Grade 11 Revision Exercise for Year-End Assessment (Set A)

Name: _____   **Class: _____ (   )**

1. Simplify $\dfrac{(x^{10}y^{-2})^3}{x^{20}}$ and express your answer with positive indices.

2. Simplify $\dfrac{2}{3x-2} - \dfrac{3}{5x-6}$.

3. Factorize

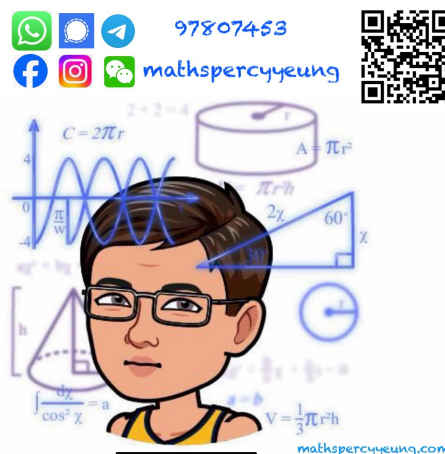   (a) $9x^2 - 1$,

    (b) $6x^2 y + xy - y$,

    (c) $9x^2 - 1 - 6x^2 y - xy + y$.

4. Make n the subject of the formula $\dfrac{2m - 6n + 1}{2n} = 5$.

5. The marked price of a wallet is $720. The wallet is sold at a discount of 25% on its marked price.

    (a) Find the selling price of the wallet.

    (b) If the marked price of the wallet is 20% above its cost, determine whether there will be a gain or a loss after selling the wallet. Explain your answer.

6. The pie chart below shows the distribution of the numbers of coupons owned by the boys in a group.
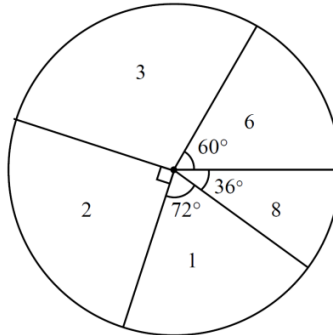
   (a) Write down the mode of the distribution.

   (b) Find the mean of the distribution.

   (c) If a boy is randomly selected from the group, find the probability that the selected boy owns more than 2 coupons.

7. (a) Find the range of values of x which satisfy $\dfrac{x+1}{3} > \dfrac{x-2}{2}$.

   (b) Find the greatest integer which satisfies both $5x-16 < 2x+2$ and $\dfrac{x+1}{3} > \dfrac{x-2}{2}$.

8. In Figure 1, O is the center and AOD is a straight line. It is given that $AB = BC$ and $\angle CBD = 24°$. Find $\angle ADB$.
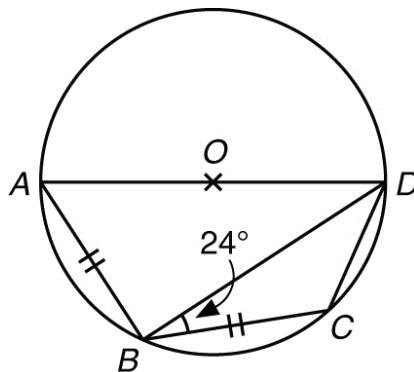
Figure 1

9. $A(4, a)$, $B(1, 8)$ and $C(0, 11)$ are three points on a rectangular coordinate plane. The circle

    $S : x^2 + y^2 - 7x + ey + f = 0$ passes through A, B and C.

    (a) Find the values of a, e and f.

    (b) Determine whether A, B, C and $D(4, 14)$ are concyclic. Explain your answer.

10. It is given that f(x) is the sum of two parts, one part varies inversely as $\sqrt{x}$ and the other part

    is a constant. Suppose that f(4) = 15 and f(25) = 9.

    (a) Find $f(x)$.

    (b) Solve the equation $f(x) = 10$.

11. Let $f(x) = 2x^3 + hx^2 - kx - 2$, where h and k are constants. It is given that $f(x)$ is divisible

    by $2x + 1$, and the corresponding quotient is $Q(x)$.

    (a) Express $Q(x)$ in terms of x and k.

    (b) Francis claims that there are two pairs of integers h and k such that f(x) and $x^2 + 2x - 3$

    have a common linear factor. Do you agree? Explain your answer.

