(2 marks)**

(c) A sum of money was to be shared among three persons A, B and C in the ratio 2 : 3 : 5. C received $420 more than B.
Calculate:
(i) the sum of money shared
(ii) B's share
(iii) the percentage of the total amount that A receives. **(5 marks)**

2. (a) Given that $x = \frac{y-5}{y+2}$, express y in terms of x. **(3 marks)**

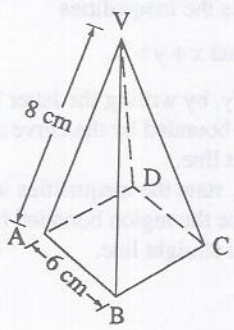
(b) Factorize completely
$-x^2 + y^2 - 5x + 5y$. **(3 marks)**

(c) Solve $\frac{x-6}{3} - \frac{x-27}{9} = 3$. **(4 marks)**

3. (a) Solve $2x^2 - 5x = 7$. **(4 marks)**

(b) Given three sets P, Q and R such that R is a subset of Q and $n(U) = n(P \cup Q \cup R) = 100$, $n(Q \cup R)=75$, $n(Q \cap R) = 41$, $n(P \cap R) = 15$, $n(P) = 44$ and $n(Q') = 25$, draw a Venn diagram to represent the data.
Hence determine $n[(P \cap Q) \cap R']$. **(6 marks)**

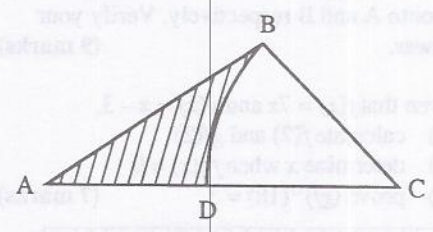
4. (a)



The diagram above shows a square-based pyramid with AB = 6 cm and AV = 8 cm. Calculate:
(i) the total surface area of the square-based pyramid correct to 3 significant figures
(ii) the volume of the square-based pyramid correct to the nearest cm^3. **(5 marks)**

(b) Using ruler and compasses only, construct a triangle ABD such that AB = 10.5 cm, AD = 8.5 cm and angle BAD = 60°. Through D, construct DC parallel to AB. Construct the line CB such that AB and CB are perpendicular. Measure and state the length of BC. **(7 marks)**

5.



In the figure above, B and D are two points on the circumference of a circle with centre C. Given that AB = 5.5 cm, BC = 4 cm and AC = 7 cm, calculate:
(a) the magnitude of angle C
(b) the area of the shaded region bounded by the arc BD and the line segments AB and AD. **(11 marks)**

6. A butcher kept the following record for the number of animals slaughtered during a nine-week period.

Days	No. of animals slaughtered
1– 7	4
8–14	3
15–21	9
22–28	18
29–35	25
36–42	17
43–49	15
50–56	8
57–63	1

(a) Using a scale of 1 cm to represent 5 days on the x-axis and 1 cm to represent 5 animals on the y-axis, draw a cumulative frequency curve on graph paper.

(b) Using your graph, estimate:
(i) the semi-interquartile range for the distribution
(ii) the number of animals slaughtered after the 40th day
(iii) the number of animals slaughtered during the last 20 days. **(12 marks)**

7. (a) The points A(3,0) and B(5,0) are reflected in the mirror line $y = x$. Find the images, A′ and B′ of the pre-images

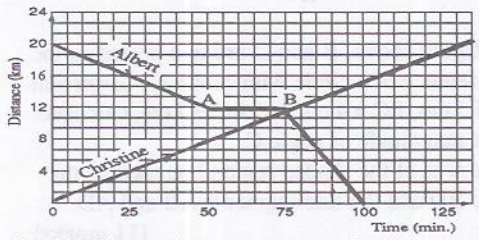
(b) A′ and B′ are then rotated counter-clockwise through an angle of 90° with the origin O as the centre of rotation. Determine the position of the images A″ and B″.

