QUESTION PAPER CODE 30/1/3

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Q. NO. 1 to 10 are multiple choice type question of 1 mark each.
Select the correct option.

Q.No. **Marks**

1. The value of k for which the system of equations $x + y - 4 = 0$ and $2x + ky = 3$ has no solution, is

(a) -2 **(b)** $\neq 2$ **(c)** 3 **(d)** 2

Ans: (d) 2 1

2. The HCF and the LCM of 12, 21, 15 respectively are

(a) 3,140 **(b)** 12,420 **(c)** 3,420 **(d)** 420,3

Ans: (c) 3,420 1

3. The value of x for which $2x, (x + 10)$ and $(3x + 2)$ are the three consecutive terms of an AP, is

(a) 6 **(b)** -6 **(c)** 18 **(d)** -18

Ans: (a) 6 1

4. The first term of an AP is p and the common difference is q, then its 10th term is

(a) $q + 9p$ **(b)** $p - 9q$ **(c)** $p + 9q$ **(d)** $2p + 9q$

Ans: (c) $p + 9q$ 1

5. If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is

(a) 10 **(b)** -10 **(c)** -7 **(d)** -2

Ans: (b) -10 1

6. The total number of factors of a prime number is

(a) 1 **(b)** 0 **(c)** 2 **(d)** 3

Ans: (c) 2 1

7. The quadratic polynomial, the sum of whose zeroes is -5 and their product is 6, is

(a) $x^2 + 5x + 6$ **(b)** $x^2 - 5x + 6$ **(c)** $x^2 - 5x - 6$ **(d)** $-x^2 + 5x + 6$

Ans: (a) $x^2 + 5x + 6$ 1

8. The value of p, for which the points A(3, 1), B(5, p) and C(7, –5) are collinear, is

(a) -2 **(b)** 2 **(c)** -1 **(d)** 1

Ans: (a) -2 1

9. The distance between the points $(a \cos\theta + b \sin\theta, 0)$ and $(0, a \sin\theta - b \cos\theta)$, is

(a) $a^2 + b^2$ **(b)** $a^2 - b^2$ **(c)** $\sqrt{a^2+b^2}$ **(d)** $\sqrt{a^2-b^2}$

Ans: (c) $\sqrt{a^2+b^2}$ 1

10. If the point P(k, 0) divides the line segment joining the points A(2, –2) and B(–7, 4) in the ratio 1 : 2, then the value of k is,

(a) 1 **(b)** 2 **(c)** -2 **(d)** -1

Ans: (d) -1 1

In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.

11. Given $\Delta ABC \sim \Delta PQR$, if $\frac{AB}{PQ} = \frac{1}{3}$, then $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} =$ __________.

Ans: $\frac{1}{9}$ 1

12. In Fig. 1, ΔABC is circumscribing a circle, the length of BC is _______cm.

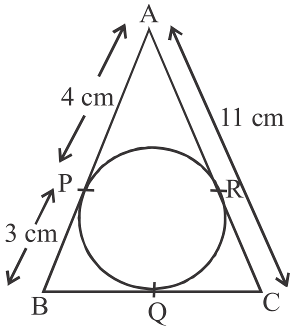


Fig. 1

Ans: 10 1

13. The value of $\left(\sin^2\theta + \frac{1}{1+\tan^2\theta}\right) =$ _________.

Ans: 1 1

OR

The value of $(1 + \tan^2\theta)(1 - \sin\theta)(1 + \sin\theta) =$_______.

Ans: 1 1

14. A ladder 10 m long reaches a window 8 m above the ground. The distance of the foot of the ladder from the base of the wall is _________ m.

Ans: 6 1

15. $\frac{2\cos 67°}{\sin 23°} - \frac{\tan 40°}{\cot 50°} - \cos 0° =$ _____________.

Ans: 0 1

Q. Nos. 16 to 20 are short answer type questions of 1 mark each.

16. If the mean of first n natural number is 15, then find n.

Ans: $\frac{\frac{n(n+1)}{2}}{n} = 15$ 1/2

$\therefore$ n = 29 1/2

17. A die is thrown once. What is the probability of getting a number less than 3?

Ans: P (number less than 3) = $\frac{2}{6}$ or $\frac{1}{3}$ 1

OR

If the probability of winning a game is 0.07, what is the probability of losing it?