12. A restaurant conducted a survey to find out the customer satisfaction on food. The stem-and-leaf diagram below shows the distribution of the scores given by 20 customers.

Stem (tens)	Leaf (units)
5	1 2 3 3 6 6 7 9 9
6	1 1 2 2 5 5 a
7	b 0 1 2

It is given that the mode of the scores of the restaurant is 65.

(a) Write down the values of a and b.

(b) Find the mean and the standard deviation of the scores of the restaurant.

(c) Two more customers completed the survey. Their scores are $61 + p$ and $61 - p$, where $p > 0$.

(i) Find the mean of the scores of all 22 customers completing the survey.

(ii) Peter claims that if $p > 7$, the standard deviation of the scores is increased. Do you agree? Explain your answer.

13. In Figure 2, a car travels from town A at 50 km/h due east. It takes 2 hours for the car to reach town B. Then, it travels in the direction of 315° to town C. Finally, it travels in the direction of 240° back to town A.
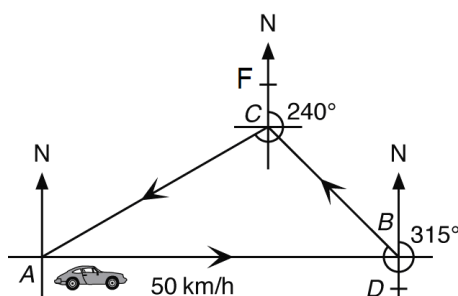

Figure 2

(a) Find the total distance the car travelled from B to A via C.

(b) If the car travels at a constant speed of 50 km/h in the whole journey, how long does the whole journey take?

14. In Figure 3, C is the centre of the circle and $ABCD$ is a straight line. AF and FD are tangents to the circle at E and D respectively.
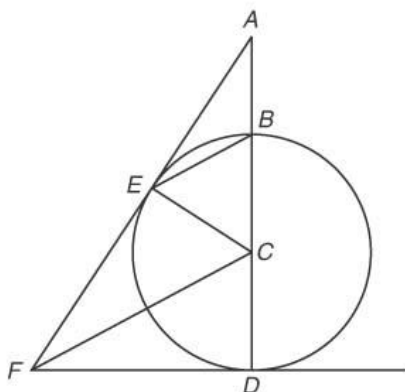

Figure 3

   (a) Let $\angle AFC = x$, show that $\angle AEB = \angle AFC$.

   (b) Show that $\triangle ABE \sim \triangle ACF$.

   (c) If $AB = 4$ cm and $BD = 12$ cm, find EF and AE.

15. A box contains 4 black balls and 6 red balls. 5 balls are randomly drawn from the box at the same time.

   (a) Find the probability that all the 5 balls drawn are red.

   (b) Find the probability that the number of red balls drawn is more than the number of black balls drawn.

16. In a dessert shop, customers can choose toppings from two sets A and B, when ordering a yogurt. There are 8 different kinds of toppings in each set. Henson chooses 5 different kinds of toppings for his yogurt. Find the number of combinations of toppings if

   (a) there are no restrictions,

   (b) he chooses 3 different kinds of toppings from set A,

   (c) he chooses at most 3 different kinds of toppings from each set.

17. In Figure 4, the equations of the four straight lines are $x + y = 17$, $x + y = 24$, $x = 18$ and $y = 15$. The shaded region (including the boundary) represents the solution of a system of inequalities.
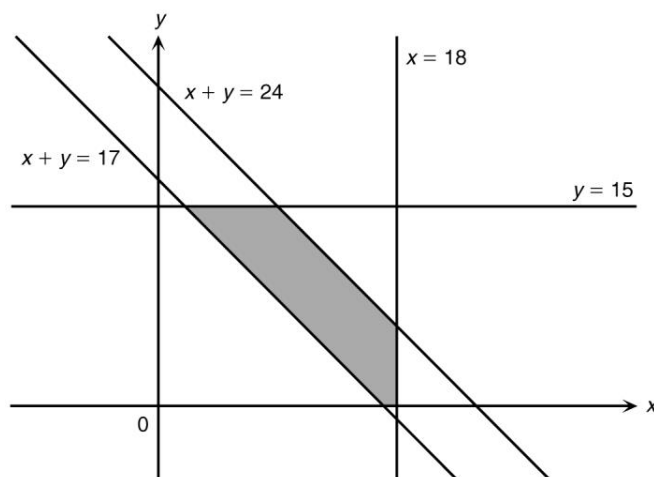

Figure 4

(a) Find the system of inequalities.