(c) Find the single matrix which represents the reflection followed by the rotation above.

(d) Use this matrix to verify the answers in (b).

(e) Find the single matrix which will map A″ and B″ onto A and B respectively. Verify your answer. **(9 marks)**

8. (a) Given that $f(x) = 7x$ and $g(x) = x - 3$,
(i) calculate $f(2)$ and $gf(2)$
(ii) determine x when $fg(x) = 0$
(iii) prove $(gf)^{-1}(18) = 3$. **(7 marks)**



(b) The figure above represents the distance-time graph of two persons, Albert and Christine, journeying between two towns, P and Q. Albert leaves Town P at the same time that Christine leaves Town Q.
Use the graph to:
(i) determine the distance between the two towns
(ii) find the time Christine spent in travelling between the two towns
(iii) determine how far from Town P Albert and Christine met
(iv) explain the line segment AB on Albert's graph
(v) calculate the ratio of Albert's average speed to Christine's average speed. **(7 marks)**

SECTION II

Answer TWO questions in this section.

RELATIONS AND FUNCTIONS

9. (a) (i) Use the method of completing the square to determine the value of x for which the expression $5x^2 + 5x + 2$ is a minimum.
(ii) Hence deduce the minimum value of $5x^2 + 5x + 2$. **(6 marks)**

(b) A driver starting a car from rest, accelerates uniformly to a speed of 30 kmh^{-1} in 2 minutes. She maintains this speed for another 5 minutes. She then applies the brakes and decelerates uniformly to rest in 1 minute. Draw a velocity–time graph to show the different segments of the journey.
Determine:
(i) the acceleration in kmh^{-2}, during the first two minutes
(ii) the retardation, in kmh^{-2}, during the last two minutes
(iii) the total distance travelled in km
(iv) the average speed for the whole journey in kmh^{-1}. **(9 marks)**

10. (a) Copy and complete the table for $y = \frac{8}{x}$.

x	1	2	3	4	5	6	7	8
y	8.00	4.00				1.33		1

(b) Using a scale of 2 cm to represent 1 unit on BOTH the x and y-axes, draw the graph of the function above for $1 \leqslant x \leqslant 8$.

(c) Using the same axes and scale given above, draw the graph of the function $x + y = 9$ for $0 \leqslant x \leqslant 9$.

(d) (i) Shade on your graph the region which satisfies the inequalities $x \geqslant 0$, $y \geqslant 0$, $y \leqslant \frac{8}{x}$ and $x + y \leqslant 9$.
(ii) Indicate a point K in the region which satisfies the inequalities $y \leqslant \frac{8}{x}$ and $x + y > 9$.
(iii) Identify, by writing the letter L, the region bounded by the curve and the straight line.
(iv) Hence, state the inequalities which describe the region bounded by the curve and the straight line. **(15 marks)**

TRIGONOMETRY

11. (a) Prove that $\frac{1}{\cos^2\theta} - \frac{1}{\sin^2\theta} = \frac{2\sin^2\theta - 1}{\sin^2\theta\cos^2\theta}$. **(2 marks)**

(b) A ship sails 3 nautical miles from Port P on a course 064° to Port Q, then changes course to 285° and sails a further 7 nautical miles to Port R.

(i) Draw a carefully labelled diagram of the entire route taken. Show the north direction where necessary.

(ii) Calculate the distance PR to 3 significant figures.

(iii) Determine the bearing of P from R. **(13 marks)**

12. (a) If $\cos A = \frac{12}{13}$, $\sin B = \frac{8}{17}$ and A and B are acute angles, determine the exact value of $\tan A \tan B$. **(3 marks)**

(b) [Take the radius of the earth to be 6 400 km and π to be 3.142]

(i) The distance between Town P(63°N, 70°E) and Town R(63°N, x°E) is 900 km. If Town R is east of Town P, determine x°E, the longitude of R. Give your answer to 1 decimal place.

