IX Homework – 17 (HERON'S FORMULA) MCQs

1) A triangle and a parallelogram have the same base and the same area. If the sides of the triangle are 26cm, 28cm and 30cm and the parallelogram stands on the base 28cm, then height of the parallelogram is:
(a) 8 cm (b) 10 cm (c) 12 cm (d) 14 cm.

2) An isosceles $\Delta$ has perimeter 30cm and each of the equal sides is 12cm. The area of the triangle is
(a) $9\sqrt{15}$ $cm^2$ (b) $11\sqrt{15}$ $cm^2$ (c) $17\sqrt{15}$ $cm^2$ (d) $15\sqrt{15}$ $cm^2$

3) The sides of the triangular plot are in the ratio of 3:5:7 and its perimeter is 300m. The area =
(a) $1100\sqrt{3}$ $m^2$ (b) $1500\sqrt{3}$ $m^2$ (c) $1700\sqrt{3}$ $m^2$ (d) $1800\sqrt{3}$ $m^2$

4) If a, b and c are the sides of the $\Delta$ and S is the semi-perimeter then area of a $\Delta$ by Heron's formula is given by
(a) $\sqrt{(S-a)(S-b)(S-c)}$ (b) $\sqrt{S(S-a)(S-b)(S-c)}$

(c) $\sqrt{(S+a)(S+b)(S+c)}$ (d) $\sqrt{S(S+a)(S+b)(S+c)}$

5) If a, b and c are the sides of a $\Delta$ and S is the semi-perimeter then S is equal to
(a) $\frac{a+b+c}{2}$ (b) $2(a+b+c)$ (c) $2(a-b+c)$ (d) $\frac{a+b-c}{2}$

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6) The area of a $\Delta$, two sides of which are 8cm and 11cm and the perimeter is 32cm =
(a) $7\sqrt{30}$ $cm^2$ (b) $8\sqrt{30}$ $cm^2$ (c) $9\sqrt{30}$ $cm^2$ (d) $11\sqrt{30}$ $cm^2$

7) The area of trapezium whose parallel sides are 11m and 25m long and the non-parallel sides are 15m and 13m long is:
(a) 200 $m^2$ (b) 210 $m^2$ (c) 215 $m^2$ (d) 216 $m^2$

8) The measure of each side of an equilateral $\Delta$ whose area is $\sqrt{3}$ $cm^2$ is:
(a) 1cm (b) 1.5cm (c) 2cm (d) 3cm

9) A piece of land is in the shape of a rhombus whose perimeter is 400m and one of the diagonals is 160m. The area of the land is
(a) 9000 $m^2$ (b) 9500 $m^2$ (c) 9600 $m^2$ (d) 9400 $m^2$

10) The base of an isosceles $\Delta$ measures 24cm and its

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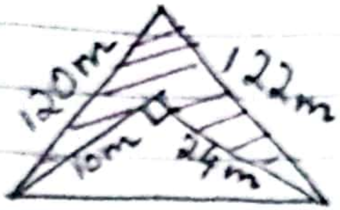
area is $192 cm^2$. The length of one of equal side is:
(a) 20cm (b) 22cm (c) 24cm (d) 28cm.

11) 


Area of the shaded region is
(a) $1400 m^2$ (approx.) (b) $1500 m^2$ (approx.) (c) $1550 m^2$ (approx.) (d) $1440 m^2$ (approx.)

12) Each of the equal sides of an isosceles $\Delta$ is 2cm greater than its height. If the base of the $\Delta$ is 12cm, then its area is:
(a) $18 cm^2$ (b) $20 cm^2$ (c) $30 cm^2$ (d) $48 cm^2$

13) The sides of a $\Delta$ are 17cm, 25cm and 26cm. The length of the altitude to the longest side correct upto two decimal places is: (a) 15.69 (b) 13.59cm (c) 12.23cm (d) 10.59cm

14) If each side of a triangle is doubled, then its area increased by: (a) 100% (b) 200% (c) 300% (d) 350%

15) The semi-perimeter of a $\Delta$ is 132cm and the product of the differences of semi-perimeter and is respective sides (in cm) is 13200. Find the area of $\Delta$.
(a) $1450 cm^2$ (b) $1320 cm^2$ (c) $850 cm^2$ (d) $1500 cm^2$.