(b) A merchant has two warehouses P and Q. Warehouse P stores 24 tonnes of flour and warehouse Q stores 16 tonnes of flour. Two cake shops A and B place orders for 18 tonnes and 15 tonnes of flour respectively. The costs of transporting each tonne of flour from the warehouses to the cake shops are shown in the following table:

From \ To	Cake shop A	Cake shop B
Warehouse P	$50	$30
Warehouse Q	$20	$10

Suppose the merchant transports x tonnes and y tonnes of flour from warehouse P to cake shops A and B respectively.

The merchant claims that the transportation cost can be less than 900. Do you agree? Explain your answer.

18. Figure 5 shows the graph of $y = -x^2 + px + q$ with the point V as its vertex. The graph cuts the x-axis at the points $A(\alpha, 0)$ and $B(\beta, 0)$. $M(2, 0)$ is the mid-point of AB.
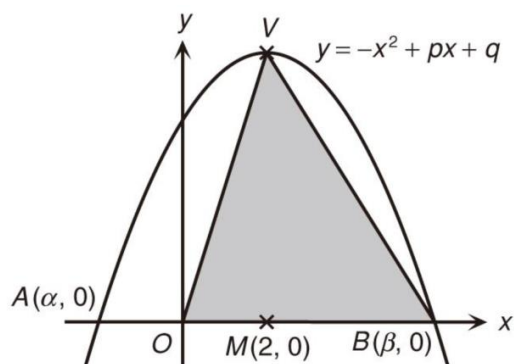

Figure 5

(a) (i) Express $\alpha + \beta$ in terms of p.

(ii) Hence, find the value of p.

(b) Furthermore, it is given that $\alpha^2 + \beta^2 = 40$.

(i) Find the value of q.

(ii) Find the coordinates of V.

(iii) Find the area of $\triangle VOB$.

19. In Figure 6(a), *ABC* is a piece of triangular paper card, where $AB = 29$ cm, $AC = 75$ cm and $BC = 92$ cm. *D* is a point on *BC* such that $AD \perp BC$.
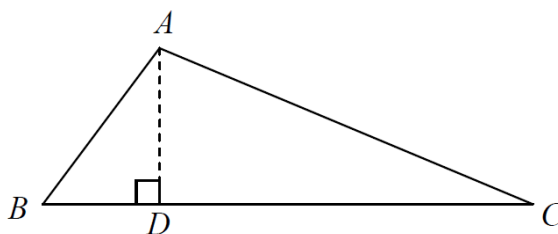

Figure 6(a)

(a) Find the lengths of *AD* and *BD*.

(b) The paper card in Figure 6(a) is then folded along *AD* such that $\triangle ABD$ lies on the horizontal ground as shown in Figure 6(b). It is given that $\angle CAB = 60°$.
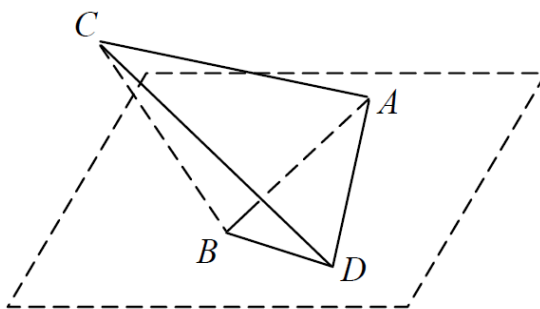

Figure 6(b)

(i) Find the angle between the plane *ABD* and the plane *ACD*.

(ii) Find the volume of the tetrahedron *ABCD*.