Ans: P (losing) = 1 – 0.07 = 0.93 **1**

18. The ratio of the length of a vertical rod and the length of its shadow is $1:\sqrt{3}$. Find the angle of elevation of the sun at that moment?

Ans: $\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30°$ **1/2+1/2**

19. Two cones have their heights in the ratio 1:3 and radii in the ratio 3:1. What is the ratio of their volumes?

Ans: $\frac{r_1}{r_2} = \frac{3}{1}, \frac{h_1}{h_2} = \frac{1}{3}$ **1/2**

$\therefore$ Ratio of volumes = $\frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = 3:1$ **1/2**

20. A pair of dice is thrown once. What is the probabiliy of getting a doublet?

Ans: Number of favourable outcomes are 6

i.e. {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6) **1/2**

$\therefore$ P (doublet) = $\frac{6}{36}$ or $\frac{1}{6}$ **1/2**

SECTION – B

Q. Nos. 21 to 26 carry 2 marks each.

21. In Fig. 2 DE||AC and DC||AP. Prove that $\frac{BE}{EC} = \frac{BC}{CP}$.

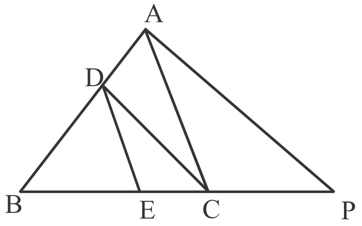


Fig 2

Ans: In ΔABC, DE || AC, $\therefore \frac{BD}{DA} = \frac{BE}{EC}$ ... (i) **1**

In ΔABP, DC || AP, $\therefore \frac{BD}{DA} = \frac{BC}{CP}$ ... (ii) **1/2**

From (i) & (ii), $\frac{BE}{EC} = \frac{BC}{CP}$ **1/2**

OR

In Fig. 3, two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that ∠PTQ = 2∠OPQ.

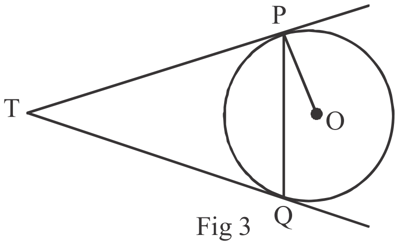


Fig 3

Ans: Let $\angle OPQ = \theta$

$\therefore \angle TPQ = \angle TQP = 90° - \theta$ **1/2**

In ΔTPQ, $2(90° - \theta) + \angle PTQ = 180°$ **1**

$\therefore \angle PTQ = 2\theta$ **1/2**

$= 2\angle OPQ$

22. The rod AC of a TV disc antenna is fixed at right angle to the wall AB and a rod CD is supporting the disc as shown in Fig. 4. If AC = 1.5m long and CD = 3m, find (i) tanθ (ii) secθ + cosecθ.

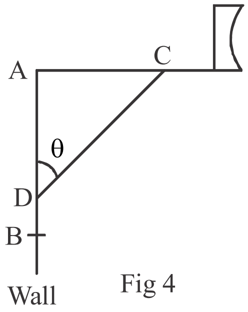


Fig 4

Ans: $\frac{AC}{CD} = \sin\theta \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30°$ **1/2**

(i) $\tan\theta = \tan 30° = \frac{1}{\sqrt{3}}$ **1/2**

(ii) $\sec\theta + \text{cosec}\theta = \sec 30° + \cos ec 30°$ **1**

$= \frac{2}{\sqrt{3}} + 2$ or $\frac{2(3+\sqrt{3})}{3}$

23. If a number x is chosen at random from the numbers –3, –2, –1, 0, 1, 2, 3. What is the probability that $x^2 \le 4$?

Ans: Total number of outcomes = 7

Favourable outcomes are –2, –1, 0, 1, 2, i.e., 5 **1**

$\therefore \quad P(x^2 \le 4) = \frac{5}{7}$ **1**

24. Find the mean of the following distribution:

Class:	3-5	5-7	7-9	9-11	11-13
Frequency:	5	10	10	7	8

Ans: 1½

Classes	x_i	f_i	f_xx_i
3 – 5	4	5	20
5 – 7	6	10	60
7 – 9	8	10	80
9 – 11	10	7	70
11 – 13	12	8	96
Total		40	326

$$\overline{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{326}{40} = 8.15$$ 1/2

OR

Find the mode of the following data:

Class:	0-20	20-40	40-60	60-80	80-100	110-120	120-140
Frequency:	6	8	10	12	6	5	3

Ans: Modal class : 60 – 80 1/2

$$\text{Mode} = \ell + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h = 60 + \frac{12-10}{24-10-6} \times 20$$ 1

= 60 + 5 = 65 1/2

25. The minute hand of a clock is 12 cm long. Find the area of the face of the clock described by the minute hand in 35 minutes.

