IES MURILLO

Maths 3rd ESO

EXAM 3_1 (Geometry – Powers)

1. Reduce the powers, using properties: (1.5 points)

a) $\left(\frac{2}{3}\right)^{-3} \cdot \frac{2}{9} \cdot \left(-\frac{2}{3}\right)^{2} =$

b) $\frac{a^{-3} \cdot (ab^2)^3 \cdot (a^2)^4}{a^4 \cdot b^{-4} \cdot (ab)^3} =$

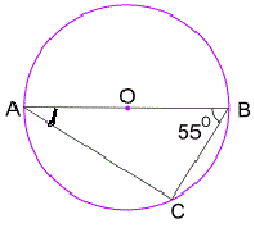
2. Calculate, giving the answer in standard form with 3 s.f. (1.5 points)

a) $(1.86 \cdot 10^{-7}) \div (6.5 \cdot 10^{-12}) =$

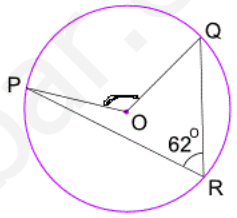
b) $8.63 \cdot 10^{11} - 4.21 \cdot 10^{10} =$

3. Find the measures of the unknown angles. (1.5 points)

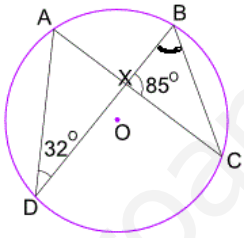
a) $B\hat{A}C =$



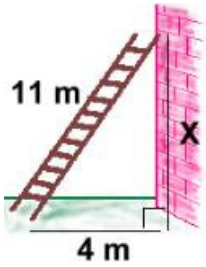
b) $P\hat{O}Q =$



b) $C\hat{B}X =$



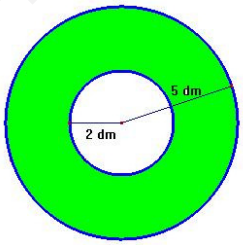
4. How far up a wall will an 11m ladder reach, if the foot of the ladder must be 4m from the base of the wall? (1 point)



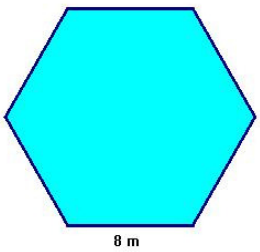
5. Find the area of the shaded regions: (1.5 points)

a)

b)

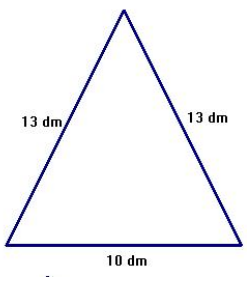


c)

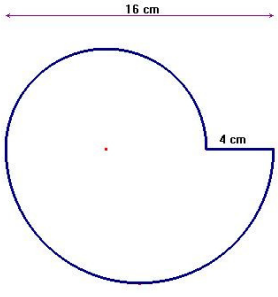


6. Find the perimeter and area of the following shapes: (3 points)

a)



b)



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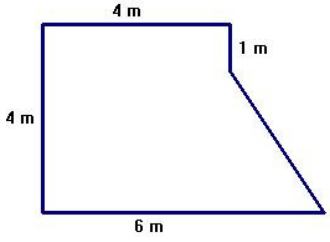


SOLUTION

1. Reduce the powers, using properties:

a) $\left(\frac{2}{3}\right)^{-3}\cdot\frac{2}{9}\cdot\left(-\frac{2}{3}\right)^{2}=\frac{3^3}{2^3}\cdot\frac{2}{3^2}\cdot\frac{2^2}{3^2}=\frac{1}{3}$

b) $\frac{a^{-3}\cdot(ab^2)^3\cdot(a^2)^4}{a^4\cdot b^{-4}\cdot(ab)^3}=\frac{a^{-3}a^3b^6a^8}{a^4b^{-4}a^3b^3}=\frac{a^8b^6}{a^7b^{-1}}=a\,b^7$

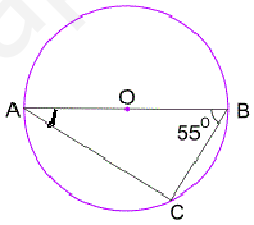
2. Calculate, giving the answer in standard form with 3 s.f.

a) $(1.86\cdot10^{-7})\div(6.5\cdot10^{-12})=(1.86\div6.5)\cdot10^{-7+12}=0.2862\cdot10^5=2.86\cdot10^4$

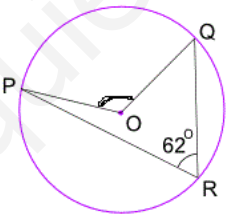
b) $8.63\cdot10^{11}-4.21\cdot10^{10}=8.63\cdot10^{11}-0.421\cdot10^{11}=8.209\cdot10^{11}=8.21\cdot10^{11}$