MC Questions

1. $\dfrac{(3x^4)^3}{3x^6} =$

    A. $3x$.

    B. $3x^6$.

    C. $9x^6$.

    D. $9x^{58}$.

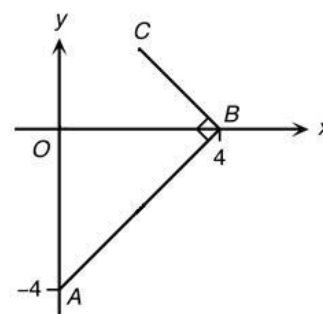2. If $m = \dfrac{2p-q}{5p}$, then $p =$

    A. $\dfrac{q}{2-5m}$.

    B. $\dfrac{q}{5m-2}$.

    C. $\dfrac{mq}{2-5m}$.

    D. $\dfrac{mq}{5m-2}$.

3. $(x-3)(x+5)-(x-9) =$

    A. $(x-2)(x-3)$.

    B. $(x-2)(x+3)$.

    C. $(x+2)(x-3)$.

    D. $(x+2)(x+3)$.

4. If $0° < x < y < 90°$, which of the following must be true?

I. $\tan x < \tan y$

II. $\sin x < \sin y$

III. $\cos y < \cos x$

    A.   I and II only

    B.   I and III only

    C.   II and III only

    D.   I, II and III

5.   If $4x + 3y = 1 = 3x + 2y$, then $x =$

    A. -2.

    B. -1.

    C. 1.

    D. 2.

6.   In the figure, BC is perpendicular to AB. Find the equation of BC.

    A. $4x + y + 1 = 0$

    B. $4x + y - 1 = 0$

    C. $x + y + 4 = 0$

    D. $x + y - 4 = 0$

7. Solve the equation $2ax(2-ax)+ax=2$, where $a \neq 0$.

    A. $x = \dfrac{1}{2a}$ or $\dfrac{2}{a}$

    B. $x = 2a$ or a

    C. $x = \dfrac{1}{2a}$

    D. $x = 0$

8. When $9x^3 + 10x^2 - 5x + 16$ is divided by $x + 2$, the remainder is

    A.   118.

    B.   38.

    C.   –6.

    D.   –26.

9. It is given that y varies directly as $\sqrt{x}$. If x is increased by 125%, then y is

    A.   increased by 25%.

    B.   decreased by 25%.

    C.   increased by 50%.

    D.   decreased by 50%.

10. In the figure, O is the centre of the circle and $OM \perp AB$. It is given that $OM = 3$ cm and $AB = 8$ cm. Find the circumference of the circle.

    A. 10π cm

    B. 20π cm

    C. 25π cm

    D. 100π cm
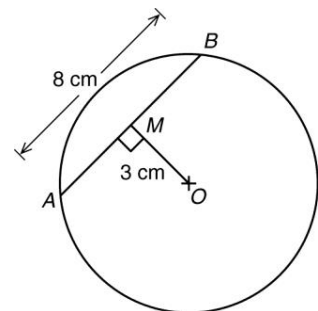
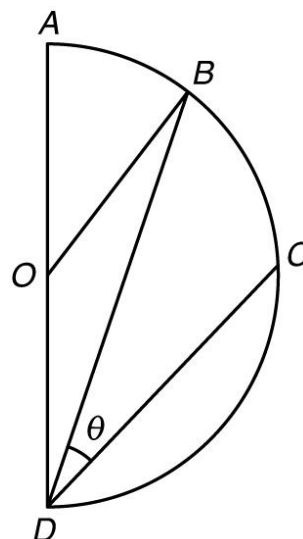11. In the figure, AC is a diameter of the circle. It is given that

$\angle CBE = 66°$. Find $\angle ADE$.

     A.   22°
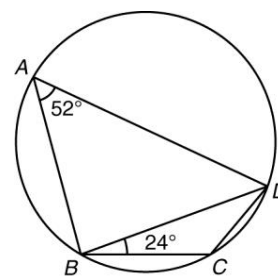
     B.   24°

     C.   33°

     D.   34°
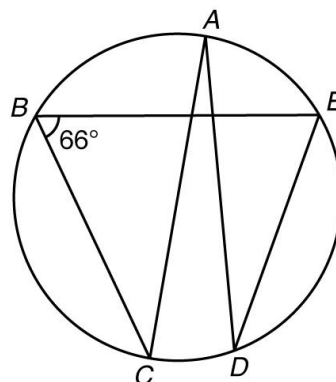
12. In the figure, O is the centre of the semi-circle and $\overarc{AB} : \overarc{BC} = 3:4$.
If $\angle BDC = \theta$, then $\angle AOB =$