Ans: Angle swept in 35 min $= \frac{360}{60} \times 35 = 210°$ 1

Area of face of clock $= \frac{22}{7} \times 12 \times 12 \times \frac{210}{360} = 264\,\text{cm}^2$ 1

Accept: Area $= \frac{22}{7} \times (12)^2 \times \frac{35}{60} = 264\,\text{cm}^2$ 1+1

26. The sum of the first 7 terms of an AP is 63 and that of its next 7 terms is 161. Find the AP.

Ans: $S_7 = 63 \Rightarrow \frac{7}{2}(2a + 6d) = 63$

$\therefore$ a + 3d = 9 …(i) 1/2

$S_{14} - S_7 = \frac{14}{2}(2a + 13d) - 63 = 161$

$\Rightarrow$ 2a + 13d = 32 …(ii) 1/2

Solving (i) and (ii), a = 3, d = 2 1/2

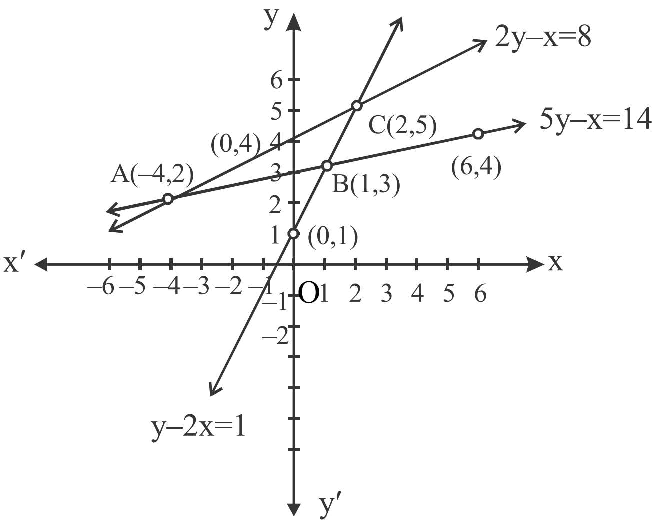
$\therefore$ AP is 3, 5, 7 … 1/2

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. Determine graphically the coordinates of the vertices of a triangle, the equations of whose sides are given by $2y - x = 8$, $5y - x = 14$ and $y - 2x = 1$.

Ans:



$2y - x = 8$

x	0	2	–4
y	4	5	2

$5y - x = 14$

x	1	6	–4
y	3	4	2

$y - 2x = 1$

x	1	2	0
y	3	5	1

Drawing 3 lines $1\frac{1}{2}$

Coordinates of the vertices of the triangle are A(–4, 2),

B(1, 3) and C(2, 5) $1\frac{1}{2}$

OR

If 4 is the zero of the cubic polynomial $x^3 - 3x^2 - 10x + 24$, find its other two zeroes.

Ans: $x - 4$ is a factor of given polynomial.

$$\begin{array}{r|l}
x-4 & \cancel{x^3}-3x^2-10x+24\;(x^2+x-6 \\
 & \cancel{x^3}-4x^2 \\
 & \cancel{-}\quad + \\
\hline
 & \quad\cancel{x^2}-10x+24 \\
 & \quad\cancel{x^2}-4x \\
 & \quad\cancel{-}\quad + \\
\hline
 & \qquad -\cancel{6x}+\cancel{24} \\
 & \qquad -\cancel{6x}+\cancel{24} \\
 & \qquad +\quad \cancel{-} \\
\hline
 & \qquad\qquad 0 \\
\hline
\end{array}$$