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## IX Heron's formula (Answers) — 17

1) Let $a = 26cm$, $b = 28cm$, $c = 30cm$

$$s = \frac{a+b+c}{2} = \frac{26+28+30}{2} = 42cm$$

$$\text{area of } \Delta = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{42(42-26)(42-28)(42-30)}$$

$$= \sqrt{\underset{6\times 7}{42} \times 16 \times \underset{7\times 2}{14} \times \underset{6\times 2}{12}} = 6 \times 7 \times 2 \times 4$$

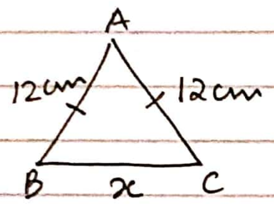
$$= 336 cm^2$$

area of $\Delta$ = area of parallelogram (given)

$\therefore b \times h = 336$

$28 \times h = 336$

$\therefore h = \frac{336}{28} = 12cm$ (c)

2) 


Perimeter $(\Delta ABC) = 30cm$

$12 + 12 + x = 30$

$x = 30 - 24 = 6cm$

Let $a = 12cm$, $b = 12cm$, $c = 6cm$

$$s = \frac{a+b+c}{2} = \frac{12+12+6}{2} = \frac{30}{2} = 15cm$$

$$\text{area}(\Delta ABC) = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{15(15-12)(15-12)(15-6)}$$

$$= \sqrt{15 \times 3 \times 3 \times 9} = 3 \times 3\sqrt{15}$$

$$= 9\sqrt{15} cm^2 \text{ (a)}$$

3) Let the sides be $3x$, $5x$ and $7x$.

Then, perimeter $= 3x + 5x + 7x = 300$

$15x = 300$

$x = 20$

$\therefore$ The sides are $3x = 60cm$

$5x = 100 cm$

and $7x = 140cm$

Let $a = 60cm$, $b = 100cm$, $c = 140cm$

Then $s = \frac{\text{perimeter}}{2} = \frac{300}{2} = 150cm$

$$\text{area} = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{150(150-60)(150-100)(150-140)}$$

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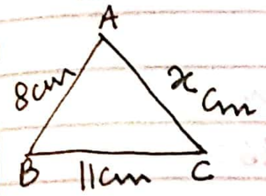
$$= \sqrt{\underset{5\times30}{150} \times \underset{3\times30}{90} \times \underset{5\times10}{50} \times \underset{10}{10}} = 30 \times 5 \times 10\sqrt{3}$$

$$= \underline{1500\sqrt{3}\,m^2}$$

4) $\sqrt{s(s-a)(s-b)(s-c)}$ (b)

5) $\frac{a+b+c}{2}$ (a)

6) 

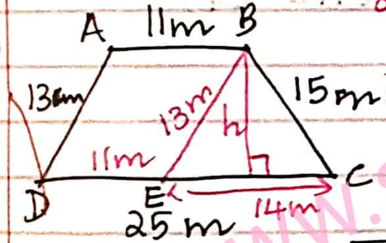

Perimeter $= 8 + 11 + x = 32$

$x = 32 - 19 = 13cm$

Let $a = 8cm,\ b = 11cm,\ c = 13cm$

$s = \frac{\text{Perimeter}}{2} = \frac{32}{2} = 16cm$

$$\text{area}(\triangle ABC) = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{16(16-8)(16-11)(16-13)}$$
$$= \sqrt{16 \times \underset{8\times2}{8} \times 5 \times 3} = 8\sqrt{30}\ cm^2 \text{ (b)}$$