(ii) The shortest distance between Town P(63°N, 70°E) and Town Q(y°N, 110°W) is 6 702.9 km. Determine y°N, the latitude of Q. **(12 marks)**

VECTORS AND MATRICES

13. (a) If $A = \begin{pmatrix} 3 & 4 \\ 4 & -3 \end{pmatrix}$,

(i) evaluate the determinant of A

(ii) determine A^{-1}

(iii) using A^{-1}, solve the simultaneous equations:

$$3x + 4y = 2$$
$$4x - 3y = 11$$ **(7 marks)**

(b) T is the transformation represented by $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 0 \\ 3 \end{pmatrix}$.

(i) Perform the transformation T on a square with vertices A(0,0), B(1,0), C(1,1) and D(0,1) and write in coordinate form, the images of A, B, C and D.

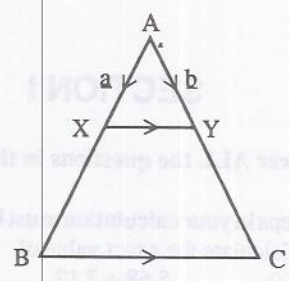
(ii) Describe in words, the single transformation represented by the transformation T. **(8 marks)**

14.(a) (i) T is the matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$.

Determine the elements of T which map A(4,1) onto A′(1,2) and B(6,2) onto B′(2,3).

(ii) Derive the matrix S, such that TS represents the transformation matrix for a reflection in the y-axis. **(10 marks)**

(b)



In the figure above, ΔABC is the image of ΔAXY under an enlargement of scale factor 3 and centre A. Given that $\overrightarrow{AX} = \underline{a}$ and $\overrightarrow{AY} = \underline{b}$, use a vector method to prove that

(i) $\overrightarrow{XY}$ is parallel to $\overrightarrow{BC}$

(ii) $XY = \frac{1}{3}BC$. **(5 marks)**

C.X.C. MODEL EXAMINATION 6

MATHEMATICS

Paper 2 – General Proficiency

2 hours 40 minutes

SECTION I

Answer ALL the questions in this section.

1. **All steps in your calculation must be clearly shown.**
   (a) Calculate the exact value of
   (i) $\dfrac{5.68 + 7.12}{3.2 \times 0.04}$ **(3 marks)**
   (ii) $\dfrac{\frac{5}{6} \times \frac{3}{10}}{\frac{2}{3} \times \frac{3}{4}}$ **(3 marks)**
   (b) (i) Years ago, US $1.00 (one United States dollar) was equivalent to TT$2.25 (two dollars and twenty-five cents, Trinidad and Tobago currency). Calculate the amount in US currency that was equivalent to TT$6 750.
   (ii) Because of devaluations, TT $1.00 is worth 40% of its original value. Calculate the new rate of exchange for US $1.00. Hence, calculate the amount of Trinidad and Tobago currency that would be equivalent to
   — US $2 800
   — US $3 000. **(7 marks)**

2. A survey on a sample of students who read either Karate Illustrated (K) Reader's Digest (R) or National Geographic (N) yielded the following data:
   52 students read K.
   71 students read R.
   45 students read N.
   12 students read only K and R.
   9 students read only R and N.
   17 students read only K and N.
   35 students read R only.
   (a) Use x to represent the number of students who read Karate Illustrated, Reader's Digest and National Geographic. Hence, draw a carefully labelled Venn diagram to represent the data.
   (b) Determine the value of x.
   (c) Calculate the number of students in the sample. **(5 marks)**

3. Solve the following equations for x:
   (a) $5(x+2)^2 = 4(x+3)$ **(5 marks)**
   (b) $125^{3x} = \dfrac{1}{5^{18}}$ **(4 marks)**
   (c) Given that V varies directly as r^3 and that V = 108 when $r = 3$, find V when $r = 5$ **(4 marks)**

4. (a) The points A(2,0), B(4,5), C(–1,0) and D(–3,4) are mapped onto A′(–2,4), B′(–4,13), C′(1,–2) and D′(3,–2) under a transformation T. Determine the matrix which represents the transformation T.
   (b) Find the matrix which represents the transformation that will map A′, B′, C′ and D′ onto A, B, C and D respectively. **(9 marks)**