2

$x^2 + x - 6 = (x+3)(x-2)$

$\therefore$ Other than zeroes are –3 and 2. 1

28. Find the area of triangle PQR formed by the points P(–5, 7), Q(– 4, –5) and R(4, 5).

Ans: $\text{ar}(PQR) = \frac{1}{2}\left[-5(-5-5) - 4(5-7) + 4(7+5)\right]\text{sq. units}$ **2**

$= \frac{1}{2}[50 + 8 + 48]\text{sq. units}$

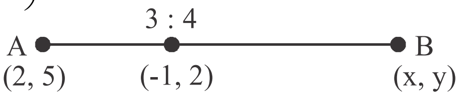
$= 53$ sq. units **1**

OR

If the point C(–1, 2) divides internally the line segment joining A(2, 5) and B(x, y) in the ratio 3 : 4, find the coordinates of B.

Ans: Coordinates of C arc $\left(\frac{3x+8}{7}, \frac{3y+20}{7}\right) = (-1, 2)$ **$1\frac{1}{2}$**

$\Rightarrow x = -5,\ y = -2$ **1**



$\therefore$ Coordinates of B are (–5, –2) **1/2**

29. Find the quadratic polynomial whose zeroes are reciprocal of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$.

Ans: $f(x) = ax^2 + bx + c$

$\alpha + \beta = -\frac{b}{a},\ \alpha\beta = \frac{c}{a}$ **1/2**

New sum of zeroes $= \frac{1}{\alpha} + \frac{1}{\beta} = -\frac{b}{c}$ **1**

New product of zeroes $= \frac{1}{\alpha} \times \frac{1}{\beta} = \frac{a}{c}$ **1**

$\therefore$ Required quardratic polynomial $= x^2 + \frac{b}{c}x + \frac{a}{c}$ or $\left(cx^2 + bx + a\right)$ **1/2**

OR

Divide the polynomial $f(x) = 3x^2 - x^3 - 3x + 5$ by the polynomial $g(x) = x - 1 - x^2$ and verify the division algorithm.

Ans:

$$\begin{array}{r|l|l} -x^2 + x - 1 & -x^3 + 3x^2 - 3x + 5 & x - 2 \\ & -x^3 + x^2 - x & \\ & + \quad - \quad + & \\ \hline & \quad 2x^2 - 2x + 5 & \\ & \quad 2x^2 - 2x + 2 & \\ & \quad - \quad + \quad - & \\ \hline & \quad\quad 3 & \end{array}$$ **2**

Divisor × Quotient + Remainder

$= (-x^2 + x - 1)(x - 2) + 3$

$= -x^3 + 3x^2 - 3x + 5 = \text{Dividend}$ **1**

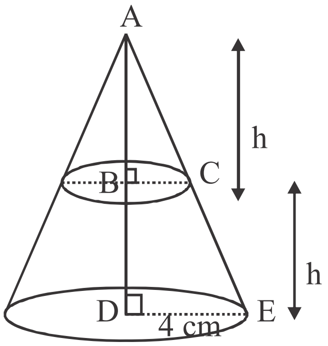
30. In a triangle, if square of one side is equal to the sum of the squares of the other two sides, then prove that the angle opposite to the first side is a right angle.

Ans: For correct given, To prove, construction and figure. $1\frac{1}{2}$

For correct proof. $1\frac{1}{2}$

31. A cone of base radius 4 cm is divided into two parts by drawing a plane through the mid-point of its height and parallel to its base. Compare the volume of the two parts.

Ans: cor. fig 1/2



$\Delta ABC \sim \Delta ADE, \ \frac{h}{2h} = \frac{BC}{4}$

$\therefore$ BC = 2 cm 1

Ratio of volumes of two parts

$$= \frac{\frac{1}{3}\pi \times 2^2 \times h}{\frac{1}{3}\pi \times (2^2 + 4^2 + 2 \times 4) \times h}$$ 1

$= \frac{4}{28} = \frac{1}{7}$ or 1 : 7 (accept 7 : 1 also) 1/2

32. A man can row a boat downstream 20 km in 2 hours and upstream 4 km in 2 hours. Find his speed of rowing in still water. Also find the speed of the stream.

Ans: Let the speed of rowing in still water x km/hr
and speed of stream be y km/hr.