     A. $\dfrac{\theta}{2}$.

     B. $\dfrac{3\theta}{4}$.

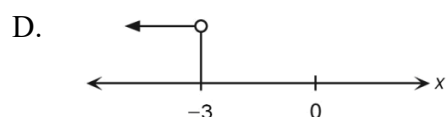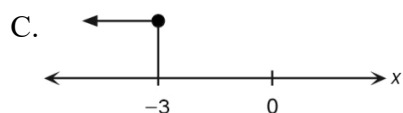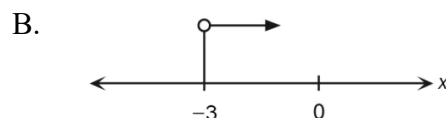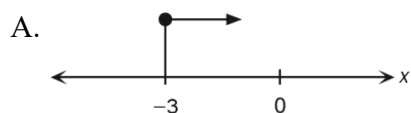   C. $\dfrac{3\theta}{2}$.

     D. $\dfrac{5\theta}{2}$.

13. In the figure, $\overarc{AB} : \overarc{BC} = 3:2$. It is given that $\angle BAD = 52°$ and
$\angle CBD = 24°$. Find $\angle ADB$.

     A.   28°

     B.   36°
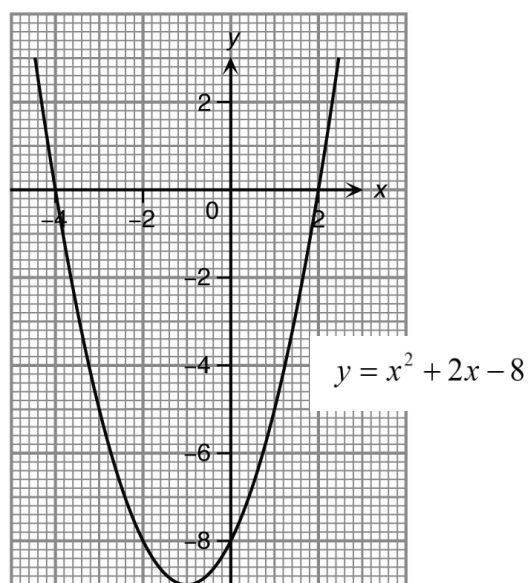
     C.   38°

     D.   42°

14.   Which of the following represents the solutions of '$x + 3 > 0$ and $2x + 10 \geq 0$'?

A.

B.

C.

D.

15.   The figure shows the graph of $y = x^2 + 2x - 8$.

The solutions of $x^2 + 2x - 8 > 0$ are

A. $x > -4$.

B. $x < 2$.

C. $-4 < x < 2$.
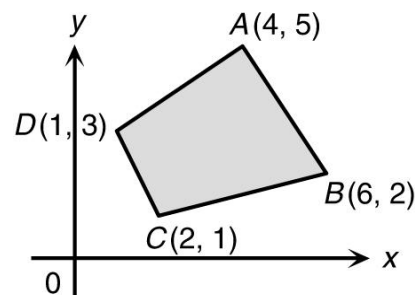
D. $x < -4$ or $x > 2$.

$y = x^2 + 2x - 8$

16.   Consider a square with perimeter y cm. If its area does not exceed 100 cm^2, find the range of values of y.

A. $10 \leq y \leq 40$

B. $0 < y \leq 10$

C. $0 < y \leq 40$

D. $-40 \leq y \leq 40$

17. In the figure, find the minimum and maximum values of $P = 4x + 3y$, where (x, y) is a point in the shaded region.

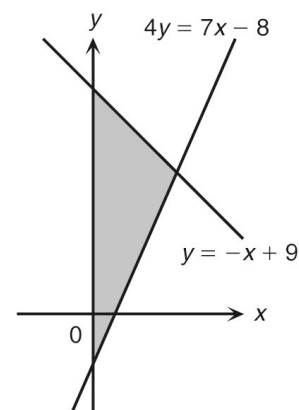|	Minimum	Maximum
A.	13	31
B.	11	31
C.	13	30
D.	11	30