5. (a) Draw the graph of the function $y = x^2 + 3x - 5$, for $-5 \leqslant x \leqslant 2$, using 1 cm to represent 1 unit on both axes.
   (b) From the graph, determine:
   (i) the equation of the axis of symmetry
   (ii) the minimum or maximum value of the function
   (iii) which members of the range are negative. **(10 marks)**

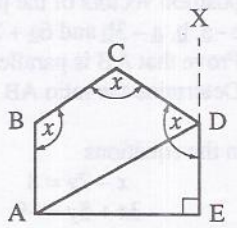
6. (a) Given that $A = \begin{pmatrix} -1 & x \\ y & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$.
   (i) Calculate the matrix product AB.
   (ii) If $C = \begin{pmatrix} a & 10 \\ 6 & b \end{pmatrix}$ and AB = C, calculate the values of a, b, x and y. **(8 marks)**
   (b) The ratio of the prices of two different quality pens is 3 : 7. The total cost for 30 of the cheaper pens and 10 of the more expensive pens is $1 568. Given that p dollars represent the cost of one of the cheaper pens, determine:
   (i) an algebraic expression in p for the cost of ONE of the more expensive pens
   (ii) the value of p
   (iii) the cost of ONE of the more expensive pens. **(6 marks)**

7. In a survey of the wages earned per week by 2 samples of 70 employees, the table below was obtained.

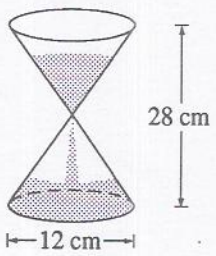
Wages per week in dollars	Sample I No. of employees	Sample II No. of employees
50 – 59	9	2
60 – 69	11	5
70 – 79	16	12
80 – 89	14	14
90 – 99	11	10
100–109	6	15
110–119	3	12

(a) Estimate the mean wages per week of the employees in Sample I. State your answer correct to the nearest cent.
(b) Using a scale of 2 cm to represent \$10 and 2 cm to represent 5 employees draw a frequency polygon to illustrate the wages of the employees in Sample II.
(c) State how you would determine which sample had a more equitable distribution of wages. **(12 marks)**

8.



(a) In the figure above, ABCDE is a pentagon. Angle ABC = angle BCD = angle CDE. Calculate, giving a reason for each answer, the magnitude of angle
(i) ABC (ii) CDX.
(b) Given that AD = 18 cm and angle EAD = 30°, calculate the length of
(i) DE (ii) AE **(7 marks)**
(c) [In this question take $\pi = \frac{22}{7}$ and Volume of cone, $V = \frac{1}{3}\pi r^2 h$].



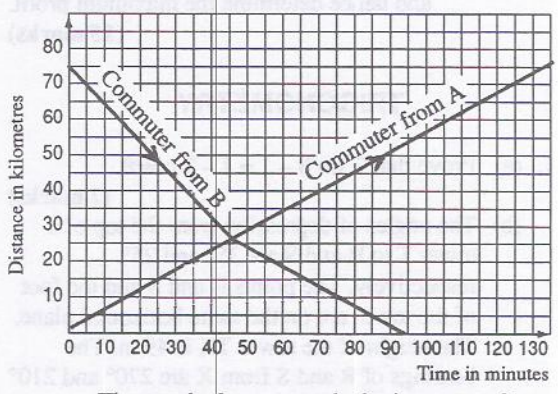
The diagram above represents an hour-glass of altitude 28 cm and base diameter 12 cm. Assume that the hour-glass consists of two congruent cones and one cone is filled with sand two-third its volume.
Calculate:
(i) the volume of sand in the hour-glass
(ii) the rate at which the sand must fall in cm^3/s, so that the time taken for it to enter the bottom cone is one hour. State your answer correct to 2 significant figures. **(7 marks)**

SECTION II

Answer TWO questions in this section.

