A survey regarding the heights(in cm) of 50 girls of class X of a school was conducted and the following data was obtained. 6

Heights(in cm)	No. of girls
120 - 130	2
130 - 140	8
140 - 150	12
150 - 160	20
160 - 170	8

Find the mean, median and mode of the data.

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Total number of printed pages - 6

M E C - **2017**

MATHEMATICS

Full Marks - 80
Time : Three hours

Attempt all questions

For Question Nos. 1 to 5, write the letter corresponding to the correct answer. The figures in the right hand margin indicate full marks for the questions.

1. The H.C.F. of two numbers is 8. Which one of the following can be their L.C.M. ?
   (A) 24
   (B) 48
   (C) 56
   (D) 60

2. One of the equation of a pair of dependent equations is $-5x + 7y - 2 = 0$. The second equation can be :
   (A) $-10x - 14y - 4 = 0$
   (B) $-10x + 14y - 4 = 0$
   (C) $-10x + 14y + 4 = 0$
   (D) $10x - 14y + 4 = 0$

3. If the sum of n terms of an A.P is $2n^2 + 5n$, then its n^{th} term is :
   (A) $4n - 3$
   (B) $3n - 4$
   (C) $4n + 3$
   (D) $3n + 4$
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Which one of the following do not have the same value ? **1**

(A) sin 30^0 and cos 60^0

(B) cos 45^0 and tan 30^0

(C) tan 30^0 and cot 60^0

(D) sec 0^0 and sin 90^0

The slant height of a right circular cone is 10 m and its height is 8 m. Then, the area of its curved surface is : **1**

(A) 30π m^2

(B) 40π m^2

(C) 60π m^2

(D) 80π m^2

Find the constant remainder when $2x^2 - 3x + 2$ is divided by $x - 1$. **1**

When is an algebraic expression said to have cyclic factors ? **1**

If α, β are the roots of the quadratic equation $x^2 - px + q = 0$, $q \neq 0$, what is $\alpha^2 + \beta^2$ equal to. **1**

Write the arithmetic progression whose first term is a and the common difference is d. **1**

The perimeter of two similar triangles ABC and PQR are respectively 72 cm and 48 cm. If PQ = 20 cm, what is the length of AB ? **1**

28. Contruct a triangle similar to a given Δ ABC, with its sides equal to $\frac{4}{7}$ of the corresponding sides of the Δ ABC. Write the steps of construction.

29. The angle of elevation of the top Q of a vertical tower PQ from a point X on the ground is 60^0. At a point Y, 40 m vertically above X, the angle of elevation is 45^0. Find the height of the tower PQ and the distance XQ.[Take $\sqrt{3}$ = 1.732] **5**

Or,

Two poles of equal heights are standing opposite to each other on either sides of a road, which is 100 metres wide. From a point between them on the road, the angles of elevation of their tops are 30^0 and 60^0. Find the position of the point and also heights of the poles.

30. BC is the arc of a quadrant of a circle of radius 8 cm. A semi-circle is described on the chord BC on the side opposite to the centre of the quadrant. Find the area enclosed between arc BC and the semi-circle.

31. If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, prove that the triangles on each side of the perpendicular are similar to the whole triangle and to each other.

Or,

State and prove SAS Similarity Theorem.

11. In a circle of radius 6.3 cm, an arc AB subtends an angle 90^0 at the centre O of the circle. Find the length of the arc AB.

12. Write the formula for the total surface area of a frustum of a cone.

13. When a fair die is tossed two times, how many outcomes can be there ?

14. Find any four consecutive odd composite numbers less than 300.

15. For what value of k does $(k - 12)x^2 + 2(k - 12)x + 2 = 0$ have equal roots ?

16. Find the 15^{th} term from the last term (towards the first term) of the A.P : 3, 7, 11, ..., 123.

17. Determine whether $\tan^2\theta - \sin^2\theta = \tan^2\theta \sin^2\theta$ is an identity.

18. Find the volume of the largest cone that can be carved out of a cube of side 16.8 cm.

19. Show that one of three consecutive odd integers is a multiple of 3.

20. Factorise $x^2 - 5x + 6$ by using Factor Theorem.

21. Solve graphically :

$3x + 2y = 4$

$6x + 4y = 13$

A circle touches the side BC of a Δ ABC at P and the sides AB and AC produced at Q and R respectively. Prove that AQ = $\frac{1}{2}$ (perimeter of Δ ABC). **3**

In a right Δ ABC, right angled at B, prove that $\sin A = \cos(90^0 - A)$ and $\cos A = \sin(90^0 - A)$. **3**

A bag contains green, yellow and white marbles. The probability of a green marble at random is $\frac{1}{4}$ white the probability of selecting a white marble at random from the bag is $\frac{1}{3}$. If there are 10 yellow marbles in the bag, the total number of marbles in the bag. **3**

Factorise : $x^6(y^4 - z^4) + y^6(z^4 - x^4) + z^6(x^4 - y^4)$ **4**

Or,

Factorise : $a(b - c)^2 + b(c - a)^2 + c(a - b)^2 + 8abc$.

Twenty years ago a father was five times as old as his son and 4 years hence he will be twice as old as his son. Find their present ages. **4**

Determine the ratio in which the line $2x + y - 4 = 0$ divides the line segment joining the points A(2, -2) and B(3, 7). **4**

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