$\frac{20}{x+y} = 2 \Rightarrow x + y = 10$ (i) 1

$\frac{4}{x-y} = 2 \Rightarrow x - y = 2$ (ii) 1/2

Solving (i) & (ii), x = 6, y = 4 1

$\therefore$ Speed of rowing in still water = 6 km/hr
and speed of stream = 4 km/hr $\}$ 1/2

33. In given Fig. 5, two circles touch each other at the point C. Prove that the common tangent to the circles at C, bisects the common tangent at P and Q.

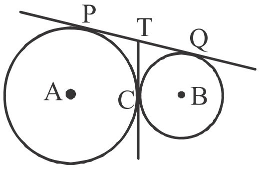


Figure 5

Ans: PT = TC 1

and TQ = TC 1

$\therefore$ PT = TQ

Hence TC bisects PQ 1

34. Prove that : $\dfrac{\cot\theta + \text{cosec }\theta - 1}{\cot\theta - \text{cosec }\theta + 1} = \dfrac{1+\cos\theta}{\sin\theta}$

Ans: $\dfrac{\cot\theta + \text{cosec }\theta - 1}{\cot\theta - \text{cosec }\theta + 1} = \dfrac{(\cot\theta + \text{cosec }\theta) - (\text{cosec}^2\theta - \cot^2\theta)}{\cot\theta - \text{cosec }\theta + 1}$ 1

$= \dfrac{(\text{cosec }\theta + \cot\theta)(1 - \text{cosec}\theta + \cot\theta)}{(\cot\theta - \text{cosec}\theta + 1)}$ 1

$= \text{cosec}\theta + \cot\theta = \dfrac{1+\cos\theta}{\sin\theta}$ 1

SECTION – D

Question numbers 35 to 40 carry 4 marks each.

35. The following table gives production yield per hectare (in quintals) of wheat of 100 farms of a village:

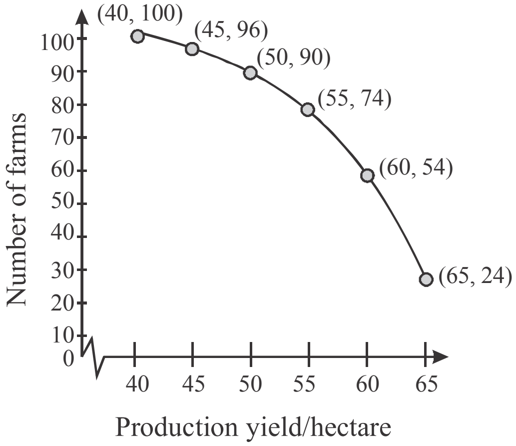
Production yield/hect.	40-45	45-50	50-55	55-60	60-65	65-70
No. of farms	4	6	16	20	30	24

Change the distribution to 'a more than' type distribution and draw its ogive.

Ans:

Production yield/hectare	**No. of forms**
More than or equal to 40	100
More than or equal to 45	96
More than or equal to 50	90
More than or equal to 55	74
More than or equal to 60	54
More than or equal to 65	24
Total	

2



2

OR

The median of the following data is 525. Find the values of x and y, if total frequency is 100:

Class :	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
Frequency:	2	5	x	12	17	20	y	9	7	4

Ans:

Classes	**Frequency**	**Cumulative frequency**
0-100	2	2
100-200	5	7
200-300	x	7 + x
300-400	12	19 + x
400-500	17	36 + x
500-600	20	56 + x
600-700	y	56 + x + y
700-800	9	65 + x+ y
800-900	7	72 + x+ y
900-1000	4	76 + x+ y
Total	100	

→ Median class **2**

$76 + x + y = 100 \Rightarrow x + y = 24 \quad \ldots \text{(i)}$ **1/2**

500 – 600 is the median class

$$\text{Median} = \ell + \frac{\frac{n}{2} - cf}{f} \times h$$

$$\Rightarrow \; 525 = 500 + \frac{50 - 36 - x}{20} \times 100$$

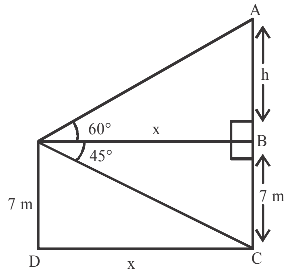
Solving we get, x = 9 **1**

From (i), y = 15 **1/2**

36. A bucket in the form of a frustum of a cone of height 30 cm with radii of its lower and upper ends as 10 cm and 20 cm respectively. Find the capacity of the bucket. Also find the total cost of milk that can completely fill the bucket at the rate of ₹ 40 per litre. $\left(\text{Use } \pi = \frac{22}{7}\right)$