18. If (a, b) is a point in the shaded region, which of the following must be true?
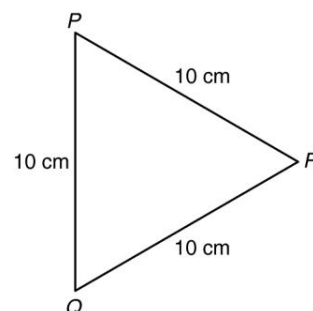   I. $a \geq 0$
    II. $a + b \leq 9$
    III. $7a - 4b > 8$

    A. I and II only

    B. I and III only
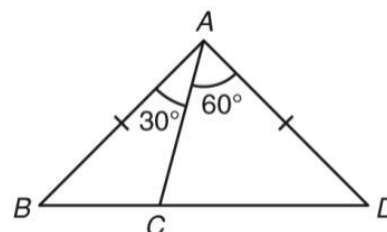
    C. II and III only

    D. I, II and III

19. Find the area of $\triangle PQR$ in the figure, correct to 3 significant figures.

    A. 25.0 cm^2

    B. 30.5 cm^2

    C. 43.3 cm^2

    D. 45.5 cm^2

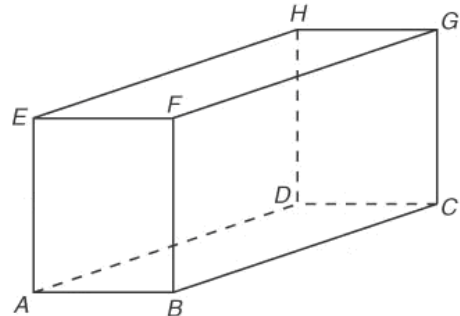20. In the figure, the ratio of the area of $\triangle ABC$ to the area of $\triangle ACD$ is

    A. $1:1$.

    B. $1:2$.

    C. $1:\sqrt{2}$.

    D. $1:\sqrt{3}$.

21.　The figure shows a rectangular block. Which of the following angles must be equal to $\angle DGE$?

I.　　$\angle AFH$

II.　　$\angle GEC$

III.　　$\angle BHD$

　　　A.　　I only

　　　B.　　II only

　　　C.　　I and III only

　　　D.　　II and III only

22.　Find the centre and the radius of the circle $x^2 + y^2 - 2x + 8y + 1 = 0$.

	Centre	Radius
A.	$(-1, 4)$	2
B.	$(1, -4)$	2
C.	$(-1, 4)$	4
D.	$(1, -4)$	4

23.　If the straight line $L: x - y - 1 = 0$ does not intersect the circle $C: x^2 + y^2 - 4x + 4y + k = 0$, find the range of values of k.

　　　A.　　$k > 3$

　　　B.　　$k > \dfrac{7}{2}$
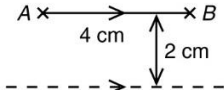
　　　C.　　$k < -3$

　　　D.　　$k < -\dfrac{7}{2}$

24.　If $M(1, 2)$ is the mid-point of a chord of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$, find the equation of the chord.
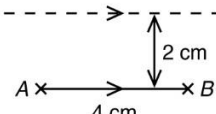
　　　A.　　$x - 2y + 3 = 0$

　　　B.　　$x - 2y + 6 = 0$
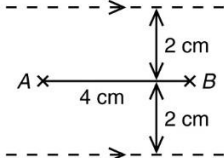
　　　C.　　$x + 2y - 3 = 0$

　　　D.　　$x + 2y - 6 = 0$

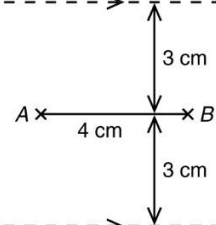25. Consider two fixed points A and B. P is a moving point such that $AP \perp BP$. The locus of P is

    A. a straight line.

    B. a circle with AB as diameter, excluding A and B.

    C. a pair of straight lines parallel to AB.

    D. a parabola.

26. Given a line segment AB of length 4 cm, which of the following dotted lines may represent the locus of a point P such that the area of $\triangle PAB$ is always equal to 4 cm²?

    A.

    B.

    C.

    D.