RELATIONS AND FUNCTIONS

9. (a) Solve the equation $3x^2 + 5x = 7$, giving your answer correct to two decimal places. **(5 marks)**



The graph above records the journeys of two commuters travelling between Towns A and B. The commuters begin their journeys at the same time. Calculate:
(i) the distance between the two towns
(ii) the time the commuter from B takes for the journey
(iii) the average speed of the commuter from B, in metres per second
(iv) the distance from Town B where the commuters met
(v) the average speed, in metres per second, at which the commuter from A would need to travel after he met the commuter from B, in order to complete the journey in the same time as the commuter from B. **(10 marks)**

10. A manufacturer produces two types of bolts - Type R and Type S. There are at least 40 of Type R and at least 15 of Type S.

The manufacturer does not produce more than 80 of Type R or more than 50 of Type S or more than 110 of both Type R and Type S taken together.

(a) Using x to represent the number of Type R bolts produced and y to represent the number of Type S bolts produced, write THREE inequalities (not including $x \geqslant 0$ and $y \geqslant 0$) which represent the above conditions.

(b) Using a scale of 1 cm to represent 5 bolts on EACH axis, draw the graph of the inequalities.
Identify the region which satisfies the inequalities.

(c) The manufacturer makes a profit of \$1.25 on each Type R and \$0.95 on each Type S bolt.
(i) State an expression to represent his total profit.
(ii) Use the graph to determine the values of x and y which give a maximum profit, and hence determine the maximum profit.
(15 marks)

TRIGONOMETRY

11. (a) Prove that $2\sin^2\theta - 1 = 1 - 2\cos^2\theta$.
(2 marks)

(b) The angles of depression from the top of a tower T to R and S are 35° and 25° respectively. The points R and S and the foot of the tower are on the same horizontal plane. The height of the tower TX is 49 m. The bearings of R and S from X are 270° and 210° respectively.
(i) Draw a sketch to represent the information given above.
Hence or otherwise, calculate
(ii) the distance RS to 1 decimal place
(iii) the bearing of S from R. **(13 marks)**

12. In this question take the radius of the earth to be 6 400 km and π to be 3.142.

(a) The coordinates of two places P and Q on the earth's surface are (29°S, 35°W) and (70°N, 35°W) respectively.
Calculate:
(i) the shortest distance from P to Q
(ii) the circumference of the circle of latitude 70°N. **(7 marks)**

(b) Two earth stations X and Y are both situated on latitude 70°N. Station X is situated at (70°N, 5°E) and station Y is situated west of X. The distance between X and Y measured along the latitude 70°N is 2 100 km. Calculate the position of the earth station Y.

VECTORS AND MATRICES

13 (a) The points P, Q and R have position vectors $\begin{pmatrix}-2\\-3\end{pmatrix}$, $\begin{pmatrix}2\\7\end{pmatrix}$ and $\begin{pmatrix}4\\\lambda\end{pmatrix}$ respectively. If P, Q and R are collinear, determine the value of λ.
(6 marks)

(b) The matrix $\begin{pmatrix}4 & 9\\3 & 4\end{pmatrix}$ represents a transformation T.
(i) Determine the coordinates of the image of the point (–1,2) under the transformation T.
(ii) Derive the equation of the line onto which the line $x + \frac{1}{2}y = 0$ is mapped by the transformation T. **(9 marks)**

14. (a) The position vectors of the points A, B, C and D are $-\underline{a}$, $\underline{b}$, $\underline{a} - 3\underline{b}$ and $6\underline{a} + 2\underline{b}$ respectively.
(i) Prove that AB is parallel to CD.
(ii) Determine the ratio AB : CD.
(8 marks)

(b) Given the equations
$$x - 2y = 8$$
$$3x + 5y = -9,$$
(i) write the equations in matrix form
(ii) determine the inverse of the 2 x 2 matrix
(iii) hence, solve the equations.
(7 marks)