3. Find the measures of the unknown angles.

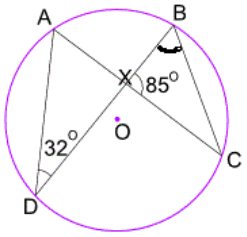
1- $B\hat{A}C=90-55=35^o$



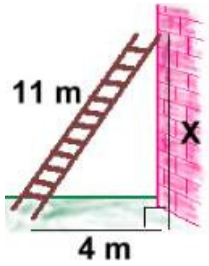
2- $P\hat{O}Q=2\cdot62^o=124^o$



3- $C\hat{B}X=180-32-85=63^o$



4. How far up a wall will an 11m ladder reach, if the foot of the ladder must be 4m from the base of the wall?

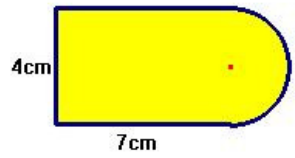


Pythagorean Theorem

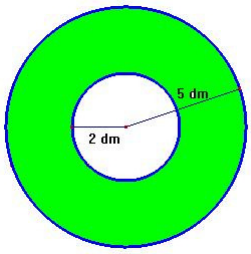
$11^2=x^2+4^2\rightarrow x^2=121-16=105\rightarrow x=\sqrt{105}$ m

5. Find the area of the shaded regions:

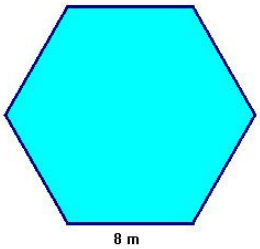
a)



b)



c)



a) $A = A_{rectangle} + \frac{1}{2}A_{circle} = 4 \cdot 7 + \frac{1}{2}\pi \cdot 2^2 = (28 + 2\pi)\text{cm}^2$

b) $A = \pi \cdot R^2 - \pi \cdot r^2 = 25\pi - 4\pi = 21\pi \text{ dm}^2$

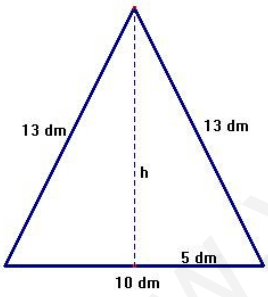
c) $A = \frac{P \cdot a}{2} \rightarrow$ First, we calculate the apothem, using Pythagorean Theorem:

$$8^2 = 4^2 + a^2 \rightarrow a = \sqrt{64 - 16} = \sqrt{48} = 4\sqrt{3} \text{ m}$$

$$A = \frac{P \cdot a}{2} = \frac{48 \cdot 4\sqrt{3}}{2} = 96\sqrt{3} \text{ m}^2$$

6. Find the perimeter and area of the following shapes:

a)



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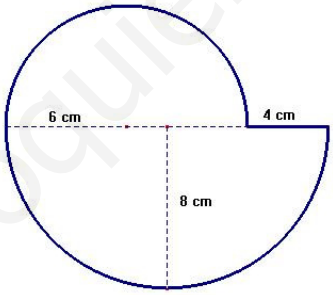
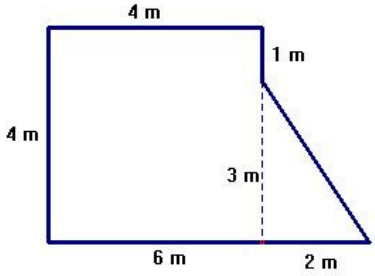


c)



a) Pythagorean Theorem: $13^2 = h^2 + 5^2 \rightarrow h^2 = 169 - 25 = 144 \Rightarrow h = 12$ dm

$A = \frac{10 \cdot 12}{2} = 60 \text{ dm}^2$, Perimeter $= 10 + 13 + 13 = 36$ dm

b) Two semicircles: one small with radius 6 cm and one big with radius 8 cm

$A = \frac{\pi \cdot 8^2}{2} + \frac{\pi \cdot 6^2}{2} = 50\pi \text{ cm}^2$, Perimeter $= \pi \cdot 8 + \pi \cdot 6 + 4 = (14\pi + 4)$ cm

c) A square and a triangle: Pythagorean theorem:

$x^2 = 2^2 + 3^2 \rightarrow x^2 = 4 + 9 = 13 \Rightarrow h = \sqrt{13}$ m;

Perimeter $= 6 + 4 + 4 + 1 + \sqrt{13} = (15 + \sqrt{13})$ m

Area $= 4^2 + \frac{2 \cdot 3}{2} == 19 \text{ m}^2$