27. Find the mean and the inter-quartile range of the data set {102, 32, 8, 92, 100, 82, 46, 78, 36}.

	Mean	Inter-quartile range
A.	64	62
B.	64	94
C.	78	62
D.	78	94

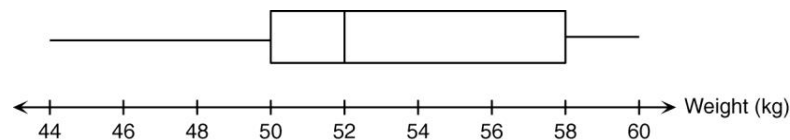28.   The following table shows the distribution of the weights of 40 teenagers.

Weight (kg)	Frequency
44 – 47	5
48 – 51	7
52 – 55	11
56 – 59	10
60 – 63	7

Find the range of the weights of the teenagers.

    A.   20 kg

    B.   19 kg

    C.   17 kg

    D.   16 kg

29.   The following box-and-whisker diagram shows the distribution of the weights of a group of students.

Which of the following is/are true?
I.   The lightest student weighs 44 kg.
II.   The inter-quartile range is 6 kg.
III.   At least 25% students weigh 56 kg or above.

    A.   I only

    B.   II only

    C.   I and III only

    D.   II and III only

30.   How many different 3-letter strings can be formed from the letters of the word 'NUMBER' if no repetition of letters is allowed?

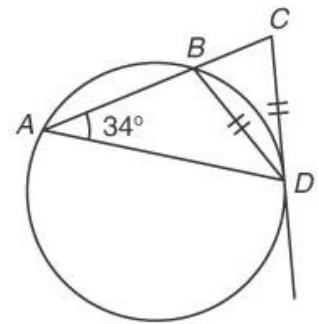   A.   20

    B.   120

    C.   216

    D.   720

Section B

31.   Find the real roots of the equation $x^4 - 3x^2 - 54 = 0$.

        A. $x = -6$ or 9

        B. $x = -3$ or 3

        C. $x = -\sqrt{6}$ or $\sqrt{6}$

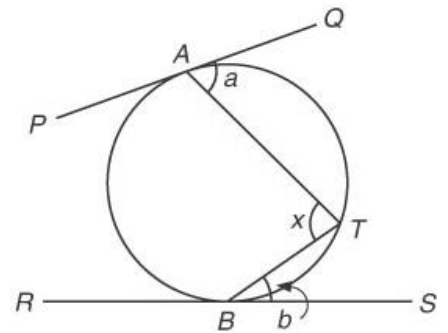   D. $x = -3, -\sqrt{6}, \sqrt{6}$ or 3

32.   In the figure, CD is the tangent to the circle at D. CBA is a
straight line. Find $\angle BDA$.

        A. $36°$

        B. $37°$

        C. $38°$

        D. $39°$

33.   In the figure, PQ and RS are tangents to the circle at A and B respectively. Express x in
terms of a and b.

        A. $a + b$

        B. $180° - a - b$

        C. $\dfrac{a + b}{2}$

        D. $90° - \left(\dfrac{a + b}{2}\right)$

34.   In the figure, find the minimum value of $P = 10x + 6y$,
where (x, y) is a point in the shaded region.

        A.   24

        B.   28

        C.   36

        D.   50
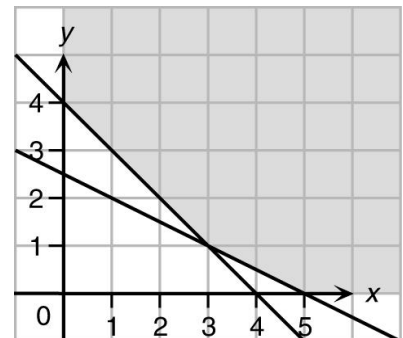
35. Let x and y be the numbers of tables and chairs made respectively. To make a table, it needs 5 units of wood and 20 working days. To make a chair, it needs 2 units of wood and 12 working days. If there are 40 units of wood and 120 working days, write down all the constraints on x and y.