7) 


In $\triangle BEC$, let $a = 13m,\ b = 15m,\ c = 14m$

$s = \frac{a+b+c}{2} = \frac{13+15+14}{2} = \frac{42}{2} = 21m$

$$\text{area}(\triangle BEC) = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{21(21-13)(21-14)(21-15)}$$

$$= \sqrt{\underset{7\times3}{21} \times \underset{2\times4}{8} \times 7 \times \underset{2\times3}{6}} = 7 \times 3 \times 2 \times 2$$
$$= 84m^2$$

Also, area $(\triangle BEC) = \frac{1}{2} \times EC \times h = 84$

$\therefore h = \frac{84 \times 2}{14} = 12m$

Thus, area of trapezium $= \frac{1}{2}(AB + DC) \times h$

$$= \frac{1}{2}(11 + 25) \times 12 = 36 \times 6 = 216m^2 \text{ (d)}$$

8) area of an equilateral $\triangle = \frac{\sqrt{3}a^2}{4} = \sqrt{3}$

$a^2 = \frac{\sqrt{3} \times 4}{\sqrt{3}} = 4$

$a = \sqrt{4} = 2cm$ (c)

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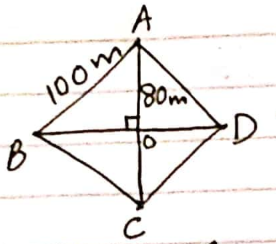
9)




$AB = \frac{400}{4} = 100\,m$

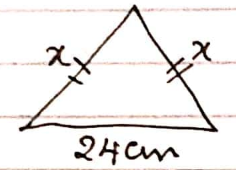
$OA = \frac{AC}{2} = \frac{160}{2} = 80\,m$

Using Pythagoras Theorem, $OB^2 = AB^2 - OA^2 = 100^2 - 80^2$
$= 10000 - 6400$
$= 3600$

$\therefore OB = 60\,m$
$BD = 2OB = 120\,m$

$\therefore$ area of land $= \frac{1}{2} \times d_1 \times d_2 = \frac{1}{\cancel{2}_1} \times \cancel{120}^{60} \times 160$
$= 9600\,m^2$

10)




$S = \frac{x+x+24}{2} = \frac{2x+24}{2} = \frac{2(x+12)}{2} = (x+12)\,cm$

area $= \sqrt{s(s-a)(s-b)(s-c)}$

$\Rightarrow 192 = \sqrt{(x+12)(x+12-x)(x+12-x)(x+12-24)}$

$192 = \sqrt{(x+12) \times 12 \times 12\,(x-12)}$

$192 = 12\sqrt{x^2 - 12^2}$

$192^2 = (x^2 - 12^2) \times 12^2$

$\frac{\cancel{192}^{16} \times \cancel{192}^{16}}{\cancel{12}_1 \times \cancel{12}_1} = x^2 - 144$

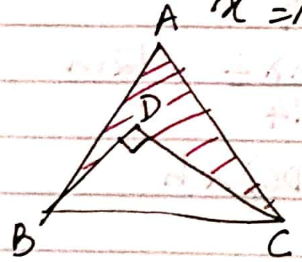
~~$3072 + 144 = x^2$~~
~~$x^2 = 3216$~~
~~$x =$~~

$256 + 144 = x^2$

$x^2 = 400$

$x = \sqrt{400} = 20\,cm$ (a)

11)




$BC^2 = BD^2 + DC^2 = 10^2 + 24^2 = 100 + 576 = 676$

$\therefore BC = \sqrt{676} = 26\,cm$.

area $(\triangle BDC) = \frac{1}{2} \times BD \times DC$
$= \frac{1}{2} \times 10 \times 24 = 120\,m^2$