Ans: Capacity of bucket $= \frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$

	$= \frac{1}{3}\times\frac{22}{7}\times 30\left(10^2+20^2+10\times 20\right)cm^3$	1
	$= 22000\ cm^3$	$1\frac{1}{2}$
	$= 22l$	1/2
	Cost of milk = ₹ 40 × 22 = ₹ 880	1
37.	Show that the square of any positive integer cannot be of form (5q + 2) or (5q +3) for any integer q.	
	Ans: Let a be any positive integer. Take b = 5 as the divisor.	
	∴ a = 5m + r , r = 0,1,2,3,4	1
	Case-1 : $a = 5m \Rightarrow a^2 = 25m^2 = 5(5m^2) = 5q$	1/2 for each case = $2\frac{1}{2}$
	Case-2 : $a = 5m+1 \Rightarrow a^2 = 5(5m^2 + 2m) + 1 = 5q + 1$	
	Case-3 : $a = 5m+2 \Rightarrow a^2 = 5(5m^2 + 4m) + 4 = 5q + 4$	
	Case-4 : $a = 5m+3 \Rightarrow a^2 = 5(5m^2 + 6m + 1) + 4 = 5q + 4$	
	Case-5 : $a = 5m+4 \Rightarrow a^2 = 5(5m^2 + 8m + 3) + 1 = 5q + 1$	
	Hence square of any positive integer cannot be of the form (5q + 2) or (5q + 3) for any integer q.	1/2
	OR	
	Prove that one of every three consecutive positive integers is divisible by 3.	
	Ans: Let n be any positive integer. Divide it by 3.	
	∴ n = 3q + r, r = 0,1,2	1
	Case-1 : n = 3q (divisible by 3) n +1 = 3q + 1, n + 2 = 3q + 2	1 for each case = 3
	Case-2 : $n = 3q+1 \Rightarrow n+1 = 3q + 2, n+2 = 3q+3$ (divisible by 3)	
	Case-3 : $n = 3q+2 \Rightarrow n+1 = 3q + 3$ (divisible by 3), $n + 2 = 3q + 4$	
38.	The sum of four consecutive numbers in AP is 32 and the ratio of product of the first and last terms to the product of two middle terms is 7:15. Find the numbers.	
	Ans: Let four consecutive number be a – 3d, a – d, a + d, a + 3d	1/2
	Sum = 32 ∴ $4a = 32 \Rightarrow a = 8$	1/2
	$\frac{(a-3d)(a+3d)}{(a-d)(a+d)} = \frac{7}{15} \Rightarrow 15(64-9d^2) = 7(64-d^2)$	1
	∴ $d^2 = 4 \Rightarrow d = \pm 2$	1
	Four numbers are 2,6,10,14.	1

	OR	
	Solve: 1+ 4 + 7 + 10 +…+ x = 287	
	Ans: $x = a_n = 1 + 3n - 3 = 3n - 2$	**1**
	$S_n = 287 \Rightarrow \frac{n}{2}[1 + 3n - 2] = 287$	**1**
	$\therefore \quad 3n^2 - n - 574 = 0$	**1/2**
	$(n - 14)(3n + 41) = 0 \Rightarrow n = 14$	**1**
	$\therefore \quad x = 3n - 2 = 40$	**1/2**
39.	Draw a ΔABC with BC = 7 cm, $\angle B = 45°$ and $\angle A = 105°$. Then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of ΔABC.	
	Ans: Construction ΔABC with given measurement.	**1**
	Construction of similar triangle	**3**
40.	From the top of a 7 m high building the angle of elevation of the top of a tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower.	
	 	**cor. fig 1**
	Ans: From the figure, $\frac{h}{x} = \tan 60°$	
	$\Rightarrow \quad h = x\sqrt{3} \quad \ldots(i)$	**1**
	and $\frac{7}{x} = \tan 45°$	
	$\Rightarrow \quad x = 7$	**1**
	From (i), $h = 7\sqrt{3}$	
	$\therefore \quad$ Height of tower $= \left(7\sqrt{3} + 7\right)$m or $7\left(\sqrt{3} + 1\right)$m	**1**