    A. $\begin{cases} 5x + 2y \geq 40 \\ 5x + 3y \geq 30 \\ x \text{ and } y \text{ are non-negative integers.} \end{cases}$

    B. $\begin{cases} 5x + 2y \leq 40 \\ 5x + 3y \geq 30 \\ x \text{ and } y \text{ are non-negative integers.} \end{cases}$

    C. $\begin{cases} 5x + 2y \geq 40 \\ 5x + 3y \leq 30 \\ x \text{ and } y \text{ are non-negative integers.} \end{cases}$

    D. $\begin{cases} 5x + 2y \leq 40 \\ 5x + 3y \leq 30 \\ x \text{ and } y \text{ are non-negative integers.} \end{cases}$

36. The figure shows a window opened through an angle of 30° from position $ABCD$ to $ABFE$. If the dimensions of the window are 40 cm × 60 cm, find $\angle FAC$ correct to the nearest degree.

    A.   17°

    B.   19°

    C.   22°

    D.   24°
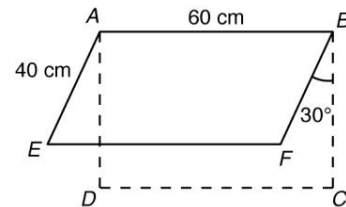
37. In the figure, VB is a building of height 80 m. The points A and C are due west and due south of B respectively. If the angles of elevation of V from A and C are 44° and 42° respectively, find the compass bearing of A from C, correct to the nearest degree.

    A.   S42°E

    B.   N42°W

    C.   S43°E

    D.   N43°W
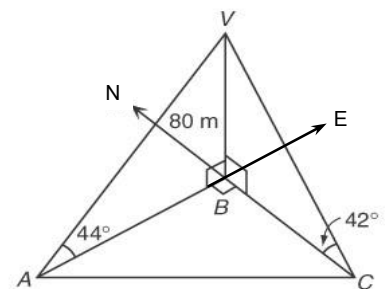
38. Given that moving point $P(x, y)$ is always 3 units from a fixed point $R(2, 5)$, find the equation of the locus of P.

   A. $x^2 + y^2 - 2x - 5y + 20 = 0$

   B. $x^2 + y^2 - 4x - 10y + 20 = 0$

   C. $x^2 + y^2 + 2x + 5y + 20 = 0$

   D. $x^2 + y^2 + 4x + 10y + 20 = 0$

39. Consider two fixed points $A(4, 0)$ and $B(-7, 1)$. If $P(x, y)$ moves such that $AP \perp PB$, find the equation of the locus of P.

   A. $x^2 + y^2 + 3x - y - 28 = 0$

   B. $x^2 + y^2 + x - 3y - 28 = 0$

   C. $x^2 - y^2 + 3x - y + 28 = 0$

   D. $x + 11y - 4 = 0$

40. The mean and the standard deviation of a data set are m and s respectively. If each number is first multiplied by 2 and then increased by 3, what are the mean and the variance of the new data set?

	Mean	Variance
A.	$2m$	$4s + 3$
B.	$2m + 3$	$2s + 3$
C.	$2m + 3$	$4s^2$
D.	$2m + 3$	$4s^2 + 3$

41. 2 cards are selected from 10 cards numbered 1 to 10. In how many ways can the 2 cards be selected such that their sum is even?

   A. 12

   B. 20

   C. 30

   D. 50

42. 6 people are sitting in two rows. The first row has 4 seats and the second row has 3 seats. If 3 of them sit in the first row, find the number of ways of seating.

   A.   980

   B.   1260

   C.   2880

   D.   5040

43. A road safety patrol of 4 members are selected from 10 girls and 8 boys. In how many ways can the patrol be formed if there are at least 2 girls in the patrol?

   A.   1260

   B.   2220

   C.   2340

   D.   2430

44. There are 4 boys and 5 girls in room P, and 7 boys and 5 girls in room Q. A child is selected at random from room P and the selected child enters room Q. Then, a child is selected from room Q at random. What is the probability that the child selected from room Q is a boy?

   A. $\dfrac{67}{117}$

   B. $\dfrac{72}{117}$

   C. $\dfrac{87}{117}$

   D. $\dfrac{92}{117}$

45. 4 legislators and 6 government officials sit in a row at random. Find the probability that no legislators sit next to each other.

   A. $\dfrac{1}{5040}$

   B. $\dfrac{1}{4320}$

   C. $\dfrac{1}{36}$

   D. $\dfrac{1}{6}$