In $\triangle ABC$, Let $a = 120\,m$,
$b = 122\,m$, $c = 26\,cm$

$S = \frac{a+b+c}{2} = \frac{268}{2} = 134\,m$

area $(\triangle ABC) = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{\underset{2 \times 67}{134} \times \underset{2 \times 7}{14} \times 12 \times \underset{12 \times 9}{108}} = 12 \times 3 \times 2\sqrt{469}$

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$= 72\sqrt{469}$

$= 72 \times 21.65$

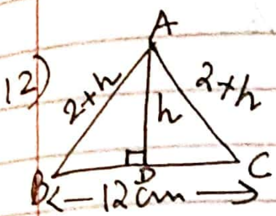
$= 1558.8\ m^2$

$\therefore$ area of Shaded region $=$ area($\triangle ABC$) $-$ area($\triangle BDC$)

$= 1558.8 - 120 = 1438.8\ m^2$

$\approx 1440 m^2$ (approx.)

(d)

12) 

Using Pythagoras Theorem, in $\triangle ABD$

$AB^2 = AD^2 + BD^2$

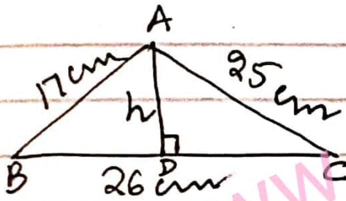
$(2+h)^2 = h^2 + 6^2$

$4 + 4h + \cancel{h^2} = \cancel{h^2} + 36$

$4h = 32$

$h = \frac{32}{4} = 8cm$

$\therefore$ area($\triangle ABC$) $= \frac{1}{2} \times BC \times AD = \frac{1}{2} \times 12 \times 8 = 48 cm^2$ (d)

13) 

Let $a = 17cm$, $b = 25cm$, $c = 26cm$

$s = \frac{a+b+c}{2} = \frac{17+25+26}{2} = \frac{68}{2} = 34cm$

area($\triangle ABC$) $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{34(34-17)(34-25)(34-26)}$

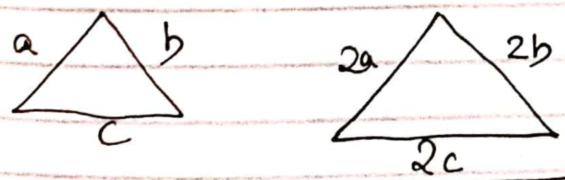
$= \sqrt{\underset{17\times2}{34} \times 17 \times 9 \times \underset{2\times4}{8}} = 17 \times 2 \times 2 \times 3$

$= 204\ cm^2$

area of ($\triangle ABC$) $= \frac{1}{2} \times BC \times AD = 204 cm^2$

$\frac{1}{2} \times h \times 26 = 204$

$\therefore h = \frac{204 \times \cancel{2}\,1}{\cancel{26}\,13} = 15.69\ cm$ (a)

14) 

$s = \frac{a+b+c}{2}$ ; $s' = \frac{2a+2b+2c}{2}$

$= 2\left(\frac{a+b+c}{2}\right) = 2s$

original area $= \sqrt{s(s-a)(s-b)(s-c)} = A$

New area $= \sqrt{s'(s'-2a)(s'-2b)(s'-2c)}$

$= \sqrt{2s(2s-2a)(2s-2b)(2s-2c)}$

$= \sqrt{2s \times 2(s-a) \times 2(s-b) \times 2(s-c)}$

$= \sqrt{16s(s-a)(s-b)(s-c)} = 4A$

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increase % in area = $\frac{\text{New area} - \text{original area}}{\text{original area}} \times 100\%$

$= \frac{4A - A}{A} \times 100\%$

$= \frac{3A}{A} \times 100\% = 300\%$ (c)

15) $S = 132\text{cm}$

$(S-a)(S-b)(S-c) = 13200$

area $= \sqrt{S(S-a)(S-b)(S-c)}$

$= \sqrt{132 \times 13200}$

$= 132 \times 10 = 1320\text{cm}^2$ (b)

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